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CONNECTICUT
GREEN BANK

October 14, 2016

Dear Connecticut Green Bank Board of Directors:

Welcome back from summer!

We have a regular meeting of the Board of Directors scheduled for Friday, October 21, 2016 from 9:00 to 11:00 a.m. in the Colonel Albert Pope Board Room of the Connecticut Green Bank at 845 Brook Street, Rocky Hill, CT 06067.

On the agenda we have the following items:

- **Consent Agenda** – we have a number of items on the consent agenda for this meeting, including:

    a. Approval of meeting minutes from July 22, 2016;
    b. Approval of Board of Directors and Committee Regular Meetings for 2017;
    c. Job study and economic development metrics – an update of a prior study done by DECD and our predecessor (CCEF) that will improve estimates for job creation resulting from investments in clean energy deployment;
    d. FY 2016 restatements of sector updates – as we typically do, we update the year-end performance after reviewing the numbers during the summer;
    e. FY 2016 investment and public benefit performance – showing that we are approaching $1 billion of capital mobilized in Connecticut's clean energy economy;
    f. Banking resolutions – to allow us to open up bank accounts for various needs, including special purpose vehicles that we create for various products and programs;
    g. Progress to targets for FY 2017 – a memo outlining where we are at in terms of our FY 2017 target.

- **Strategic Discussion** – we have invited The Cadmus Group to present their evaluation findings for the cost-effectiveness of the Residential Solar Investment Program (RSIP). We would like the Board's insights and feedback on things like how these findings support net metering policy as well as the inclusion of distributed energy resources (e.g., energy efficiency, demand response, and storage), renewable thermal technologies (e.g., air source heat pumps, ground source heat pumps, etc.), and electric vehicles, into a new RSIP tranche which would be in partnership with the Connecticut Energy Efficiency Fund and Department of Energy and Environmental Protection.

- **Committee Recommendations and Discussions** – we have several proposals from the Audit, Compliance and Governance Committee, including the draft Comprehensive Annual Financial

Report for FY 2016. We would also like to discuss a commercial financing product that we are working closely on with our utility partners through the Joint Committee.

- **Commercial, Industrial, and Institutional Sector Programs –** we will be bringing forward a C-PACE transaction in Bloomfield, as well as propose a new commercial solar PPA facility in partnership with a private investor. We are going to provide an update on our hydro project in Meriden and ask for a time extension for a prior approved resolution. And we are going to discuss a unique opportunity we are pursuing with a foundation on a program related investment.

- **Executive Session** – we are going to go into executive session for personnel related matters

- **Other Business** – if we have any time left, and there are other business issues that the staff or members of the Board of Directors wants to raise, we will have time for that.

If you have any questions, comments or concerns, please feel free to contact me at any time.

We look forward to seeing you next week.

Sincerely,

Bryan Garcia
President and CEO

AGENDA

Board of Directors of the
Connecticut Green Bank
845 Brook Street
Rocky Hill, CT 06067

Friday, October 21, 2016
9:00-11:00 a.m.

Staff Invited: George Bellas, Craig Connolly, Mackey Dykes, Brian Farnen, Bryan Garcia, Ben Healey, Dale Hedman, Bert Hunter, Kerry O'Neill, and Eric Shrago

1. Call to order

2. Public Comments – 5 minutes

3. Consent Agenda* – 5 minutes

   a. Approval of Meeting Minutes for July 22, 2016*
   b. Regular Board of Directors and Committee Meeting Schedules for 2017*
   c. Navigant Jobs Study and Economic Development Metrics with DECD*
   d. Sector Updates and Progress to Targets for FY 2016 (Restatements)*
   e. Connecticut Green Bank – Investment and Public Benefit Performance from Clean Energy Projects from FY 2012 through FY 2016*
   f. Sector Progress to Targets for Q1 of FY 2017

4. Board of Directors Strategic Discussions – 30 minutes

   a. Cost-Effectiveness Assessment of the Residential Solar Investment Program

5. Board of Director Committee Recommendations and Updates* – 35 minutes

   a. Audit, Compliance, and Governance Committee Recommendations* – 25 minutes

      i. Proposed Draft Comprehensive Annual Financial Report for FY 2016* – 20 minutes
      ii. Proposed Updated Banking Resolutions* - 5 minutes

   b. Joint Committee of the Connecticut Green Bank and the Energy Conservation and Load Management Fund – 10 minutes

      i. Partnership on the Small Business Energy Advantage Program – 10 minutes

6. Staff Transaction Recommendations* – 40 minutes

a. Commercial, Industrial, and Institutional Sector Program Transaction Recommendations* – 40 minutes

i. C-PACE Transaction (Bloomfield)* – 5 minutes
ii. Commercial Solar PPA Partnership* – 15 minutes
iii. New England Hydropower Project (Meriden)* – 5 minutes
iv. Kresge Foundation PRI and Storage – 15 minutes

7. Executive Session – 5 minutes

8. Other Business – 5 minutes

9. Adjourn

*Denotes item requiring Board action

Join the meeting online at https://global.gotomeeting.com/join/880854925

Or call in using your telephone:
Dial (872) 240-3311
Access Code: 880-854-925

Next Regular Meeting: Friday, December 16, 2016 from 9:00-11:00 a.m.
Connecticut Green Bank, 845 Brook Street, Rocky Hill, CT

RESOLUTIONS

Board of Directors of the
Connecticut Green Bank
845 Brook Street
Rocky Hill, CT 06067

Friday, October 21, 2016
9:00-11:00 a.m.

Staff Invited: George Bellas, Craig Connolly, Mackey Dykes, Brian Farnen, Bryan Garcia, Ben Healey, Dale Hedman, Bert Hunter, Kerry O'Neill, and Eric Shrago

1. Call to order

2. Public Comments – 5 minutes

3. Consent Agenda* – 5 minutes

   a. Approval of Meeting Minutes for July 22, 2016*

   Resolution #1

   Motion to approve the minutes of the Board of Directors Meeting for July 22, 2016

   b. Regular Board of Directors and Committee Meeting Schedules for 2017*

   Resolution #2

   Motion to approve the Regular Board of Directors and Committee Meeting Schedules for 2017

   c. Navigant Jobs Study and Economic Development Metrics with DECD*

   Resolution #3

   WHEREAS, the Connecticut Green Bank and the Department of Economic and Community Development working with Navigant Consulting updated a prior study estimating clean energy jobs in Connecticut created from clean energy deployment.

   WHEREAS, the Department of Economic and Community Development has demonstrated support for the job creation estimation methodology; and

   WHEREAS, the Audit, Compliance, and Governance Committee at a meeting on

October 21, 2016, reviewed and now recommend that the Board of Directors approve the proposed Connecticut Green Bank and Connecticut Department of Economic and Community Development Evaluation Framework – Societal Perspective – Economic Development documentation;

NOW, therefore be it:

RESOLVED, that the Board approves the proposed Connecticut Green Bank and Connecticut Department of Economic and Community Development Evaluation Framework – Societal Perspective – Economic Development documentation to be used for reporting, communication, and other purposes as deemed necessary.

d. Sector Updates and Progress to Targets for FY 2016 (Restatements)*

Resolution #4

WHEREAS, in July of 2011, the Connecticut General Assembly passed Public Act 11-80 (the Act), "AN ACT CONCERNING THE ESTABLISHMENT OF THE DEPARTMENT OF ENERGY AND ENVIRONMENTAL PROTECTION AND PLANNING FOR CONNECTICUT'S ENERGY FUTURE," which created the Connecticut Green Bank (the "Green Bank") to develop programs to finance and otherwise support clean energy investment per the definition of clean energy in Connecticut General Statutes Section 16-245n(a);

WHEREAS, the Act directs the Green Bank to develop a comprehensive plan to foster the growth, development and commercialization of clean energy sources, related enterprises and stimulate demand clean energy and deployment of clean energy sources that serve end use customers in this state;

WHEREAS, on June 20, 2014, the Board of Directors of the Green Bank (the "Board") approved a Comprehensive Plan for FY 2015 and FY 2016, including an annual budget and targets for FY 2016.

NOW, therefore be it:

RESOLVED, that Board has reviewed and approved the Revised Program Performance towards Targets for FY 2016 memos dated October 21, 2016, which provide an overview of the performance of the Statutory and Infrastructure, Residential, and Commercial and Industrial with respect to their FY 2016 targets.

e. Connecticut Green Bank – Investment and Public Benefit Performance from Clean Energy Projects from FY 2012 through FY 2016*

Resolution #5

WHEREAS, in July of 2011, the Connecticut General Assembly passed Public Act 11-80 (the Act), "AN ACT CONCERNING THE ESTABLISHMENT OF THE DEPARTMENT OF ENERGY AND ENVIRONMENTAL PROTECTION AND PLANNING FOR CONNECTICUT'S ENERGY FUTURE," which created the Connecticut Green Bank (the "Green Bank") to develop programs to finance and otherwise support clean energy investment per the definition of clean energy in Connecticut General Statutes Section 16-245n(a);

WHEREAS, the Act directs the Green Bank to develop a comprehensive plan to foster the growth, development and commercialization of clean energy sources, related enterprises and stimulate demand clean energy and deployment of clean energy sources that serve end use customers in this state;

WHEREAS, on June 20, 2014, the Board of Directors of the Green Bank (the "Board") approved a Comprehensive Plan for FY 2015 and FY 2016, including an annual budget and targets for FY 2016.

NOW, therefore be it:

RESOLVED, that Board has reviewed and approved the Investment and Public Benefit Performance from Clean Energy Projects from FY 2012 through FY 2016 memo dated October 21, 2016, which provides an overview of the economic development and environmental protection benefits resulting from the investments by the Green Bank.

f. Sector Progress to Targets for Q1 of FY 2017

4. Board of Directors Strategic Discussions – 30 minutes

   a. Cost-Effectiveness Assessment of the Residential Solar Investment Program

5. Board of Director Committee Recommendations and Updates* – 35 minutes

   a. Audit, Compliance, and Governance Committee Recommendations* – 20 minutes

      i. Proposed Draft Comprehensive Annual Financial Report for FY 2016* – 20 minutes

Resolution #6

WHEREAS, Article V, Section 5.3.1(ii) of the Connecticut Green Bank ("Green Bank") Operating Procedures requires the Audit, Compliance, and the Governance Committee (the "Committee") to meet with the auditors to review the annual audit and formulation of an appropriate report and recommendations to the Board of Directors of the Green Bank (the "Board") with respect to the approval of the audit report;

WHEREAS, the Committee recommended to the Board for approval the 2016 Comprehensive Annual Financial Report which includes the Financial Statements ~~and the Federal Single Audit Report~~ of the Connecticut Green Bank for the Fiscal Year Ending June 30, 2016.

NOW, therefore be it:

RESOLVED, that the Board approves the 2016 Comprehensive Annual Financial Report which includes the Financial Statements ~~and the Federal Single Audit Report~~ of the Connecticut Green Bank for the Fiscal Year Ending June 30, 2016 contingent upon no further adjustments to the financial statements or additional required disclosures which would materially change the financial position of the Green Bank as presented.

ii. Updated Banking Resolutions

RESOLVED: that if any FDIC insured bank requires a particular form of resolution of the Connecticut Green Bank ("Green Bank") Board of Directors for opening a bank account or for other bank account matters, the President and CEO of the Green Bank is hereby authorized to approve the form of such resolutions after review and approval by the General Counsel of the Green Bank,

RESOLVED, that upon such approval, each resolution is hereby adopted and the Secretary or Assistant Secretary as applicable is hereby authorized to certify the adoption of all such resolutions.

RESOLVED, that the Board of Directors authorizes the President and CEO to open such bank accounts as are necessary or desirable in the ordinary course of business for the Green Bank and any affiliates it controls that are in existence as of the date of this resolution or to be created by the Board of Directors including but not limited to:

- CEFIA Holdings LLC
- CT Solar Loan I LLC
- CEFIA Services Inc.
- CT Solar Lease 2 LLC
- CGB Meriden Hydro LLC

RESOLVED, that the Board of Directors authorizes the following Green Bank employee positions to draw checks and initiate and release wire or ACH transfers from such accounts in accordance with the established signatory authority as stated in the Green Bank internal control procedures manual:

- President and CEO
- Vice President Finance and Administration
- Executive Vice President and Chief Investment Officer
- Vice President, Commercial and Industrial Programs
- Managing Director, Statutory and Infrastructure Programs
- Director of Operations

RESOLVED, that the Board of Directors affirms that as of the date of this resolution these positions are occupied by the following individuals:

- President and CEO - Bryan Garcia
- Vice President Finance and Administration - George Bellas
- Executive Vice President and Chief Investment Officer – Roberto Hunter
- Vice President, Commercial and Industrial Programs – Michael Dykes
- Managing Director, Statutory and Infrastructure Programs – Dale Hedman
- Director of Operations – Eric Shrago
- Secretary – Matthew Ranelli

b. Joint Committee of the Connecticut Green Bank and the Energy Conservation and Load Management Fund – 15 minutes

   i. Partnership on the Small Business Energy Advantage Program – 10 minutes

6. Staff Transaction Recommendations* – 35 minutes

a. Commercial, Industrial, and Institutional Sector Program Transaction Recommendations* – 40 minutes

   i. C-PACE Transaction (Bloomfield)* – 5 minutes

Resolution #7

WHEREAS, pursuant to Section 16a-40g of the Connecticut General Statutes, as amended, (the “Act”), the Connecticut Green Bank (the “Green Bank”) is directed to, amongst other things, establish a commercial sustainable energy program for Connecticut, known as Commercial Property Assessed Clean Energy (“C-PACE”);

WHEREAS, the Green Bank Board of Directors (the “Board”) has approved a $40,000,000 C-PACE construction and term loan program;

WHEREAS, the Green Bank seeks to provide a $1,440,300 construction and (potentially) term loan under the C-PACE program to a special purpose entity substantially controlled by the MSL Group, Inc. that will install, own, and operate a solar PV system, as well as install other energy efficiency measures, for the First Baptist Church of Hartford, the building owner of 900 Asylum Ave, Bloomfield, Connecticut (the "Loan"), to finance the construction of specified clean energy measures in line with the State’s Comprehensive Energy Strategy and the Green Bank’s Strategic Plan; and

NOW, therefore be it:

RESOLVED, that the President of the Green Bank and any duly authorized officer of the Green Bank is authorized to execute and deliver the Loan in an amount not to be greater than one hundred ten percent of the Loan amount with terms and conditions consistent with the memorandum submitted to the Board of Directors dated October 14, 2016, and as he or she shall deem to be in the interests of the Green Bank and the ratepayers no later than 120 days from the date of this authorization;

RESOLVED, that before executing the Loan, the President of the Green Bank and any other duly authorized officer of the Green Bank shall receive confirmation that the C-PACE transaction meets the statutory obligations of the Act, including but not limited to the savings to investment ratio and lender consent requirements; and

RESOLVED, that the proper the Green Bank officers are authorized and empowered to do all other acts and execute and deliver all other documents and instruments as they shall deem necessary and desirable to effect the above-mentioned legal instruments.

ii. Commercial Solar PPA Partnership* – 15 minutes

Resolution #8

WHEREAS, in response to continued demand for commercial-scale solar PV project financing in Connecticut and capital constraints limiting new projects under the CT Solar Lease 2 ("SL2") program, Green Bank proposed a new private capital partnership ("SL3") to provide project financing and the structural mechanism for repayment of capital providers via cash payments from commercial-scale property owners in exchange for the benefits derived from SL3-owned solar PV assets;

WHEREAS, Green Bank issued a competitive Request for Proposals ("RFP") to source private capital to fund SL3;

WHEREAS, Onyx Renewables Partners, L.P. ("Onyx") responded to the RFP with a proposal to undertake commercial-scale solar PV projects in Connecticut using a capitalized fund structure that was down-selected through the Green Bank's RFP selection and award process;

WHEREAS, Onyx's proposed fund structure for capitalizing SL3 will likely require Green Bank subordinated debt to meet Onyx's portfolio return criteria; and

WHEREAS, Onyx's proposed fund structure has constraints on the types of projects it may accept, and such constraints may require Green Bank to find alternative means of developing and financing certain commercial-scale solar PV projects that fall outside of the anticipated SL3 structure.

NOW, therefore be it:

RESOLVED, that the Board of Directors approves funding for the continued development of commercial-scale solar PV projects in an amount not to exceed $15.0 million, to be utilized for the following purposes:

a.) Working capital during project construction;
b.) Term financing, including the ability to subordinate Green Bank's position; and
c.) Credit enhancements as required on a case-by-case basis.

RESOLVED, that the President of Green Bank; and any other duly authorized officer of Green Bank, is authorized to execute and deliver, any contract or other legal instrument necessary to effect the SL3 program on such terms and conditions as are materially consistent with the memorandum submitted to the Green Bank Board on October 14, 2016; and

RESOLVED, that the proper Green Bank officers are authorized and empowered to do all other acts and execute and deliver all other documents as they shall deem necessary and desirable to effect the above-mentioned legal instrument.

iii. New England Hydropower Project (Meriden)* – 5 minutes

Resolution #9

WHEREAS, pursuant to the development of a small hydroelectric facility at the Hanover Pond Dam on the Quinnipiac River in Meriden ("Project"), at its February 26, April 22, July 6 and July 22, 2016 meetings, the Green Bank Board of Directors (the "Board") previously authorized:

i) a guaranty to a third party lender for construction financing in an amount not to exceed $3.9 million,
ii) funding from the Green Bank's balance sheet in an amount not to exceed $1,400,000,
iii) a working capital guaranty in an amount not to exceed $600,000 for the benefit of New England Hydropower Company ("NEHC"), the project developer, with a 24-month repayment schedule under the Green Bank's existing working capital facility partnership with Webster Bank;
iv) term financing based on the following prerequisites:
    a. issuing New Clean Renewable Energy Bonds ("CREBs") in an amount not to exceed $3,100,000 within 270 days from the date of authorization by the Board of Directors on February 26, 2016; and,
    b. securing the issuance utilizing the Special Capital Reserve Fund ("SCRF") subject to further Board, Office of the Treasurer, and Office of Policy and Management approval; and
    c. the creation of a Special Purpose Entity that will be wholly owned by the Green Bank, to own, operate and manage the Project, as required by CREBs regulations.

WHEREAS, Green Bank staff recommends that the Board authorize a 135-day extension from the original date of authorization by the Board of Directors for the issuance of the CREBs,

NOW, therefore be it:

RESOLVED, that the President of the Green Bank and any other duly authorized officer is authorized to proceed with the prerequisites for the issuance of CREBs no later than 405 days from the authorization by the Board of Directors on February 26, 2016, provided that staff will submit for Board approval all relevant documentation (including but not limited to an indenture of trust) required for the actual issuance of bonds;

RESOLVED, that the proper Green Bank officers are authorized and empowered to do all other acts and execute and deliver all other documents and instruments as they shall deem necessary and desirable to effect the above-mentioned legal instruments.

iv. Kresge Foundation PRI and Storage – 15 minutes

7. Executive Session* – 5 minutes

8. Other Business – 5 minutes

9. Adjourn

*Denotes item requiring Board action

Join the meeting online at https://global.gotomeeting.com/join/880854925

Or call in using your telephone:
Dial (872) 240-3311
Access Code: 880-854-925

Next Regular Meeting: Friday, December 16, 2016 from 9:00-11:00 a.m.
Connecticut Green Bank, 845 Brook Street, Rocky Hill, CT

Board of Directors Meeting

October 21, 2016

Board of Directors

Agenda Item #1

Call to Order

CONNECTICUT GREEN BANK

Board of Directors

Agenda Item #2

Public Comments

Board of Directors

Agenda Item #3

Consent Agenda

Consent Agenda
Resolutions 1 through 5

1. **<u>Meeting Minutes</u>** – approval of meeting minutes of June 22

2. **<u>2017 Schedule</u>** – approval of BOD and Committee schedule

3. **<u>Jobs Study and Metrics</u>** – approval of estimate methodology for job creation from clean energy investment and deployment

4. **<u>FY 2016 Sector Restatements</u>** – approval of revised Statutory and Infrastructure, Residential, and Commercial and Industrial progress to target memos

5. **<u>FY 2012 through FY 2016 Public Benefit Performance</u>**– approval of investment and estimation of economic development (i.e., job-years created) and environmental protection (i.e., GHG emission reductions)

- **<u>Progress to Targets</u>** – Q1 of FY 2017 memo

Board of Directors

Agenda Item #4a – Strategic Discussions
Cost-Effectiveness Assessment of the
Residential Solar Investment Program

CADMUS

Residential Solar Investment Program

Cost-Effectiveness Study Results

Connecticut Green Bank

Presented by Shawn Shaw, P.E.

October 21, 2016

About Cadmus

Supporting good clean energy investments since 2002

Technical Due Diligence

- Inspections
- Design Reviews
- Feasibility Studies

Policy and Financial Analysis

- Utility Planning and Programs
- Net Metering Policy and Tracking
- Program Design & Evaluation

Training

- Code Officials
- Installers
- Emergency Personnel

Cadmus RSIP Evaluations To Date

RSIP Impact Evaluation

- Completed 1/2015
- Capacity/energy generation
- Customer/installer surveys

RSIP Cost-Effectiveness Evaluation

- Completed 3/2016
- Test cost effectiveness of RSIP and bundled resources

Cost Effectiveness Tests

Participant Cost Test (PCT)

Societal Cost Test (SCT)

Program Administrator/Utility Test (UCT)

Total Resource Cost (TRC)

Ratepayer Impact Measure (RIM)

CADMUS

Included Costs & Benefits

	TRC	PACT	PCT	RIM	SCT	CGB OF
Avoided Energy Supply	Benefit	Benefit		Benefit	Benefit	
Non-Embedded Avoided Emissions	Benefit				Benefit	
Avoided Capacity Supply	Benefit	Benefit		Benefit	Benefit	
Participant Bill Savings			Benefit	Cost		Benefit
Program Administration Costs	Cost	Cost		Cost	Cost	Cost
Program Incentives		Cost	Benefit	Cost		Cost
Participant Incremental Measure Costs	Cost		Cost		Cost	
Federal Investment Tax Credit (ITC)	Benefit		Benefit			
Job Creation Benefits					Benefit	
MACRS Benefits (PBI Only)	Benefit		Benefit			

CADMUS

Overall RSIP Results Over Time

- **Cost-effectiveness increases over time**
- **CGB is generating $6.47 in benefits for every $ spent in Step 7**

CGB RSIP 2012-2015	TRC	PACT	PCT	RIM	SCT	CGB OF (kWh/$)
Steps 1 & 2	1.44	1.50	1.72	0.40	1.64	18.1
Step 3	1.59	2.07	1.80	0.43	1.81	25.7
Step 4	1.70	2.63	1.83	0.45	1.78	33.4
Step 5	1.74	3.57	1.80	0.47	1.72	45.3
Step 6	1.77	5.16	1.80	0.49	1.76	67.0
Step 7	1.58	6.47	1.57	0.50	1.75	83.9
Total	1.65	3.05	1.75	0.46	1.75	38.7

CADMUS

Future Opportunities: Bundled Resources

RSIP is cost-effective: Are We Done?

+

+

= ?

Tesla PowerWall image courtesy of Tesla Motors

“Excess” Cost Effectiveness to Support New Technologies

- From the TRC Perspective
  - RSIP Step 7: $24,502 net benefits
  - Home Energy Solutions: $2,495 net benefits
  - Total net benefit: ~$27,000

- Cost of Tesla PowerWall: $5,000 (9 yr lease)
- Cost of program admin: $400 (8%)
- **Net Benefit per Customer: ~$21,600**

Innovative and Cost Effective

Program	Test	Benefits/ Participant	Costs/ Participant	Net Benefits/ Participant	Ratio
RSIP 2015 Step 7	TRC	$55,050	$30,548	$24,502	1.80
	PACT	$17,525	$2,709	$14,816	6.47
	PCT	$48,093	$26,724	$21,370	1.80
EE 2016 Eversource – Home Energy Solutions (HES)	TRC	$3,597	$1,102	$2,495	3.26
	PACT	$990	$547	$443	1.81
	PCT	$1,933	$65	$1,868	29.75
RSIP 2015 Step 7 + EE 2016 Eversource HES	TRC	$58,647	$31,651	$26,996	1.85
	PACT	$18,514	$3,255	$15,259	5.69
	PCT	$50,026	$26,789	$23,238	1.87
Energy Storage	TRC	$0	$5,400	($5,400)	0.00
	PACT	$0	$400	($400)	0.00
	PCT	$0	$5,000	($5,000)	0.00
RSIP 2015 Step 7 + Storage	TRC	$55,050	$35,948	$19,102	1.53
	PACT	$17,525	$3,109	$14,416	5.64
	PCT	$48,093	$31,724	$16,370	1.52
RSIP 2015 Step 7 + EE 2016 Eversource HES + Storage	TRC	$58,647	$37,051	$21,596	1.58
	PACT	$18,514	$3,655	$14,859	5.06
	PCT	$50,026	$31,789	$18,238	1.57

CADMUS

Program/Product Examples

- **Green Mountain Power (GMP) - Vermont**
  - Energy storage using the Tesla Powerwall with or without solar PV
  - 7 kWh Powerwall -- four to six hours of backup power
  - Customers allowing GMP access to stored energy at peak times receive bill credits
  - Customers can purchase for $6,501 or lease for $1.25 per day
- **Zero Energy Now! (ZEN) - Vermont**
  - Offered by Building Performance Professionals Association of VT in collaboration with GMP
  - Comprehensive residential home energy improvement program including energy efficiency upgrades, renewable heating options, solar PV and energy storage
  - Contractors assist customers to develop a comprehensive package of energy improvements
  - Threshold for participation - must significantly reduce customer's energy costs - at least 10% reduction in heating load, at least 50% reduction in annual MMBtu/yr of total fossil fuel and electric energy usage, adoption of a renewable heating system (such as biomass or heat pump technology) to meet at least 50% of heating load
- **Green Bank Smart-E Bundle loan –** two+ measures including solar and EE

RSIP Pilot
Deliver “Cost-Effective” DER

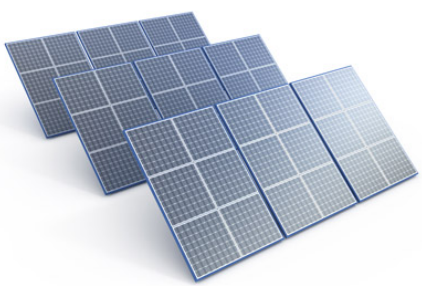
Identify Improvement Location

Individual Home Energy Score Assessment

Individual Solar PV Remote Assessment

DER System Planning

EE



RE

DR/RTT

Storage/EV

REFERENCES
Cost-Effectiveness Assessment of the Residential Solar Investment Program by the Cadmus Group (March 9, 2016)

Distributed Energy Resources RSIP Pilot

RSIP Incentive Step	HESEE-EPBB ($/W)			HESEE-PBI ($/kWh)		
	Tier I EE/DER	**Tier II** RTT	**Tier III** EV	**Tier I** EE/DER	**Tier II** RTT	**Tier III** EV
11	+[X]/W	+[Y]/W	+[Z]/W	+[X]/kWh	+[Y]/W	+[Z]/kWh
12	+[X]/W	+[Y]/W	+[Z]/W	+[X]/kWh	+[Y]/W	+[Z]/kWh
13	+[X]/W	+[Y]/W	+[Z]/W	+[X]/kWh	+[Y]/W	+[Z]/kWh

- Collaboration with the EDCs and DEEP – GHG reductions GC3 (i.e., zero emission heating) and jobs (i.e., Jobs Study says RTT near top in terms of jobs created per $ invested)
  1. Efficiency First – Home Energy Solutions assessment which produces a DOE Home Energy Score
  2. "DEEPer" energy efficiency improvements
  3. RSIP incentive with declining incentive block structure in support of Sustained Orderly Development
  4. Smart-E Loan interest rate buy-downs to support energy efficiency, DER, RTT, and EV

Board of Directors

Agenda Item #5a – ACG Committee

Comprehensive Annual Financial Report

Green Bank Financial Audit Results for Fiscal Year 2016

CONNECTICUT GREEN BANK

- **Audit performed by Blum Shapiro & Company**
- **Audit performed under Auditing Standards Generally Accepted in the United States of America (GAAS) and standards applicable to financial audits contained in Government Auditing Standards issued by the Comptroller General of the United States (GAGAS).**
- **Unmodified audit opinion to be issued.**
- **No material weaknesses within internal controls were identified.**
- **No instances of noncompliance with financial statement reporting standards were identified.**

Financial Highlights – Statement of Net Assets (in thousands)

	2016	2015	Increase (Decrease)
Cash and cash equivalents	$ 48,072	$ 39,893	$ 8,179
Bonds receivable	3,492	1,600	1,892
Portfolio investments	1,000	1,000	--
Solar lease notes	9,008	9,819	(811)
Program loans	33,268	40,518	(7,250)
Capital assets, net	57,864	26,971	30,893
Restricted Cash	9,750	8,800	950
Other assets	14,124	8,972	5,152
Total Assets	176,578	137,573	39,005
Deferred Outflows of Resources			
Deferred amount for pensions	2,573	1,669	904
Total Deferred Outflows of Resources	2,573	1,669	904
Future commitments against cash	90,726	89,469	

Financial Highlights – Statement of Net Assets (in thousands)

	2016	2015	Increase (Decrease)
Current liabilities	6,612	6,825	(213)
Unrearned revenue	6,258	2,519	3,739
Pension liabilities	16,096	14,900	1,196
Other long term liabilities	2,528	1,093	1,435
Long term debt, less current maturities	18,648	3,546	15,102
Total Liabilities	50,142	28,883	21,259
Deferred Inflows of Resources			
Fair value of interest rate swap	1,628	660	968
Deferred amount for pensions	(3)	532	(535)
Total Deferred Outflows of Resources	1,625	1,192	433
Invested in capital assets	57,864	26,971	30,893
Restricted Net Position:			
Non-expendable	1	1	--
Restricted - energy programs	9,750	8,799	951
Unrestricted	59,769	73,396	(13,627)
Total Net Position	$ 127,384	$ 109,167	$ 18,217

Financial Highlights – Statement of Changes in Net Assets (in thousands)

	2016	2015	Increase (Decrease)
Revenues	$ 37,788	$ 46,294	$ (8,506)
Operating Expenses			
Grants and programs	27,228	22,131	5,097
General and administrative expense	4,630	3,117	1,513
Total Operating Expenses	31,858	25,248	6,610
Operating Income	5,930	21,046	(15,116)
Non-Operating Revenues (Expenses)			
Interest earned	3,017	2,312	705
Interest expense	(731)	(119)	(612)
Investment loss	(3)	(1,180)	1,177
Unrealized loss on interest rate swap	(968)	(660)	(308)
Provision for loan losses	(1,022)	(564)	(458)
Capital contribution	12,294	6,844	5,450
Distribution to member	(301)	(105)	(196)
Payments to State of Connecticut	--	(19,200)	19,200
Net Change	$ 18,216	$ 8,374	$ 9,842

Status of 2016 Comprehensive Annual Financial Report (CAFR)

- The draft 2016 CAFR is substantially complete. No material changes to the net financial position of the Green Bank is anticipated before the issuance of the CAFR to the public.

- The structure, financial statement disclosures and financial statement statistics presented in the 2016 draft CAFR are consistent with presentations made in the 2015 CAFR.

Resolution:

RESOLVED, that the Board approves the 2016 Comprehensive Annual Financial Report which includes the Financial Statements of the Connecticut Green Bank for the Fiscal Year Ending June 30, 2016 contingent upon no further adjustments to the financial statements or additional required disclosures which would materially change the financial position of the Green Bank as presented.

Board of Directors

Agenda Item #5b – Joint Committee Partnership on the Small Business Energy Advantage Program

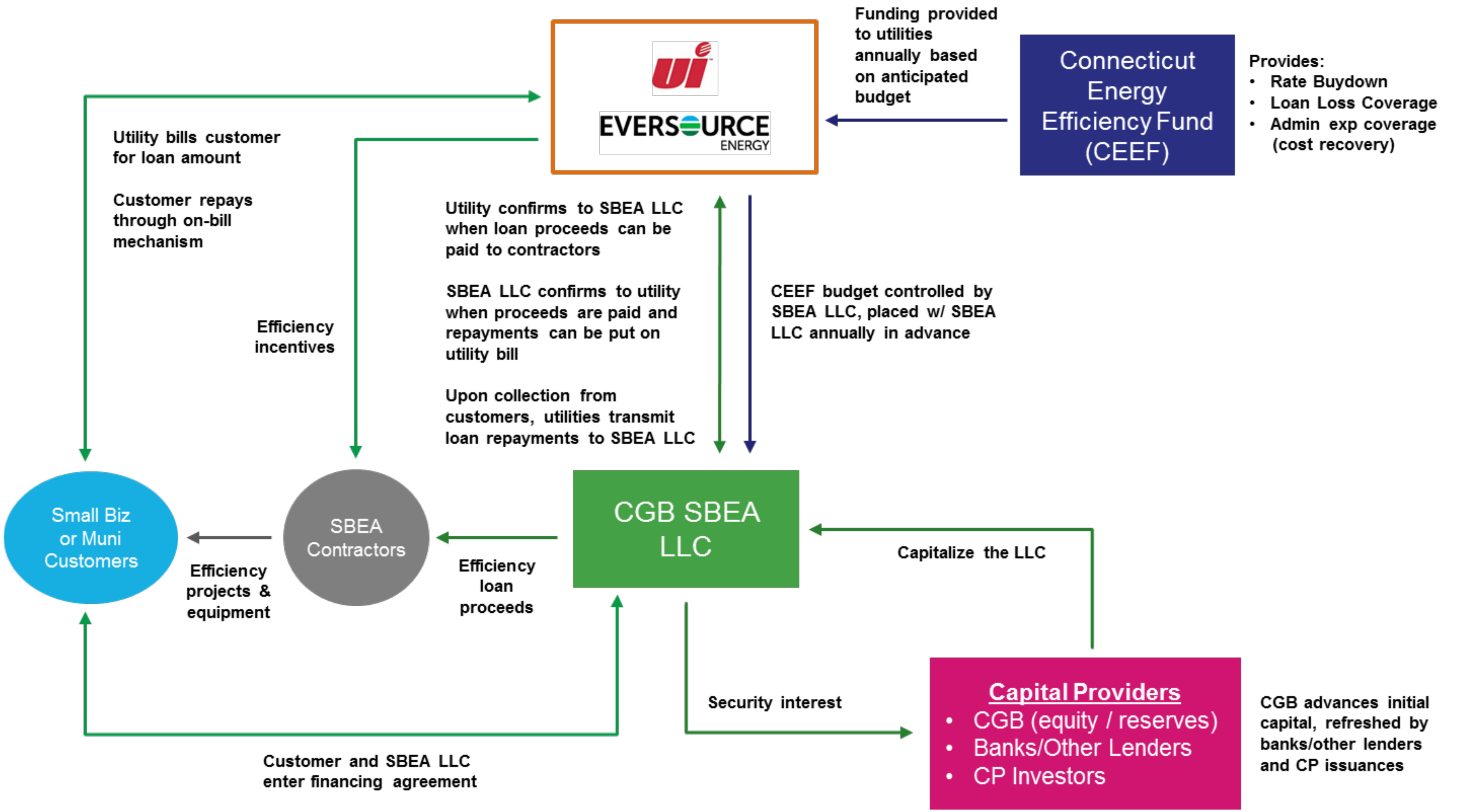
SBEA Alternative Capital Context & Objectives

- Since 2000, Eversource and United Illuminating have sponsored the Small Business Energy Advantage Program (“SBEA”) funded with utility capital to enable small C&I customers and municipalities to invest in energy efficiency
- In 2016, the Utilities and DEEP approached CGB to explore options for funding the SBEA Program with private capital
- Goals are to **obtain lower cost** (of capital and administration) while retaining similar origination (unsecured loans, utility bill payment history) and servicing processes (on-bill repayment)
- The SBEA Program will continue to access CEEF funds to provide both interest rate buy-downs and loan loss reimbursement
- CGB proposes funding the SBEA program with a combination of Green Bank capital, bank funding (or other private capital) and commercial paper, collateralized by portfolio of SBEA energy efficiency loans

SBEA Alternative Capital Overview & CEEF Support

- **Lending Overview**
  - Available to C&I and Muni customers with average 12-month peak electricity demand below 200kW to invest in electric and gas efficiency improvements
  - 0% interest loans up to $100,000 for C&I and up to $500,000 for municipalities with maximum 4-year tenor, repaid via the electric utility bill
  - Total 2015 volume across both utilities of approximately 1,600 loans and $27M
- **Connecticut Energy Efficiency Fund (“CEEF”) Support**
  - CEEF provides funding for interest rate buy-down (to 0% customer-facing), reimbursement for loan losses, and recovery of administrative expenses
- **“Must Have” Assurances for Private Capital**
  - Private capital will require assurance the same support (credit enhancements and administrative cost recovery) will be applicable to the new fund structure
  - Private capital will also require assurance that should the SBEA program or CEEF be discontinued, similar support will continue during the “wind down” phase

SBEA Alternative Capital Draft Proposed Structure



SBEA Alternative Capital Progress and Timeline

- September – November
  - Develop administrative processes and cost estimates with utilities
  - Discuss funding requirements with third-party capital providers
  - Issue RFP to capital providers and review responses
  - Present and discuss proposal with Energy Efficiency Board & Green Bank Board
- November – December
  - Receive conditional approval from Energy Efficiency Board & Green Bank Board
  - Review RFP responses and select financing partner capital provider(s)
  - Clarify and submit proposal to PURA for approval of transfer of interest rate buy-down and loan loss and administrative cost recovery to CGB SBEA LLC
- January – March 2017
  - Begin CGB SBEA LLC funding of SBEA loans
  - Receive approval from PURA on transfer of cost recovery and credit enhancement
  - Finalize funding documentation with third-party capital providers
- April 2017
  - Third-party capital providers invest into CGB SBEA LLC

Board of Directors

Agenda Item #6ai

C-PACE Transaction (Bloomfield)

1151 Blue Hills, Bloomfield Ratepayer Payback

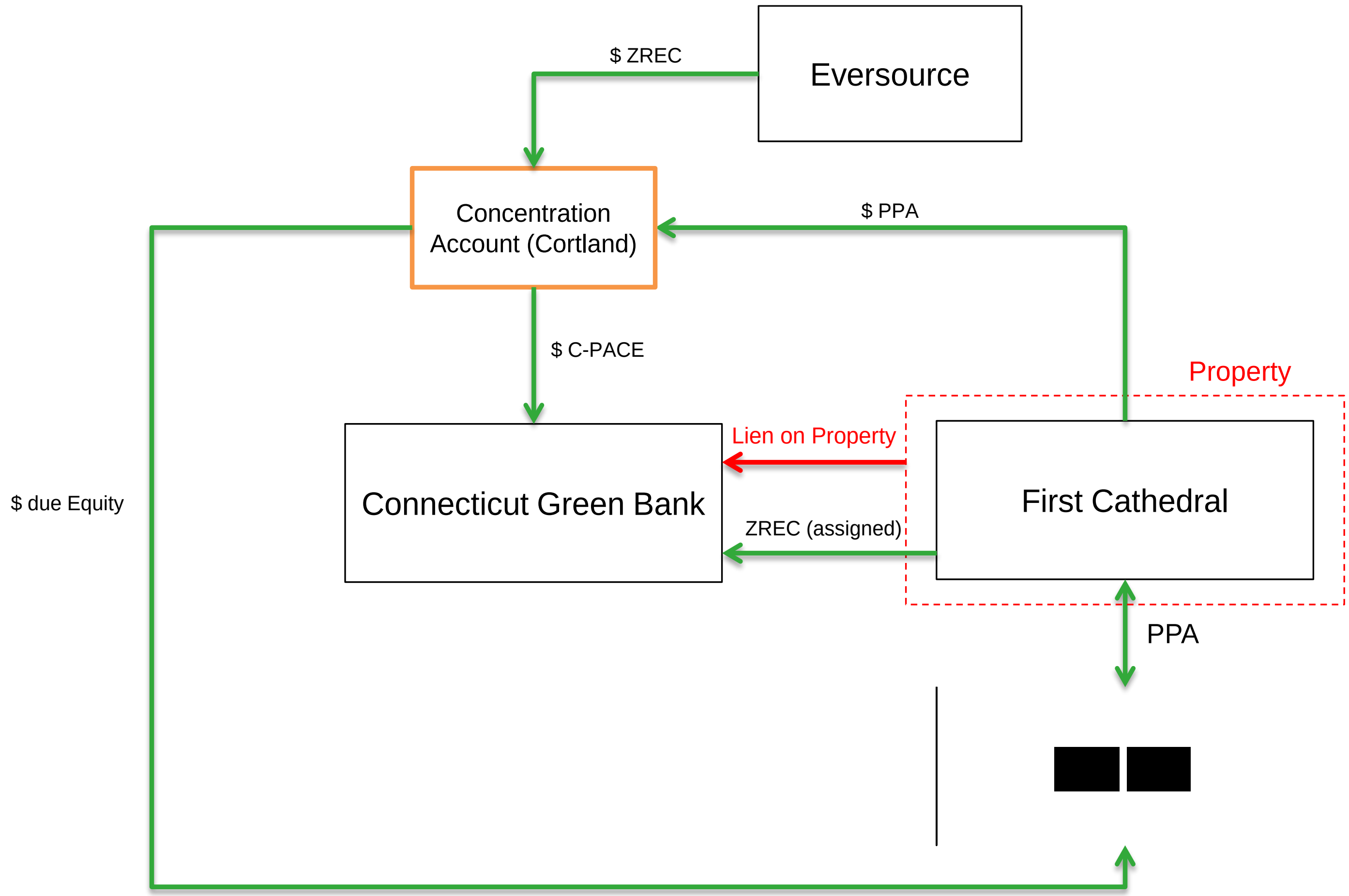
- **$1,440,300** assessment and **$562,500** of third-party tax equity to install 500.7 kW solar PV carport system; retrofit lighting with LEDs; upgrade insulation
- First transaction to utilize the PACE mechanism for a non-Green Bank affiliated third-party owned system
- Projected savings are **67,627 MMBtu** versus **$1,440,300** of ratepayer funds at risk
- Ratepayer funds will be paid back in one of the following ways
  - (a) subsequently, when the loan is sold down to a private capital provider; or
  - (b) through receipt of funds from the Town of Bloomfield as it collects the C-PACE secured PPA payments from the property owner

1151 Blue Hills, Bloomfield
Terms and Conditions

CONNECTICUT GREEN BANK

- 25 year solar PPA between third-party owner and First Cathedral, fixed C-PACE payments in the first 20 years
- **$1,440,300** construction loan at 5% and term loan set at a fixed 6.0% over the 20 year term
  - ❑ Property valued at [redacted]
  - ❑ Loan-to-value ratio equals [redacted]; Lien-to-value ratio equals [redacted]
- Assignment of ZRECs to the Green Bank
- DSCR of [redacted]

1151 Blue Hills, Bloomfield Structure



1151 Blue Hills, Bloomfield
The Five W's

CONNECTICUT GREEN BANK

- **What?** Receive approval for a **$**1,440,300 construction and (potentially) term loan under the C-PACE program to the First Cathedral to finance the construction of specified energy upgrade
- **When?** Project to commence 2017
- **Why?** Allow Green Bank to finance this C-PACE transaction, continue to build momentum in the market, potentially provide term financing for this project until Green Bank sells it along with its other loan positions in C-PACE transactions, and expand the PACE mechanism to non-Green Bank affiliated ownership structures
- **Who?** The First Baptist Church of Hartford, the property owner of the First Cathedral, and an SPV owned by [redacted]
- **Where?** 1151 Blue Hills, Bloomfield CT

1151 Blue Hills, Bloomfield Project Tear Sheet

[redacted]

1151 Blue Hills, Bloomfield Anticipated Cash Flow

CGB Pro Forma

Project Basics		*Cash Flows*	
Amount Financed by CGB	$1,440,300	Date	CEFIA $
Construction Period (years)	0.25	Mar 2017	$1,440,300
Term (years)	20	May 2017	$18,004
		Jul 2017	$125,462
Construction Financing Rate	5.00%	Jul 2018	$125,462
Term Financing Rate	6.00%	Jul 2019	$125,462
		Jul 2020	$125,462
Construction Interest Payment (bullet)	$18,004	Jul 2021	$125,462
Yearly Debt Service Payments (made semi-annually)	$125,462	Jul 2022	$125,462
		Jul 2023	$125,462
		Jul 2024	$125,462
		Jul 2025	$125,462
		Jul 2026	$125,462
		Jul 2027	$125,462
		Jul 2028	$125,462
		Jul 2029	$125,462
		Jul 2030	$125,462
		Jul 2031	$125,462
		Jul 2032	$125,462
		Jul 2033	$125,462
		Jul 2034	$125,462
		Jul 2035	$125,462
		Jul 2036	$125,462

Resolution 9

WHEREAS, pursuant to Section 16a-40g of the Connecticut General Statutes, as amended, (the “Act”), the Connecticut Green Bank (the “Green Bank”) is directed to, amongst other things, establish a commercial sustainable energy program for Connecticut, known as Commercial Property Assessed Clean Energy (“C-PACE”);

WHEREAS, the Green Bank Board of Directors (the “Board”) has approved a $40,000,000 C-PACE construction and term loan program;

WHEREAS, the Green Bank seeks to provide a $1,440,300 construction and (potentially) term loan under the C-PACE program to a special purpose entity substantially controlled by [redacted]. that will install, own, and operate a solar PV system, as well as install other energy efficiency measures, for the First Baptist Church of Hartford, the building owner of 900 Asylum Ave, Bloomfield, Connecticut (the "Loan"), to finance the construction of specified clean energy measures in line with the State’s Comprehensive Energy Strategy and the Green Bank’s Strategic Plan; and

NOW, therefore be it:

RESOLVED, that the President of the Green Bank and any duly authorized officer of the Green Bank is authorized to execute and deliver the Loan in an amount not to be greater than one hundred ten percent of the Loan amount with terms and conditions consistent with the memorandum submitted to the Board of Directors dated October 14, 2016, and as he or she shall deem to be in the interests of the Green Bank and the ratepayers no later than 120 days from the date of this authorization;

RESOLVED, that before executing the Loan, the President of the Green Bank and any other duly authorized officer of the Green Bank shall receive confirmation that the C-PACE transaction meets the statutory obligations of the Act, including but not limited to the savings to investment ratio and lender consent requirements; and

RESOLVED, that the proper the Green Bank officers are authorized and empowered to do all other acts and execute and deliver all other documents and instruments as they shall deem necessary and desirable to effect the above-mentioned legal instruments.

Submitted by: Bryan Garcia, President and CEO, Bert Hunter, EVP and CIO, Mackey Dykes, Vice President of Commercial and Industrial Programs, Ben Healey, Director of Clean Energy Finance, and Michael Yu, Senior Manager, Clean Energy Finance

Board of Directors

Agenda Item #6aii

Commercial Solar PPA Partnership

Commercial Solar PPA Fund Update

CONNECTICUT GREEN BANK

- CT Solar Lease 2 (“SL2”) fund is nearing capacity limit, having deployed $75 million in residential and commercial solar across Connecticut
- SL2 has provided an innovative solution for commercial and nonprofit properties by offering C-PACE-secured PPAs, **addressing a gap in the commercial solar market not currently addressed by the private sector**
- SL2 capacity limit reached due to program success and changing market conditions
  - Bottleneck in 2016 tax equity capacity due to uncertainty around ITC extension
  - Commercial project pipeline outstripped initial capacity allocation and additional capital infusion in Q3 2016 from current capital providers
- **Green Bank expects to originate additional 15-30MW of commercial solar PV projects between now and December 31, 2017**

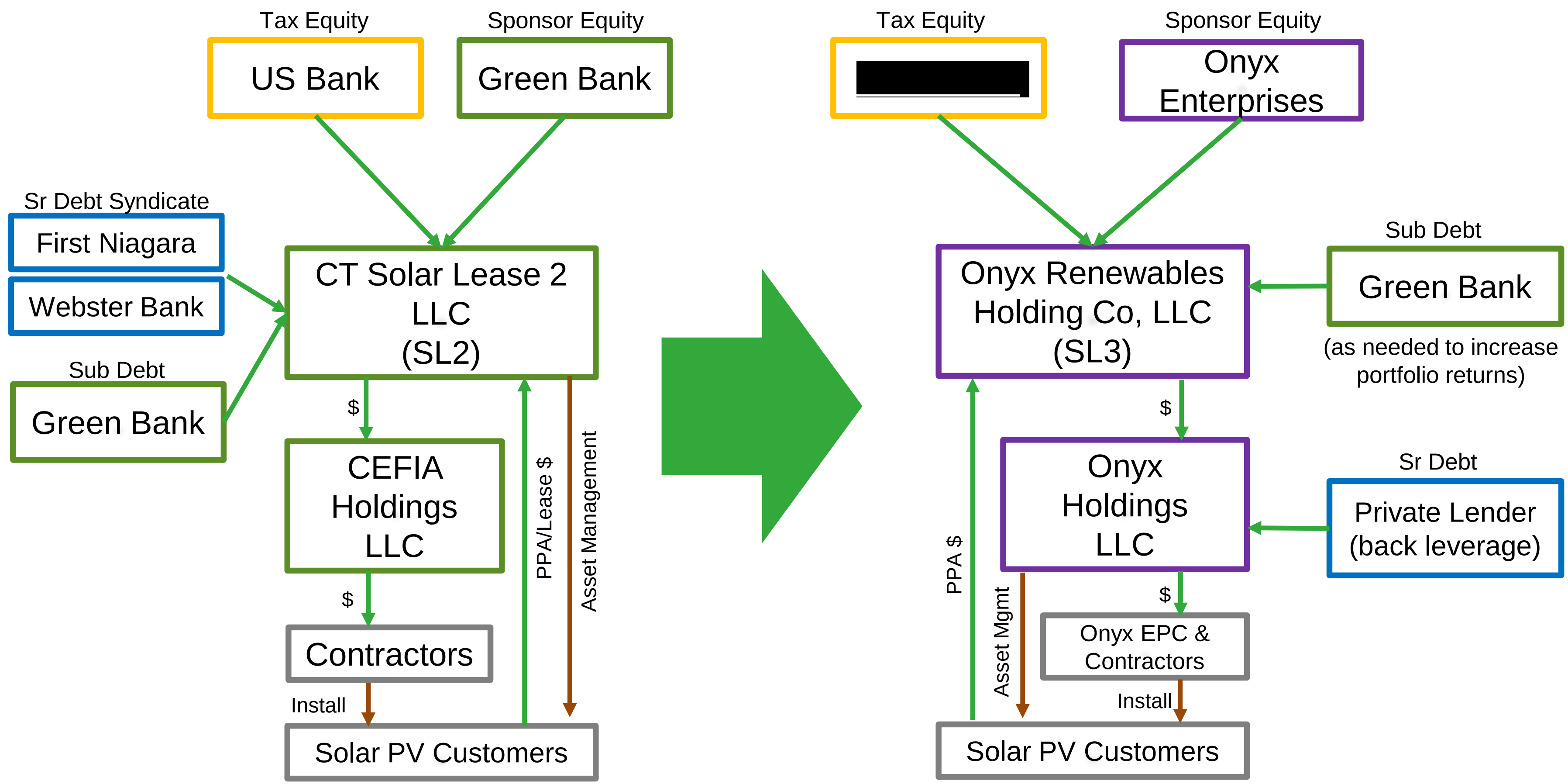
RFP Process for New Fund Solution

- In June 2016, staff went to market with an open RFP for a new fund solution
- Proposal from **Onyx Renewable Partners L.P. ("Onyx")** stood out in terms of demonstrated ability to achieve Green Bank's goals for commercial solar PV market in Connecticut
- Onyx proposed "full fund" solution, in partnership with tax equity provider [redacted], incorporating:
  - Ample tax equity capacity for 2016 and 2017
  - A vertically integrated approach with strong supply chain relationships, facilitating procurement of lower cost solar equipment
  - A seasoned team of design, engineering, construction and project management experts
  - Full-service capabilities for long-term asset management
  - Appetite to incorporate C-PACE-secured PPAs into their fund solution

Onyx Fund Solution

- Green Bank intends to source projects for Onyx to develop / acquire with right of first refusal
- Onyx has committed to accepting the existing pipeline of commercial solar projects under development by Green Bank
  - To enhance the returns on some of these projects and mitigate pricing inconsistencies, predominantly during the transition from SL2 to the Onyx fund structure, **Green Bank proposes to provide subordinated debt to a new Onyx SPV on an as-needed basis, so that portfolio-level returns can achieve Onyx return requirements**
- For future projects, Onyx will co-develop and fund construction as necessary, with the intention of owning each operating project
- Onyx will provide asset management responsibilities, with Green Bank providing administrative support for C-PACE servicing

SL2 vs SL3 – Structure



SL2 vs SL3 – Responsibilities

CONNECTICUT GREEN BANK

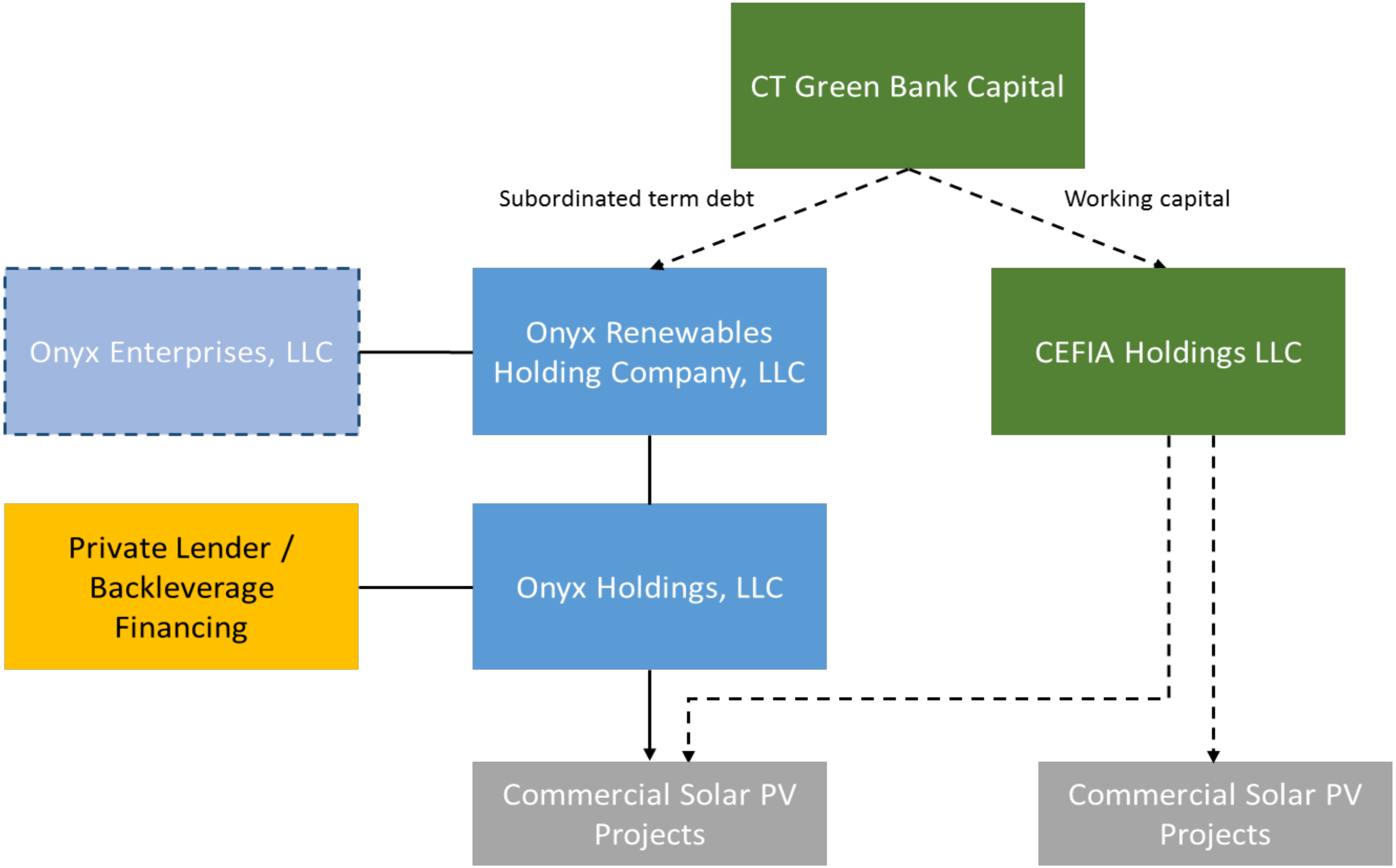
	SL2	SL3
Structuring Costs	Paid by Green Bank	N/A
Origination	Green Bank & Local Contractors	Green Bank & Local Contractors
Origination Compensation to	N/A	Green Bank
Development	Green Bank	Onyx (Green Bank involvement in initial pipeline)
Development Compensation to	Green Bank	Onyx
Senior Debt	Green Bank Sourced Commercial Lenders (project-level)	Onyx Sourced Lender(s) (back levered)
Subordinated Debt	Green Bank	Green Bank
Tax Equity	US Bank	[redacted]
Sponsor Equity	Green Bank	Onyx
Asset Management & Admin. (Operational Leverage)	Green Bank	Onyx (Green Bank for C-PACE)
Financial Leverage	3:1	>10:1
Green Bank Risk Position	Equity	Debt

Fundamental trade-offs: 1) more net return for Green Bank from SL2, given equity and development capital risk, but this new structure helps us **maximize deployment at scale with limited capital**; and 2) less discretionary control for Green Bank over credits, but we have negotiated **flexible underwriting box** and are creating development "off ramps"

Commercial Solar PPA Funding Options

- Onyx fund solution has a few project-level restrictions, including:
  - Systems less than 50kW DC in size
  - Houses of worship without mortgages
  - Landfills / brownfield sites
- Because these project types may struggle to find financing absent Green Bank support, staff is currently developing alternative financing structures to capitalize these types of projects on an as-needed basis. Solutions include:
  - Securing a follow-on pool of 2017 tax equity capacity from existing SL2 investor
  - Issuing Clean Renewable Energy Bonds (“CREBs”) for use with municipal properties
- **These solutions require the continued use of Green Bank’s CEFIA Holdings subsidiary as developer to provide working capital and bridge to term financing**

Capital Request for Continued Support of Commercial Solar PV



* CEFIA Holdings delivering to Onyx only for currently “in progress” projects

Proposed Resolutions

- RESOLVED, that the Board of Directors approves funding for the continued development of commercial-scale solar PV projects in an amount not to exceed $15.0 million, to be utilized for the following purposes:
  - Working capital during project construction;
  - Term financing, including the ability to subordinate Green Bank's position; and
  - Credit enhancements as required on a case-by-case basis.

- RESOLVED, that the President of Green Bank; and any other duly authorized officer of Green Bank, is authorized to execute and deliver, any contract or other legal instrument necessary to effect the SL3 program on such terms and conditions as are materially consistent with the memorandum submitted to the Green Bank Board on October 14, 2016; and

- RESOLVED, that the proper Green Bank officers are authorized and empowered to do all other acts and execute and deliver all other documents as they shall deem necessary and desirable to effect the above-mentioned legal instrument.

Board of Directors

Agenda Item #6aiii

New England Hydropower (Meriden)

Hanover Pond Hydro
Project Construction Update

- $3.9 million construction financing provided by First Niagara, guaranteed by Green Bank, closed in July 2016
- Phase I construction complete: water intake channel
- Phase II under construction: downstream cofferdam
- Archimedes Screw Generator arriving in New London this week


Water intake channel, lateral view


Water intake channel, view from the top


Archimedes Screw Generator ready for shipping

Hanover Pond Hydro: Clean Renewable Energy Bonds (CREBs) Financing

- **Bond Documentation**
  - Sharing draft **Bond Indenture** with Office of the Treasurer ("OTT") and Banc of America Public Capital Corp ("Bank of America") for comment
  - Draft opinion on **self-sufficiency**: working with OTT to obtain Special Capital Reserve Fund ("SCRF") approval
- **CREBs allocation** from **IRS** granted, requires bonds issued by April 4, 2017
- Executed **Term Sheet** with Bank of America (CREBs purchaser)

Hanover Pond Hydro: Proposed Resolutions

- Authorize a **135-day extension** from the original date of authorization by the Board of Directors for the issuance of the CREBs

Board of Directors

Agenda Item #6aiv

Kresge Foundation PRI and Storage

Kresge Foundation PRI and Storage

About KCF & Environment Program

CONNECTICUT GREEN BANK

KRESGE COMMUNITY FINANCE

SOCIAL INVESTMENT PRACTICE

- **Kresge Community Finance (KCF) launched in March 2016**
- **New way for a large foundation like Kresge to support work of Community Development Finance Institutions (CDFIs) and Development Finance Agencies (DFAs) with standardized, patient capital through Program Related Investments (PRIs)**
  - Loan amount $500,000 to $3,000,000
  - Rate commensurate with the proposed use of funds, 2% minimum
  - Term as supported by the proposed use of funds, 10-year maximum
- **Kresge Environment Program focus – climate resilience and urban and coastal areas, and energy resilience in particular**

Kresge Foundation PRI and Storage Proposal Summary

- **PRI:** $3 million, 10-year term, 2% interest rate
- **Purpose/use**: energy storage solutions (combined with solar) to demonstrate both resiliency value and financing model
- **Target beneficiaries**: 13-18 projects
- **Type of property**: i) affordable multifamily; ii) community / critical facilities; iii) local businesses acting as a hub for communities
- **Geographic target**: i) coastal and upriver; ii) suburban and rural (high concentration of elderly residents); iii) initial focus on the Greater Bridgeport, Greater New Haven, and Greater Hartford regions

Kresge Foundation PRI and Storage Process and Next Steps

- Kresge **program team has approved and recommended** advancing Green Bank's proposal
- Kresge **internal investment committee** to review underwriting package on November 15, 2016
- Once fully approved, Kresge will provide **term sheet** by end of calendar year
  - Would become second DFA and first Green Bank awarded PRI
- Green Bank staff would then proceed to seek Board approval to:
  - Accept PRI obligation
  - Create SPE to receive PRI funds

Kresge Foundation PRI and Storage PRI Deployment Strategy

- Deployment strategy:
  - Combine with solar PV financed through: SL2, C-PACE, LIME
  - Engage energy storage providers
  - Develop financing structure: PPA, Lease, ESA
- Solar + storage **value proposition**:
  - Peak shaving → reduce demand charges
  - Resiliency → backup power during grid outages
  - Grid Services → frequency regulation

Board of Directors

Agenda Item #7

Executive Session

Board of Directors

Agenda Item #8

Other Business

Board of Directors

Agenda Item #9

Adjourn

CONNECTICUT GREEN BANK
Board of Directors
Draft Minutes
Friday, July 22, 2016

A regular meeting of the Board of Directors of the **Connecticut Green Bank (the "Green Bank")** was held on July 22, 2016 at the office of the Green Bank, 845 Brook Street, Rocky Hill, CT, in the Colonel Albert Pope board room.

1. **Call to Order** Catherine Smith, Chairperson of the Green Bank, called the meeting to order at 9:00 a.m. Board members participating: Bettina Bronisz, State Treasurer's Office ("Designee"), Norma Glover, John Harrity, Reed Hundt (by phone), Tom Flynn (by phone), Matt Ranelli and Tracey Babbidge ("Designee") of the Department of Energy and Environmental Protection ("DEEP").

   Members Absent: Pat Wrice, Kevin Walsh, and Mun Choi

   Staff Attending: Bert Hunter, George Bellas, Brian Farnen, Matt Macunas, Mackey Dykes, Bryan Garcia, Kerry O'Neill, Dale Hedman, Craig Connolly, Bryant Ebright, Ryan Shelby, George Bellas, Eric Shrago, Jane Murphy, Emily Basham, Anthony Clark, Isabelle Hazlewood, Alysse Buzzelli, Chris Magalhaes, Madeline Tiscarino and Cheryl Samuels.

   Others attending: Austin Casagrande (Intern for the Office of the State Treasurer)

2. **Public Comments**

   There were no public comments

3. **Consent Agenda**

   Commissioner Smith requested a motion to approve Resolutions 1 through 3 on the Consent Agenda. Upon a motion made by Matt Ranelli and seconded by Bettina Bronisz Resolutions 1 through 3 passed unanimously**.**

   a. Approval of Meeting Minutes for June 17, 2016 and July 6, 2016

      Resolution #1

      Motion to approve the minutes of the Board of Directors Meeting for June 17, 2016 and July 6, 2016.

      Upon a motion made by Matt Ranelli and seconded by Bettina Bronisz Resolution 1 passed unanimously**.**

b. Under 300,000 and No More in Aggregate than $1,000.00

Resolution #2

WHEREAS, on January 18, 2013, the Connecticut Green Bank (the "Green Bank") Board of Directors (the "Board") authorized the Green Bank staff to evaluate and approve funding requests less than $300,000 which are pursuant to an established formal approval process requiring the signature of a Green Bank officer, consistent with the Green Bank Comprehensive Plan, approved within Green Bank's fiscal budget and in an aggregate amount not to exceed $500,000 from the date of the last Deployment Committee meeting, on July 18, 2014 the Board increase the aggregate not to exceed limit to $1,000,000 ("Staff Approval Policy for Projects Under $300,000"); and

WHEREAS, Green Bank staff seeks Board review and approval of the funding requests listed in the Memo to the Board dated June 17, 2016 which were approved by Green Bank staff since the last Deployment Committee meeting and which are consistent with the Staff Approval Policy for Projects Under $300,000;

NOW, therefore be it:

RESOLVED, that the Board approves the funding requests listed in the Memo to the Board dated July 22, 2016 which were approved by Green Bank staff since the last Deployment Committee meeting. The Board authorizes Green Bank staff to approve funding requests in accordance with the Staff Approval Policy for Projects Under $300,000 in an aggregate amount to exceed $1,000,000 from the date of this Board meeting until the next Deployment Committee meeting.

c. Board of Directors and Committee Reports for FY 2016

Resolution #3

WHEREAS, in July of 2011, the Connecticut General Assembly passed Public Act 11-80 (the Act), "AN ACT CONCERNING THE ESTABLISHMENT OF THE DEPARTMENT OF ENERGY AND ENVIRONMENTAL PROTECTION AND PLANNING FOR CONNNECTICUT'S ENERGY FUTURE," which created the Connecticut Green Bank (the "Green Bank") and vests the power in a Board of Directors comprised of eleven voting and two non-voting members; and

WHEREAS, the structure of the Board of Directors is governed by the bylaws of the Connecticut Green Bank, including, but not limited to, its powers, meetings, committees, and other matters.

NOW, therefor be it:

RESOLVED, that Board has reviewed and approved the Overview of Compliance Reporting and the Board of Directors and Committees for FY 2016 memo dated July 22, 2016 prepared by staff, which provides a summary report of the FY 2016 governance of the Board of Directors and its Committees of the Connecticut Green Bank.

d. Request for Approvals for PSA's Over $75,000 in FY 2016
e. Succession Plan (FY 2017)

4. **Board of Directors Strategic Discussions**

a. SunShot Prize: Reducing "Soft Costs" for Residential Solar PV

Isabelle Hazelwood provided a thorough overview of the SunShot Initiative and the role of the Green Bank in competing for and winning federal funds – about $1 million between grants and prizes – and implementing programs throughout the state to reduce "soft costs" for residential solar PV in Connecticut. Commissioner Smith commended Isabelle and the team for their excellent work on the program.

Anthony Clark provided a thorough overview of the Green Bank's efforts to visualize data through a partnership with Kevala. He discussed how data might be presented and solicited guidance from the Board of Directors on what other uses they might see with regards to data visualization. Tracy Babbidge requested that the Green Bank work with DEEP and the utilities on grid-side visualization. Tom Flynn suggested that the data being collected by the Green Bank had value and the staff should look into it.

b. Information and Visualization

5. **Important Documentation**

a. Comprehensive Plan (FY 2017 and FY 2018)

Bryan Garcia provided an overview of the Comprehensive Plan. He noted that at the June 17, 2016 Board of Directors meeting that the Board had approved of the FY 2017 budget and targets. He provided an overview of the contents of the Comprehensive plan including a focus on the work through the Joint Committee with the Energy Efficiency Board. Bert Hunter and Mackey Dykes discussed the progress the teams are making with the utilities on the Small Business Energy Advantage program as evidence of the second area of positive development alongside multifamily efforts.

Upon a motion made by Matt Ranelli and seconded by Bettina Bronisz Resolution 4 passed unanimously.

<u>Resolution #4</u>

WHEREAS, in July of 2011, the Connecticut General Assembly passed Public Act 11-80 (the Act), "AN ACT CONCERNING THE ESTABLISHMENT OF THE CEPARTMENT OF ENERGY AND ENVIRONMENTAL PROTECTION AND PLANNING FOR CONNECTICUT'S ENERGY FUTURE, "which created the Connecticut Green Bank (the "Green Bank") to develop programs to finance and otherwise support clean energy investment per the definition of clean energy in Connecticut General Statutes Section 16-245n(a):

WHEREAS, the Act directs the Green Bank to develop a comprehensive plan to foster the growth, development and commercialization of clean energy sources, related enterprises and stimulate demand clean energy and deployment of clean energy sources that serve end use customers in this state.

WHEREAS, the Budget and Operations Committee reviewed the Comprehensive Plan for FY 2017 and FY 2018 at a meeting on June 7, 2016;

WHEREAS, the staff of the Connecticut Green Bank discussed the Comprehensive Plan for FY 2017 and FY 2018 on the Quarterly Market Insights webinar on June 16, 2016 and subsequently requested public comments through July 15, 2016;

WHEREAS, the Board of Directors reviewed and approved the key components of the Comprehensive Plan, including the FY 2017 budget and targets at a meeting on June 17, 2016;

WHEREAS, the Joint Committee of the Energy Efficiency Board and the Connecticut Green Bank reviewed and were provided an opportunity to comment on the Comprehensive Plan for FY 2017 and FY 2018 at a meeting on July 20, 2016;

WHEREAS, Article V of the Green Bank Operating Procedures requires the Green Bank Board of Directors (the "Board") to adopt an Annual Plan for each forthcoming fiscal year;

NOW, therefor be it:

RESOLVED, that the Board approves the proposed revisions by the Officers of the Comprehensive Plan for Fiscal Years 2017 and 2018;

RESOLVED, that the Board will allow additional clarifications be made over the next two weeks based on final comments submitted to the officers through the Joint Committee on the Comprehensive Plan for FY 2017 and FY 2018;

RESOLVED, that the Board approves of the proposed Comprehensive Plan for FY 2017 and FY 2018 as presented to the Board on July 22, 2016, and subject to nonmaterial modifications made by the officers as described above.

As the Green Bank just passed its 5-year anniversary, Eric Shrago and Bryan Garcia provided an overview for a proposed strategic retreat to support the development of the next 5 years of the Green Bank. Commissioner Smith asked Board members to volunteer to lead a subcommittee to develop the retreat plans to which Norma Glover and Reed Hundt volunteered.

b. Evaluation Framework

Bryan Garcia provided an overview of the Evaluation Framework to the Board of Directors. The draft framework was presented to the Audit, Compliance and Governance Committee, Budget and Operations Committee, and the Joint Committee of the Energy Efficiency Board.

Upon a motion made by Matt Ranelli and seconded by Bettina Bronisz Resolution 5 passed unanimously.

Resolution #5

WHEREAS, the Audit, Compliance and Governance Committee at a meeting on May 25, 2016, and the Budget and Operations Committee at a meeting on June 7, 2016 reviewed and now recommend that the Board of Directors approve the proposed Evaluation Framework; and

WHEREAS, the Joint Committee of the Energy Efficiency Board and the Connecticut Green Bank reviewed and were provided an opportunity to comment on the Evaluation Framework at a meeting on April 20, 2016 and July 20, 2016;

NOW, therefor be it:

RESOLVED, that the Board will allow additional clarifications be made over the next two weeks based on final comments submitted to the officers through the Joint Committee on the Evaluation Framework;

RESOLVED, that the Board approves the proposed Evaluation Framework as presented to the Board on July 22, 2016, and subject to nonmaterial modifications made by the officers as described above.

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6. Staff Transaction Recommendations

a. Commercial, Industrial, and Institutional Sector Program Transaction Recommendations

i. Energy on the Line

Mackey Dykes explains that energy costs are high in Connecticut and 10% of consumption is in the manufacturing sector. CPACE is a great tool for manufacturer to reduce their costs. We partnered with DECD and the Manufacturing Innovation Fund to make CPACE projects produce even more savings for manufacturers by providing up to $50,000 in grant funding, $40,000 from DECD/MIF and $10,000 from CGB, for manufacturers who do a CPACE project. CGB is also providing technical expertise to help manufacturers identify opportunities, select contractors, and navigate the utility and financing process. Funding per project is equal to the value of a 1% interest rate reduction, up to a total value of $50,000. Catherine Smith questioned why you need to add $10,000 of CGB funding? Mackey Dykes explained that the original CGB request didn't include a cap but the MIF wanted to limit the per project funding so it could be spread out to more participants. That would "top out" below the CPACE average project size so, in order to drive bigger and more comprehensive projects, CGB included up to $10,000 more. John Harrity questions, how complicated is the process? Mackey Dykes explains that the application is no different than the regular CPACE application. Mackey Dykes explains that we do have our first approved project. We are continuing to promote the program through press releases, website, emails, and through manufacturing associations in the state.

Upon a motion made by Matt Ranelli and seconded by Bettina Bronisz Resolution 6 passed unanimously.

<u>Resolution #6</u>

WHEREAS, Pursuant to Section 157 of Public Act No. 12-2 of the June 12, 2012 Special Session of the Connecticut General Assembly (the "Act"), Connecticut Green Bank ("Green Bank") is directed to, amongst other things, establish a commercial sustainable energy program for Connecticut, known as Commercial Property Assessed Clean Energy ("C-PACE"), and Green Bank established the C-PACE program;

WHEREAS, In February of 2016, Green Bank partnered with the Department of Economic and Community Development ("DECD") through it's the Manufacturing Innovation Fund ("MIF") to create and administer the Energy on the Line campaign for the purpose of incentivizing manufacturers to undertake energy-saving improvements to their buildings (the "EotL Program"); and

WHEREAS, through the EotL Program, eligible manufacturers who finance an energy savings project using C-PACE may receive a grant to buy-down the cost of such project and improve their cash-flow over the life of the C-PACE assessment.

WHEREAS, such grants will b equivalent to a one percent (1%) interest rate buy-down of the C-PACE financing, up t $50,000.

WHEREAS, DECD provided $800,000 in funding to Green bank for such grants, to be used for the first $40,000 of any individual grant

NOW, therefor be it:

RESOLVED, that the Green Bank Board of Directors (the "Board") authorizes grants to be made to eligible Connecticut manufacturers pursuant to the EotL Program as described in that certain memo to the Board dated July 15, 2016; and

RESOLVED, that the proper Green Bank officers are authorized and empowered to do all other acts and execute and deliver all other documents and instruments as they shall deem necessary and desirable to effect the above-mentioned legal instruments.

ii. C-PACE Disbursement Cap

For background, Bert Hunter reminded the Board that staff issued an RFP in December 2014 for additional private capital for the C-PACE program. Originally, the Green Bank used $20 million of its balance sheet (which was subsequently increased to $40 million) for construction financing. After the projects were completed, the Green Bank sold off about $20 million of these benefit assessment liens to Clean Fund. To enable the program to scale, the Green Bank need larger facility – which was the purpose of the RFP he noted earlier, and which was closed in December of 2015. Associated with the new facility with Hannon, he noted, is an internal working capital facility that is used to finance the construction part of disbursements. Chris Magalhaes on the finance team explained the operation of the working capital facility and that while the Green Bank and Hannon both fund the disbursement, there can be excess funds left in the disbursement account due to forecasting errors (generally by the contractors). This leads, he explained, to an interest expense drag since interest that the Green Bank has to pay to Hannon starts accruing as soon as their funds go into the account. George Bellas noted that the agreements only require Hannon to prefund once a month. He added that the C-PACE program has difficulty forecasting due to the ordinary course of construction activities. This is what leads to the funds sitting idly in the account. After a bit more discussion, the Board was satisfied that staff's request warranted approval.

Upon a motion made by Matt Ranelli and seconded by Norma Glover Resolution 7 passed unanimously.

Resolution #7

WHEREAS, Pursuant to Section 157 of Public Act No. 12-2 of the June 12, 2012 Special Session of the Connecticut General Assembly (the "Act"), Connecticut Green Bank ("Green Bank") is directed to, amongst other things, establish a commercial sustainable energy program for Connecticut, known as Commercial Property Assessed Clean Energy ("C-PACE"), and Green Bank established the C-PACE program;

WHEREAS, on December 17, 2015 Green Bank closed on a financing facility with HASI OBS OP A LLC, a Maryland limited liability company ("HA"), and HA C-PACE LLC, a Delaware limited liability company ("HA C-PACE") in support of the C-PACE program and in order to fund C-PACE transactions (the HA Facility")

WHEREAS, at its January 15, 2015 meeting, the Green Bank Board of Directors ("Board") authorized a $750,000 working capital facility associated with the Green Bank's C-PACE partnership with HA;

WHEREAS, under the HA Facility, the Green Bank is permitted to advance more than its pro rata share of funds to C-PACE borrowers during construction in order to avoid disruption in construction activities; and

WHEREAS, Green Bank staff has attempted various ways to operationalize the construction financing partnership for C-PACE borrowers under the HA Facility within existing constraints and found such alternatives inefficient or costly.

NOW, therefore be it:

RESOLVED, that the Board authorizes a working capital facility associated with the HA Facility in an amount not to exceed $3,300,000 in aggregate for the purpose of allowing the Green Bank to make advances to HA C-PACE for construction disbursements to C-PACE borrowers in excess of the Green Bank's pro rata share of such financing, which exceedance amount will then be recovered under the terms of the HA Facility;

RESOLVED, that this authorization expressly includes the ability for the proper Green Bank officers to commit capital in excess of existing authorization levels solely for the purpose of providing short-term construction financing advances to C-PACE borrowers under the terms of the HA Facility, and with the expectation of monthly repayment via the HA Facility, and for no other purpose whatsoever; and

RESOLVED, that the proper Green Bank officers are authorized and empowered to do all other acts and execute and deliver all other documents and instruments as they shall deem necessary and desirable to effect the above-mentioned legal instruments.

7. Sector Updates and Progress to Targets for FY 2016

George Bellas, Bryan Garcia, and Eric Shrago provided an update on the progress to targets for FY 2016 with respect to the budget and financial position of the organization as well as the progress to targets.

Upon a motion made by Matt Ranelli and seconded by Bettina Bronisz, Resolution 8 passed unanimously.

Resolution #8

WHEREAS, in July of 2011, the Connecticut General Assembly passed Public Act 11-80 ("the Act") "AN ACT CONCERNING THE ESTABLISHMENT OF THE DEPARTMENT OF ENERGY AND ENVIRONMENTAL PROTECTION AND PLANNING FOR CONNECTICUT'S ENERGY FUTURE," which created the Connecticut Green Bank (the "Green Bank") to develop programs to finance and otherwise support clean energy investment per the definition of clean energy in Connecticut General Statutes Section 16-245n(a);

WHEREAS, the Act directs the Green bank to develop a comprehensive plan to foster the growth, development and commercialization of clean energy sources, related enterprises and stimulate demand clean energy and development of clean energy sources that serve end use customers in this state;

WHEREAS, on July 17, 2015, the Board of Directors of the Connecticut Green Bank approved a revised Comprehensive Plan for FY 2015 and FY 2016, including an annual budget and targets for FY 2016.

Now, therefore be it:

RESOLVED, that Board has reviewed and approved the Program Performance towards targets for FY 2016 memos dated July 22, 2016, which provide an overview of the performance of the Statutory and Infrastructure, Residential, Commercial and Industrial, and Institutional sectors with respect to their FY 2016 targets.

8. Other Business

Bert Hunter reminded the Board that the transaction being reported on was approved by the Board previously. He explained that First Niagara Bank agreed to lend to the microgrid project a net $3.8m after the proceeds of the DEEP grant (paid following the end of construction) is taken into account. Also, he explained, the city council of Bridgeport did meet and approved the energy agreement with the developer. Also, he noted, the DEEP grant was extended into 2017, a point confirmed by Ms. Babbage. In discussions with First Niagara, he continued, they requested some flexibility to lend more to the project in case there are cost overruns. In this case, there would be additional funding that would be senior to the Green Bank. The Green Bank is not changing the loan amount being advanced to the project, so staff is not revising the standing approval. But, this involves a further 10% potentially being loaned by First Niagara, and staff wanted to make the Board aware of that. The transaction is scheduled to close today – and if the Board is still comfortable, staff will go ahead. Tracey Babbage explains that DEEP grant is a reimbursement (i.e., paid following the completion of construction). Bert Hunter explains that the net amount of the loan does, in fact, mean after the DEEP payment. Catherine Smith, noting concurrence by the Board, agreed that staff should move ahead with the transaction.

Kerry O'Neill provided an update on recent developments with respect to R-PACE at the federal level with the White House. These developments were modelled a lot after the R-PACE policy in Connecticut. The leadership of Governor Malloy was acknowledged by the team.

Bryan Garcia and Reed Hundt provided an overview on recent developments with respect to the Green Bank Act of 2016 at the federal level with Congressman Chris Van Hollen (MD) and Senator Chris Murphy (CT) proposing legislation modelled after the Connecticut Green Bank.

9. Adjourn

Upon a motion made by Catherine Smith and moved by Norma Glover, and seconded by John Harrity, the meeting was adjourned at 11:04 a.m.

Respectfully Submitted,

____

Catherine Smith, Chairperson

BOARD OF DIRECTORS

REGULAR MEETING SCHEDULE FOR 2017

The following is a list of dates and times for **regular meetings** of the Connecticut Green Bank Board of Directors through **2017**.

- January 20, 2017 – Regular Meeting from 9:00 to 11:00 a.m.
- April 14, 2017 – Regular Meeting from 9:00 to 11:00 a.m.
- June 23, 2017 – Regular Meeting from 9:00 to 11:00 a.m.
- July 21, 2017 – Regular Meeting from 9:00 to 11:00 a.m.
- October 20, 2017 – Regular Meeting from 9:00 to 11:00 a.m.
- December 15, 2017 – Regular Meeting from 9:00 to 11:00 a.m.

Should a **special meeting** need to be convened for the Connecticut Green Bank board of Directors to review staff proposals or to address other issues that arise, a meeting will be scheduled accordingly.

All regular and special meetings will take place at the:

Connecticut Green Bank
845 Brook Street, Building #2
Albert Pope Board Room
Rocky Hill, CT 06067

AUDIT, COMPLIANCE AND GOVERNANCE COMMITTEE
<u>REGULAR MEETING SCHEDULE FOR 2017</u>

The following is a list of dates and times for regular meetings of the Connecticut Green Bank Audit, Compliance and Governance Committee through **2017**.

- Wednesday, May 24, 2017 – Regular Meeting from 8:30am - 9:30am
- Wednesday, October 11, 2017 – Regular Meeting from 8:30am - 9:30am

All regular meetings will take place at:

Connecticut Green Bank
845 Brook Street, Building #2
Albert Pope Board Room
Rocky Hill, CT 06067

CONNECTICUT GREEN BANK BUDGET AND OPERATIONS COMMITTEE
2017 REGULAR MEETING SCHEDULE

The following is a list of dates and times for regular meetings of the Connecticut Green Bank Budget and Operations Committee through **2017**.

- Friday, February 10, 2017 – Regular Meeting from 3:00 to 4:30 p.m.
- Friday, May 19, 2017 – Regular Meeting from 3:00 to 4:30 p.m.
- Friday, June 9, 2017 – Regular Meeting from 3:00 to 4:30 p.m.

All regular meetings will take place at:

Connecticut Green Bank
845 Brook Street, Building 2
Rocky Hill, CT 06067

REGULAR DEPLOYMENT COMMITTEE 2017 MEETING SCHEDULE

The following is a list of dates and times for regular meetings of the Connecticut Green Bank Deployment Committee through **2017**.

- Monday, February 27, 2017 – Regular Meeting from 2:00pm – 3:00pm
- Tuesday, March 28, 2017 – Regular Meeting from 2:00pm – 3:00pm
- Tuesday, May 30, 2017 – Regular Meeting from 2:00pm – 3:00pm
- Tuesday, September 5, 2017 – Regular Meeting from 2:00pm – 3:00pm
- Wednesday, November 8, 2017 – Regular Meeting from 2:00pm – 3:00pm

All regular meetings will take place at:

Connecticut Green Bank
845 Brook Street, Building #2
Albert Pope Board Room
Rocky Hill, CT 06067

Joint Committee of the CT Energy Efficiency Board and the Connecticut Green Bank Board of Directors

REGULAR QUARTERLY MEETING SCHEDULE FOR 2017

The following is a list of dates and times for **regular meetings** of the Clean Energy Finance and Investment Authority and the Connecticut Energy Efficiency Board through 2016

- **January 18, 2017** – Wednesday from 1:30-3:30 p.m.
- **April 19, 2017** – Wednesday from 1:30-3:30 p.m.
- **July 19, 2017** – Wednesday from 1:30-3:30 p.m.
- **October 18, 2017** – Wednesday from 1:30-3:30 p.m.

Should a **special meeting** be needed to address other issues that arise, a meeting will be scheduled accordingly.

All regular and special meetings will take place at the:

Department of Energy and Environmental Protection Commissioners Conference room
10 Franklin Square New Britain, CT 06051

CLEAN ENERGY JOBS IN CONNECTICUT

FINAL REPORT

AUGUST 10, 2016

NAVIGANT REFERENCE NO. 184823

DISCLAIMER

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August 2016

CONTRIBUTORS

This study was conducted by Navigant Consulting, Inc. (Navigant) with support from the Connecticut Green Bank (CGB) and Connecticut Department of Economic and Community Development (DECD), and assistance by Connecticut utilities Eversource Energy and United Illuminating (UI).

Note: If this document is referenced, it should be cited as: Navigant Consulting Inc., Connecticut Department of Economic and Community Development, and Connecticut Green Bank. June 2016. *Clean Energy Jobs in Connecticut*.

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COMPARISON

Connecticut Green Bank requested Navigant refresh their Clean Energy Economy Baseline Study as the industry has evolved.

2009-2010 STUDY[1]

- **Central focus:** To provide **detailed inventory/accounting** of renewable energy and energy efficiency jobs and wages, jobs impact based on dollars invested, clean energy value chain, and a summary of DECD work
- **Study pool:** 74 companies interviewed, 95 researched
- **Interview focus:** Job counts and industry insights
- **Technology:** Energy efficiency (EE) in general and renewable energy (RE), primarily solar PV and fuel cells

2015-2016 REFRESH

- **Central focus:** To provide an **updated calculator** tool to estimate the economic development benefits (i.e., job-years created) from clean energy investments in Connecticut
- **Study pool:** 31 companies interviewed, 40 researched
- **Interview focus:** Technology-specific data inputs for calculator
- **Additional technologies:** New distributed energy resources (DER) such as electric vehicle (EV) charging and energy storage

[1]*Connecticut Renewable Energy and Energy Efficiency Economy Baseline study, Navigant Consulting, Inc. [Completed in March 2009 and subsequently updated in 2010]*

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APPROACH

Navigant employed a top-down approach, seeking to interview and research the biggest employers and, using that data, extrapolate to the whole market.

- Focus was on **product development** and **manufacturing** as well as **project development** and **deployment** jobs across various leading and emerging **RE and EE** technologies.
- **Cross-checking was conducted using CGB, utility, and DECD resources**, Navigant's internal databases, and Connecticut industry experts.
- The state-wide industry size was estimated by extrapolation. **Assumptions and methodology were verified by CGB and DECD.**
- For market segments **not included in utility or Green Bank data**, employee counts were updated from the last study based on Navigant's existing data sources and professional judgement.
- Charts and figures in this presentation represent **direct jobs specific to RE and/or EE only** and refer to indirect and induced jobs only when specified.
- 40 companies were researched in detail, and **31 interviews were conducted** including:
    - 22 RE/EE companies
    - Three utilities
    - Three organizations/institutions
    - Three subject matter experts (SMEs)

INTERVIEWS

A focused interview approach was used to gather results from top employers or other sources and extrapolate for all current jobs.

1. **Build the initial company database.** Navigant developed a company and contact list using information from Connecticut Green Bank, Navigant's 2010 study, trade organizations, utilities, other public sources, and companies known to the evaluation team.

2. **Research primary contact information.** Missing email addresses and telephone numbers were researched through online searches and phone calls.

3. **Create, test, and revise the interview questions.** The interview question set was refined several times with the goal of making it concise while capturing information that was of greatest interest (see next slide).

4. **Conduct interviews.** Navigant managed the interview process and conducted the interviews. The evaluation team conducted 31 formal interviews of some of the largest RE/EE companies and contacted other stakeholders in this sector to augment the information collected from the formal interviews.

5. **Data collection.** Navigant worked with Connecticut Green Bank and other Connecticut departments to cross-check and supplement the team's assumptions and findings.

6. **Review and clean the data set.** Navigant worked with Connecticut Green Bank and other Connecticut departments to extensively review the analysis and results for accuracy and completeness, following up to verify and correct information as needed.

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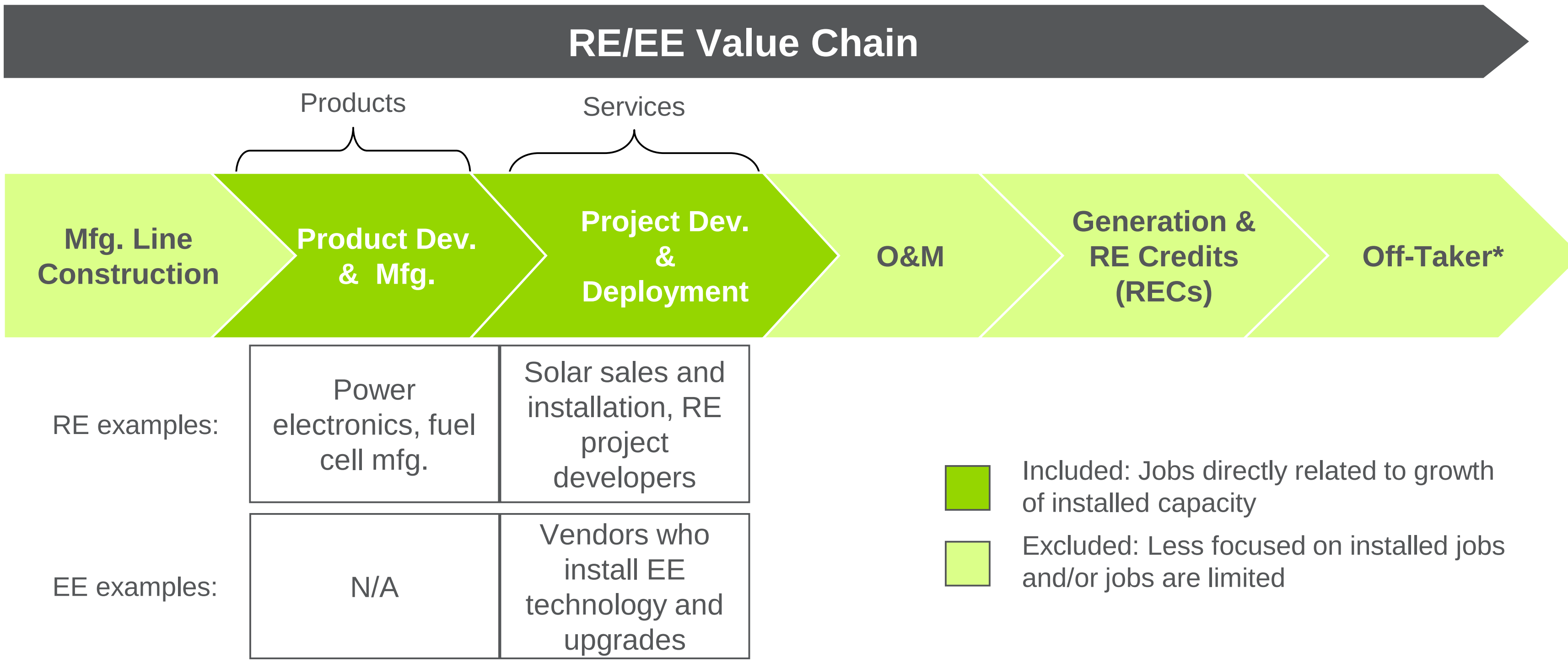
VALUE CHAIN

Based on a recommendation by the CGB, Navigant focused the calculator and jobs study on sections of the value chain most closely associated with project installation, which is the focus of the CGB.



**Note: An off-taker is an entity that purchases electricity or RECs from an independent power producer or marketer*

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JOB TYPES

In line with the value chain segments examined, “jobs types” included in the calculator related to manufacturing, installation, engineering, and project management.

General Job Type	Example Specific Occupation Types[1]
Manufacturing	Production occupations (e.g., assemblers, fabricators, equipment operators, and process workers)
Installers/Field Technicians	Installation and construction occupations (e.g., solar PV installers, heating, AC and refrigeration mechanics and installers, insulation workers, floor, ceiling and wall)
Electricians	Electricians, electro-mechanical technicians, electrical and electronics installers and repairers
Engineers/Project Managers	Engineers (e.g., mechanical, civil, and electrical engineers); management occupations (e.g., project, construction, and engineering managers)

[1]*Specific Occupation titles from Bureau of Labor Statistics – May 2015 State Occupational Employment and Wage Estimates Connecticut* http://www.bls.gov/oes/current/oes_ct.htm

DIRECT VS. INDIRECT JOBS

This analysis mainly considers direct jobs in private companies that employ people who are based in Connecticut. A multiplier for calculating indirect and induced jobs from the number of direct jobs was provided by the DECD for this study.

DIRECT JOBS

- For the purpose of this baseline analysis, direct jobs are considered existing jobs in the specified Connecticut industries.
- In policy analysis, direct jobs are commonly defined as the initial change in final demand for the industry sector in question. Direct job impacts describe the changes in economic activity for sectors that first experience a change in demand because of a project, policy decision, or some other stimuli.

INDIRECT JOBS

- Represents the response as supplying industries increase output in order to accommodate the initial change in final demand. These indirect beneficiaries will then spend money for supplies and services, which results in another round of indirect spending.

INDUCED JOBS

- Jobs generated by the spending of households who benefit from the additional wages and business income they earn through direct and indirect activity. The increase in income, in effect, increases the purchasing power of households.

Primary scope (the numbers presented in this report are direct jobs unless otherwise indicated)

Secondary scope through use of multipliers

Source: S. Grover, "Energy, Economic, and Environmental Benefits of the Solar America Initiative," August 2007, NREL/SR-640-41998.

DECD ANALYSIS OF INDIRECT AND INDUCED JOBS

DECD provided a multiplier for calculating indirect and induced jobs from the number of direct jobs for this study.

- DECD performed the simulations by creating net new jobs in the following sectors that include the occupations listed below:

Occupation	NAICS Code	Sector Description
Electrician, Installer/Field Technician	23	Construction
Engineer	541	Professional, technical, and scientific services
Fuel Cell Manufacturing (Solid State)	334	Computer and electronic product manufacturing
Fuel Cell Manufacturing (Electrochemical Generators)	335	Electrical equipment and appliance manufacturing

- DECD then obtained the multiplier by dividing the total employment generated in the economy by the net new jobs in the above sectors entered as input into Connecticut's REMI[1] model.
- The simulations generated an employment multiplier of 2.3, which means that for each RE/EE job, an additional 1.3 jobs are created, on average, each year.
- This relatively high multiplier most likely reflects the relatively large local supply of labor and intermediate goods; the decrease in the same multiplier over the 2010 study is likely due to the narrower job base classifications used this time around, as well as higher worker productivity in these sectors as companies do more with fewer workers.

[1]REMI V.1.6.7, Connecticut Single Region Model. REMI is a dynamic input-output model that assesses individual and firm behavioral responses to changes in relative prices over time. This simulation provides the potential regional employment impact of the relevant industry groups in Connecticut.

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2016 STUDY OVERVIEW

TECHNOLOGIES

This study includes some additional RE and EE technology industries as compared to the last study, such as EV infrastructure and energy storage.

Renewable Energy	
Technology	**Markets**
Fuel cells Solar PV Solar thermal Wind Geothermal Small hydro Energy storage EV charging	Residential Commercial and industrial (C&I) Utility

Energy Efficiency	
Technology*	**Markets**
High efficiency heating, ventilation and air conditioning (HVAC) Efficient lighting Efficient home appliances Water heating Building envelope Demand response	Residential (including low-income weatherization) C&I Small business

**Note: For the purpose of this analysis, Navigant merged all EE technologies and presented the results by market.*

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RECOMMENDATIONS

Because the focus of this study was the jobs calculator and installation-focused job creation—specifically product and project development jobs—the study could be expanded to address other segments.

Some areas for future investigation include:

Area of Study	Analysis Focus
Commercial EE	Commercial EE jobs count by job title and customer type
Other RE Manufacturing and R&D	Emerging RE manufacturing and R&D in Connecticut, including EV charging and storage
RE Utility Employees	Number of employees or job-years focused on administering RE programs
Value Chain Segments	Other areas of the value chain not explored in this study, including supply chain, operations and maintenance (O&M), academic, etc.

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OVERVIEW

The jobs calculator estimates the job-years created from $1 million in investment based on industry inputs such as cost allocation of labor and current wages.

2016 Analysis: RE/EE Job-Years Created from Public Investments Made by Connecticut Green Bank

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Occupation	Capital Invested	Company Overhead (SG&A) and Margin (%)	Project Cost After Overhead (SG&A) and Margin	Labor (% of Project Cost)	Non-Labor (% of Project Cost)	Weighted Average Wage	Fully Burdened Employee Cost	Direct Job Years Created per Million Dollars Invested	Indirect & Induced Jobs Multiplier	Indirect & Induced Jobs Created per Million Dollars Invested	Total Job-Years Created from Capital Invested
Renewable Energy	A	B	C=A*(1-B)	D	E=100%-D	F	G=F*1.3	H=C*(D/G)	I	J=H*I	K=H+J
Fuel Cell											
Fuel Cell Manufacturing	$ 1,000,000	20%	$ 800,000	40%	60%	$ 50,000	$ 65,000	4.9	1.3	6.4	**11.3**
Fuel Cell R&D/Engineering	$ 1,000,000	20%	$ 800,000	40%	60%	$ 85,000	$ 110,500	2.9	1.3	3.8	**6.7**
Solar PV											
Solar PV Installation - Residential	$ 1,000,000	20%	$ 800,000	35%	65%	$ 55,000	$ 71,500	3.9	1.3	5.1	**9.0**
Solar PV Installation - Non-Residential	$ 1,000,000	20%	$ 800,000	25%	75%	$ 50,000	$ 65,000	3.1	1.3	4.0	**7.1**

Excerpt from the jobs calculator.

UPDATES TO PREVIOUS STUDY

- These values are representative of the **2015-2016** market in Connecticut.
- Final values are given in **job-years** created per $1 million in capital invested.
- Public vs. private funding is **not specified** in the 2016 calculator refresh.
- Job-years created are calculated **after Sales, General & Administrative (SG&A) and margin** is removed.

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JOBS IMPACT BASED ON DOLLARS INVESTED

KEY FINDINGS

More job-years in EE are created per $1 million capital investment than for RE because material costs and wages are, on average, lower in the EE industry.

FAST FACTS

A $1 million capital investment creates:

- ~**5 job-years** for **energy storage** installers
- ~**7 job-years** for **EV charging** station installers
- ~**9 job-years** for **residential solar** installers
- ~**11 job-years** for **fuel cell** manufacturers
- ~**14 job-years** for **wind** project installers
- ~**14 job-years** for **commercial EE** installers
- ~**15 job-years** for **renewable thermal technologies (RTT)** installers
- ~**18 job-years** for **residential EE** installers

Job-years created are direct, indirect, and induced.

KEY FINDINGS

- More fuel cell manufacturing job-years are created per $1 million investment than solar installation jobs because a larger portion of funding goes toward labor.
- Renewable Thermal Technologies (RTT) and residential EE technologies create the most job-years per investment because labor and material costs are lower for these technologies.
- Investments in residential solar create more job-years from investment than commercial solar because material costs make up a larger portion of overall project cost for commercial customers.
- Other RE technologies such as energy storage and EV charging stations are still new to market and maintain high material costs, with less investment going toward installation labor.

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RESULTS: RENEWABLE ENERGY

RE job-years created per $1 million capital invested per the calculator approach:

Occupation	Direct Job-Years Created per $1 Million Invested	Indirect and Induced Jobs Created per $1 Million Invested	Total Job-Years Created from $1 Million Invested
Renewable Energy			
Fuel Cell			
Fuel Cell Manufacturing	4.9	6.4	11.3
Fuel Cell R&D/Engineering	2.9	3.8	6.7
Solar PV			
Solar PV Installation - Residential	3.9	5.1	9.0
Solar PV Installation - Non-Residential	3.1	4.0	7.1
Renewable Thermal Technologies			
Ductless Split Heat Pump	6.7	8.7	15.4
Geothermal	6.7	8.7	15.4
Solar Thermal	5.6	7.3	12.9
Other			
Wind Installation	6.2	8.0	14.2
Hydro Installation	6.2	8.0	14.2
EV Charging Stations - Installation	3.1	4.0	7.1
Storage Installation	2.2	2.9	5.1

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RESULTS: ENERGY EFFICIENCY

EE job-years created per $1 million capital invested per the calculator approach:

Occupation	Direct Job-Years Created per $1 Million Invested	Indirect and Induced Jobs Created per $1 Million Invested	Total Job-Years Created from $1 Million Invested
Energy Efficiency			
Residential (Single and Multifamily)			
Lighting	7.7	10.0	17.7
Home Energy Solutions (HES) - Audits	7.8	10.2	18.0
HES - Weatherization & HVAC	5.6	7.3	12.9
Gas Conversion	5.6	7.3	12.9
Commercial[1]			
Small Business (e.g., Small Business Energy Advantage)	6.2	8.0	14.2
Large Commercial and Industrial (e.g., C-PACE)	5.6	7.3	12.9

[1] *The municipalities, universities, schools, and hospitals (MUSH) market is included in Commercial.*

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METHODOLOGY

The two key inputs to calculate job-years created for each RE and EE job type are labor allocation of total project cost and average wage.

1. **Labor allocation:** The average of the values provided in company interviews and discussions with SMEs (particularly for wind and storage) was used.

2. **Average wage:** The wage for each of the four job types analyzed by the calculator was taken from the Bureau of Labor Statistics, or BLS, (CT, 2015) for the most similar occupation titles.

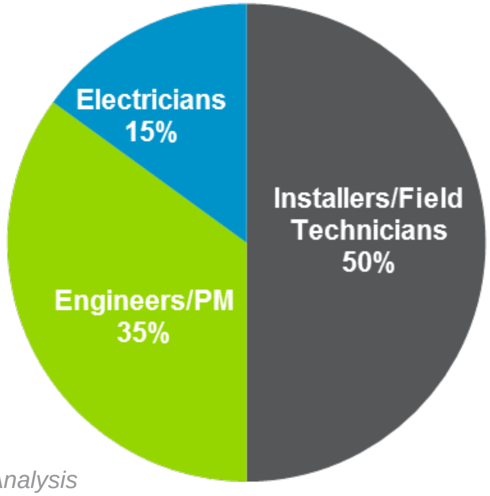
Job Type for Calculator	BLS Occupation Code*	BLS Occupation Title*	BLS Wage CT*	BLS Wage MA**	CT Wage vs. MA
Manufacturing	51-0000	Production occupations	$41,730	$39,500	6%
Installers/Field Technicians	47-2231	Solar photovoltaic installers	$37,270	$43,860	-15%
Electricians	47-2111	Electricians	$55,750	$64,790	-14%
Engineers/PM/R&D	17-2141	Mechanical engineers	$84,520	$91,270	-11%

*May 2015 State Occupational Employment and Wage Estimates Connecticut http://www.bls.gov/oes/current/oes_ct.htm
**May 2015 State Occupational Employment and Wage Estimates Massachusetts http://www.bls.gov/oes/current/oes_ma.htm

METHODOLOGY

3. A **weighted-average wage** was then calculated for each RE and EE offering by multiplying the BLS wages by the job classification breakdown, which was collected through interviews and internal research/experts.
   - The job classification breakdown used for residential solar is provided in the pie chart.
   - The job classification breakdowns used for all other technologies are provided in the table.

Residential Solar Employee Breakdown by Job Type (Average 36 Total Employees)



Source: Navigant Analysis

Employee Breakdown by Job Type*

Technology	Inst.	Elec.	Eng.
Commercial Solar	60%	15%	25%
Fuel Cell	60%	0%	40%
Wind	40%	20%	40%
EV Charging Stations	50%	30%	20%
Storage	25%	5%	70%
Lighting	80%	20%	0%
Small Business Energy Advantage (SBEA)	70%	15%	15%
Large C&I	50%	25%	25%

*Employee breakdowns were determined based on information collected in interviews, as well as with available internal research for the technologies included in this study.

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ASSUMPTIONS

The calculator primarily determines job-years per investment for installation- and manufacturing-type labor.

- Distribution/supply work is considered **indirect.**
- Subcontracted work is considered **indirect.**
- **Assumed** 20% for company overhead (SG&A) costs (including jobs) and margin (%).
- The wages **included** are calculated as a weighted average of four different job classifications:
  - Installers/Field Technicians
  - Electricians
  - Engineers/Project Managers/R&D
  - Manufacturing
- **Excluded** from the weighted average wage are the following job types:
  - Administrative and executive
  - O&M
  - Finance and accounting
  - Sales and marketing

NOTES

Some assumptions were made and included as notes within the calculator to clarify key variables and inputs to job-year calculation.

- Job-year final values are representative of the **2015-2016** market in Connecticut.
- Company Overhead and Margin (C) is **assumed to be 20%** and accounts for jobs related to sales, marketing, management, and other overhead jobs and expenses.
- **Labor** (D) is the percentage of the project cost that is used to pay installers, electricians, project managers and engineers.
- Non-Labor (E) is the percentage of the project cost that is used to cover **all other project expenses**, including materials and non-labor soft costs.
- Weighted Average Wage (F) is distributed among **installers, electricians, and PM/engineers** based on wages in Connecticut as reported by the U.S. Department of Labor as of May 2015.
- The weight for each job type is based on research and/or interview feedback for employee breakdowns for that field/technology.
- Total Direct Job-Years Created from Capital Invested (H) is the **total number of installer, electrician, and PM/engineering jobs created for 1 year.**
- Total Indirect and Induced Job-Years (J) is calculated from **DECD inputs.**

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OVERVIEW

Overall, this analysis estimates Connecticut has 5,300 direct jobs in the product development and manufacturing and project development and deployment segments of the RE/EE value chain.

OVERALL

- 5,300 direct RE/EE jobs
- Direct RE/EE jobs account for 0.31% out of a workforce of 1.7 million[1]

RENEWABLE ENERGY (RE)

- 12 companies interviewed, 17 researched, representing ~60% of the market
- 2,500 direct jobs
- Primarily solar and fuel cell jobs

ENERGY EFFICIENCY (EE)

- 10 key companies interviewed, 20 researched, representing ~30% of the market
- 2,800 direct jobs
- Primarily jobs in the residential and C&I market

Note: Indirect and induced jobs can be calculated using a multiplier of 1.3 for all jobs (DECD).
[1]Connecticut Department of Labor, Nonfarm Employment/Residents Employed as of April 2016 http://www1.ctdol.state.ct.us/lmi/ctnonfarmemployment.asp.

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RESULTS: RENEWABLE ENERGY

Employment in the solar industry has grown by approximately 30% since 2010 to become the largest RE industry for jobs in Connecticut.

FAST FACTS

- The total number of direct jobs for the RE industry in 2016 is ~2,500.
  - In 2010, the total number of RE jobs was ~1,700.
- 78% of the total fuel cell industry identified.
  - Leading employers include Doosan Group and FuelCell Energy.
- 68% of the total solar industry identified.
  - Biggest contributors include SolarCity and Trinity Solar.
- 26 RE companies identified: 9 companies interviewed, 17 companies researched in detail.
- Of ~2,500 direct jobs:
  - 44% products
  - 56% services

KEY FINDINGS

- The majority of RE jobs are split between the solar and fuel cell industries, with other RE technologies making up the remaining 6% of RE industry jobs.
- Installation and engineering jobs account for the largest job type at solar companies.
- Manufacturing and engineering jobs account for the largest job type at fuel cells companies.
- The majority of solar employees in Connecticut focus on the residential market.

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RESULTS: ENERGY EFFICIENCY

Overall employment in the EE industry has remained relatively constant, experiencing most job growth in the residential customer market.

FAST FACTS

- The total number of direct jobs for the EE industry in 2016 is ~2,800.
  - In 2010, the total number of EE jobs was ~2,700.
- 28% of the residential EE industry identified.
  - Biggest contributors include Competitive Resources and Energy Efficiencies Solutions.
- 27 EE companies identified: 7 companies interviewed, 20 companies researched in detail
- Of ~2,800 direct jobs:
  - 23% products
  - 74% services
  - 3% utility

KEY FINDINGS

- EE technologies mainly included lighting, HVAC, and building envelope, with the majority of companies participating in multiple technologies.
- Installation jobs account for the majority of roles in EE.
- Most EE jobs are focused on the residential and C&I customer markets, with the remaining focused on retail and utility.
  - The average number of employees at C&I companies is 90-120 vs. 10-40 at residential companies.
- Percentage of total EE employees participating in the C&I and retail markets was based off the percentage from the 2010 study.

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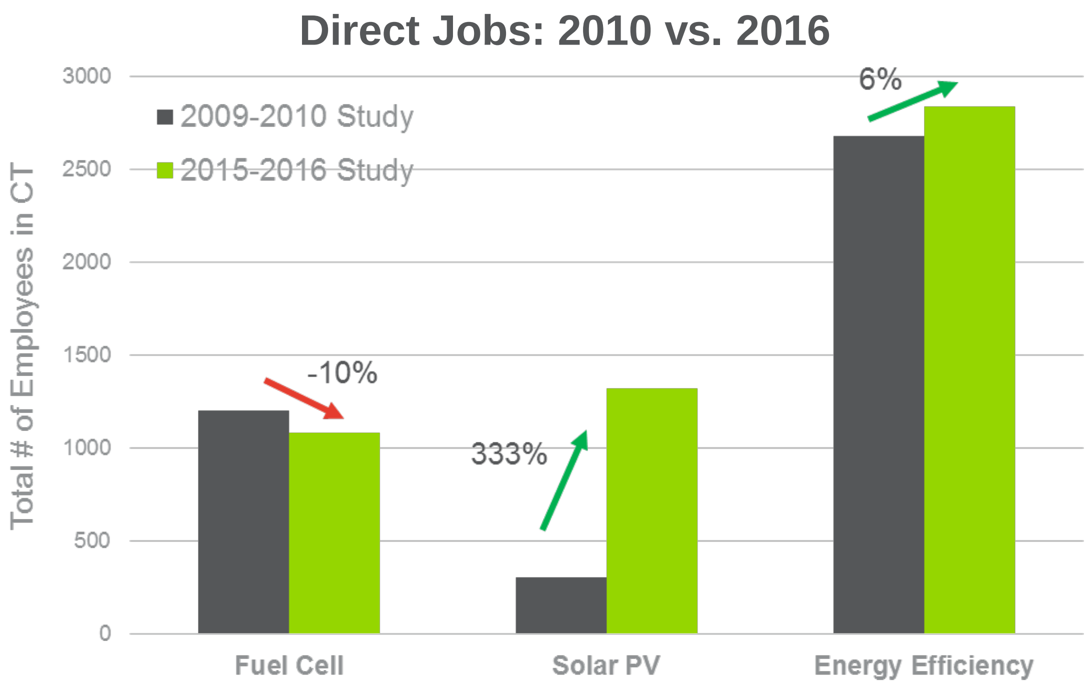
KEY FINDINGS

The number of direct solar industry jobs in Connecticut is more than 4 times greater than it was 5 years ago, while fuel cell and EE employment numbers have stayed relatively the same.



Source: Navigant Analysis

Note: The methodologies differ between this and the previous study; therefore, the results may not be 1-to-1 comparable. For example, not as many commercial EE companies were directly identified and interviewed in this study, so other sources were used to estimate the number of commercial EE companies and jobs.

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INDUSTRY REVIEW

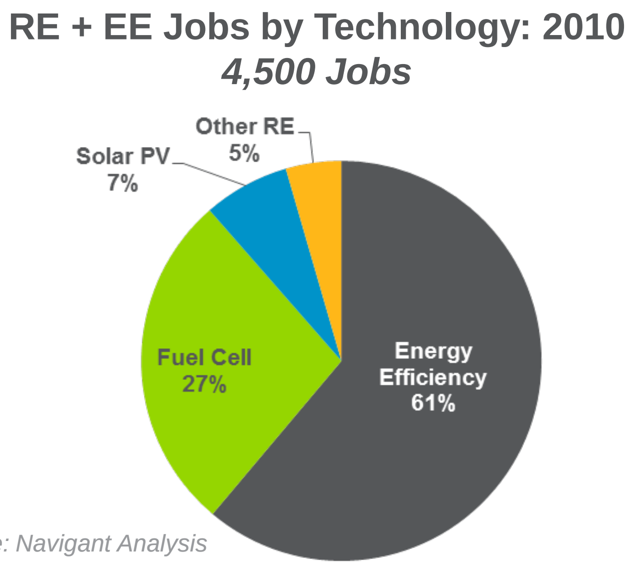
The top 10 RE/EE employers represent approximately 50% of total direct jobs in 2010 and 2016, but there has been significant turnover, which is evident in the variances between the lists below.

2010 Top 10 RE/EE Employers*
United Technologies Corp. (UTC)
FuelCell Energy, Inc.
Sensor Switch
Schuco USA
US Insulation Corp.
Home Depot
Trane
Noble Environmental Power
Alliance Energy Solutions (AES)
Wal-Mart

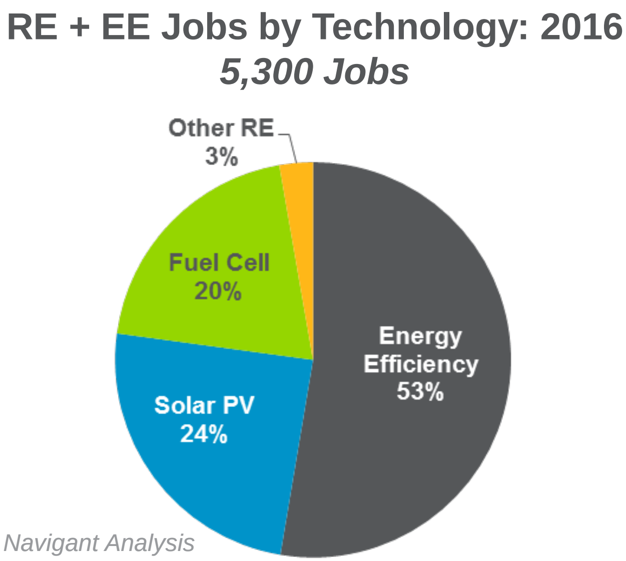
2016 Top 10 RE/EE Employers*
FuelCell Energy, Inc.
SolarCity
Doosan Fuel Cell America, Inc.
Trane
EMCOR
Home Depot
Greenskies Renewable Energy
CED Greentech
Trinity Solar
Competitive Resources

**Utility jobs excluded.*

Parallel to the growth of the solar industry, employment in this market has experienced the greatest increase among technologies.



Source: Navigant Analysis

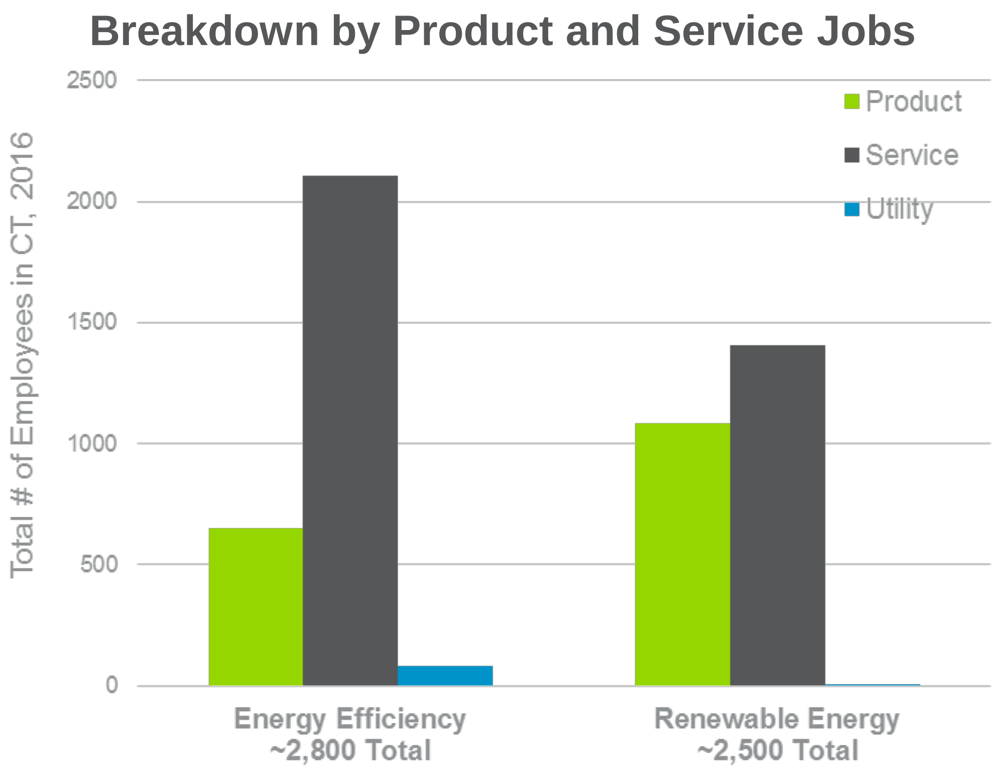


Source: Navigant Analysis

- The methodologies differ between this and the previous study; therefore, the results may not be 1-to-1 comparable.
- The decrease in employment in the fuel cell industry was related to the bankruptcy of UTC Power in 2013 following acquisition by ClearEdge. (Doosan acquired the ClearEdge assets in 2014.). Subsequently, in June 2016, Doosan made some additional layoffs.
- The small increase in EE employment was likely due to the industry increase in available residential program funding and technologies.
- The increase in solar employment was driven by technology cost reduction (i.e., hard and soft costs), public policy, incentives, and access to financing.

BREAKDOWN OF JOBS BY PRODUCT, SERVICE, AND UTILITY

The majority of RE companies and EE companies in Connecticut offer services, with the majority of product jobs belonging to the fuel cell industry.



Source: Navigant Analysis

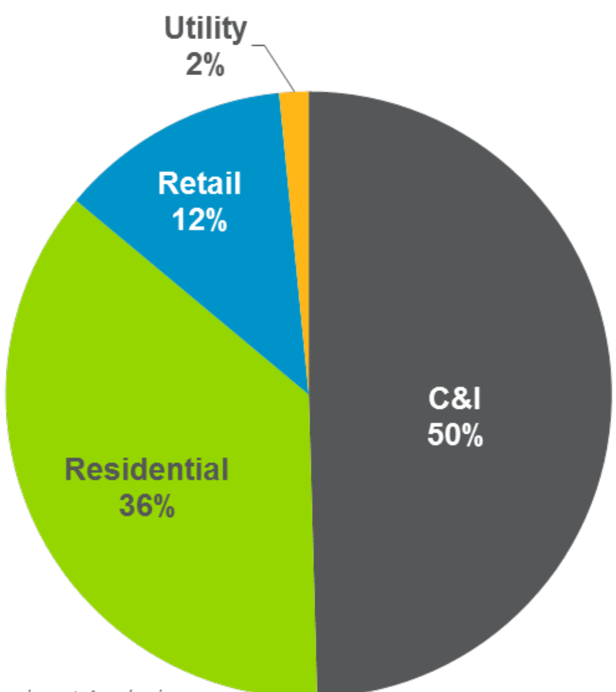
- For this study, focus is on those parts of the value chain that, for the most part, have jobs in product and service offerings.
  - Jobs were classified as offering either primarily products or primarily services, though companies may offer both.
- Product companies either manufacture and sell to customers or buy from manufacturers and sell to RE/EE installers and developers.
- Service companies provide services such as installation and auditing.
- RE industry service jobs are primarily in solar (~1,300 jobs out of ~1,400 service jobs).
- RE industry jobs at product companies are solely in the fuel cell industry (~1,100 jobs).
- EE industry is mostly service jobs (~2,100 of total EE jobs), with some retail and supply jobs (~600) and minimal utility jobs (~80).

Note: The "Utility" category includes ~80 EE program administration jobs and <10 RE program administration jobs within Eversource, UI, and Norwich Public Utilities (NPU).

JOBS BY CUSTOMER MARKET

More than half of RE and EE employees studied in the state serve the C&I customer market.

RE + EE Jobs by Customer Market in CT: 2016
5,300 Direct Jobs



Source: Navigant Analysis

- All fuel cell employees are categorized as working in the C&I customer market, which accounts for approximately 1,100 jobs.
- About 40% of the 2,800-plus EE employees serve the C&I customer market as well.

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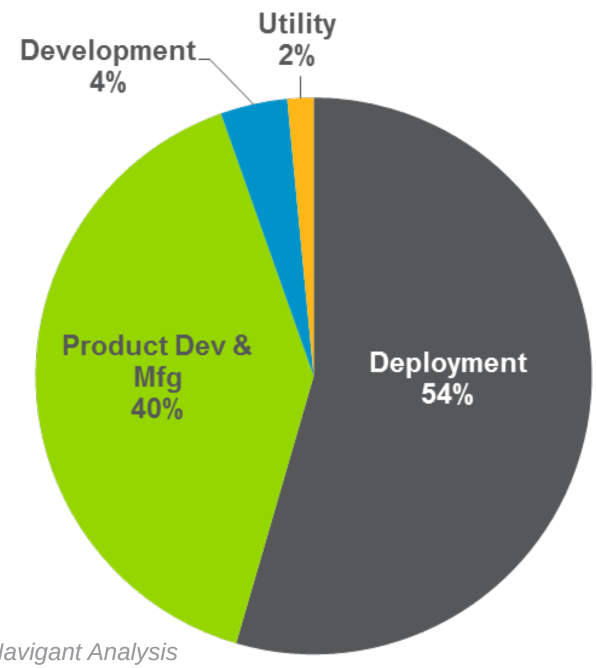
JOBS BY VALUE CHAIN

More than half of RE and EE employees studied in the state work in the deployment part of the value chain.

RE + EE Jobs by Value Chain in CT: 2016
5,300 Direct Jobs



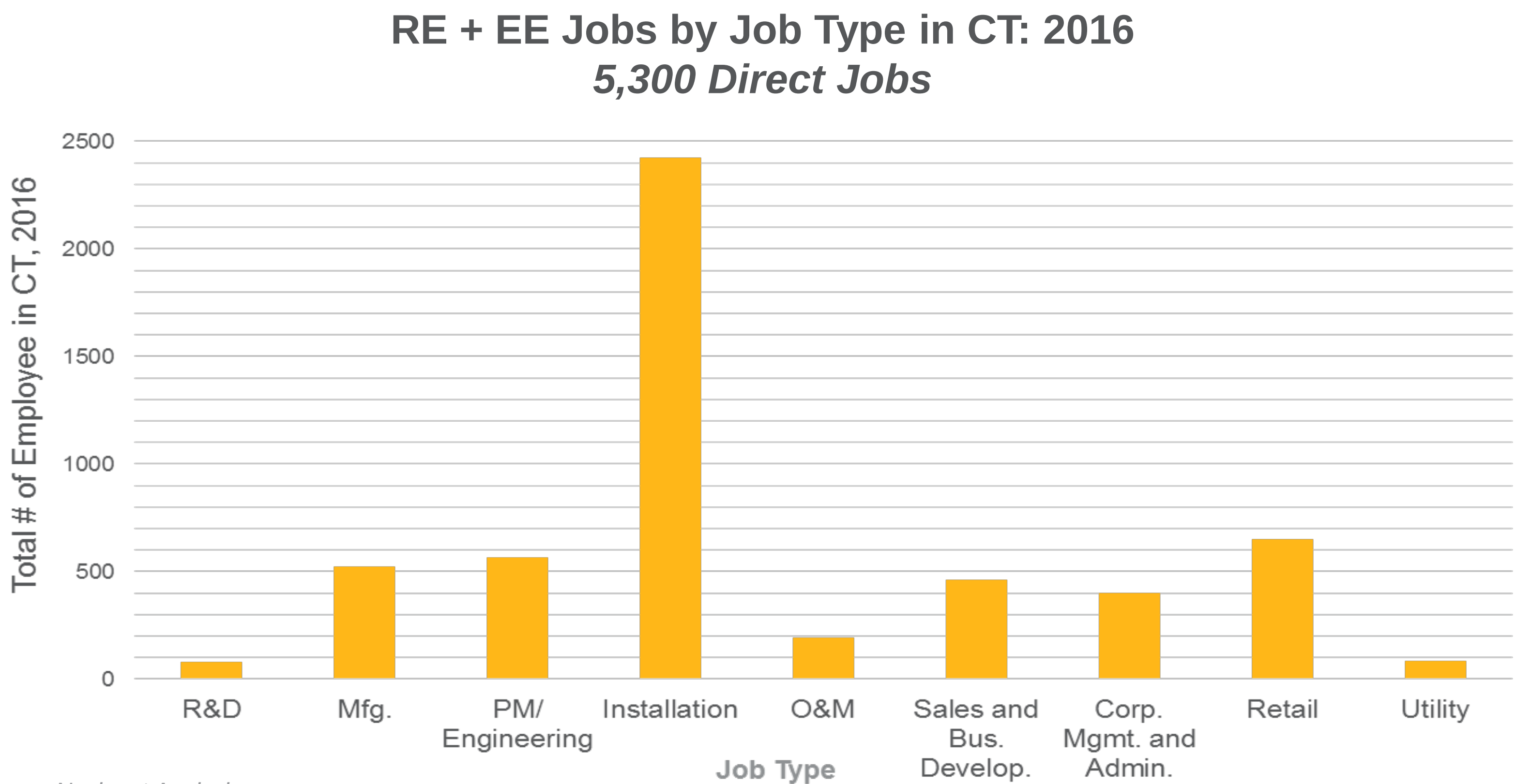
Source: Navigant Analysis

Note: Direct jobs in deployment and development mostly include installer and engineer job types.

- Navigant specifies the difference between deployment and development as companies in deployment employ their own installers, while project developers subcontract the installation.
- Solar and other RE technologies (apart from fuel cells) account for the majority of the deployment and development jobs.
- All fuel cell employees and the retail and supply portion of the EE industry make up the product development and manufacturing percentage.

JOBS BY JOB TYPE

Most RE and EE employees studied in the state working within the manufacturing and deployment segments have installation jobs, primarily in the solar and EE industries.



Source: Navigant Analysis

APPROACH

The following summarizes the methodology used to collect data through interviews and then extrapolate for statewide current jobs.

1. Calculation of total number of jobs for top companies:

- Interview top companies:
  - Renewable energy and energy efficiency
  - State leaders for each product of interest
  - Variety of roles along value chain
- Ask each company for current total number of RE/EE jobs

2. Extrapolation to represent the total market in Connecticut:

- Determine market share of interviewed and research companies in Connecticut RE/EE industry
  - Feedback from 2010 study was that biggest players were representative of the statewide industry
  - For market segments without interview data, estimate market share based on 2010 study
- Extrapolate to calculate for non-interviewed companies:

  If interviewed companies had X jobs representing Y% of market share,
  then all jobs = X / Y%

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NOTES

Various sources of public and private data were used to extrapolate the jobs reported in interviews and literature to statewide industry employment.

1. Green Bank and utility-provided data, as well as industry reports and articles, were used to estimate total market size.
   - Publicly available industry reports and internal research were used to estimate the fuel cell market size.
   - Green Bank data was used for the residential solar market size (assuming Green Bank data captures 100% of the residential solar market).
   - Utility Zero Emission Renewable Energy Credit (ZREC) data was used for the commercial solar market size (assuming the top ten installers for small, medium and large commercial projects in the ZREC program represent the commercial solar market).
   - Utility EE data was used for the residential EE market size (assuming utility EE data captures 100% of the residential EE market).
   - Commercial EE and “Other” RE technology market size were based off market share from the 2010 study (limited interviews and data on these players).
2. Jobs reported by companies interviewed or researched were then divided by the market sizes from the first step to calculate statewide industry size in terms of employment.
   - Only full-time employee (FTE) jobs were reported in interviews and research.
   - LinkedIn current employee counts in Connecticut were used for some companies with missing information, and a multiplier of three was applied (derived from companies where employee count was reported in interviews divided by the number on LinkedIn).

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INTERVIEW GUIDE

The interview guide for this study was based off the last study, with questions more directed toward the current economy in Connecticut.

YOUR COMPANY

1. Please tell us a little about yourself and your role in the company.
2. Describe your overall business.
3. Describe your RE/EE business.
   a. Do you offer primarily RE, EE, or a combination?
   b. Do you offer primarily products or services?
   c. To which **renewable or energy efficiency technology** do you must closely associate? See dropdown list **RE (and Other) Products** and **EE Products**
   d. In which area of the value chain does your RE/EE business primarily operate? See dropdown list **Value Chain (High-level)** and **Value Chain (Detailed)**

CUSTOMERS

4. Which market do you primarily serve? See dropdown list **Market Segment**
5. What percentage of RE/EE customers are in CT?

PROJECT ECONOMICS

6. What is the average/median wage for different specialties/job classifications that your company uses for your RE/EE work (provide examples)?
7. What is average project cost?
8. What is the typical split between labor and material as a percent of total project cost?
9. Which RE/EE state-funded programs do you participate in?
10. What percentage of your project costs are funded by upfront state incentives (e.g., Connecticut Energy Efficiency Fund, Green Bank)?
11. Of these project economics inputs you provided, what are the market conditions that could trigger them to change?

CURRENT JOBS

11. How many FTE (full-time equivalent) employees did you have working on RE/EE jobs in Connecticut at the end of 2015?
12. What portion of your Connecticut RE/EE employees are in each value chain segment? See dropdown list **Value Chain (High-level)** and **Value Chain (Detailed)**

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INTERVIEW GUIDE

The following list of dropdowns were used with the interview questions and allowed respondents to identify all that applied.

RE Products	EE Products	Market Segment	Value Chain (High-Level)	Value Chain (Detailed)
Fuel Cell	HVAC	Residential	Mfg. Line Construction	R&D
Solar PV	Lighting	Small Business	Product Dev. & Mfg.	Raw Material Supplier
Solar Thermal	Appliances	Large C&I	Deployment	Component Mfg.
Wind	Water Heating	MUSH	O&M	Assembly & Test
Geothermal	Commercial Refrigeration	Utility/IPP	Generation and REC	RE Deploy: Distributor
Hydro	Pumps, Motors, Drives	Retail	Off-Taker	RE Deploy: Developer
Hydrogen	Building Envelope	Other		RE Deploy: System Integrator
Biomass	Demand Response	Multiple		RE Deploy: Installer
Anaerobic Digestion	Other			RE Deploy: Project Investor
CHP	Multiple			RE Deploy: Business Support
Microgrids				EE Deploy: Supply & Wholesale
Storage				EE Deploy: Retail & Distribution
Grid Infrastructure				EE Deploy: Delivery & Installation
AFV Infrastructure				EE Deploy: Marketing & Outreach
Other				EE Deploy: Evaluation & Consulting
Multiple				EE Deploy: Business Support
				In-House O&M
				Contract O&M
				Finance & Ownership

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RE CALCULATOR RESULTS (DETAILED)

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Occupation	Capital Invested	Company Overhead (SG&A) and Margin (%)	Project Cost After Overhead (SG&A) and Margin	Labor (% of Project Cost)	Non-Labor (% of Project Cost)	Weighted Average Wage	Fully Burdened Employee Cost	Direct Job Years Created per Million Dollars Invested	Indirect & Induced Jobs Multiplier	Indirect & Induced Jobs Created per Million Dollars Invested	Total Job-Years Created from Capital Invested
Renewable Energy	A	B	C=A*(1-B)	D	E=100%-D	F	G=F*1.3	H=C*(D/G)	I	J=H*I	K=H+J
Fuel Cell											
Fuel Cell Manufacturing	$ 1,000,000	20%	$ 800,000	40%	60%	$ 50,000	$ 65,000	4.9	1.3	6.4	**11.3**
Fuel Cell R&D/Engineering	$ 1,000,000	20%	$ 800,000	40%	60%	$ 85,000	$ 110,500	2.9	1.3	3.8	**6.7**
Solar PV											
Solar PV Installation - Residential	$ 1,000,000	20%	$ 800,000	35%	65%	$ 55,000	$ 71,500	3.9	1.3	5.1	**9.0**
Solar PV Installation - Non-Residential	$ 1,000,000	20%	$ 800,000	25%	75%	$ 50,000	$ 65,000	3.1	1.3	4.0	**7.1**
Renewable Thermal Technologies											
Ductless Split Heat Pump	$ 1,000,000	20%	$ 800,000	60%	40%	$ 55,000	$ 71,500	6.7	1.3	8.7	**15.4**
Geothermal Installation	$ 1,000,000	20%	$ 800,000	60%	40%	$ 55,000	$ 71,500	6.7	1.3	8.7	**15.4**
Solar Thermal Installation	$ 1,000,000	20%	$ 800,000	50%	50%	$ 55,000	$ 71,500	5.6	1.3	7.3	**12.9**
Other											
Wind Installation	$ 1,000,000	20%	$ 800,000	60%	40%	$ 60,000	$ 78,000	6.2	1.3	8.0	**14.2**
Hydro Installation	$ 1,000,000	20%	$ 800,000	60%	40%	$ 60,000	$ 78,000	6.2	1.3	8.0	**14.2**
EV Charging Stations - Installation	$ 1,000,000	20%	$ 800,000	25%	75%	$ 50,000	$ 65,000	3.1	1.3	4.0	**7.1**
Storage Installation	$ 1,000,000	20%	$ 800,000	20%	80%	$ 55,000	$ 71,500	2.2	1.3	2.9	**5.1**

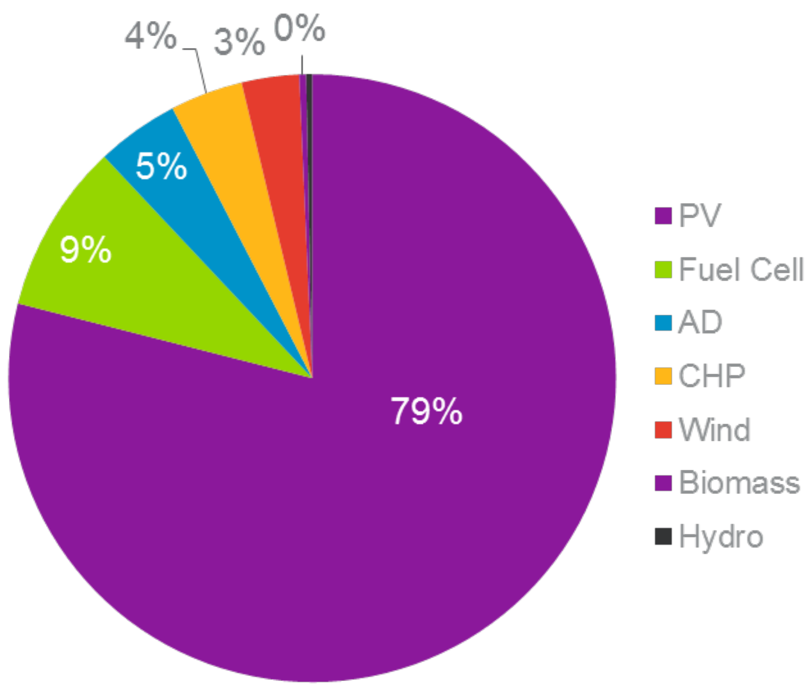
EE CALCULATOR RESULTS (DETAILED)

Occupation	Capital Invested	Company Overhead (SG&A) and Margin (%)	Project Cost After Overhead (SG&A) and Margin	Labor (% of Project Cost)	Non-Labor (% of Project Cost)	Weighted Average Wage	Fully Burdened Employee Cost	Direct Job Years Created per Million Dollars Invested	Indirect & Induced Jobs Multiplier	Indirect & Induced Jobs Created per Million Dollars Invested	Total Job-Years Created from Capital Invested
Energy Efficiency	A	B	C=A*(1-B)	D	E=100%-D	F	G=F*1.3	H=C*(D/G)	I	J=H*I	K=H+J
Residential (Single and Multi-Family)											
Lighting	$ 1,000,000	20%	$ 800,000	50%	50%	$ 40,000	$ 52,000	7.7	1.3	10.0	**17.7**
Home Energy Solutions (HES) - Audits	$ 1,000,000	20%	$ 800,000	70%	30%	$ 55,000	$ 71,500	7.8	1.3	10.2	**18.0**
HES - Weatherization & HVAC	$ 1,000,000	20%	$ 800,000	50%	50%	$ 55,000	$ 71,500	5.6	1.3	7.3	**12.9**
Gas Conversion	$ 1,000,000	20%	$ 800,000	50%	50%	$ 55,000	$ 71,500	5.6	1.3	7.3	**12.9**
Commercial											
Small Business Energy Advantage	$ 1,000,000	20%	$ 800,000	50%	50%	$ 50,000	$ 65,000	6.2	1.3	8.0	**14.2**
Large Commerical and Industrial	$ 1,000,000	20%	$ 800,000	50%	50%	$ 55,000	$ 71,500	5.6	1.3	7.3	**12.9**

INTERVIEW TARGETS

Because solar makes up 79% of the RE industry in Connecticut based on power capacity (kW), it was important to reach out to solar companies.

Market Share of RE Companies: 2011-2015
165 MW



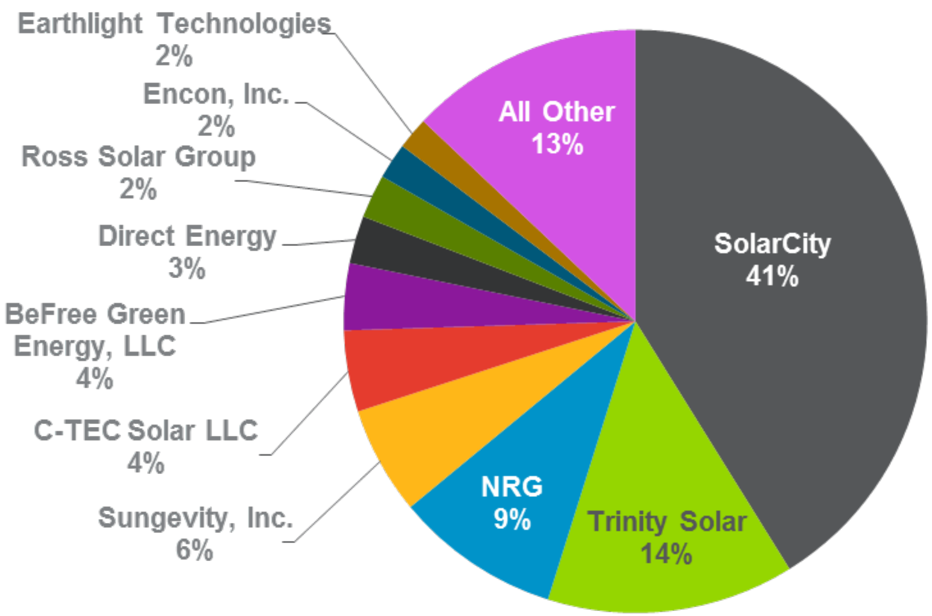
Source: Connecticut Green Bank data, Navigant analysis

- Solar makes up 79% of the RE market in Connecticut based on total number of kilowatts.
- Solar makes up 99.9% of the RE market in Connecticut based on the 15,042 projects reported by the CGB from 2011-2015.
- There are more anaerobic digestion (AD) and combined heat and power (CHP) projects, by count, but more kilowatts from fuel cells.
- The employee-to-kilowatt or employee-to-project count ratio for fuel cell, AD, and wind projects follows a drastically different structure than solar due to average project capacity and technology specifics.

RE INTERVIEW TARGETS: SOLAR

The list of first priority solar companies to contact/research was created based on market share data provided by the Green Bank.

Market Share of Solar Companies: 2015
6,122 Projects



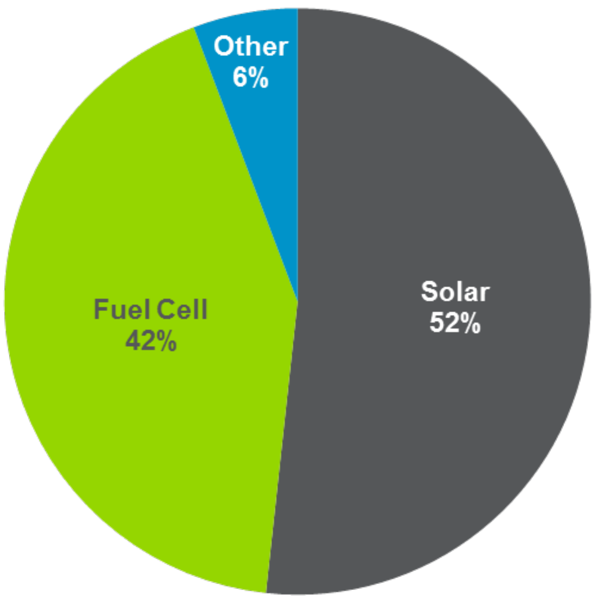
Source: Connecticut Green Bank data, Navigant analysis

- SolarCity holds the greatest share of the solar market in Connecticut based on kilowatts and number of projects.
- The top 10 solar contributors were part of the first priority RE companies to interview.
- For those companies Navigant was able to get an employee count for, this market share was used for extrapolating statewide.
- It was assumed that the Connecticut Green Bank database covered 100% of the residential solar market.
  - Utility data for the top ten installers for small, medium and large commercial projects in the ZREC program was used to represent the commercial market

RE JOBS ANALYSIS

The majority of RE jobs are split between the solar and fuel cell industries, with other RE technologies making up the remaining 6% of RE industry jobs.

RE Jobs by Technology in Connecticut
2,500 Direct Jobs



Source: Navigant Analysis

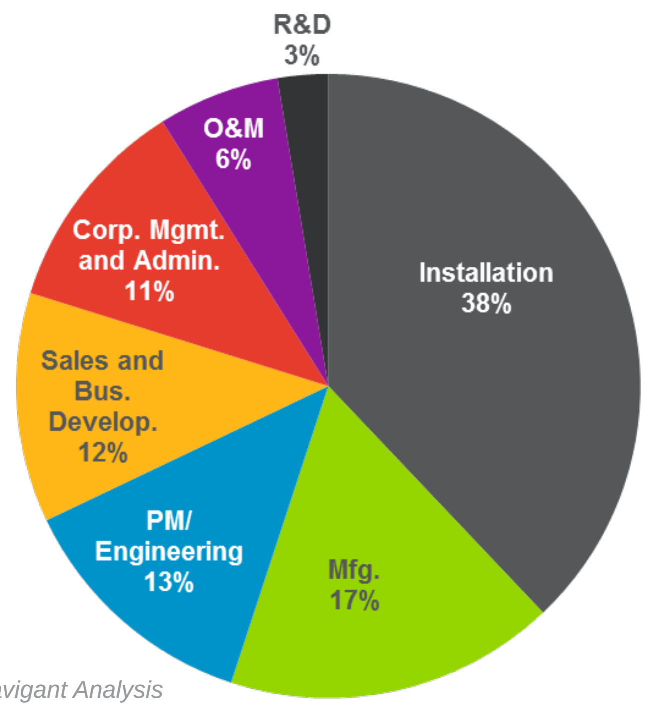
- Solar jobs account for 52% of the overall RE industry (~1,300 jobs).
  - In 2010, only 18% of RE jobs were solar.
- Fuel cell jobs account for 42% of the RE industry (~1,100 jobs).
  - In 2010, fuel cells account for 71% of the total RE jobs.
- The “Other” category includes solar thermal, geothermal, wind, small hydro, EV, energy storage, biomass, and hydrogen.[1]

[1]*Few companies from the “Other” category were interviewed for this study given the focus on current leading technologies; therefore, the total percentage of these technologies was generally assumed to be the same as the 2010 study.*

RE JOBS ANALYSIS

Installation-type jobs make up the majority of RE labor, mainly due to the large size of the solar industry in Connecticut.

RE Jobs by Type in Connecticut
2,500 Direct Jobs



Source: Navigant Analysis

- Installation jobs account for the largest job type at solar companies.
- Manufacturing and engineering jobs account for the largest job type at fuel cell companies.
  - R&D also makes up a portion of the fuel cell jobs but does not appear in any other technology industry in this study.
- Sales and business development-type jobs made up a larger portion at solar companies as compared to fuel cells.
- Corporate, management, and administrative-type jobs were noted as a portion of employees across all technologies.

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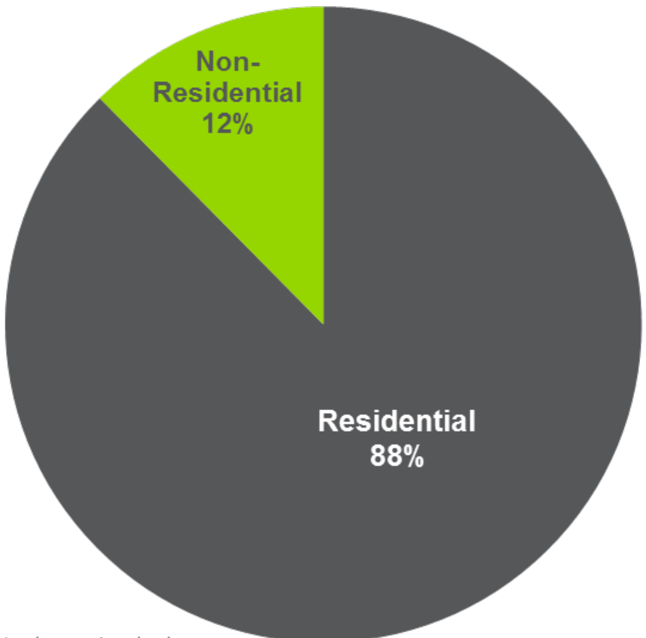
Similar to the trend across the country, residential is the primary customer market for solar in Connecticut.

Solar Jobs by Customer Market in Connecticut
1,300 Direct Jobs



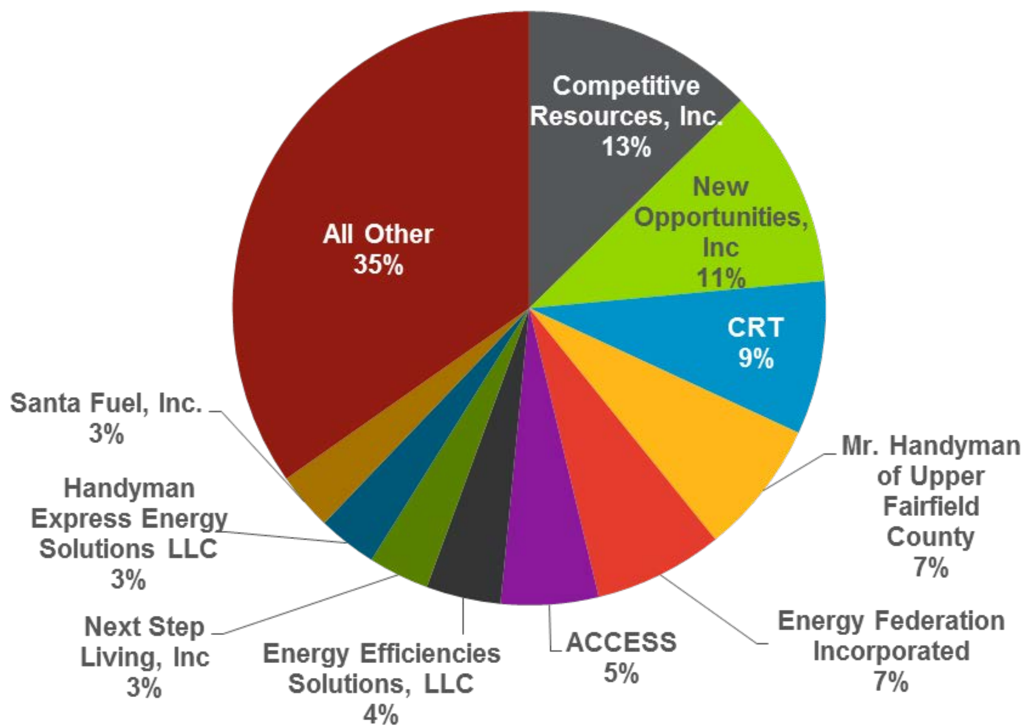
Source: Navigant Analysis

- The majority of solar employees in Connecticut focus on the residential customer market.
- Some companies reported to work in both residential and non-residential; however, in those cases, the majority of employees focused on residential.
- The non-residential market includes:
  - Small business
  - Large C&I
  - MUSH
  - There were few, if any, jobs associated with utility-scale solar

EE INTERVIEW TARGETS

The EE market is highly fragmented, with many companies operating; utility data was used to identify the largest players.

Market Share of EE Companies: 2015
49,210 Projects



Source: Eversource data, Navigant analysis

- Market leaders vary greatly based on annual power capacity (in MMBtu[1]) and number of projects in the EE market due to different technology offerings.
- Unlike RE, the top EE leaders are closer in market share to each other and to all others.
- For this reason, although just as many EE companies were interviewed and researched as RE companies, a smaller portion of the market was captured—approximately 30%.

[1]million British Thermal Units

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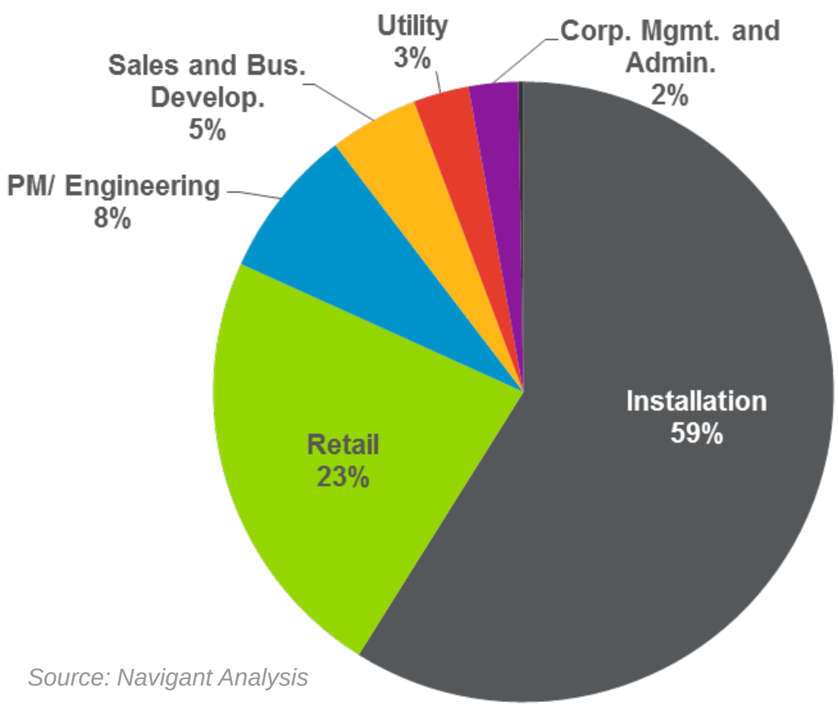
EE JOBS ANALYSIS

Installation-type jobs make up 59% of EE-related labor, followed by 23% retail, across all EE technologies.

EE Jobs by Type in Connecticut
2,800 Direct Jobs



Source: Navigant Analysis

- Installation jobs account for the majority of roles in EE.
- Job titles included under installation varied in skill level and trade:
  - Electricians (master and apprentice)
  - Plumbers and other HVAC-specific technicians
  - Installers of appliances, windows, and insulation
- The retail channel is more important to EE relative to RE.
- Corporate, management, and administrative-type jobs and sales and business development-type jobs account for only a small portion of EE-related labor.

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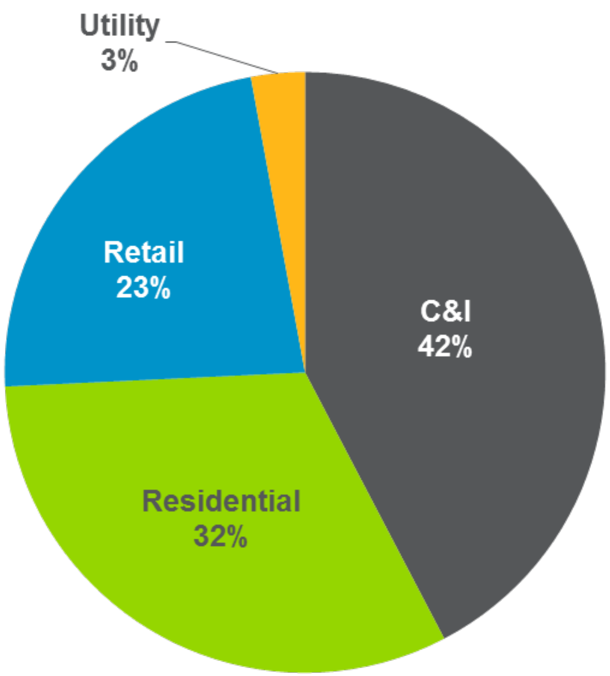
EE JOBS ANALYSIS

Most EE jobs are focused on the residential and C&I customer markets, with the remaining focused on retail and only a few on utility.

EE Jobs by Customer Market in Connecticut
2,800 Direct Jobs



Source: Navigant Analysis

- The majority of EE employees in Connecticut focus on the residential and C&I customer markets.
  - Though there are less EE companies focused on C&I in Connecticut, they hire a larger amount of employees per company.
- The non-residential market includes small business, C&I, and MUSH customers.
- A significant portion of the residential market serves multifamily customers.
- The retail segment includes retail and wholesale suppliers.
- Jobs in the utility sector only include employees who work primarily on EE-related work, such as supporting EE programs and incentives across markets.

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Clean Energy Jobs in Connecticut

Prepared for the Connecticut Green Bank

August 10, 2016

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2016 Analysis: RE/EE Job-Years Create

Occupation	Capital Invested	Company Overhead (SG&A) and Margin (%)	Project Cost After Overhead (SG&A) and Margin
Renewable Energy	A	B	C=A*(1-B)
Fuel Cell			
Fuel Cell Manufacturing	$ 1,000,000	20%	$ 800,000
Fuel Cell R&D/Engineering	$ 1,000,000	20%	$ 800,000
Solar PV			
Solar PV Installation - Residential	$ 1,000,000	20%	$ 800,000
Solar PV Installation - Non-Residential	$ 1,000,000	20%	$ 800,000
Renewable Thermal Technologies			
Ductless Split Heat Pump	$ 1,000,000	20%	$ 800,000
Geothermal Installation	$ 1,000,000	20%	$ 800,000
Solar Thermal Installation	$ 1,000,000	20%	$ 800,000
Other			
Wind Installation	$ 1,000,000	20%	$ 800,000
Hydro Installation	$ 1,000,000	20%	$ 800,000
EV Charging Stations - Installation	$ 1,000,000	20%	$ 800,000
Storage Installation	$ 1,000,000	20%	$ 800,000
Energy Efficiency	A	B	C=A*(1-B)
Residential (Single and Multi-Family)			
Lighting	$ 1,000,000	20%	$ 800,000
Home Energy Solutions (HES) - Audits	$ 1,000,000	20%	$ 800,000
HES - Weatherization & HVAC	$ 1,000,000	20%	$ 800,000
Gas Conversion	$ 1,000,000	20%	$ 800,000
Commercial			
Small Business Energy Advantage	$ 1,000,000	20%	$ 800,000
Large Commerical and Industrial	$ 1,000,000	20%	$ 800,000

Calculator Notes:

Company Overhead and Margin (C) is assumed to be 20% and include jobs related to sales

Labor (D) is the percent of the project cost that is used to pay installers, electricians, project r

Non-Labor (E) is the percent of the project cost that is used to cover all other project expens

Weighted Average Wage (F) is distributed amongst installers, electricians and PM/engineers
The weight for each job type is based on research and/or interview feedback for employee b
Total Job-Years Created from Capital Invested (H) is the total number of installer, electricia

Source: Navigant Consulting, Connecticut Green Bank, DECD.
DECD provided multiplier of 1.3 for burden rate and 1.6 for indirect and induced jobs.

ed from Public Investments Made by Connecticut Green Bank

Labor (% of Project Cost)	Non-Labor (% of Project Cost)	Weighted Average Wage	Fully Burdened Employee Cost	Direct Job Years Created per Million Dollars Invested	Indirect & Induced Jobs Multiplier
D	E=100%-D	F	G=F*1.3	H=C*(D/G)	I
40%	60%	$ 50,000	$ 65,000	4.9	1.3
40%	60%	$ 85,000	$ 110,500	2.9	1.3
35%	65%	$ 55,000	$ 71,500	3.9	1.3
25%	75%	$ 50,000	$ 65,000	3.1	1.3
60%	40%	$ 55,000	$ 71,500	6.7	1.3
60%	40%	$ 55,000	$ 71,500	6.7	1.3
50%	50%	$ 55,000	$ 71,500	5.6	1.3
60%	40%	$ 60,000	$ 78,000	6.2	1.3
60%	40%	$ 60,000	$ 78,000	6.2	1.3
25%	75%	$ 50,000	$ 65,000	3.1	1.3
20%	80%	$ 55,000	$ 71,500	2.2	1.3
D	E=100%-D	F	G=F*1.3	H=C*(D/G)	I
50%	50%	$ 40,000	$ 52,000	7.7	1.3
70%	30%	$ 55,000	$ 71,500	7.8	1.3
50%	50%	$ 55,000	$ 71,500	5.6	1.3
50%	50%	$ 55,000	$ 71,500	5.6	1.3
50%	50%	$ 50,000	$ 65,000	6.2	1.3
50%	50%	$ 55,000	$ 71,500	5.6	1.3

;, marketing, management and other overhead jobs
nanagers and engineers
es, including materials and non-labor soft costs

s based on wages in CT as reported by the U.S. Department of Labor as of May 2015
breakdowns for that field/technology
n and PM/engineering jobs created for 1 year

Indirect & Induced Jobs Years Created per Million Dollars Invested	Total Job-Years Created from Capital Invested
J=H*I	K=H+J
6.4	**11.3**
3.8	**6.7**
5.1	**9.0**
4.0	**7.1**
8.7	**15.4**
8.7	**15.4**
7.3	**12.9**
8.0	**14.2**
8.0	**14.2**
4.0	**7.1**
2.9	**5.1**
J=H*I	K=H+J
10.0	**17.7**
10.2	**18.0**
7.3	**12.9**
7.3	**12.9**
8.0	**14.2**
7.3	**12.9**

EVALUATION FRAMEWORK SOCIETAL PERSPECTIVE

CONNECTICUT GREEN BANK

Connecticut still revolutionary

Economic Development Overview

One of the indicators that the Connecticut Green Bank will be tracking in its programs and overall portfolio is the extent to which investments in clean energy create value from a societal perspective as it relates to the economic development of the state[1]. For the Green Bank programs this will be measured as the relationship between investments and associated direct and indirect jobs created. In 2009, and updated in 2010, Navigant Consulting prepared a Connecticut Renewable Energy and Energy Efficiency Economy Baseline Study[2], which included a focus on the investments in those energy sectors and the resulting job creation. Since that report was prepared, the availability of new clean energy technologies that have emerged (e.g., DER resources, EVs, electric charging stations, etc.), and a variety of related economic factors (e.g., costs of labor, cost of resource acquisition, etc.) have changed. In coordination with the Connecticut Department of Economic and Community Development (DECD) and with assistance from Eversource Energy and United Illuminating, The Connecticut Green Bank contracted Navigant Consulting to refresh the investment-jobs portion of its earlier study by providing an updated calculator tool to estimate the economic development benefits from clean energy investments in Connecticut, as reflected in job-years created. The updated study focused on jobs associated with the investment area of the Connecticut Green Bank: renewable energy (RE) and energy efficiency (EE) project development and deployment, and product development and manufacturing. The final value output in the jobs calculator is *job-years created per $1 million invested in clean energy projects in Connecticut*.

The Connecticut Green Bank, through its Evaluation Framework, and specifically its Societal Perspective metrics, will use the findings of this study to estimate, analyze, and report on the economic development benefits of the investment activity in clean energy deployment in Connecticut that it is an integral part of.

Results of RE/EE job-years created to investment analysis

Below is a summary of the results of the analysis of direct, indirect, and induced job-years created by each million-dollar investment in clean energy deployment in Connecticut:

~5 job-years for storage tech installers	**~9 job-years** for residential solar installers	**~14 job-years** for commercial EE installers
~7 job-years for EV charging installers	**~11 job-years** for fuel cell manufacturers	**~15 job-years** for RTT installers
~7 job-years for commercial solar installers	**~14 job-years** for wind project installers	**~18 job-years** for residential EE installers

About the Connecticut Green Bank

The Connecticut Green Bank was established by the Connecticut General Assembly on July 1, 2011 as a part of Public Act 11-80. As the nation's first full-scale green bank, it is leading the clean energy finance movement by leveraging public and private funds to scale-up renewable energy deployment and energy efficiency projects across Connecticut. The Green Bank's success in accelerating private investment in clean energy is helping Connecticut create jobs, increase economic prosperity, promote energy security and address climate change. For more information about the Connecticut Green Bank, please visit www.ctgreenbank.com

About the Department of Economic and Community Development

The Department of Economic and Community Development is the state's lead agency responsible for strengthening Connecticut's competitive position in the rapidly changing knowledge-based global economy. The department administers the Manufacturing Innovation Fund that was created to support and strengthen Connecticut's manufacturing sector. For more information about the Department of Economic and Community Development, please visit www.decd.org

continued >

Methodology

1 Calculation of total jobs at top companies:

Interviewed top companies, 22 total (40 researched)

- 12 RE companies interviewed, 17 researched, 60% of market
- 10 EE companies interviewed, 17 researched, 30% of market
- Asked each company for current total number of RE/EE jobs in relevant job classifications and sections of the RE/EE value chain

2 Extrapolation to represent the total industry of CT:

Determined market share for companies in Connecticut RE/EE industry

- Calculated for non-interviewed companies
- If interviewed companies had **X** jobs, representing **Y%** of the market share, then all jobs = **X / Y%**

3 Estimated jobs created per $1 Million invested using jobs calculator

This analysis mainly considers direct jobs[3] in private companies that employ people who are based in Connecticut. A multiplier for calculating indirect jobs[4] and induced jobs[5] from the number of direct jobs was provided by DECD for the study.

Key Findings

Renewable Energy: Employment in the solar industry has grown by approximately 30% since 2010 to become the largest RE industry for jobs in Connecticut.

- The majority of RE jobs are split between the solar and fuel cell industries, with other RE technologies making up the remaining 6% of RE industry jobs
- Installation and engineering jobs account for the largest job type at solar companies
- Manufacturing and engineering jobs account for the largest job types at fuel cell companies
- The majority of solar employees in Connecticut focus on the residential market

Energy Efficiency: Overall employment has remained relatively constant, experiencing most job growth in the residential customer market.

- EE technologies mainly include lighting, HVAC, and building envelope, with the majority of companies participating in multiple technologies
- Installation jobs account for the majority of roles
- Most jobs are focused on residential and C&I customer markets, with the remaining focused on retail and utility
- The average number of employees at C&I companies is 90-120, while it is 10-40 at residential companies

Example of Jobs Calculator: Residential Solar

In the example below, the Connecticut Green Bank would apply the Societal Perspective to report the economic development results in its Comprehensive Annual Financial Report in the following manner: **"In FY 2016 there was a total investment of $240 million in Residential Solar PV in Connecticut. Through the Connecticut Green Bank's support, about 940 direct and 1,220 indirect and induced job-years were created in the state from installing nearly 60 MW of Residential Solar PV."**

Occupation	Capital Invested	Company Overhead and Margin	Project Cost after Overhead and Margin	Labor (% of project cost)	Non-labor Costs (% of project costs)
Solar PV Installation – Residential	A	B	C=A×(1-B)	D	E=100%-D
	$1,000,000	20%	$800,000	35%	65%
Weighted Average Wage	**Fully Burdened Employee Cost**	**Job-years Created per Million Dollars Invested**	**Indirect and Induced Job Multiplier**	**Indirect and Induced Jobs Created from Capital Invested**	**Total Job Years Created from Capital Invested**
F	G=F×1.3	H=C×(D/G)	I	J=H×I	K=H+J
$55,000	$71,500	3.9	1.3	5.1	9.0

[1] See Section 7 of Connecticut Green Bank's Evaluation Framework: Assessing, Monitoring, and Reporting of Program Impacts and Process (July 2016)
[2] Connecticut Renewable Energy and Energy Efficiency Economy Baseline study, Navigant Consulting, Inc. [Completed in March 2009 and subsequently updated in 2010]
[3] These are existing jobs in the specified Connecticut industries.
[4] Represents the response as supplying industries increase output in order to accommodate the initial change in final demand.
[5] Generated by the spending of households who benefit from the additional wages and business income they earn through direct and indirect activity.

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CONNECTICUT GREEN BANK

Memo

To: Nandika Prakash

From: Bryan Garcia

CC: Commissioner Catherine Smith, Chairwoman; Eric Shrago, Director of Operations; Lucy Charpentier, Manager of Evaluation, Measurement, and Verification

Date: September 13, 2016

Re: Request for Review and Approval – Clean Energy Jobs in Connecticut Study and Calculator and Evaluation Framework for Societal Perspective for Economic Development Draft Fact Sheet

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As you are aware, the Connecticut Green Bank ("Green Bank"), in conjunction with the Department of Economic and Community Development ("DECD"), engaged Navigant Consulting to conduct a study with regard to the economic impact (i.e., estimate of direct, indirect and induced job-years created) from the investment in clean energy deployment in Connecticut. We appreciate your guidance and assistance throughout that process.

Through its evaluation efforts in general, and specially its "Evaluation Framework: Assessing, Monitoring, and Reporting of Program Impacts and Processes," the Green Bank has assembled the following materials for your review and approval:

- Clean Energy Jobs in Connecticut – Final Report by Navigant Consulting (August 10, 2016);
- Clean Energy Jobs in Connecticut – Final Calculator by Navigant Consulting (August 10, 2016); and
- Evaluation Framework: Societal Perspective (Economic Development) – Draft Fact Sheet by the Green Bank

If you could review the attached materials and provide an official DECD approval response of these materials by Friday, October 7, 2016, we would appreciate it. We have provided a link to a similar response from Michael Lettieri from the DECD of December 16, 2013 as an example – click here.

We will then provide all of these jointly produced materials to the Board of Directors of the Green Bank for their review and approval at the October 21, 2016 meeting.

Thank you Nandika for your continuous support.

MEMO

To: Bryan Garcia, President and CEO, Connecticut Green Bank

Cc: Bart Kollen, Deputy Commissioner, DECD

From: Nandika Prakash, Ph.D., Senior Economist, DECD

Re: Request by the Connecticut Green Bank on September 13, 2016 for Review and Approval of the 2016 Clean Energy Jobs in Connecticut Study, Calculator, and Societal Perspective/Evaluation Framework Draft Fact Sheet

Date: October 14, 2016

Background

The Connecticut Green Bank ("Green Bank"), in conjunction with the Department of Economic and Community Development ("DECD"), engaged Navigant Consulting to conduct a study with regard to the economic impact (i.e., estimate of direct, indirect and induced job-years created) from the investment in clean energy deployment in Connecticut. The Green Bank assembled the following materials for DECD's review and approval:

- Memo (September 13, 2016);
- Clean Energy Jobs in Connecticut – Final Report by Navigant Consulting (August 10, 2016);
- Clean Energy Jobs in Connecticut – Final Calculator by Navigant Consulting (August 10, 2016); and
- Evaluation Framework: Societal Perspective (Economic Development) – Draft Fact Sheet by the Green Bank.

Review

The Connecticut Green Bank wants to estimate the extent to which investments in clean energy create value from a societal perspective as it relates to the economic development of the state. For Green Bank programs this will be measured as the relationship between investments and associated direct, indirect and induced jobs created. In coordination with DECD, the Green Bank contracted Navigant Consulting to refresh the investment-jobs portion of its Connecticut Renewable Energy and Energy Efficiency Economy Baseline Study (2009, 2010) by providing an updated calculator tool to estimate the economic development benefits from clean energy investments in Connecticut, as reflected in job-years created. The updated study focused on jobs associated with the investment area of the Connecticut Green Bank: renewable energy (RE) and energy efficiency (EE) project development and deployment, and product development and manufacturing. The final value output in the jobs calculator is job-years created per $1 million invested in clean energy projects in Connecticut. DECD provided the indirect and induced jobs multiplier, obtained from simulations run using DECD's Connecticut REMI model, to use in the updated calculator.

Findings

DECD reviewed The Green Bank's Final Report, Final Calculator and the Fact Sheet. Our view is that the study is focused and illustrative and the estimates provided by the calculator are reasonable. DECD approves the report, the jobs calculator and the summary fact sheet.

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CONNECTICUT GREEN BANK

Memo

To: Board of Directors of the Connecticut Green Bank

From: Lucy Charpentier, Bryan Garcia, Dale Hedman, and Eric Shrago

Cc Mackey Dykes, Brian Farnen, and Bert Hunter

Date: October 21, 2016

Re: Statutory and Infrastructure Sector Programs – Program Performance towards Targets for FY 2016 Restated

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Overview

Public Act 11-80, *An Act Concerning the Establishment of the Department of Energy and Environmental Protection and Planning for Connecticut's Energy Future*, requires that the Connecticut Green Bank (Green Bank) to develop and implement several programs to support the deployment of solar photovoltaic (PV), combined heat and power (CHP), and anaerobic digester (AD) technologies. Alongside this act, through the Comprehensive Energy Strategy (CES) released by the Department of Energy and Environmental Protection (DEEP), there is the goal of delivering cleaner, cheaper and more reliable sources of energy through the deployment of in-state renewable energy sources, including the need for more microgrids.

For a description of the programs and the TAM and SAM, please see the Comprehensive Plan for Fiscal Years 2015 and 2016.

Performance Targets and Progress

With respect to the Comprehensive Plan approved by the Board of Directors of the Green Bank on July 17, 2015, the following are the performance targets for FY 2016 and progress made to targets for the Statutory and Infrastructure Sector Programs (see Table 1).

Table 1. Program Performance Targets and Progress Made to the Comprehensive Plan for FY 2016 (as of June 30, 2016)

Key Metrics	Program Performance Targets	Program Progress[1]
Capital Deployed	$474,594,745	$256,448,961
Investment at Risk[2]	$42,074,000	$23,011,235
Private Capital	$432,520,745	$233,437,726

[1] Includes only closed and completed transactions

[2] Includes funds from the Clean Energy Fund, RGGI allowance revenue, repurposed ARRA-SEP funds, and other resources that are managed by the Green Bank that are committed and invested in subsidies, credit enhancements, and loans and leases.

Deployed (MW)	99.0	61.0
# of Loans/Projects	11,992	7,702
Annual Generated/Saved (MMBtu)	649,789	239,542

Statutory and Infrastructure Sector Programs

The following are overviews of the Statutory and Infrastructure Sector Programs being implemented and the contributions towards the achievement of the targets noted in the Comprehensive Plan.

- **Residential Solar Investment Program** – $21.6 million in subsidies[3] from the Green Bank has attracted $230.7 million of funds from other sources. Of the 7,919 residential solar PV projects supported through the program 7,701 of the projects are either completed or under construction and 218 of the projects are approved (see Table 2).[4] This is resulting in the deployment of 61.7 MW of installed capacity – 60.0 MW from completed or under construction projects (i.e., approved and in process) and 1.7 MW of submitted, but not yet approved projects. This results in the creation of 1,451 direct job years (and 2,337 indirect and induced job years) and the reduction of 739,276 tons of CO_2 emissions over the life of the projects.

Table 2. RSIP Overview for FY 2016 (as of June 30, 2016)

Program Data	Submitted and In Review	Approved and In Process	Completed	Total Submitted
Projects	218	4,128	3,573	7,919
Installed Capacity (MW)	1.7	32.3	27.7	61.7
Clean Energy Produced (MWh)[5]	40,197	767,507	658,289	1,375,473
Combined Energy Generated & Saved (MMBtu)[6]	5,486	104,749	89,843	200,079
Subsidies ($'s)	$581,431	$10,762,706	$10,251,126	$21,595,263
Credit Enhancement ($'s)	-	-	-	-
Loans or Leases ($'s)	-	-	-	-
Total Green Bank Investment ($'s)	$581,431	$10,762,70	$10,251,126	$21,595,263
Private Capital ($'s)	$5,735,450	$121,404,030	$103,531,099	$230,670,579

The residential solar PV market in Connecticut has seen a dramatic improvement over the past several years (see Figure 1). Installed costs have decreased by over 60% from a high of $8.70/W in 2007 to $3.30/W today. Incentives have decreased by over 90% from a high of $4.52/W in 2005 to $0.34/W today.

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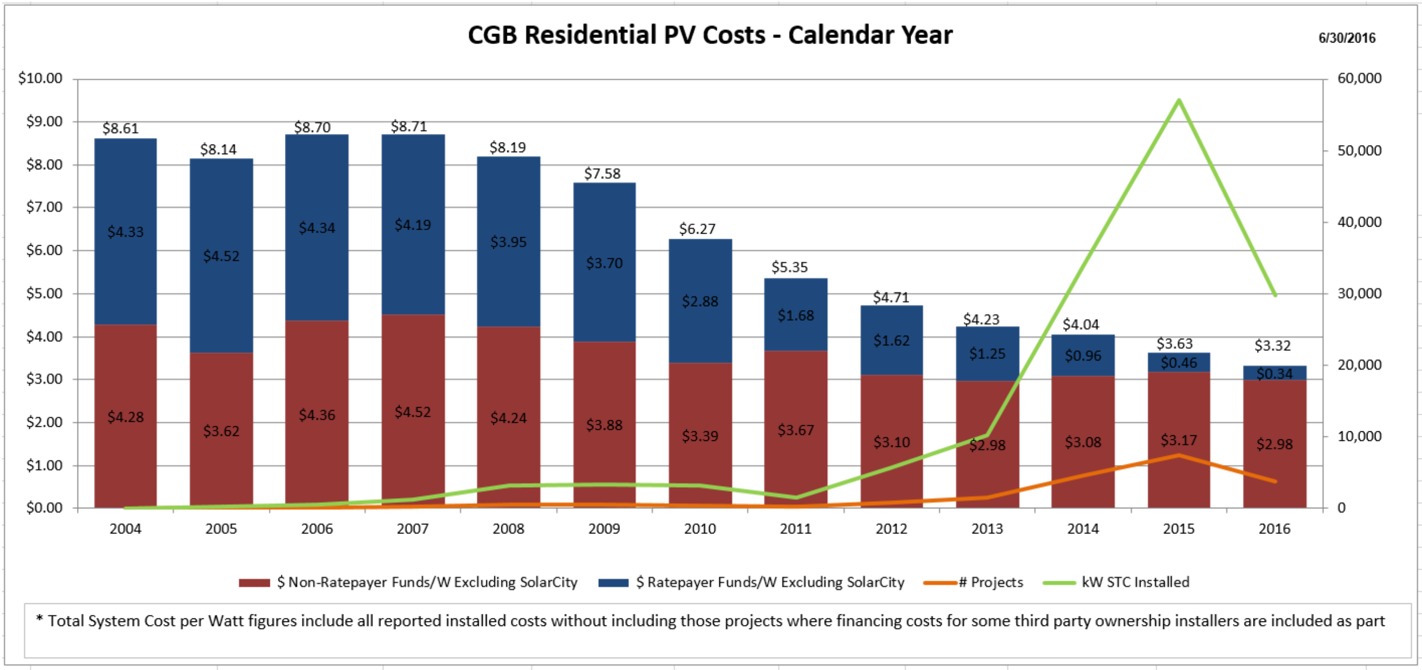
[3] Note the distribution of EPBB and PBI and the 6-year payout of the PBI.

[4] Based on nearly 10-years of historical experience, [91%] of projects approved result in project completions. (1,170 cancellations / 13,130 applications that are currently In Progress or Completed)

[5] Over the life of the measure(s)

[6] First year of the measure(s)

Figure 1. Installed Cost ($/W – Y1 Axis) and Installed Capacity (kW – Y2 Axis) by Fiscal Year (as of June 30, 2016)



- **<u>CHP and AD Pilot Programs</u>** – $0 in subsidies, $0 in credit enhancements, and $13.4 million in loans for a total Green Bank investment of $13.4 million. Of the $13.4 million of Green Bank investment in these projects (see Tables 3 and 4), $66.5 million of private capital has been attracted to support them. This has resulted in 2 CHP projects totaling 3.3 MW of installed capacity – approved only – and 4 AD projects totaling 7.2 MW of installed capacity – 1 of which closed in FY 2016.

Table 3. CHP Pilot Program Overview for FY 2016 (as of June 30, 2016)

Program Data	Approved	Closed not yet Complete	Closed and Completed	Total
Projects	2	-	-	2
Installed Capacity (MW)	3.3	-	-	3.3
Clean Energy Produced (MWh)[7]	301,992	-	-	301,992
Combined Energy Generated & Saved (MMBtu)[8]	423,180	-	-	423,180
Subsidies ($'s)	-	-	-	-
Credit Enhancement ($'s)	-	-	-	-
Loans or Leases ($'s)	$1,502,860	-	-	$1,502,860
Total Green Bank Investment ($'s)	$1,502,860	-	-	$1,502,860
Private Capital ($'s)	$6,898,532	-	-	$6,898,532

[7] Over the life of the measure(s)
[8] First year of the measure(s)

Table 4. AD Pilot Program Overview for FY 2016 (as of June 30, 2016)

Program Data	Approved	Closed not yet Complete	Closed and Completed	Total
Projects	3	1	-	4
Installed Capacity (MW)	6.2	1.0	-	7.2
Clean Energy Produced (MWh)[9]	505,101	82,283	-	587,384
Combined Energy Generated & Saved (MMBtu)[10]	277,362	44,949	-	322,311
Subsidies ($'s)	-	-	-	-
Credit Enhancement ($'s)	-	-	-	-
Loans or Leases ($'s)	$11,860,109	$1,997,403	-	$13,857,512
Total Green Bank Investment ($'s)	$11,860,109	$1,997,403	-	$13,857,512
Private Capital ($'s)	$51,139,891	$8,502,597	-	$59,642,488

For a breakdown of the use of Green Bank resources for Statutory and Infrastructure Sector Programs (see Table 5).

Table 5. Distribution of Green Bank Funds Invested in Projects and Programs through Subsidies, Credit Enhancements, and Loans and Leases for FY 2016 (as of June 30, 2016)[11]

Program	Subsidies	Credit Enhancements	Loans and Leases	Total
RSIP	$21,013,832	-	-	$21,013,832
CHP	-	-	-	-
AD	-	-	$1,997,403	$1,997,403
Total	**$21,013,832**	**-**	**-**	**$23,011,235**

Of the $23.0 million of Green Bank resources invested, over 90% was in subsidies. It should be noted that because of the passage of PA 15-194, that all subsidies, administrative costs, and other expenses for the RSIP are to be recovered through the price and sale of 15-year renewable energy credits through a master purchase agreement between the Green Bank and the electric distribution companies (i.e., Eversource Energy and Avangrid).

Of these programs, the following is a breakdown of their contributions made thus far towards the performance target and the human resources required to implement them (see Table 6):

Table 6. Program Progress Made in FY 2016[12]

Key Metrics	RSIP	CHP and AD Program	Total Program Progress
Date of Program Approval	Feb 2012	Feb 2012	
Date of Program Launch	Mar 2012	Jun/Dec 2012	
Ratepayer Capital at Risk	$21,013,832	$1,997,403	$23,011,235
Private Capital	$224,935,129	$8,502,597	$233,437,726

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[9] Over the life of the measure(s)
[10] First year of the measure(s)
[11] Includes only closed and completed transactions
[12] Includes only closed and completed transactions

Deployed (MW)	60.0	1.0	61.0
# of Loans/Installations	7,701	1	7,702
Lifetime Production (MWh)	1,425,797	82,283	1,508,079
Annual Generated/Saved (MMBtu)	194,593	44,949	239,542
Full Time Equivalent Staff	6.5	3.3	9.8

"Top 5" Headlines

The following are the "Top 5" headlines for the statutory and infrastructure sector programs for FY 2016:

1. Connecticut's first commercial wind farm powers up in Colebrook
   New Haven Register
   ... "took passion ... and some serious money ... before there was any iron in the ground."

2. Connecticut Green Bank To Approve 100th Megawatt Of Residential Solar By Year's End
   Solar Industry
   More than 15,000 Connecticut homes have gone solar and will generate a majority of their electricity with solar energy.

3. Green Bank Invests $2M in Southington Digester Project
   Hartford Business Journal
   The Southington facility will be the first of its kind in Connecticut…

4. Study Shows Differences In Municipal Support For Residential Solar Power
   Hartford Courant
   The Yale study looked at how much solar capacity has actually been installed in a municipality, how easy it is to get local permits for solar power, and whether a city or town offers information and assistance to homeowners going solar.

5. Connecticut Green Bank Partners With Utilities, Contractors And Municipalities To Compete In SunShot Prize
   Solar Industry Magazine
   The team will aim to install 1 MW of solar PV in participating municipalities by January 2016 and 3 MW by March 2016.

Lessons Learned

Based on the implementation of the Statutory and Infrastructure Sector Programs, the following are the lessons learned:

- Leases and PPA financing have become increasingly important tools for the independent installers. We are working to bring third-party owners and independent installers together via partnership agreements.

- Homeowners need more information on solar PV system design to make an informed decision on size of a system that makes the most economic sense for their needs. We will be working with Marketing to develop a campaign that effectively help homeowners with their decision to adopt solar.

- Exogenous impacts outside our and developers' control (e.g. permitting, site control) are impediments to completing Anaerobic Digesters and CHP projects on a timely basis. We are working on our mitigation of these risks.

Infrastructure Sector Programs FY 2017 Targets

Of the 2 programs being implemented in the Infrastructure Sector Programs, the following is a breakdown of the key targets for each program (see Table 7):

Table 7. Number of Projects, Capital Deployed, and Clean Energy Deployed (MW)

Program	# of Projects	Capital Deployed	Clean Energy Deployed (MW)
RSIP	6,377-8,500	$210,800,000-$282,302,000	48.5-64.6
AD	1	$18,000,000	1.6
Total	**6,378-8,501**	**$228,800,000-300,302,000**	**50.1-66.2**

To achieve these targets, the Infrastructure Sector Programs will focus its programmatic expenses in the following areas:

- **New Marketing Initiative to educate customers around solar installations.** GoSolarCT.com is an initiative of the Connecticut Green Bank. To give consumers more tools for going solar the smart way, GoSolarCT has partnered with EnergySage, the nation's leading online marketplace for solar, to connect them with Connecticut Green Bank-eligible solar contractors who will compete for your business. Through this unique partnership, they will be able to compare solar quotes from multiple pre-screened contractors online.

- **Partnering with 3rd party providers and capital providers to give installers more options to sell potential customers.** When the CT Solar Lease 2 closed to residential customers, the ability for small installers to offer leases to customers diminished. CGB is working with lease financiers to offer leasing solutions that installers can offer customers as a way to compete with larger, vertically integrated third-party-owner/installers.

- **Continue process efficiencies for RSIP application approvals.** Connecticut Green Bank has an open RFP for a replacement of PowerClerk, the core software for the RSIP program used by contractors and CGB for determining incentives. The new software will address efficiency issues in the existing process and allow for scale. Additionally, the team internally is focused on increasing transparency and improving the workflow.

- **Continue efforts around consumer protection**. To better support consumers of solar PV, the Green Bank is updating its GoSolarCT.com website to provide consumers with a trusted information source. Other consumer protection efforts include partnering with the Connecticut Department of Consumer Protection, Office of Consumer Counsel, and Attorney General's offices to address consumer complaints and coordinate trainings for contractors on licensing requirements, and serving on the Advisory Committee of the federally funded

Sustainable Solar Education Project led by the Clean Energy States Alliance to develop resources on solar PV consumer protection and related topics.

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CONNECTICUT GREEN BANK

Memo

To: Board of Directors of the Connecticut Green Bank

From: Lucy Charpentier, Bryan Garcia, Kerry O'Neill, and Eric Shrago

Cc Mackey Dykes, Brian Farnen, and Bert Hunter

Date: October 21, 2016

Re: Residential Sector Programs – Program Performance towards Targets for FY 2016 Restated

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Overview

Public Act 11-80 (PA 11-80), *An Act Concerning the Establishment of the Department of Energy and Environmental Protection and Planning for Connecticut's Energy Future*, requires that the Connecticut Green Bank (Green Bank) develop and implement several programs to finance and otherwise support clean energy investment in residential projects to promote deep energy efficiency retrofits, renewable energy deployment, and fuel and equipment conversions in single-family and multifamily homes across the state.

For a description of the programs and the TAM and SAM, please see the Comprehensive Plan for Fiscal Years 2015 and 2016.

Performance Targets and Progress

With respect to the Comprehensive Plan approved by the Board of Directors of the Green Bank on July 17, 2015, the following are the performance targets for FY 2016 and progress made to targets for the Residential Sector Programs (see Table 1).

Table 1. Program Performance Targets and Progress Made to the Comprehensive Plan for FY 2016 (as of June 30, 2016)

Key Metrics	Program Performance Targets	Program Progress[1]
Capital Deployed	$57,537,000	$41,088,574
Investment at Risk[2]	$14,400,000	$8,578,785
Private Capital	$43,137,000	$32,509,789

[1] Includes only closed and completed transactions

[2] Includes funds from the Clean Energy Fund, RGGI allowance revenue, repurposed ARRA-SEP funds, and other resources that are managed by CEFIA that are committed and invested in subsidies, credit enhancements, and loans and leases. Does not include commitments for the $600,000 guarantee for Connecticut Housing Investment Fund (now called Capital for Change) to support their recapitalization from Webster Bank for residential 1-4 energy lending, including Smart-E lending, or the $5,000,000 guarantee to Housing Development Fund for the repayment of the MacArthur Foundation program related investment.

Key Metrics	Program Performance Targets	Program Progress[1]
Deployed (MW)	9.4	8.1
# of Loans/Projects	2,162	1,052
Annual Generated/Saved (MMBtu)	66,810	34,209

Residential Sector Programs

The following are brief descriptions of the progress made under the Comprehensive Plan for FY 2016 in the Residential Sector Programs

- **Energize CT Smart-E Loan** – a credit enhancement program that uses repurposed ARRA-SEP funds as a loan loss reserve and interest rate buy down to attract private capital from local credit unions and community banks. The product provides low interest (i.e. 4.49-6.99%) unsecured loans at long terms (i.e. between 5 to 12 years) for technologies that are consistent with the goals of the Comprehensive Energy Strategy and includes special offers of 2.99% rates for installing multiple eligible measures or converting to natural gas (see Table 2).

Table 2. Energize CT Smart-E Loan Overview for FY 2016 (as of June 30, 2016)

Program Data	Approved	Closed not yet Complete	Closed and Completed	Total
Projects	93	48	171	312
Installed Capacity (MW)	0.2	0.2	0.7	1.1
Clean Energy Produced (MWh)[3]	3,383	5,036	17,414	25,834
Combined Energy Generated & Saved (MMBtu)[4]	957	1,560	4,730	7,246
Subsidies ($'s)	-	-	-	-
Credit Enhancement ($'s)	-	$977,824	$197,197	$1,175,021
Loans or Leases ($'s)	-		-	
Total Green Bank Investment ($'s)[5]		$977,824	$197,197	$1,175,021
Private Capital ($'s)	$1,812,926	$1,311,593	$4,328,724	$7,453,243

[3] Over the life of the measure(s)
[4] First year of the measure(s)
[5] Based on the Objective Functions for the Smart-E Loan, the credit enhancement for the second loss reserve represents 7.5% of the value of the local lender loans for Class A loans (FICO of >680) or 15% of the value of the local lender loans for Class Be loans (FICO of 640-679). This is the actual loan loss reserve position as of 6/30/2016 and also includes $246,045 for interest rate buydowns disbursed during the fiscal year.

The Smart-E Loan program is estimated to have created 49 direct and 79 indirect and induced jobs years and 13,360 tons of CO2 emissions reduced over the life of the projects.

- **CT Solar Lease** – a lease program that uses repurposed ARRA-SEP funds as a loan loss reserve and debt and equity from Green Bank approved by the Board of Directors to attract private capital from a syndicate of local lenders and tax equity to provide homeowners with FICO scores of 640 and above with a no upfront financing option for residential and commercial solar – note the data below applies to residential only (see Table 3).

Table 3. CT Solar Lease Overview for FY 2016 (as of June 30, 2016)

Program Data	Approved	Closed not yet Complete	Closed and Completed	Total
Projects	-	35	438	473
Installed Capacity (MW)	-	0.3	3.6	3.8
Clean Energy Produced (MWh)[6]	-	6,497	84,911	91,409
Combined Energy Generated & Saved (MMBtu)[7]	-	887	11,589	12,475
Subsidies ($'s)	-	-	-	-
Credit Enhancement ($'s)[8]	-	$72,320	$942,128	$1,014,449
Loans or Leases ($'s)[9]	-	$208,305	$2,555,748	$2,764,053
Total Green Bank Investment ($'s)	-	$280,625	$3,497,877	$3,778,502
Private Capital ($'s)	-	$1,102,613	$13,528,256	$14,630,868

The CT Solar Lease program is estimated to have created 103 direct and 165 indirect and induced jobs years and 47,395 tons of CO2 emissions reduced over the life of the projects.

- **Low Income** – an innovative solar PV lease and efficiency energy savings agreement financing model provided by PosiGen and, supported by a $5 million subordinated debt investment, with an additional $5 million option from the Green Bank, into a total fund of $27 million to support 1,000 homes with a focus on the low-to-moderate income market segment utilizing alternative underwriting approaches that examine factors such as bill payment history and bad debt and bank databases (see Table 4). All projects include light weatherization and efficiency provided by HES or HES-IE.

Table 4. Low Income Overview for FY 2016 (as of June 30, 2016)

Program Data	Approved	Closed not yet Completed	Closed and Completed	Total

[6] Over the life of the measure(s)
[7] First year of the measure(s)
[8] Based on the Objective Functions for the CT Solar Lease, the loan loss reserve credit enhancement represents about 5.85% of the value of the lease.
[9] Based on the Objective Functions for the CT Solar Lease, the loan financing represents about 15.89% of the value of the lease.

Projects	-	288	45	333
Installed Capacity (MW)	-	1.9	0.3	2.2
Clean Energy Produced (MWh)[10]	-	45,270	6,985	52,255
Combined Energy Generated & Saved (MMBtu)[11]	-	10,008	1,551	11,559
Subsidies ($'s)	-	-	-	-
Credit Enhancement ($'s)	-	-	-	-
Loans or Leases ($'s)	-	-	-	-
Total Green Bank Investment ($'s)	-	-	-	-
Private Capital ($'s)	-	$8,519,825	$1,324,040	$9,843,865

The Low Income programs are estimated to have created 58 direct and 94 indirect and induced jobs years and 27,0946 tons of CO2 emissions reduced over the life of the projects.

- **Multifamily** – offerings for both the affordable and market rate multifamily segments include pre-development loan programs supported by Green Bank capital and term financing options such as the Low Income Multifamily (LIME) loan offered by Connecticut Housing Investment Fund (CHIF, now called Capital for Change) and supported by $1,000,000 of seed capital and $300,000 of ARRA-SEP funds for a loss reserve, a credit enhancement fund for gap financing supported by Green Bank capital, and C-PACE and solar lease options, leveraging the C&I sector programs (see Table 5). Affordable pre-development loans and gap financing are offered with Housing Development Fund (HDF) as a result of a $5 million program related investment from MacArthur Foundation where the Green Bank provides a guaranty to HDF for repayment of the MacArthur investment.

Table 5. Multifamily (Term Financing[12]) Overview for FY 2016 (as of June 30, 2016)

Program Data	Approved	Closed not yet Completed	Closed and Completed	Total
Projects	5	27	-	32
Installed Capacity (MW)	0.3	1.2	-	1.5
Clean Energy Produced (MWh)[13]	6,751	28,476	-	35,227
Combined Energy Generated & Saved (MMBtu)[14]	921	3,886	-	4,807
Subsidies ($'s)	-	-	-	-
Credit Enhancement ($'s) [15]	-	$300,000	-	$300,000
Loans or Leases ($'s)	$2,192,339	$3,325,262	-	$5,517,601
Total Green Bank Investment ($'s)	$2,192,339	$3,625,262	-	$5,817,601

[10] Over the life of the measure(s)
[11] First year of the measure(s) and includes an additional 13.3 MMBtu for each project for the HES audit.
[12] Additional predevelopment loan activity for FY16 includes: 5 approved loans for $505,700 and 5 closed loans for $48,650. This activity gets reflected in the table when projects move to the installation and construction phase.
[13] Over the life of the measure(s)
[14] First year of the measure(s)
[15] This is the actual loan loss reserve position of the LIME loan as of 6/30/2016

Private Capital ($'s)	$906,691	$2,394,739	-	$3,301,430

The Multifamily programs are estimated to have created 26 direct and 42 indirect and induced jobs years and 18,265 tons of CO2 emissions reduced over the life of the projects.

For a breakdown of the use of Green Bank resources for Residential Programs – see Table 6.

Table 6. Distribution of Green Bank Funds Invested in Projects and Programs through Subsidies, Credit Enhancements, and Loans and Leases for FY 2016 (as of June 30 2016)[16]

Program	**Subsidies** (i.e. Buy-Downs)	Credit Enhancements	Loans and Leases	Total
Smart-E Loan	-	$1,175,021	-	$1,175,021
CT Solar Lease	-	$1,014,449	$2,764,053	$3,778,502
Low Income	-	-	-	-
Multifamily	-	$300,000	$3,325,262	$3,625,262
Total	-	$2,489,470	$6,089,315	$8,578,785

Of the $8.3 million of Green Bank resources invested, 0% was in subsidies, 26% was in Credit Enhancements, and 74% was in Loans and Leases. Of these programs, the following is a breakdown of their contributions made thus far towards the performance target and the human resources required to implement them (see Table 7):

Table 7. Program Progress Made for FY 2016 (as of June 30, 2016)[17]

Key Metrics	Smart-E	CT Solar Lease	Low Income	Multifamily[18]	Total Program Progress
Date of Program Approval	Nov 2012	Jun 2013	Jun 2015	Oct 2013 – Oct 2015	
Date of Program Launch	Nov 2013	Sep 2013	Jul 2015	Oct 2013 – Oct 2015	
Ratepayer Capital at Risk	$1,175,021	$3,778,502	-	$3,625,262	$8,578,785
Private Capital	$5,640,316	$14,630,868	$9,843,865	$2,394,739	$32,509,789
Deployed (MW)	0.9	3.8	2.2	1.2	8.1
# of Loans/Installations	219	473	333	27	1,052
Lifetime Production (MWh)	22,451	91,409	52,255	28,476	194,590
Annual Generated/Saved (MMBtu)	6,289	12,475	11,559	3,886	34,209
Full Time Equivalent Staff	2.54	1.28	1.71	4.48	10.01

[16] Includes only closed and completed transactions
[17] Includes only closed and completed transactions
[18] Multifamily is a collection of individual programs, each with their own approval and launch dates.

Market Transformation

The following are products that "graduated" from the Connecticut Green Bank and serve as example of the green bank model at work – demonstrating market transformation.

- **<u>Sungage Financial & Digital Federal Credit Union</u>** – in partnership with a servicer (i.e. Sungage Financial), a 15-year solar loan product – called the CT Solar Loan – was offered to a range of credit quality consumers (no less than 680 FICO) interested in solar PV through October of 2014. A specialty product designed for solar PV, interest rates are affordable at 6.49% and the CT Solar Loan may re-amortize after the ITC is received by the borrower to ensure the positive cash flow of energy savings from solar PV exceeding the debt service of the loan. This product is the 1st to "graduate" from the Green Bank's support with Sungage Financial receiving a $100 million financial commitment from the Digital Federal Credit Union for residential solar PV loans to support projects in Connecticut as well as California, Florida, Massachusetts, New Jersey, New York, and Texas. This is an example of the green bank model at work – true market transformation (see Table 8).

Table 8. Sungage and DFCU Overview for FY 2016 (as of June 30, 2016)

Program Data	Approved	Closed not yet Complete	Closed and Completed	Total
Projects	117	185	-	302
Installed Capacity (MW)	1.1	1.7	-	2.8
Clean Energy Produced (MWh)[19]	26,716	40,846	-	67,562
Combined Energy Generated & Saved (MMBtu)[20]	3,646	5,575	-	9,221
Private Capital ($'s)	$4,471,367	-	$6,874,525	$11,345,892

- **<u>Sunnova</u>** – In the first quarter of FY16 the CT Solar Lease expended its fund allocation for residential projects and took its last application. Instead of raising another residential solar lease fund, the Green Bank recognized that the private market for solar financing had evolved substantially and issued an RFP for private solar financing companies to become a preferred provider serving independent and regional installers operating in our RSIP program. Sunnova responded to the RFP and was selected to offer solar leases and PPAs to eligible installers at terms substantially similar to the CT Solar Lease, but requiring no credit enhancement from the Green Bank. We facilitated introductions and trainings for Sunnova with RSIP installers in July, 2016. While Sunnova was the only company to take advantage of this preferred status offered by the RFP, we observed other solar financing providers supporting installers who had been using CT Solar Lease. This is another example of the green bank model at work with market transformation (see Table 9).

[19] Over the life of the measure(s)
[20] First year of the measure(s)

Table 9. Sunnova Overview for FY 2016 (as of June 30, 2016)

Program Data	Approved	Closed not yet Complete	Closed and Completed	Total
Projects	-	15	141	156
Installed Capacity (MW)	-	0.1	1.0	1.1
Clean Energy Produced (MWh)[21]	-	2,508	24,092	26,600
Combined Energy Generated & Saved (MMBtu)[22]	-	342	3,288	3,630
Private Capital ($'s)	-	$335,112	$3,178,525	$3,513,637

Between the Green Bank's current products and those that have graduated in the marketplace, the following is a breakdown for Residential Programs – see Table 10.

Table 10. Program and Market Progress Made for FY 2016 (as of June 30, 2016)[23]

Key Metrics	Green Bank Products	Market Transformation	Total Product and Market Progress
Ratepayer Capital at Risk	$8,578,785	$0	$8,578,785
Private Capital	$32,509,789	$10,388,163	$42,897,952
Deployed (MW)	8.1	2.8	10.9
# of Loans/Installations	1,052	341	1,393
Lifetime Production (MWh)	194,590	67,447	262,037
Annual Generated/Saved (MMBtu)	34,209	9,205	43,414

"Top 5" Headlines

The following are the "Top 5" headlines for residential sector programs for FY 2016:

1. Malloy touts solar energy savings
   CTpost
   "I am just so elated," she said of her latest $27.85 bill from United Illuminating…"

2. CT Green Bank crowdfunds $1M in solar loans
   Hartford Business Journal
   The **Green Bank** packaged $1 million of its loan programs and sold that bundle to solar crowdfunding platform Mosaic.

3. Connecticut Green Bank Joins Partnership to Ease Middle-Class Energy Costs
   The Commercial Record
   The MacArthur funds enable the **Connecticut Green Bank** and the Housing Development Fund to tackle these challenges…

[21] Over the life of the measure(s)
[22] First year of the measure(s)
[23] Includes only closed and completed transactions

4. Solar PV and the Smart-E loan
   WFSB - Better Connecticut
   "The **Smart-E program**. We're working with local lenders and it's really easy to get a loan…"

5. Connecticut Program Makes Solar Affordable for Low-Income Families
   Inside Climate News
   Faith groups and churches are working with a third-party solar provider to spread renewable energy to people who normally could not afford it.

Lessons Learned

Based on the implementation of the Residential Sector Programs thus far, the following are the key lessons learned:

- **Ramping up activity in hard to reach low-to-moderate (LMI) single family and affordable multifamily markets is slower than we would like, but momentum is building** – While it has been true in any of the new products we've launched in the residential sector, it's been all the more a factor in our products targeting harder to reach markets.
    - In the **single family LMI space, PosiGen experienced delays** in getting mobilized for the three community campaigns as well as growing pains as it expanded its operations here in CT, while simultaneously expanding into other new markets. It took them longer to staff up than they anticipated, particularly in positions that were focused on building relationships with community groups serving the target demographic. However, starting in early 2016, we began to see consistent growth in the pipeline as the campaigns finally got under way in earnest, and we've been working closely with the management team to position their outreach and operations for continued growth.
    - **Uptake has also been slower than we'd like for our affordable multifamily programs**, due to long project development and decision making cycles, owner knowledge and capacity (often operating on a shoestring and with other more pressing competing priorities), and housing & energy consultants and contractors limited in their capacity to take a whole building approach needed to scope, define and implement deeper measures. Many projects require a great deal of technical assistance and hand holding to push through the process, and lean heavily on Green Bank staff for expertise. However, the recently launched pre-development programs are showing a lot of promise and are a way to meet the challenges in the sector. The LIME Loan is also starting to take off – and we've learned how critically important it is to have a non-secured loan product that can be layered on top of existing debt with multiple requirements/restrictions.

- **We are making inroads in solar penetration for the LMI market, but there is still much work to do** – We began tracking our penetration of solar PV in the residential space back in 2014 which highlighted the significant disparity between deployment in lower income census tracts versus higher income tracts. Since then, through focused messaging to solar installers regarding customer opportunities in the LMI market, the introduction of the LMI RSIP incentive, and the PosiGen partnership, we have seen solid increases in the rate of solar in lower income census tracts (e.g., projects per 1000 household in <60% AMI census tracts are 5 times lower than >100% AMI census tracts now, vs 10 times lower in 2014). In the affordable multifamily sector, we've gone from no activity for solar on housing projects to 15 in this last fiscal year through the first round of Solarize for CHFA's State Sponsored Housing Portfolio. Our focused initiatives in these markets are beginning to pay off, but are still in the early stages.

- **Stakeholder work in the affordable multifamily market is a significant time commitment and results come slowly, but they do come and they are transformative when they are realized** – Staff has invested significant time and resources in our CHFA and Department of Housing (DOH) relationships over the last three years and this year saw several key developments that impact the entire CHFA pipeline and much of the DOH pipeline including CHFA integrating energy goals into its agency policy statement; a new utility incentive process whereby all projects must seek energy incentives (as a result of the LEAN process); and Passive House and higher energy standards being pushed by CHFA. We've provided leadership to help raise the bar in this sector, resulting in the state housing agencies requiring applicants to compete and drive to higher energy performance standards (akin to raising the building code). Even though we are not ultimately financing many of these housing agency deals, our work has had greater market impact on the multifamily sector since the ecosystem of providers to CHFA and DOH properties also serve the broader affordable multifamily market.

- **Solar as a gateway to energy efficiency is gaining traction** – We continued to see momentum in the Smart-E Bundle where again this year solar bundles dominated. Additionally, the PosiGen model is showing great promise for even wider spread integration of efficiency and solar. 100% of PosiGen projects get light weatherization efficiency (through HES or HES-IE), and 64% of customers take the energy savings agreement for deeper efficiency measures. This is in contrast to 26% of HES customers going deeper. Coupling solar and efficiency at the point of sale is attractive to customers.

- **Smart-E is still competing with subsidized capital and has unrealized growth in the utility/Home Energy Solutions channel which could be a risk in keeping lenders engaged over the long term** – like last year, the EnergizeCT Heating Loan is still in the market and draining HVAC business. Additionally, we had expected 600 loans from the utility/HES channel which did not materialize since the lender for that channel, CHIF (now called Capital for Change) was delayed a full year in coming onto the Smart-E platform. Liberty Bank did not come back into the program after a planned hiatus due to a systems upgrade, and another lender with lower rates raised them back up to the maximum, due to lack of volume/competitive pressure. However, we did see one new lender proactively join the program, Mutual Security Credit Union, and another community bank express renewed interest in joining. Lender engagement will continue to be a concern until volume builds.

- **Product development approaches that use our capital or credit enhancements and partners' origination and operations capabilities are ideal to ensure scalability** – The challenges in managing the operations of CT Solar Lease have taught us the value in approaching new products differently. As we developed solutions for LMI solar (PosiGen) and the entire multifamily product suite we are not taking on the operations burden in-house, but working with partners who will do that. The R-PACE program design contemplates the same model.

- **<u>The Green Bank is viewed as the authority on residential solar, even for areas we don't have purview over (e.g., consumer protection issues, real estate transactions involving solar)</u>** – As residential solar continue to grow and inevitable challenges arise with consumer protection issues, bad actors in the contractor space, and more home sales involving solar, a variety of stakeholders sought out the Green Bank to field concerns, (including high profile media inquiries, Department of Consumer Protection, Office of Consumer Counsel, realtor groups, etc.). The Green Bank must continue to be a resource to stakeholders, coordinating where it makes sense, but not take on more than is appropriate.

Residential Sector Programs FY 2017 Targets

Of the 4 program areas being implemented in the Residential Sector Programs, the following is a breakdown of the key targets for each program (see Table 11):

Table 11. Number of Projects, Capital Deployed, and Clean Energy Deployed (MW)

Program	# of Projects	Capital Deployed	Clean Energy Deployed (MW)
Smart-E Loan	538	$9,039,000	1.1
LMI Leases and ESAs	500	$15,250,000	3.4
Multifamily Term Loans	55	$12,310,000	0.9
Multifamily Predevelopment Loans	36	$570,000	N/A
Total	**1,093**	**$36,599,000**	**5.4**

Note that Multifamily Predevelopment Loan activity is not included in the Total and that the Multifamily Program targets are concentrated in the affordable housing space, as that is where staff time and resources are concentrated for FY17.

To achieve these targets, the Residential Sector Programs will focus its programmatic expenses in the following areas:

- **<u>Driving Demand/Marketing Innovation</u>** –
  - **Smart-E**
    - Ensuring Capital for Change is a success in the utility/HES channel and the credit-challenged customer segment
    - Marketing efficiency to homeowners who are in the process or have already gone solar in the RSIP, using the Bundle offer
    - Contractor engagement strategies such as the co-op marketing program delivered through an online platform; a new mobile app to support selling upgrades with financing; recapturing HVAC contractors
    - Lender pilots for tailored marketing campaigns
  - **LMI pipeline support for PosiGen and Affordable Multifamily Programs**
    - Pay for performance pilots working with nonprofits or other key stakeholders to drive demand through their networks
    - "Road show" for predevelopment loan programs to drive pipeline for term financing, including partnering with private lenders who will market to their

own client base for their term products (rationale: our resources will help them source high quality deals that cash flow, and are larger since they include energy upgrades)
  - Priming the multifamily pipeline with our Benchmark CT initiative with CHFA and Wegowise to benchmark 1800 buildings and identify best prospects for energy investments
  - Solarize Round 2 with CHFA for solar on housing authorities
  - Community campaigns with geographically targeted outreach and technical assistance for multifamily, converting leading owners into champions for programs and creating “communities of practice”

- **Capacity Building for Multifamily Pipeline Development** – we are still early in our experience in financing projects in this sector and we continue to see a significant need for high touch technical assistance for projects that have complex existing capital stacks and/or complicated project and technology assessment challenges, particularly on deep energy upgrades. We also continue to see a need to support the integration work with the utility processes to continue our LEAN work. Ongoing training is also needed, particularly around how to approach deeper energy improvements, for our housing agency partners, nonprofit developers and a variety of professional service providers in the market. We have developed a stable of trusted consultants that are assisting us in working through case-by-case project challenges and developing and delivering training. This work supports building the capacity of both owners to ask the right questions around energy and high quality firms that will serve owners’ needs and successfully deliver on more complex projects.

- **Investigation of Sustainable Scaling Models for the LMI Market** – This will include exploration of integrated funding and delivery models for the remediation of health and safety issues which prevent a significant percentage of energy upgrades from moving forward in the LMI single family and affordable multifamily market segments. We will also seek to run a pilot in one community or neighborhood, potentially leveraging HUD HOME or CDBG funds. This will also include exploration of leveraging the “community design center” concept to incorporate clean energy activities at the neighborhood/grass roots level.

- **Real Estate Ecosystem Engagement** – realtor and lender engagement to educate about the programs and resources available for making clean energy improvements. We also plan to conduct a study on home values for homes with and without energy upgrades.

- **Processing Support** – Continue development of the Metis data platform for single family products and implement Salesforce for multifamily programs.

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CONNECTICUT GREEN BANK

Memo

To: Board of Directors of the Connecticut Green Bank

From: Lucy Charpentier, Mackey Dykes, Bryan Garcia, and Eric Shrago

Cc Brian Farnen and Bert Hunter

Date: October 21, 2016

Re: Commercial and Industrial Sector Programs – Program Performance towards Targets for FY 2016 Restated

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Overview

Pursuant to Public Act 12-2, the Connecticut Green Bank ("Green Bank") launched the Commercial and Industrial Property Assessed Clean Energy (C-PACE) program in January 2013. C-PACE is a statutorily mandated program that was the primary commercial and industrial (C&I) financing product in the comprehensive plan and budget for fiscal years 2015 and 2016.

For a program description and information on the Total Addressable Market and Serviceable Addressable Market (SAM), please see the FY 2015 and FY 2016 Comprehensive Plan.

Performance Targets and Progress

With respect to the Comprehensive Plan approved by the Board of Directors of the Green Bank on July 17, 2015, the following are the performance targets and the progress made in FY 2016 for the Commercial and Industrial Sector Programs (see Table 1).

Table 1. Program Performance Targets and Progress Made to the Comprehensive Plan for FY 2016 (as June 30, 2016)

Key Metrics	Program Performance Targets	Program Progress[1]
Capital Deployed	$53,000,000	$38,877,085
Investment at Risk[2]	$6,530,000	$12,072,077
Private Capital	$46,470,000	$26,805,008
Deployed (MW)	9.0	8.1
# of Loans/Projects	88	57
Annual Saved (MMBtu)	-	61,262

[1] Includes only closed and completed transactions

[2] Includes funds from the Clean Energy Fund, RGGI allowance revenue, repurposed ARRA-SEP funds, and other resources that are managed by the Connecticut Green Bank that are committed and invested in subsidies, credit enhancements, and loans and leases.

In January 2013, the Green Bank introduced the C-PACE program. C-PACE is one of the country's first statewide programs to provide 100 percent upfront financing for energy upgrades to commercial, industrial and nonprofit buildings. Under this program, property owners obtain financing needed to make key energy improvements, and then repay it as a benefit assessment charge on their property tax bill. Because the payments can be spread over a period of up to 25 years, owners save on energy costs immediately and for years to come. The financed improvements increase the building's value, while preserving the building owner's capital and credit lines for core investments.

C-PACE financing is available for a wide range of clean energy and energy efficiency improvements, including new boilers and chillers, upgraded insulation, new windows or solar installations. Energy audits and construction costs can also be financed through C-PACE. C-PACE has been a notable success in deploying clean energy throughout the state. 122 Connecticut municipalities, together accounting for over 90 percent of the state's commercial and industrial square footage, have signed onto the program. For initial C-PACE debt funding, the Green Bank established a $40 million warehouse facility using the Green Bank's balance sheet. Working with its group of qualified capital providers, the Green Bank auctioned its first group of transactions to Clean Fund and secured private capital to purchase the initial $30 million portfolio of transactions that the Green Bank would originate. At the end of 2015, the Green Bank entered into a $100 million public-private partnership with Hannon Armstrong to create a warehouse to provide debt to projects. Having proved the warehouse model with its own balance sheet, the Green Bank can now continue it without pledging as large a portion of public funds.

Commercial and Industrial Sector Programs

The following are brief descriptions of the progress made under the last comprehensive plan in the Commercial and Industrial Sector Programs

- **C-PACE** – Commercial Property Assessed Clean Energy (C-PACE) is an innovative financing program that is helping commercial, industrial and multi-family property owners access affordable, long-term financing for smart energy upgrades to their buildings (see Table 2).

Table 2. C-PACE Overview for FY 2016 (as of June 30, 2016)[3]

Program Data	Approved	Closed Not Yet Complete	Closed and Completed	Total
Projects	14	29	14	57
Installed Capacity (MW)	1.1	2.6	1.2	4.9
Clean Energy Produced (MWh)[4]	26,526	60,993	27,937	115,456
Energy Saved (MMBtu)[5]	9,763	19,052	28,045	56,860
Subsidies ($'s)	-	-	-	-
Credit Enhancement ($'s)	-	-	-	-
Loans or Leases ($'s)	$28,757	$5,688,840	$1,092,973	$6,810,570

[3] Includes Clean Tech and Greenworks Lending projects.
[4] Over the life of the measure(s)
[5] First year of the measure(s)

Program Data	Approved	Closed Not Yet Complete	Closed and Completed	Total
Total Green Bank Investment ($'s)	$28,757	$5,688,840	$1,092,973	$6,810,570
Private Capital ($'s)	$6,172,805	$8,705,746	$12,095,878	$26,974,429

Overall, the implementation of C-PACE has been steady and progress continues to grow. The C-PACE program is estimated to have created 173 direct and 276 indirect and induced jobs years and reduced 78,690 tons of CO2 emissions over the life of the projects.

- **CT Solar Lease (Commercial)** – a loan-lease program that provides public and private funding through the Connecticut Solar Lease Program to provide Power Purchase Agreements (PPAs) for solar PV to creditworthy commercial and industrial end-users of electricity (see Table 3). This program will support solar PV projects between 50-200 kW in size – with an average size of 75 kW.

Table 3. CT Solar Lease Overview for FY 2016 (as of June 30, 2016) – for For-Profit Organizations Only[6]

Program Data	Approved	Closed Not Yet Complete	Closed and Completed	Total
Projects	-	8	6	14
Installed Capacity (MW)	-	3.4	0.9	4.4
Clean Energy Produced (MWh)[7]	-	81,563	22,223	103,786
Energy Saved (MMBtu)[8]	-	11,132	3,033	14,165
Subsidies ($'s)	-	-	-	-
Credit Enhancement ($'s)	-	-	-	-
Loans or Leases ($'s)[9]	-	$4,175,323	$1,114,941	$5,290,264
Total Green Bank Investment ($'s)	-	$4,175,323	$1,114,941	$5,290,264
Private Capital ($'s)	-	$4,559,301	$1,444,073	$6,003,374

[6] Includes former Institutional sector Commercial Leases.
[7] Over the life of the measure(s)
[8] First year of the measure(s)
[9] Based on the Objective Functions for the CT Solar Lease, the loan financing represents about 26% of the value of the lease.

The CT Solar Lease (Commercial) program is estimated to have created 38 direct and 61 indirect and induced jobs years and reduced 53,813 tons of CO2 emissions over the life of the projects.

For a breakdown of the use of the Green Bank resources for Commercial and Industrial Programs, see table 4 below.

Table 4. Distribution of Green Bank Funds Invested in Projects and Programs through Subsidies, Credit Enhancements, and Loans and Leases for FY 2016 (as of June 30 2016)[10]

Program	Subsidies	Credit Enhancements	Loans and Leases	Total
C-PACE	-	-	$6,781,813	$6,781,813
CT Solar Lease	-	-	$5,290,264	$5,290,264
Total	**-**	**-**	**$12,072,077**	**$12,072,077**

Of the $11.6 million of Connecticut Green Bank resources invested, 0% was in subsidies, 0% was in Credit Enhancements, and 100% was in Loans and Leases.

Of these programs, the following is a breakdown of their contributions made thus far towards the performance target and the human resources required to implement them (see Table 5):

Table 5. Program Progress Made in FY 2016 (as of June 30, 2016)[11]

Key Metrics	C-PACE	Commercial Lease	Total Program Progress
Date of Program Approval	Sep 2012	Jun 2013	
Date of Program Launch	Jan 2013	Sep 2013	
Ratepayer Capital at Risk	$6,781,813	$5,290,264	$12,072,077
Private Capital	$20,801,624	$6,003,374	$26,805,008
Deployed (MW)	3.7	4.4	8.1
# of Loans/Installations	43	14	57
Lifetime Production (MWh)	88,930	103,786	192,716
Annual Saved (MMBtu)	47,097	14,165	61,262
Full Time Equivalent Staff	6.8	1.3	8.1

Top Headlines

The following are the top headlines for the Commercial and Industrial Sector programs for FY 2016:

Connecticut Green Bank Inks $100m Funding Deal
Hartford Business Journal
(Connecticut Green Bank) has signed an agreement with Maryland-based Hannon Armstrong to provide up to $100 million in financing for green energy projects…

CPACE unveils manufacturer, multi-family perks
Hartford Business Journal

10 Includes only closed and completed transactions
11 Includes only closed and completed transactions

it will bundle more than $8 million in private funds to match $800,000 from the Department of Economic and Community Development's manufacturing innovation fund.

Bridgeport's Wade's Dairy ready to double in size
CTpost
“This is a big, big project for us,” he said. “It will set the stage for the fifth generation of the family to take over.”

The Real Story, Connecticut Green Bank
Fox61
Mackey Dykes talks with Jenn Bernstein about marketplace growth and how you can access affordable options.

Lessons Learned

Based on the implementation of the Commercial and Industrial Sector Programs thus far, the following are the key lessons learned:

- **Invest in Contractors** – contractors are the main source of projects for the program. Early work in training and supporting contractors yielded a small first class of contractors who understand C-PACE and are doing projects. However, in order to grow the market and continue building demand for the Hannon Armstrong warehouse (as many of the first class of contractors have moved to other lenders), more investment in recruiting, training and supporting contractors is necessary.

- **Long Sales Cycle** – moving projects through the C-PACE pipeline can take a year a more. This learning is bearing out in new C-PACE programs around the country. Educating building owners, working with them through the upgrade and then financing decision-making process, and scoping projects takes time. Given these timelines, meeting our goals requires working multiple channels at once and building a pipeline with multiple projects in all stages of the process.

- **Subsector Focus** – campaigns such as “Energy on the Line” allow for targeted messaging and focused marketing efforts, which has higher yields than approaching the entire market at once. The C-PACE program should continue and pilot new ways of running subsector campaigns.

- **Open Market Success** – the open market concept, opening the C-PACE platform up to allow private lenders to lend directly to building openers, is working. With no public dollars being invested, the open market is yielding a growing amount of projects. However, it’s growing slowly so there is still a role for CGB capital to play to continue the success of the program, especially in investing efforts to bring in new contractors.

Commercial, Industrial, and Institutional Sector Programs FY 2017 Targets

Of programs being implemented in the Commercial, Industrial, and Institutional Sector Programs, the following is a breakdown of the key targets (see Tables 6):

Table 6. Number of Projects, Capital Deployed, and Clean Energy Deployed (MW)

Program	# of Projects	Capital Deployed	Clean Energy Deployed (MW)
C-PACE	79	$45,550,000	11.1
CT Solar Lease	15	$11,500,000	3.7
Total	**94**	**$56,800,000**	**14.8**

To achieve these targets, the Commercial, Industrial, and Institutional Sector Programs will focus its programmatic expenses in the following areas:

- **Contractors** – through efforts such as updating our C-PACE trainings and the newly-launched Project Accelerator Service, the program will recruit, train and support new contractors and help them source and develop projects.

- **Demand** - the program will explore new ways to partner with contractors and new strategic channel partners (i.e. BOMA, CoreNet, Connecticut Sustainable Business Council, etc.) to raise awareness of C-PACE and source projects. This will also include the deployment of specialized campaigns (i.e. Solarize for commercial and industrial) to give select contractors the opportunity to source new deals

- **New Lease Fund** – due to the success of the commercial and institutional portion of SL2, CGB will create a third fund dedicated to these sectors.

- **New Products and Markets** – the team will continue to pursue new market segments and to develop alternative financing products such as energy service agreements (ESAs) to meet the financing gaps in the market not met by C-PACE.

    - In FY16, the Green Bank funded a pilot ESA for the Bridgeport International Academy (BIA) after BIA was unable to finance their energy efficiency project through C-PACE. We will use performance data from that project and our ongoing engagement with building owners, contractors, ESA market leaders, and capital providers to determine the viability of a Green Bank ESA product.

    - The Green Bank is working on several fronts with the utilities to improve the complementarity of our programs and products. We are currently focused on working with UI/Avangrid and Eversource to bring more and cheaper capital into the Small Business Energy Advantage financing program.

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CONNECTICUT GREEN BANK

Memo

To: Connecticut Green Bank Board of Directors

From: Lucy Charpentier, Bryan Garcia, and Eric Shrago

Date: October 21, 2016

Re: Connecticut Green Bank – Investment and Public Benefit Performance from Clean Energy Projects from FY 2012 through FY 2016

Per Section 99 of Public Act 11-80, the Connecticut Green Bank began operations on July 1, 2011 – the start of FY 2012. This memo outlines the progress that has been made with respect to investment in projects by sector (i.e., approved, closed, and complete transactions) and an estimate of the public benefits (i.e., economic development and environmental protection).

Investments in Projects

From the period of FY 2012 through FY 2016, there has been a significant shift in the use of the organizations resources for programs and projects (see Table 1 and Table 2).

Table 1. Project Investments Approved between FY 2012 through FY 2016 by Sector and Type[1]

	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016
Commercial, Industrial & Institutional	-	$4.4	$24.9	$66.6	$22.3
Residential	-	$0.4	$10.1	$32.3	$41.8
Infrastructure	$15.0	$115.9	$147.5	$247.5	$251.0
Total Project Investment[2]	**$15.0**	**$120.3**	**$172.0**	**$312.2**	**$297.0**
Total CGB Investment	**$4.8**	**$21.3**	**$44,9**	**$50.4**	**$42.3**
Grants from CGB	$4.8	$13.1	$20.6	$34.1	$22.0
Loans from CGB	-	$8.3	$27.0	$20.8	$25.2
% of Funding Approved as Grants	**100%**	**62%**	**46%**	**68%**	**52%**
Installed Capacity of Approved Projects (MW)[3]	**2.9**	**26.5**	**30.2**	**61.1**	**71.7**

[1] Approved transactions are either projects or programs approved by the Board of Directors consistent with its Comprehensive Plan and Budget. Closed or completed projects are a percentage of those projects approved to date.
[2] Total has been adjusted to eliminate the projects that overlap sectors.
[3] kW_{STC} was used for solar PV, CHP, AD and wind projects while kW_{AC} was used for fuel cell projects.

Table 2. Project Investments Closed between FY 2012 through FY 2016 by Sector and Type[4]

	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016
Commercial, Industrial & Institutional	-	$1.8	$21.3	$34.4	$21.0
Residential	-	$0.2	$10.7	$39.9	$38.6
Infrastructure	$15.0	$110.0	$80.5	$243.9	$256.4
Total Project Investment[5]	**$15.0**	**$111.2**	**$101.9**	**$279.2**	**$282.6**
Total CGB Investment	**$4.8**	**$18.4**	**$31.0**	**$51.1**	**$40.9**
Grants from CGB	$4.8	$12.3	$20.8	$34.1	$21.0
Loans from CGB	-	$6.0	$12.5	$21.3	$20.1
% of Funding Closed as Grants	**100%**	**67%**	**67%**	**67%**	**51%**
Installed Capacity of Closed Projects (MW)[6]	**2.9**	**23.5**	**23.2**	**62.6**	**67.4**

Between FY 2012 through FY 2016 there has been $916 million of approved projects, of which nearly $790 million has been closed or completed.

A brief review of the data indicates the following:

- **Scaling Up Investment Activity** – the organization's programs and products have attracted an increasing amount of investment in clean energy in Connecticut from $15.0 million approved in FY 2012 to over $300 million approved in FY 2016 (an increase of 20 times the approvals);

- **Stewardship of Funds** – a change in the way the organization's resources are being managed from 100% grants in FY 2012 to just over 50% grants in FY 2016 and about 50% in loans and credit enhancements;

- **Demonstrated Results** – the Statutory and Infrastructure projects (i.e., grid-tied systems, AD and CHP, and residential solar PV, etc.) are contributing a majority of the investment in clean energy deployment to date.

- **New Market Growth** – the Commercial, Industrial, & Institutional (i.e., C-PACE) and Residential (i.e., Smart-E Loan) sector financing programs – launched in January and July of 2013 respectively continue to grow. In FY 2016 we launched our partnership with PosiGen to support solar PV leasing and energy efficiency ESAs to low-to-moderate income households. This product is demonstrating steady growth and attracting more private investment.

- **Mature Market** – Successful Green Bank products CT Solar Loan and CT Solar Lease have graduated from the organization's offerings and private financiers and developers now offer equivalent or more competitive products. This is market transformation.

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[4] Approved transactions are either projects or programs approved by the Board of Directors consistent with its Comprehensive Plan and Budget. Closed or completed projects are a percentage of those projects approved to date.

[5] Total has been adjusted to eliminate the projects that overlap sectors.

[6] kW_{STC} was used for solar PV, CHP, AD and wind projects while kW_{AC} was used for fuel cell projects.

Public Benefits from Projects – Economic Development and Environmental Protection
As more and more investment in clean energy deployment in Connecticut is achieved, the economic development and environmental protection benefits increase (see Table 3 and Table 4). Note, these estimates are based on approved projects – not closed and completed.

Table 3. Estimates of Economic Development Benefits between FY 2012 through FY 2016[i,ii]

Sectors	FY 2013	FY 2013	FY 2014	FY 2015	FY 2016
	Direct / Indirect and Induced (Job-Years)	Direct / Indirect and Induced (Job-Years)	Direct / Indirect and Induced (Job-Years)	Direct / Indirect and Induced (Job-Years)	Direct / Indirect and Induced (Job-Years)
Commercial & Industrial	-	29 / 46	137 / 220	115 / 182	80 / 130
Institutional	-	2 / 3	4 / 6	19 / 31	14 / 23
Residential	-	3 / 4	67 / 108	200 / 321	200 / 322
Statutory & Infrastructure	88 / 142	548 / 1,114	375 / 604	1,102 / 1,775	1,371 / 2,208
Total Public Benefits	**88 / 142**	**548 / 1,114**	**583 / 937**	**1,437 / 2,310**	**1,666 / 2,682**

Table 4. Estimates of Environmental Protection Benefits between FY 2012 through FY 2016[iii,iv]

Sectors	FY 2013	FY 2013	FY 2014	FY 2015	FY 2016
	Lifetime CO2 Emission Reductions (Tons)	Lifetime CO2 Emission Reductions (Tons)	Lifetime CO2 Emission Reductions (Tons)	Lifetime CO2 Emission Reductions (Tons)	Lifetime CO2 Emission Reductions (Tons)
Commercial & Industrial	-	2,544	128,546	99,003	60,222
Institutional	-	0	-	23,250	18,119
Residential	-	782	26,631	83,410	86,389
Statutory & Infrastructure	35,459	175,610	239,630	510,532	695,652
Total Public Benefits	**35,459**	**178,936**	**394,806**	**716,196**	**860,383**

As a result of the clean energy projects supported by the Connecticut Green Bank, it is estimated that 4,355 direct and 7,239 indirect and induced job-years were and are to be created and the reduction of 2.2 million tons of CO_2 emissions as a result of investments in clean energy.

END NOTES

[i] Jobs estimates are based on multipliers determined as a result of work performed by Navigant Consulting for the *Connecticut Renewable Energy and Energy Efficiency Economy Baseline Study* completed in March 2009 and subsequently updated in 2010. This Navigant Study was an independent, third party analysis of Connecticut's clean energy economy. Data was acquired as a result of primary research. Navigant performed a census of over 300 companies, institutions, and organizations identified as active players in Connecticut's renewable energy and energy efficiency economy. Seventy four (74) key renewable energy and energy efficiency companies were interviewed; 95 additional key companies were researched in detail. All renewable companies in Connecticut were identified and analyzed. Key energy efficiency companies were identified and analyzed, with the overall market size estimated by extrapolation. Company interviews included questions about customers, supply chain, number of jobs, corresponding salaries, and revenue. Detailed interview questionnaires are available in the Methodology section of the Baseline Study, pages 58-81 –

http://www.ctcleanenergy.com/Portals/0/Phase%201%20Deliverable%20Final%20Full.pdf.

DECD has approved of the methodology for estimating the economic development benefits (i.e., job-years created) from the investment in clean energy projects.

[ii] All emissions reductions from renewable energy projects are determined using ISO-New England information, because that is where the energy will be displaced. This produces results that may be significantly different from emissions savings based on a comparison to national averages. In addition, the generation characteristics of each technology have an impact on the emissions reduction that can be expected. Solar-powered systems will produce only during the daylight hours, which normally coincide with the peak demand period for the utilities. The generating fleet during this time may include peaking plants and reserve plants, which will have lower efficiencies than the "baseload" plants which run 24 hours per day. Consequently, emissions are higher, and the renewable energy systems look better by comparison. The calculations are based on the results of the 2007 New England Marginal Emission Rate Analysis (http://www.iso-ne.com/genrtion_resrcs/reports/emission/2007_mea_report.pdf). The appropriate marginal emissions rates for Connecticut are used to determine the net avoided emissions for each of the technologies evaluated.

a. PV systems are analyzed using the average of the Marginal Emission Rates (in Lbs/MWh) for "On-Peak Ozone Season" and "On-Peak Non-Ozone Season". The underlying assumptions are that PV systems will be operating primarily during the on-peak periods, and that their output in the five months of the "Ozone Season" (May – September) is about the same as in the seven months of the "Non-Ozone Season."
b. Fuel cells are also evaluated using the "Annual Average (all hours) Marginal Emission Rates", because they are expected to produce power continually as "base load" generators. Fuel Cell emissions assume that 50% of the thermal output ("waste heat") is used to displace natural gas used for heating. This is conservative, since 50% thermal utilization is the minimum standard for CCEF's acceptance of a fuel cell project.

It should be noted that emissions estimates for anaerobic digester, wind, and energy efficiency projects were not estimated.

To determine the exact avoided CO_2 for CHP projects we need to know what the CHP system is displacing (i.e. boiler, grid, etc.), as well as the efficiencies, in order to determine the existing CO_2 emissions and then do the calculation to get the avoided emissions. For general purposes a typical 3.7 MW system operating on natural gas would generate about 13,000 tons of CO2 annually and 195,000 Tons over its 15-year life. Typically avoiding 35-50% CO_2 overall from the existing infrastructure. Not factoring in the utility transmission and distribution losses.

It should be noted that a methodology for estimating the environmental protection benefits (i.e., GHG emissions reduced) has not yet been proposed to or approved by DEEP from the investment in clean energy projects.

END NOTES

[iii] Jobs estimates are based on multipliers determined as a result of work performed by Navigant Consulting for the *Connecticut Renewable Energy and Energy Efficiency Economy Baseline Study* completed in March 2009 and subsequently updated in 2010. This Navigant Study was an independent, third party analysis of Connecticut's clean energy economy. Data was acquired as a result of primary research. Navigant performed a census of over 300 companies, institutions, and organizations identified as active players in Connecticut's renewable energy and energy efficiency economy. Seventy four (74) key renewable energy and energy efficiency companies were interviewed; 95 additional key companies were researched in detail. All renewable companies in Connecticut were identified and analyzed. Key energy efficiency companies were identified and analyzed, with the overall market size estimated by extrapolation. Company interviews included questions about customers, supply chain, number of jobs, corresponding salaries, and revenue. Detailed interview questionnaires are available in the Methodology section of the Baseline Study, pages 58-81 –

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[iv] All emissions reductions from renewable energy projects are determined using ISO-New England information, because that is where the energy will be displaced. This produces results that may be significantly different from emissions savings based on a comparison to national averages. In addition, the generation characteristics of each technology have an impact on the emissions reduction that can be expected. Solar-powered systems will produce only during the daylight hours, which normally coincide with the peak demand period for the utilities. The generating fleet during this time may include peaking plants and reserve plants, which will have lower efficiencies

than the “baseload” plants which run 24 hours per day. Consequently, emissions are higher, and the renewable energy systems look better by comparison. The calculations are based on the results of the 2007 New England Marginal Emission Rate Analysis (http://www.iso-ne.com/genrtion_resrcs/reports/emission/2007_mea_report.pdf). The appropriate marginal emissions rates for Connecticut are used to determine the net avoided emissions for each of the technologies evaluated.

c. PV systems are analyzed using the average of the Marginal Emission Rates (in Lbs/MWh) for “On-Peak Ozone Season” and “On-Peak Non-Ozone Season”. The underlying assumptions are that PV systems will be operating primarily during the on-peak periods, and that their output in the five months of the “Ozone Season” (May – September) is about the same as in the seven months of the “Non-Ozone Season.”
d. Fuel cells are also evaluated using the “Annual Average (all hours) Marginal Emission Rates”, because they are expected to produce power continually as “base load” generators. Fuel Cell emissions assume that 50% of the thermal output (“waste heat”) is used to displace natural gas used for heating. This is conservative, since 50% thermal utilization is the minimum standard for CCEF’s acceptance of a fuel cell project.

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It should be noted that a methodology for estimating the environmental protection benefits (i.e., GHG emissions reduced) has not yet been proposed to or approved by DEEP from the investment in clean energy projects.

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CONNECTICUT GREEN BANK

Memo

To: Connecticut Green Bank Board of Directors

From: Bryan Garcia (President and CEO)

Date: October 21, 2016

Re: Q1 Progress to Targets

The following memo outlines Connecticut Green Bank (CGB) progress to Q1 targets for fiscal year 2017 as of September 30, 2016, the end of the first quarter. To date, the Connecticut Green Bank has invested $5.97 million of its resources in FY 2017 to attract $53.6 million of private capital resources.[1] Of the $5.97 million of resources invested by the Connecticut Green Bank $5.3 million was in grants,[2] $ 50,000 in credit enhancements, and $0.5 million in financing.

Statutory and Infrastructure Sector

The Statutory and Infrastructure sector is on target to exceed the lower range of the sector's goal of 6378 projects representing 50.1 MW and $228,800,000 of capital deployed. The organization set our targets as a range due to the uncertainty around key installers continued participation in the RSIP during the year as we expect to see market transformation with certain installers using the Class I RPS market for incentives versus the RSIP.

The Anaerobic Digester and Combined Heat and Power programs saw one project closed, a CHP project in Bridgeport. The team remains focused on sourcing a fifth Anaerobic Digestion project to achieve its statutorily mandated goal.

Table 1. Statutory and Infrastructure Sector Q1 Cumulative Progress to Targets

	Projects		Capital Deployed		Capacity installed (MW)	
Program/Product	**Closed**	**Target**	**Closed**	**Target**	**Closed**	**Target**
AD & CHP	1	1	$3,401,392	$18,000,000		1.6
Residential Solar1	1,681	6,377-8,500	$50,125,336	$210,800,000-$282,302,000	13.4	48.5-64.6
Total	**1,682**	**6,378-8,501**	$53,526,728	**$228,800,000-$300,302,000**	**14.2**	**50.1-66.2**

[1] Including credit enhancements of $1.2 million for LLRs

[2] Of the $5.3 million invested in grants, $5.3 million was through the Residential Solar Investment Program. Per PA 15-194, all of the incentives and administrative costs provided through the RSIP will be recovered through the sale of Solar Home Renewable Energy Credits to the electric distribution companies for Class I RPS compliance.

Residential Sector

Smart-E has not seen the volume that we projected in the first fiscal quarter. Lower fuel oil and natural gas prices are impacting demand for energy efficiency and HVAC products across the board. Table 3 outlines our Smart-E channels and projected volume. The Capital for Change/HES channel has significantly underperformed, despite significant amounts of work with the utilities to coordinate our programs and drive financing through the HES program. The EE/HVAC channel is below target in part due to the continued competition in the market from the ratepayer-subsidized EnergizeCT Heating Loan (this product closed $11 million in loans in the first 8 months of this calendar year). The solar channel has felt the effects of the continued dominance of the lease/PPA model versus ownership as well as the loss of a key solar installer who shifted to another loan product (the decision was made at the corporate level, out of state). To drive more volume, the team is focused on targeted lender campaigns as well as seasonal co-op marketing programs for contractors and targeted recruitment of HVAC contractors.

Low Income Leases/Loans (PosiGen) saw the efforts of past community campaigns finally bearing fruit in closed projects this quarter. A fourth campaign was just launched in New London which will continue the momentum. Additionally, PosiGen is committing more marketing resources to the state as it shifts away from the NY market to the more successful CT market. It should also be noted that over 60 percent of households in addition to installing solar PV are undertaking deeper energy efficiency measures through the Energy Savings Agreement product of PosiGen.

Multifamily closed 5 term loans that weren't reflected in the data provided by partners yet, and has a robust pipeline particularly for pre-development (over 30 in the pipeline). It will take several quarters of experience to better project when deals will close, and we are seeing particularly in the affordable multifamily segment that timelines from application to close are long and highly variable. A new initiative called BenchmarkCT launched over the summer and has 100 buildings under management. Over time this program will be a source of deals into the pre-development program. The team just completed its suite of Multifamily marketing materials and is turning its attention from standing up/operationalizing programs to focused outreach with partners such as Connecticut Housing Coalition and the major trade associations and networks.

As shown in the Market Transformation portion of Table 2, we continue to see results from prior product spin-offs to 100% private capital.

Table 2. Residential Sector Q1 Cumulative Progress to Targets

Program/Product	Projects		Capital Deployed		Capacity installed (MW)	
	Closed	Target	Closed	Target	Closed	Target
Smart-E	27	538	$645,298	$9,039,000	0.1	1.1
Low Income Loans/Leases (PosiGen)	175	500	$4,983,930	$15,250,000	1.1	3.4
Multi-Family (Term Only)	0	55	$0	$12,310,000	0.0	0.9
Multi-Family (Pre-Dev Only)	0	36	$0	$570,000	0.0	0.0
CGB Total	**202**	**1,093**	$5,629,228	**$36,599,000**	**1.2**	**5.4**

Sungage/DCU	27		$975,392		0.3	
Sunnova	11		$266,866		0.1	
Total Market Transformation	**38**			**$0**	**0**	**0**

Table 3. Smart-E Channel Breakout

Breakdown for Smart-E Channels	Closed	Target
Capital for Change/HES	1	250
EE/HVAC	15	145
Solar	10	143
TBD	1	0
Total	**27**	**538**

Commercial, and Industrial, and Institutional Sector

Excluding CPACE-backed CT Solar Lease projects, C-PACE tied for its most successful quarter in history for number of projects. In the state, third party C-PACE lenders continue to show strength and growth, matching their most successful quarter for total number of projects.

Solar continues to drive the C-PACE market, with nearly 80% of Q1 projects solar only or energy efficiency and solar. Although number of projects was at an all-time high, capital deployed matched the quarterly average due to a decrease in average project size (~$400,000 for Q1).

CGB continues to leverage its warehouse facility with Hannon Armstrong to increase its leverage and lend in the state.

Table 4. Commercial, Industrial, and Institutional Q1 Cumulative Progress to Targets

	Projects		Capital Deployed		Capacity installed (MW)	
Program/Product	Closed	Target	Closed	Target	Closed	Target
CPACE	14	79	$3,762,031	$45,550,000	0.5	11.1
Commercial Lease	0	15	$0	$11,250,000	0.0	3.7
CEBS	1		$1,648,000	$0		
Total	**15**	**94**	**$5,410,031**	**$56,800,000**	**0.5**	**14.8**

Table 5. CPACE projects by Originator

Originator	Projects	Capital Deployed	Capacity installed (MW)
CGB	6	$1,670,091	0.1
Greenworks Lending	8	$2,091,940	0.3
Total CPACE	14	$3,762,031	**0.5**

Connecticut Green Bank – Progress to Targets through Q1 of FY 2017

The following is a breakdown of total progress to targets through Q1 of FY 2017 for closed projects (see Table 6).

Table 5. Q1 Cumulative Progress to Targets

Program/Product	Projects		Capital Deployed		Capacity installed (MW)	
	Closed	Target	Closed	Target	Closed	Target
Commercial, Industrial and Institutional	**15**	**94**	**$5,410,031**	**$56,800,000**	**0.5**	**14.8**
Residential	**202**	**1,093**	**$5,629,228**	**$36,599,000**	**1.2**	**5.4**
Infrastructure	**1,682**	**6,378-8,501**	**$53,526,728**	**$228,800,000 - $300,302,000**	**14.2**	**50.1- 66.2**
Total CGB	**1,726**	**9,688**	**$59,474,616**	**$393,701,000**	**14.8**	**86.4**

* Adjusted to avoid double counting. (Excludes duplicates for RSIP projects using residential financing products, residential low income leases (Posigen) projects within RSIP and MFH using CPACE.)

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CONNECTICUT
GREEN BANK

March 9, 2016

A Message from the President and CEO

This second evaluation of the Residential Solar Investment Program (RSIP) conducted by The Cadmus Group for the Connecticut Green Bank is focused on RSIP cost-effectiveness. The enclosed report, "Cost-Effectiveness Assessment of the Residential Solar Investment Program" documents the findings of this evaluation, which concludes that RSIP is cost-effective from multiple perspectives including for program participants and the efficient use of program funds.

RSIP provides two types of incentives for residential solar PV projects, an Expected Performance Based Buydown (EPBB) or upfront rebate provided for the customer through the installer, and a Performance Based Incentive for third party owned systems. This evaluation spans incentive steps 1 through 7, for which incentives decreased from $2.45/W to $0.54/W for the EPBB and $0.30/kWh to $0.064/kWh for the PBI. During this time, over 12,200 projects or 91.3 MW had been approved, were in progress or had been completed through RSIP.

RSIP reached its original legislative target of 30 MW eight years ahead of schedule in July 2014. On July 2, 2015, the Governor and Connecticut legislature passed an expanded RSIP target of 300 MW by 2022, along with creation of Solar Home Renewable Energy Credits (SHRECs) as a funding source for the program. Recent milestones also include:

- RSIP step 9 began February 1, 2016, with incentive levels at $0.513/W for EPBB and $0.046/kWh – an equivalent ZREC price of between $20-$25.
- As of March 4, 2016, RSIP reached over 16,000 projects or 121 MW in approved or later statuses, while average installed costs were $3.36/W thus far for calendar year 2016 (excluding those projects where financing costs for some third party ownership installers are included as part of the total system cost).
- Federal incentives including the 30% investment tax credit and MACRS were extended in December 2015.
- Along with www.EnergizeCT.com, www.GoSolarCT.com is serving as a trusted information resource that the Connecticut Green Bank is developing for the residential solar PV market in Connecticut.
- The Green Bank offers the Smart-E residential financing product, providing low interest loans for most residential energy improvements including solar PV and energy efficiency measures. Lower rates are offered for Smart-E technology bundles that combine two or more qualifying measures.
- We continue to see developments in emerging technologies such as energy storage that along with solar PV, energy efficiency, and demand response hold promise to provide comprehensive solutions to meet the energy needs of Connecticut customers while providing broader benefits to the electricity system.
- The Green Bank completed its second Comprehensive Annual Financial Report (CAFR), for FY 2015 (see www.ctgreenbank.com, "About Us").

We thank all our stakeholders for your strong support of the Residential Solar Investment Program and the Connecticut Green Bank as we continue working to make clean energy more affordable and accessible to consumers.

Bryan T. Garcia
President and CEO

Cost-Effectiveness Assessment of the Residential Solar Investment Program

March 8, 2016

Connecticut Green Bank
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Rocky Hill, CT 06067

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CADMUS

Introduction

A report capturing the findings of a first evaluation[1] of the Connecticut Green Bank Residential Solar Investment Program (RSIP) was submitted to the state of Connecticut legislature at the beginning of 2014 to provide an update on progress made toward the 30 MW[2] by 2022 goal specified in PA 11-80.[3] The first evaluation covered the time period from March 2012 through June 2013, by which time 10 MW of projects had been approved, in progress, or completed through RSIP. This second evaluation is focused on assessing the cost-effectiveness of RSIP overall, from Step 1 beginning in March 2012 through Step 7 ending in August 2015. As of August 12, 2015, the cut-off date for the data included in this evaluation, 91.3 MW of solar PV projects had been approved, in progress, or completed through RSIP.

Cadmus and the Connecticut Green Bank are grateful for support from:

- Joseph Swift of Eversource Energy in providing input, guidance and modeling assistance on cost-effectiveness benchmarking for utility-administered energy efficiency programs.
- Chris Kramer of Energy Futures Group, Financing Consultant to the Connecticut Energy Efficiency Board (EEB)[4], and Glenn Reed and Richard Faesy of Energy Futures Group, Residential Consultants to the EEB, for providing guidance, information and resources on cost-effectiveness benchmarking for utility-administered energy efficiency programs, and for feedback on this report.
- Jeff Schlegel, Senior Technical Consultant to the EEB, for feedback on the report.
- Les Tumidaj, Commercial and Industrial Consultant to the EEB, for feedback on the report.
- Paul Horowitz of PAH Associates, for feedback on the report.

While reviewer comments were incorporated into the report as much as possible, these acknowledgements do not imply that all reviewer comments were addressed nor that the authors and reviewers agree on all assumptions and methodological decisions.

To provide results that would be meaningful to policymakers looking at cost-effectiveness broadly for all programs in Connecticut, the aim was to conduct this evaluation using assumptions as consistent as possible with those used in the analysis of the energy efficiency programs delivered by Connecticut's two investor-owned utilities, Eversource Energy and the United Illuminating Company (UI). However,

[1] "Residential Solar Investment Program Evaluation," Shawn Shaw, Danielle Kolp, Mary Knipe, Ryan Fahey, Kathleen Higgins, The Cadmus Group, January 28, 2015. http://www.ctgreenbank.com/wp-content/uploads/2016/02/RSIP_Evaluation_I_Final_Report_and_cvr_ltr.pdf

[2] All instances of MW or kW referenced in this report are provided in Watts-DC (direct current) or equivalently, Watts – STC (standard test conditions), unless stated otherwise.

[3] The text of PA 11-80 can be found here: https://www.cga.ct.gov/2011/act/pa/2011PA-00080-R00SB-01243-PA.htm.

[4] http://www.energizect.com/about/eeboard

there remained differences between the processes used to derive the solar PV cost-effectiveness ratios in this report and those used by utilities to calculate cost-effectiveness for energy efficiency. As a result, although solar PV and energy efficiency[5] are both cost-effective, a direct comparison is not presented in this report.

The report section "Cost-Effectiveness of Energy Efficiency" references cost-effectiveness results for energy efficiency and explains some of the differences in the assumptions and methodologies used to determine solar PV and energy efficiency benefit/cost ratios. The energy efficiency results are also included in the report section "Cost-Effectiveness of Bundled Technologies" in which an example calculation illustrates that one can combine measures that are cost-effective (e.g., solar PV and energy efficiency) with those not yet cost-effective (e.g., energy storage) to encourage adoption of more comprehensive energy solutions for participants while maintaining overall project cost-effectiveness.

[5] Energy efficiency cost-effectiveness ratios referenced in this report are from the 2016-2018 Electric and Natural Gas Conservation and Load Management (CL&M) plan filed with the Connecticut Department of Energy and Environmental Protection on October 1, 2015, available at http://www.energizect.com/about/eeboard/plans. The Eversource 2016 cost-effectiveness ratios for residential energy efficiency programs are provided for reference in the section of this report titled "Cost-Effectiveness of Energy Efficiency."

Executive Summary

Cadmus evaluated the cost-effectiveness of the Connecticut Green Bank's (the Green Bank, or CGB) Residential Solar Investment Program (RSIP). The RSIP, launched in March 2012, supports the installation of residential solar photovoltaic (PV) systems in Connecticut by providing direct purchase and third-party ownership incentives, as well as marketing and educational support for the industry, qualification of contractors and third party system owners, and inspection of solar PV systems. This evaluation assessed the cost-effectiveness of RSIP from incentive step 1 beginning in March 2012 through incentive step 7 ending in August 2015.[6] As of August 12, 2015, the cut-off date for the data included in this evaluation, 91.3 MW of RSIP solar PV projects were approved, in progress, or completed.

The key findings from this study are:

- RSIP is cost-effective from the perspective of program participants, the Connecticut Green Bank, from a total resource perspective, and for society as a whole.
- RSIP has increasingly made efficient use of program funds by reducing incentives while supporting market growth through financing, marketing, outreach and education.
- RSIP benefits sufficiently outweigh costs to allow for bundling of residential solar PV with emerging technologies such as energy storage, while maintaining cost-effectiveness.[7]

Using the five accepted cost-effectiveness tests adopted for energy efficiency programs, as defined in the California Standard Practice Manual[8], Cadmus evaluated the cost-effectiveness of the RSIP from the following perspectives:[9]

- Total Resource Cost Test (TRC)
- Program Administrator Cost Test (PACT), also called the Utility Cost Test (UCT)[10]
- Customer/Participant Cost Test (PCT)
- Ratepayer Impact Measure Test (RIM)
- Societal Cost Test (SCT)

[6] RSIP incentives levels are provided in the Methodology section of this report.
[7] The technology bundling example provided in this study includes residential solar PV (represented by RSIP) and energy efficiency (represented by Eversource Energy's Home Energy Solutions Program), both of which are cost-effective, leveraging the benefits of both technologies to enable deployment of emerging technologies such as energy storage that are not yet cost-effective.
[8] "California Standard Practice Manual. Economic Analysis of Demand-Side Programs and Projects." October 2001, first published in 1983. http://cpuc.ca.gov, or http://sustainca.org/content/california_standard_practice_manual_economic_analysis_demand_side_programs_and_projects.
[9] See the Overview section for definitions of the tests.
[10] Since the Program administrator is not the utility in this case, but rather the Connecticut Green Bank, this evaluation will refer to this test as the PACT.

In addition to these tests, Cadmus calculated the results for the Green Bank (CGB) Objective Function (OF), an indicator of the efficiency of electric generation created by RSIP as measured by energy delivered to dollars invested. Summary Tables 1 and 2 below present cost-effectiveness results for the five standard tests, as well as results for the CGB OF, for the RSIP overall and for program steps 1 through 7, associated with steadily decreasing incentives.

Table 1. RSIP Cost-Effectiveness Results for the Five Standard Tests and the Connecticut Green Bank Objective Function (CGB OF)

CGB RSIP 2012-2015	Residential Solar PV Capacity (MW)[11]	TRC	PACT	PCT	RIM	SCT	CGB OF (kWh/$ invested)
Steps 1 & 2	7.4	1.44	1.50	1.72	0.40	1.64	18.1
Step 3	13.3	1.59	2.07	1.80	0.43	1.81	25.7
Step 4	20.5	1.70	2.63	1.83	0.45	1.78	33.4
Step 5	14.8	1.74	3.57	1.80	0.47	1.72	45.3
Step 6	14.0	1.76	5.16	1.80	0.49	1.76	67.0
Step 7	21.4	1.80	6.47	1.80	0.50	1.75	83.9
Total	91.3	1.70	3.05	1.80	0.46	1.75	38.7

Table 2. RSIP Total Benefits, Costs, and Net Benefits for the Five Standard Tests

CGB RSIP 2012-2015	TRC	PACT	PCT	RIM	SCT
Installed Capacity (MW[12])	91.3	91.3	91.3	91.3	91.3
NPV Benefits	$618,994,562	$210,410,423	$596,514,388	$210,410,423	$685,462,023
NPV Costs	$364,837,887	$69,057,692	$331,819,540	$455,144,337	$390,979,712
NPV Net Benefits	$254,156,675	$141,352,731	$264,694,849	-$244,733,913	$294,482,311
Net Benefits/MW	$2,780,707.60	$1,546,528.79	$2,896,004.91	-$2,677,613.93	$3,221,907.12
B/C Ratio	1.70	3.05	1.80	0.46	1.75

[11] Step 7 projects included in the study as of August 12, 2015 amounted to 21.4 MW, including projects in approved or later project statuses. The Step 7 end date was August 7, 2015; however not all step 7 projects had been approved as of August 7 or even August 12 when the data were analyzed for this study. As of January 11, 2016, step 7 capacity was 21.3 MW, so projects that had not yet been approved as of August 12 ended up roughly balancing out with projects that had been approved by August 12 but were later cancelled.

[12] Solar PV modules convert solar radiation into direct current (DC) electricity. Solar PV capacity (kW or MW) referenced in this report are provided in Watts-DC or equivalently, Watts – STC (standard test conditions), unless otherwise specified. Capacity can also be provided as Watts-AC (alternating current) which is the wattage available for use by household AC loads such as lighting and appliances. The conversion factor from Watts-DC to Watts-AC is typically in the range of 70%-83%, depending on system losses. The National Renewable Energy Laboratory PVWatts Calculator (pvwatts.nrel.gov) uses a default DC to AC derate factor of 82.56% which comes from an 86% derate (i.e. 14% losses) multiplied by 96% inverter efficiency. RSIP incentives are based on another rating, Watts-PTC (PVUSA Test Conditions), explained in the Methodology section.

The Green Bank RSIP is a cost-effective program, producing significantly higher benefits than costs.[13] RSIP passed all cost-effectiveness tests except the RIM which many programs including most energy efficiency programs do not typically pass[14]. Based on analysis of these cost-effectiveness metrics, RSIP is delivering 0.46 to 3.05 times as many benefits as costs, depending on the cost-effectiveness test used (see Tables 1 and 2). From a program perspective (PACT), RSIP delivers triple the impact of its investment, $3.05 in benefits for every dollar invested by the Green Bank. The PACT provides net benefits of approximately $141 million. The PACT benefits are lower than for other ratios such as the TRC and PCT because the PACT benefits do not include federal tax benefits and do not include participant bill savings. On the cost side, the PACT costs are lower than for the TRC and PCT because participant measure costs are not included in the PACT. Over the RSIP's life[15], the program also contributes net benefits of approximately $265 million to program participants (PCT), $254 million from a total resource perspective (TRC), and $294 million to society as a whole (SCT).

The Connecticut Green Bank Objective Function provides another metric demonstrating efficient use of RSIP funds, with increasing energy produced for every dollar invested, as the program has progressed from steps 1 through 7 (see Table 3).

Table 3. RSIP Results for Connecticut Green Bank Objective Function

CGB RSIP Incentive Step (2012-2015)	Residential Solar PV Capacity (MW)	Lifetime kWh	Program Costs	CGB OF (kWh/$)
Steps 1 & 2	7.4	225,385,736	$12,435,693	18.1
Step 3	13.3	405,346,549	$15,784,621	25.7
Step 4	20.5	607,500,605	$18,200,235	33.4
Step 5	14.8	428,600,431	$9,467,372	45.3
Step 6	14.0	403,698,026	$6,021,396	67.0
Step 7	21.4	600,041,849	$7,148,375	83.9
Total	91.3	2,670,573,196	$69,057,692	38.7

The Green Bank increasingly makes effective use of RSIP funds, supporting strong growth in the solar market while simultaneously reducing RSIP incentives. As shown by the increasing Green Bank Objective Function and increasing PACT results over the program's life, coupled with relatively flat customer economics (represented by the PCT), the Green Bank has supported strong growth while

[13] The RSIP overall is cost effective for all tests (benefit/cost ratio greater than one), as well as for individual incentive steps 1-7, except on the RIM test for which energy efficiency programs also typically do not pass.

[14] The RIM test accounts for lost utility revenue and assumes that the cost is redistributed among all ratepayers. More often than not, measures that reduce the utility's sale of electricity will fail to pass the RIM test, regardless of societal or total resource cost-effectiveness. Load shifting and demand reduction programs are more likely to pass the RIM test.

[15] Solar PV system lifetimes are assumed to be 25 years. NREL provides a range of 25 to 40 years for the useful life of a photovoltaic system, http://www.nrel.gov/analysis/tech_footprint.html.

simultaneously reducing public subsidies and maintaining customer economics over the program's life. As the cost of solar PV has decreased[16], the Green Bank has reduced incentives to make them available to a larger number of projects. The increase in the PACT from 1.5 in Steps 1&2 to 6.47 in Step 7 amounts to more than a four-fold increase in the cost-effectiveness ratio, and the lower Step 7 incentive does not appear to have impeded market growth. Additionally, while incentives decrease and the PACT increases, net benefits/MW for the PACT are maintained over the program steps. See Table 4, below.

Table 4. RSIP PACT Results and Comparison to PCT

CGB RSIP 2012-2015	Installed Capacity (MW)	PACT Benefits	PACT Costs	Net PACT Benefits	Net Benefits/ MW	PACT Benefit/ Cost Ratio	PCT Benefit/ Cost Ratio
Steps 1 & 2	7.4	$18,646,724	$12,435,693	$6,211,031	**$839,329**	**1.50**	**1.72**
Step 3	13.3	$32,714,259	$15,784,621	$16,929,638	**$1,272,905**	**2.07**	**1.80**
Step 4	20.5	$47,901,194	$18,200,235	$29,700,959	**$1,448,827**	**2.63**	**1.83**
Step 5	14.8	$33,822,171	$9,467,372	$24,354,799	**$1,645,594**	**3.57**	**1.80**
Step 6	14	$31,078,515	$6,021,396	$25,057,119	**$1,789,794**	**5.16**	**1.80**
Step 7	21.4	$46,247,561	$7,148,375	$39,099,186	**$1,827,065**	**6.47**	**1.80**
Total	**91.3**	**$210,410,423**	**$69,057,692**	**$141,352,731**	**$1,546,529**	**3.05**	**1.80**

Taken together, the traditional cost-effectiveness tests and the Green Bank Objective Function tell a consistent story – that RSIP increasingly makes efficient use of program funds from step 1 through step 7, as represented by PACT and Green Bank Objective Function results, while the PCT which reflects the benefit/cost ratio for the participant stays level.

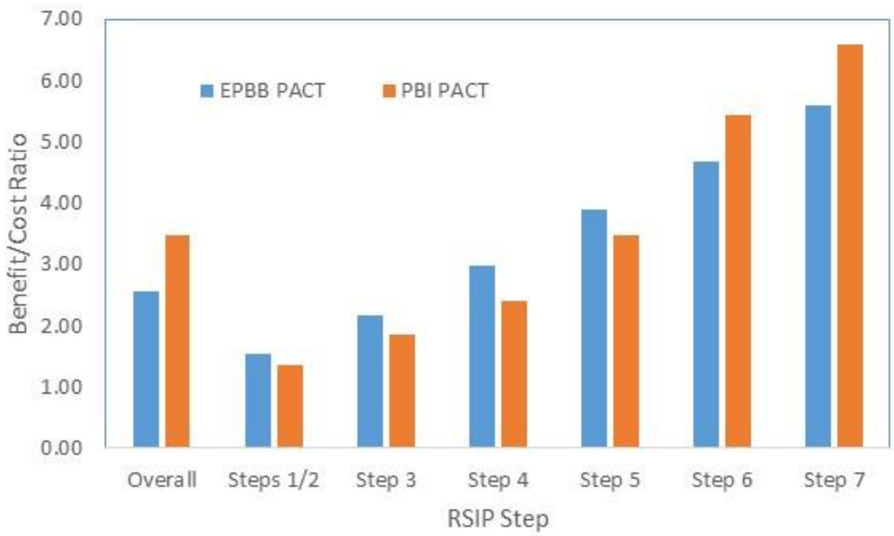
RSIP provides two types of incentives, the Expected Performance Based Buydown (EPBB) and the Performance Based Incentive (PBI).[17] Generally, the PBI proves more cost effective than the EPBB. See Figure 1 below for the PACT results shown separately for the EPBB and PBI. Though both RSIP incentive types prove cost-effective, the PBI element exhibits a higher benefit/cost ratio on all tests except for the SCT. The EPBB's slightly lower ratios partially result from leased PV systems taking advantage of

[16] The average installed cost of solar PV systems supported through the RSIP (as reported by RSIP contractors and third party system owners) has fallen from $4.54/W in Steps 1&2 to $4.29/W in Step 7 for EPBB projects, and $4.91/W in Steps 1&2 to $4.39/W in Step 7.

[17] For the EPBB, the homeowner owns the PV system and the installer receives the incentive payment from the Green Bank on behalf of the customer who has benefited from a buydown or reduction in the cost of the system. Participants also receive a 30% federal investment tax credit (ITC). For PBI, a third-party system owner owns the PV system, and leases it (and its associated generation) to the homeowner, either for a monthly payment or an energy-based charge (i.e., a power purchase agreement). Third-party system owners may utilize two federal tax incentives, the ITC and accelerated depreciation.

accelerated depreciation under the MACRS[18] program, which is not available to direct ownership PV customers. Notably, the EPBB proved initially more cost-effective for the PACT, but the PBI surpassed it in Step 6 of the program.

Figure 1. PACT Results for RSIP Incentive Types, by Step



Both RSIP and energy efficiency programs are cost-effective. To provide results that would be meaningful to policymakers looking at cost-effectiveness broadly for all programs in Connecticut, the aim was to conduct this evaluation using assumptions as consistent as possible with those used in examining the energy efficiency programs delivered by the Connecticut utilities. However, there are differences between the methodologies used to derive the solar PV cost-effectiveness ratios in this report and those used by utilities to calculate cost-effectiveness for energy efficiency. Therefore, while solar PV and energy efficiency are both cost-effective, a direct comparison is not presented in this report.

The report section "Cost-Effectiveness of Energy Efficiency" presents cost-effectiveness ratios for Eversource Energy's residential energy efficiency programs and explains some of the differences in the assumptions and methodologies used to determine solar PV and energy efficiency benefit/cost ratios. The energy efficiency cost-effectiveness ratios are also included in the report section "Cost-Effectiveness of Bundled Technologies" in which an example calculation illustrates that one can combine measures that are cost-effective (e.g., solar PV and energy efficiency) with those not yet cost-effective (e.g., energy storage) to encourage adoption of more comprehensive energy solutions for participants while

[18] MACRS (Modified Accelerated Cost Recovery System) is a Federal tax benefit that allows businesses to claim the depreciated value of solar assets as a tax deduction over a five year period. For more information: http://www.seia.org/policy/finance-tax/depreciation-solar-energy-property-macrs.

maintaining cost-effectiveness. Table 5 presents cost-effectiveness ratios for Eversource's energy efficiency programs, almost all of which are cost-effective.[19]

Table 5. Eversource 2016 Residential Energy Efficiency[20] Program Cost-Effectiveness.

Program, Year		Test	Benefits	Costs	Net Benefits	Ratio
EE 2016 Eversource	Residential Total	TRC	$186,853,379	$76,049,054	$110,804,325	2.46
		PACT	$89,622,927	$40,686,706	$48,936,221	2.20
		M-PACT	$133,786,974	$56,458,769	$77,328,205	2.37
	Residential Retail Products	TRC	$82,271,005	$24,792,006	$57,478,999	3.32
		PACT	$51,489,640	$13,622,165	$37,867,475	3.78
		M-PACT	$51,489,640	$13,622,165	$37,867,475	3.78
	Home Energy Solutions (HES)	TRC	$62,298,317	$19,090,656	$43,207,661	3.26
		PACT	$17,138,430	$9,467,560	$7,670,870	1.81
		M-PACT	$51,721,547	$17,965,248	$33,756,299	2.88
	HES HVAC	TRC	$5,794,248	$6,679,885	($885,637)	0.87
		PACT	$3,982,333	$2,000,000	$1,982,333	1.99
		M-PACT	$3,982,333	$2,000,000	$1,982,333	1.99
	HES Income Eligible	TRC	$22,914,543	$17,713,445	$5,201,098	1.29
		PACT	$8,853,029	$10,728,336	($1,875,307)	0.83
		M-PACT	$16,873,190	$17,459,712	($586,522)	0.97
	New Construction	TRC	$6,442,405	$4,773,062	$1,669,343	1.35
		PACT	$3,198,174	$1,868,646	$1,329,528	1.71
		M-PACT	$4,758,944	$2,411,645	$2,347,299	1.97
	Behavior	TRC	$7,132,861	$3,000,000	$4,132,861	2.38
		PACT	$4,961,321	$3,000,000	$1,961,321	1.65
		M-PACT	$4,961,321	$3,000,000	$1,961,321	1.65

[19] A few exceptions are: the TRC ratio for HES HVAC, and the UCT/PACT and modified UCT/PACT ratios for HES Income Eligible. The HVAC measure costs tend to be higher than those for other EE programs. For the HES Income Eligible program, incentives typically cover 100% of the measure costs, resulting in lower UCT/PACT ratios.

[20] As provided in the 2016-2018 Electric and Natural Gas Conservation and Load Management (CL&M) plan filed with the Connecticut Department of Energy and Environmental Protection on October 1, 2015, available at http://www.energizect.com/about/eeboard/plans (the numbers could be updated before the Plan is finalized). The energy efficiency numbers shown here are from Table B1, Eversource CT Electric – Costs and Benefits 2016. The PACT and the M-PACT correspond to the Electric Utility Cost Test and the Modified Utility Cost Test from the CL&M Plan. The electric utility cost test includes electric benefits and costs, while the modified utility cost test includes oil and propane savings and costs. The electric utility cost test is used as an example for combining with solar PV benefits and costs (in the next section on technology bundling) but both tests are shown here to illustrate that the EE measures have non-electric impacts (that usually increase the ratios). Also, note that the residential EE programs have been designed to maximize not just electricity, but all fuel savings, including oil, gas and propane. If the technology bundle considered in the next section included non-electric impacts, the M-PACT could be more appropriate for use in calculating the cost-effectiveness of the technology bundle.

The RSIP could incorporate residential energy storage, while remaining cost-effective. Although energy storage technologies, in the current Connecticut market, do not offer customers a financial return on investment, energy storage is desirable from an energy resilience standpoint and, as ancillary service markets develop, may offer attractive financial gains in the future, while also providing grid modernization benefits. With the Cadmus evaluation showing a PACT ratio for RSIP Step 7 approaching 7 to 1, there is an opportunity to deploy a suite of technologies along with solar PV that would provide more comprehensive energy solutions for participants and benefits to the grid while still maintaining overall cost-effectiveness. The Green Bank asked Cadmus to assess the cost-effectiveness of a potential technology combination for a typical residential customer in Connecticut, bundling solar PV, energy efficiency, and energy storage into a single resource and calculating the cost-effectiveness of the resulting resource mix. The Green Bank also asked Cadmus to comment on the potential impact of smart metering technologies, for which further discussion is provided in the body of the report.

Table 6 presents benefits, costs, and net benefits for the PACT, TRC and PCT ratios for RSIP Step 7, the Home Energy Solutions (HES) Program[21], RSIP plus HES, energy storage[22], and two technology bundles: RSIP plus storage, and RSIP plus HES plus storage. The resulting PACT, TRC, and PCT ratios for the two technology bundles that include energy storage are all greater than unity because RSIP and HES are both cost-effective and there is sufficient extra benefit with RSIP and HES to offset the additional cost of energy storage. Note that the benefits of energy storage were assumed to be zero based on the assumption that energy storage benefits are not yet able to be monetized[23].

[21] Home Energy Solutions (HES) is a residential energy efficiency program operated by the Connecticut utilities and includes a wide variety of energy efficiency measures and activities beginning with an in-home energy assessment. Core measures include a blower door test before and after implementation of air and duct sealing. The assessment also includes lighting upgrades and identification of further and deeper energy savings opportunities in the home such as insulation, appliance and HVAC upgrades for which participants have access to incentives and financing. Though this assessment does not stipulate exactly which measures are installed, the analysis uses the average benefits and costs per participant, which represents a mix of basic and more advanced efficiency measures. RSIP participants are required to obtain a HES or equivalent Buildings Performance Institute (BPI) certified energy audit in order to receive the RSIP incentive.

[22] The energy storage portion of the bundle is assumed to be a leased Tesla PowerWall 7 kWh home energy storage system. Though this unit is somewhat more expensive than current lead acid based battery systems, the popularity of the product line and offerings by major vendors make it a reasonable choice for potential future residential scale energy storage products that may be of interest to typical Connecticut customers. To calculate the PACT and TRC, Cadmus assumed an 8% program administration cost (amounting to $400) in addition to the participant cost of the energy storage system.

[23] See report section “Cost-Effectiveness of Bundled Technologies” for more details.

Table 6. Cost-Effectiveness of Bundled Resources[24]

Program/Technology	Test	# Participants	Benefits/ Participant	Costs/ Participant	Net Benefits/ Participant	Ratio
RSIP 2015 Step 7	TRC	2,639	$55,050	$30,548	$24,502	1.80
	PACT	2,639	$17,525	$2,709	$14,816	6.47
	PCT	2,639	$48,093	$26,724	$21,370	1.80
EE 2016 Eversource – Home Energy Solutions (HES)	TRC	17,320	$3,597	$1,102	$2,495	3.26
	PACT	17,320	$990	$547	$443	1.81
	PCT	17,320	$1,933	$65	$1,868	29.75
RSIP 2015 Step 7 + EE 2016 Eversource HES	TRC	1	$58,647	$31,651	$26,996	1.85
	PACT	1	$18,514	$3,255	$15,259	5.69
	PCT	1	$50,026	$26,789	$23,238	1.87
Energy Storage	TRC	1	$0	$5,400	($5,400)	0.00
	PACT	1	$0	$400	($400)	0.00
	PCT	1	$0	$5,000	($5,000)	0.00
RSIP 2015 Step 7 + Storage	TRC	1	$55,050	$35,948	$19,102	1.53
	PACT	1	$17,525	$3,109	$14,416	5.64
	PCT	1	$48,093	$31,724	$16,370	1.52
RSIP 2015 Step 7 + EE 2016 Eversource HES + Storage	TRC	1	$58,647	$37,051	$21,596	1.58
	PACT	1	$18,514	$3,655	$14,859	5.06
	PCT	1	$50,026	$31,789	$18,238	1.57

The RSIP net benefits (approximately $24,500 per participant) are sufficient, on a per participant basis, to support the cost of a 7 kWh residential energy storage system, while still passing the TRC, PACT and PCT tests. More broadly, in the section of the report "Cost-Effectiveness of Bundled Technologies," we show that bundling solar PV, energy efficiency measures (using the utility-administered Home Energy Solutions Program as an example) and energy storage is cost-effective. The cost-effectiveness of mature technologies in the RSIP and HES programs can be leveraged to support newer technologies, in this case

[24] Although the PCT is not calculated in the EE CL&M plans, enough data were provided to estimate the PCT for the HES Program for the purposes of this example bundling calculation. The total customer costs and number of measures/participants for HES were taken from the 2016-2018 CL&M Plan, Table B2 – Eversource CT Electric – Resource Summary 2016. Benefits were estimated by multiplying the lifetime savings in MWh attributed to HES and multiplying by 19.23 cents per kWh, the Energy Information Administration (EIA) average residential price of electricity in CT for September 2015 (from the Electric Power Monthly Table 5.6.A. Average Price of Electricity to Ultimate Customers by End-Use Sector, by State, September 2015 and 2014). This resulted in HES per participant benefits of $1933, and costs of $65, resulting in a highly favorable PCT of 29.75. The ratio could have been higher if the benefits estimate calculation included an escalator for the price of electricity and if the peak kW impact was included in the benefit estimate, but the simplified calculation already yielded highly favorable results that were sufficient to illustrate the benefit of bundling technologies. The per participant HES cost of $65 is lower than the expected $99 (the per participant contribution to the HES Program as typically advertised); this is because some of the costs for homes utilizing gas are allocated to the respective gas budget in the CL&M plan.

energy storage, that have not yet achieved commercial cost-effectiveness. This finding supports policies and programs that support comprehensive energy solutions for homeowners as well as grid modernization benefits.

The RSIP is not currently eligible to bid resources into the ISO-NE Forward Capacity Market (FCM). The Green Bank asked Cadmus to research potential eligibility for RSIP to bid into the ISO-NE FCM. Based on Cadmus' research, the current market rules for the Forward Capacity Auction process preclude the participation of small-scale resources such as distributed solar PV systems. The most immediate obstacle to participation is the 100 kW minimum output requirement, which is required on a site by site basis and far exceeds the available output of the individual project sizes found among residential PV systems[25]. See Appendix A for a copy of Cadmus' memo to the Green Bank providing a complete analysis of this topic.

[25] The average solar PV system size is 7.44 kW for the full RSIP dataset used in this study.

Overview

Cadmus, under contract to the Connecticut Green Bank (the Green Bank, or CGB), analyzed the Residential Solar Investment Program's (RSIP) cost-effectiveness using the following five cost-effectiveness tests applied to evaluation of conservation and load management programs, as described in the California Standard Practice Manual[26].

- Total Resource Cost Test (TRC)
- Program Administrator Cost Test (PACT)
- Participant Cost Test (PCT)
- Ratepayer Impact Measure Test (RIM)
- Societal cost test (SCT)

Cadmus applied the following five cost-effectiveness tests to each of the RSIP incentive types separately, the Expected Performance Based Buy-Down Program (EPBB) and the Performance Based Incentive Program (PBI), as well as for the RSIP overall. Additionally, Cadmus calculated the Green Bank (CGB) Objective Function (OF), a performance metric (that measures energy saved/generated per dollar invested) created by the Green Bank for program assessment, planning and reporting purposes. This section provides an explanation of RSIP program elements, the cost-effectiveness tests used in this study and the calculation of the Green Bank Objective Function. Additional details about study methodology are provided in the Methodology section of the Program Cost-Effectiveness section of this report.

Background on the Residential Solar Investment Program

In 2011, Connecticut's legislature passed Public Act 11-80, which created the Connecticut Green Bank pursuant to Connecticut General Statute (CGS) 16-245n and tasked it with creation of the Residential Solar Investment Program (RSIP) (CGS 16-245ff) which was to result in installation of 30 MW of new residential solar PV by 2022, funded by no more than one-third of the total annual surcharge collected from customers of electric services, and providing "incentives that decline over time and will foster the

[26] http://cpuc.ca.gov, or http://sustainca.org/content/california_standard_practice_manual_economic_analysis_demand_side_programs_and_projects, "California Standard Practice Manual. Economic Analysis of Demand-Side Programs and Projects." October 2001, first published in 1983. The 2001 manual includes solar PV as a load management technology in the category of "self generation": "Self generation refers to distributed generation (DG) installed on the customer's side of the electric utility meter, which serves some or all of the customer's electric load, that otherwise would have been provided by the central electric grid… Self generation technologies include, but are not limited to, photovoltaics, wind turbines, fuel cells, microturbines, small gas-fired turbines, and gas-fired internal combustion engines." Note that RSIP incentives are structured to encourage solar PV system sizing that will generate enough electricity to match a customer's electricity usage on an annual basis. Additional capacity beyond that needed to meet a customer's electricity usage is incentivized at a lower, second tier amount – see Methodology section for more details on RSIP incentive levels.

sustained, orderly development of a state-based solar industry." RSIP met the 30 MW target eight years ahead of schedule, in 2014. Governor's Bill No. 6838, "An Act Concerning the Encouragement of Local Economic Development and Access to Residential Renewable Energy," was signed into law July 2, 2015 by Governor Malloy, expanding the RSIP target from 30MW to 300MW by 2022 and establishing the Solar Home Renewable Energy Credit (SHREC) a new type of Class I REC which utilities are to purchase from the Green Bank through 15-year contracts as a funding source for RSIP (this bill updates CGS 16-245ff).[27]

The RSIP provides two types of incentives, the Expected Performance Based Buydown (EPBB) and a Performance Based Incentive (PBI). For the EPBB incentive type, the homeowner owns the PV system and the installer receives the incentive payment[28] from the Green Bank on behalf of the customer who has benefited from a buydown or reduction in the cost of the system. Participants also receive a 30% federal investment Tax Credit (ITC)[29]. The system cost, Green Bank incentives, and federal ITC are modeled as occurring during the first year of installation.

For PBI projects, a third-party system owner owns the PV system, and leases it (and its associated generation) to the homeowner, either for a monthly payment or an energy-based rate/charge (i.e., a power purchase agreement). Customers generally pay a reduced electricity rate for the electricity generated by the PV system as compared to the rate charged by the utility. The rate paid by the customer and other details are specified in a contract. Some of these contracts involve an initial down payment which in some cases allows the customer to pay a fixed rate for electricity generated. Some contracts provide for an escalating rate, such as when no down payment is made.

For PBI projects, the Green Bank pays incentives to third party system owners quarterly over a six year period based on actual electricity generation measured by revenue grade meters required by the Green Bank. The Federal Investment Tax Credit (ITC) can be claimed by third party system owners in the first year and is modeled as such. Third party system owners may also take advantage of MACRS.[30] As contract details between homeowners and installers are typically different from one installation to the

[27] Governor's Bill No. 6838: https://www.cga.ct.gov/2015/TOB/h/pdf/2015HB-06838-R00-HB.pdf, and CGS chapter 283, section 16-245ff: https://www.cga.ct.gov/current/pub/chap_283.htm.
[28] A history of RSIP incentives is provided in the Methodology section.
[29] The ITC had been set to expire at the end of 2016 but was extended at its current level of 30%; a 30% ITC was assumed for all projects in this study. For third party owned projects, the ITC will decline starting in 2020, decreasing to 10% in 2022 and future years (http://programs.dsireusa.org/system/program/detail/658). For homeowner owned projects, the ITC will decline in 2020 and 2021 and expires at the end of 2012 (http://programs.dsireusa.org/system/program/detail/1235).
[30] MACRS (Modified Accelerated Cost-Recovery System) is a Federal tax benefit that allows businesses to claim the depreciated value of solar assets as a tax deduction over a five year period. For more information, see http://programs.dsireusa.org/system/program/detail/676, and http://www.seia.org/policy/finance-tax/depreciation-solar-energy-property-macrs.

next (hence offering limited access to this information), the PCT treats the third-party system owner and homeowner together as the "participant" for PBI projects.[31]

Overview of Cost-Effectiveness Tests

The below descriptions provide: (1) an overview of the five cost-effectiveness tests and (2) an explanation of the Green Bank Objective Function. Table 7, which follows these descriptions, presents a summary of the cost and benefit inputs used in the application of the five cost-effectiveness tests to RSIP.

For program assessment and planning purposes, note that in assessing the cost-effectiveness of the energy efficiency programs, Connecticut's investor owned utilities calculate the TRC, UCT/PACT, and a modified UCT/PACT which incorporates non-electric and non-resource benefits such as gas, oil, propane, and water savings. Note that jurisdictions nationwide may include different inputs for these tests – for example, the TRC, as calculated by the Connecticut utilities, includes non-embedded emissions reduction benefits.

Total Resource Cost Test

The Total Resource Cost Test (TRC) is based on the ratio of lifecycle benefits from energy and demand savings or renewables programs over lifecycle total incremental costs (regardless of who pays them). This test indicates whether an energy efficiency or renewables program is more cost-effective than supplying energy through traditional generation-based methods. The benefits are composed primarily of the reduction in current and future utility costs in the form of reduced fuel expenses and deferred capital investments in generation and transmission and distribution. As previously noted, Connecticut utilities include both embedded and non-embedded carbon dioxide emissions reduction benefits in the calculation of the TRC.[32] The TRC calculation as applied to RSIP also included both emissions reduction benefits.

Program Administrator Cost Test

The Program Administrator Cost Test (PACT) compares the value of energy efficiency or renewable energy benefits compared to the cost to the utility or the program administrator. The benefits are similar to those included in the TRC test, but the costs are narrowly defined to be those of the program administrator only.

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[31] Cadmus conducted a small test using data analyzed for steps 1 through 3 for which detailed third party owned lease and PPA rates had been previously collected; based on this data, calculating the PCT with just the homeowner as the participant, instead of the homeowner and third party owner as a group, would result in slightly lower but similar PCT scores. This is not surprising, as the third party system owner will take some of the benefit to make a profit, while still keeping the program in the financial interest of the homeowner.

[32] This study uses the Avoided Energy Supply Costs (AESC) 2015 Report estimate of $100/short ton which is considered to be a reasonable estimate of the total societal cost of carbon dioxide emissions. See the Methodology section of this report for more details.

Participant Cost Test

The Participant Cost Test (PCT) measures cost-effectiveness from the program participant's[33] perspective. The benefits estimated for the RSIP under this test are:

- Electric bill reduction (based on retail electricity rates)
- Federal tax incentives (the Federal investment tax credit as well as MACRS for PBI projects)
- RSIP incentives

As applied to RSIP, the costs are simply the installed cost of the PV system, also known as the incremental measure cost[34]. In this analysis, for the EPBB the participant was simply the homeowner who purchased solar, whereas for the PBI, the participant included the homeowner hosting the system as well as the third party developer. For EPBB, the participant costs assume a cash purchase and do not include potential customer financing costs.

Ratepayer Impact Measure Test

The Rate Payer Impact Test (RIM) measures the impact of energy efficiency or renewable energy on utility rates. The major benefit considered in the RIM test is the reduction of primary fuel consumption for electricity generation, while the costs include program administrator and program incentive costs (as in the PACT) and utility lost revenues (based on retail electricity rates) due to reduction in use of energy. The RIM test assumes that the cost of lost utility revenue is redistributed among all ratepayers. More often than not, any measure that reduces the utility's sale of electricity will fail to pass the RIM test, regardless of total resource or societal cost-effectiveness. Load shifting and demand reduction programs are more likely to pass the RIM test.

Societal Cost Test

The Societal Cost Test (SCT) expands on the TRC, taking the view of society at large, and allows for associated non-energy benefits and other environmental factors to be taken into account. In the analysis of RSIP, job creation and economic benefits, represented as increased disposable personal income[35] in the state of Connecticut, were included as a benefit for the SCT. Federal incentives

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[33] Note that, for purposes of this report, the terms "customer", "participant", "program participant", and "homeowner" may be used interchangeably to represent the host customer who owns the residence at which the PV system is installed and either owns, leases, or is an offtaker for the PV system. Note that, for PBI, the "program participant" is jointly the homeowner and the PV system installer, as the benefits are shared between these parties and cannot be readily segregated.

[34] Incremental measure cost is the term used in the energy efficiency setting for the cost of a more efficient technology such as an LED bulb instead of a baseline (incandescent) light bulb. With solar PV, the baseline "equipment" is no PV system, with a cost of zero, so the incremental cost is the total cost of the PV system.

[35] Disposable personal income is personal income less personal taxes. Estimates for disposable personal income were based on a study conducted for the Green Bank by the University of Connecticut, Connecticut Center for Economic Analysis (CCEA) : "Connecticut Green Bank's Residential Solar Investment Program: Economic Analysis of Existing Commitments and Future Scenarios," Peter Gunther (CCEA), Fred Carstensen (CCEA), and William Waite (Semnia, LLC), February 9, 2015.

(including the ITC), treated as a benefit in the TRC, were not included, as the SCT viewed these as a transfer payment from the federal government to participants.

Connecticut Green Bank Objective Function

The Green Bank uses the Objective Function (OF) as a program performance metric, calculated by dividing lifetime energy generation by program costs, including administrative and incentive payments.

The calculation of the CT Green Bank Objective Function is based on the following formula with input variables to the formula that are applicable to RSIP, including: (1) Energy generated or saved, (2) RSIP incentives, (3) RSIP program and administrative costs, and (4) Renewable energy certificate (REC) revenue. For the RSIP analyses, "credits enhancements" and "amount of financing" were not included in the Objective Function calculation, as these inputs are only applicable to Green Bank financing programs. These types of inputs were also not included in the RSIP benefit/cost ratio calculations.

Green Bank Objective Function Formula:

$$\frac{(Energy\ Generated\ or\ Saved)\ *\ (\%\ Realized)}{\begin{array}{c}Green\ Bank\ Incentives\ +\ Program\ and\ Administrative\ Cost + Credit\ Enhancements\\ +\ Amount\ of\ Financing\ -\ REC\ Revenue\end{array}}$$

For this evaluation, the variables that were included were (1) energy generated in kilowatt-hours, in the numerator, and (2) RSIP incentives and (3) RSIP Program and Administrative costs, in the denominator. REC revenues were not included in order to simplify the calculation, given the differences in applicable REC revenue streams across steps 1 through 7, as well as the minimal impact this would have on the results[36].

For energy generated, the realization rate was assumed to be 100%, to be conservative, though a previous RSIP evaluation conducted by Cadmus found RSIP steps 1 through 3 to have a 105% realization rate.[37] Solar PV system lifetime is assumed to be 25 years.[38] The electricity generation is calculated to include a 7% line loss factor, as onsite generation does not incur distribution losses. In order to simplify the analysis, Cadmus did not include performance degradation (typically 0.5% per year) or operations

[36] REC revenues numbers were not yet available for all steps and the amounts available thus far were not significant compared to the incentive costs. Thus, these revenues would not have made a significant impact on the results based on the data available thus far (though it would have made the CGB OF results slightly higher).

[37] "Residential Solar Investment Program Evaluation," Shawn Shaw, Danielle Kolp, Mary Knipe, Ryan Fahey, Kathleen Higgins, The Cadmus Group, January 28, 2015. The realization rate of 105% calculated in the earlier Cadmus evaluation of RSIP showed 5% more electricity generation measured by revenue grade meters than was calculated by the PowerClerk incentive application processing system, which estimates generation for each project based on its specific equipment and site and design characteristics including azimuth, tilt and shading. http://www.ctgreenbank.com/wp-content/uploads/2016/02/RSIP_Evaluation_I_Final_Report_and_cvr_ltr.pdf

[38] NREL provides a range of 25 to 40 years for the useful life of a photovoltaic system, http://www.nrel.gov/analysis/tech_footprint.html.

and maintenance (O&M) costs in this analysis. The impact of these values is expected to be minimal when compared to the other costs and benefits included in the analysis.

Table 7, below, summarizes the benefits and costs included in the five cost-effectiveness tests, as applied to RSIP, and the Objective Function calculation for RSIP.

The calculations of the five cost-effectiveness tests and the Green Bank Objective function for RSIP do not include the benefits of renewable energy credit (REC) revenues, losses due to system degradation, or O&M costs, as explained in the above description of the Green Bank Objective Function.

Table 7. Cost-Effectiveness Benefits and Costs

	TRC	PACT	PCT	RIM	SCT	CGB OF
Avoided Energy Supply	Benefit	Benefit		Benefit	Benefit	
Non-Embedded Avoided Emissions	Benefit				Benefit	
Avoided Capacity Supply	Benefit	Benefit		Benefit	Benefit	
Participant Bill Savings			Benefit	Cost		Benefit
Program Administration Costs	Cost	Cost		Cost	Cost	Cost
Program Incentives		Cost	Benefit	Cost		Cost
Participant Incremental Measure Costs[39]	Cost		Cost		Cost	
Federal Investment Tax Credit (ITC)[40]	Benefit		Benefit			
Job Creation Benefits					Benefit	
MACRS Benefits (PBI Only)[41]	Benefit		Benefit			

[39] Incremental measure cost is the term used in the energy efficiency setting for the cost of a more efficient technology such as an LED bulb instead of a baseline (incandescent) light bulb. With solar PV, the baseline "equipment" is no PV system, with a cost of zero, so the incremental cost is the total cost of the PV system.
[40] Treatment of tax credits varies among jurisdictions and can be modeled either as a transfer payment with neutral impact on cost effectiveness, or as a reduction in costs or as an increase in benefits. For the RSIP, the ITC and MACRS are treated as an increase in benefits for the TRC and PCT, and as transfer payments on the SCT. The ITC is treated as a benefit for the TRC as it is incorporated as an incentive (from outside the program) that reduces the cost of PV as a resource in comparison with other sources.
[41] MACRS (Modified Accelerated Cost Recovery System) is a federal tax benefit that allows businesses to claim the depreciated value of solar assets as a tax deduction over a five year period. For more information: http://www.seia.org/policy/finance-tax/depreciation-solar-energy-property-macrs.

Program Cost-Effectiveness

Methodology

This section summarizes the assumptions made and methods employed in making the cost-effectiveness calculations noted previously.

Cost Effectiveness Tests

Cadmus compiled the costs and benefits for each of the cost effectiveness tests discussed previously and calculated the relevant ratios using the parameters noted below.

Total Resource Cost Test

Benefits included:

- Avoided energy and capacity costs associated with offset electricity generation
- Federal tax incentives (ITC and, for PBI, MACRS)
- Non-embedded avoided emissions

Costs included:

- Program administrator costs
- PV system total installed cost (not including RSIP incentives)

Program Administrator Cost Test

Benefits included:

- Avoided energy and capacity costs

Costs included:

- RSIP incentives
- Program administration cost

Participant Cost Test

Benefits included:

- Electricity bill reduction
- Federal tax incentives (ITC and, for PBI, MACRS)
- RSIP incentives

Costs included:

- PV system total installed cost

Ratepayer Impact Measure Test

Benefits included:

- Avoided energy and capacity costs

Costs included:

- RSIP incentives
- Participant electricity bill reduction
- Program administration costs

Societal Cost Test

Benefits included:

- Avoided energy and capacity costs
- Non-embedded avoided emissions
- Job creation benefits

Costs included:

- Program administration costs
- PV system total installed cost

Avoided Energy and Capacity Costs

Assumptions for avoided energy and avoided capacity costs for year 2016 and future years were provided by Eversource from a model based on the Avoided Energy Supply Costs in New England: 2015 Report (AESC 2015 Report).[42] Assumptions for avoided energy and avoided capacity costs for years 2012-2015 were obtained from the AESC 2011 report.[43]

Benefits counted through the TRC, PACT, RIM, and SCT include the following:

- The full value of time and seasonally differentiated[44] avoided energy generation costs. Avoided energy costs also included Demand Reduction Induced Price Effects (DRIPE).[45]

[42] Avoided Energy Supply Costs in New England: 2015 Report, Hornby et al, Revised April 3, 2015. (AESC 2015 Report). http://www.ct.gov/deep/lib/deep/energy/aescinnewengland2015.pdf. Avoided energy and capacity costs associated with this model and provided by Eversource included the most updated 2016 cost numbers.
[43] Avoided Energy Supply Costs in New England: 2011 Report, Appendix B, Avoided Cost of Electricity Results, CT Statewide, Synapse Energy Economics, Inc., Hornby et al, Revised August 11, 2011.
[44] During different hours of the year, different fuel mixes are used to meet the hourly energy usage, causing differences in avoided generation costs. Also during certain peak hours of the year, there are added capacity cost values due to the delay in need for added capacity on the generation or on the transmission and distribution side.
[45] DRIPE effects included in this study were Intrastate, Rest-of-Pool, and Electric Own Fuel & Cross Fuel DRIPE. "DRIPE refers to the reduction in wholesale market prices for energy and/or capacity expected from reductions in the quantities of energy and/or capacity required from those markets during a given period due to the impact of

- Avoided capacity costs associated with electricity generation, transmission and distribution.
- Non-embedded emissions reductions.

Table 8 shows the seasonal categories for which avoided energy costs were provided in the AESC 2015 Report and the percentage of kWh for the RSIP portfolio assigned to each category. Though there is more available solar irradiance per day in the summer period, it is important to note that the winter period is significantly longer. The summer period includes June through September and the winter period includes all remaining months. Peak period is 7:00 am until 11:00 pm non-holiday weekdays.[46]

Table 8. Distribution of RSIP kWh across Seasonal Categories

	Winter Peak	Winter Off-Peak	Summer Peak	Summer Off-Peak
Percentage of RSIP kWh	42%	18%	28%	12%

Table 99 shows avoided energy cost for 2012[47] and the average escalator.

Table 9. Summary of Avoided Energy Costs

	2012 Value ($/kWh)	Average Yearly Escalator
Avoided Energy Cost[48]	$0.149	2.23%

Table 10 shows the average non-embedded avoided emissions cost, which is included for the TRC and SCT (as a benefit). This follows the methodology of the Eversource model which includes both embedded and non-embedded avoided emissions costs[49] in the TRC test. The PACT, PCT and RIM include only the embedded emissions.

Table 10. Summary of Non Embedded Avoided Emissions Costs

2012 Non Embedded Avoided Emissions ($/kWh)	Average Yearly Escalator
$0.044	0.72%

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efficiency and/or demand response programs [in this case from installed solar photovoltaic capacity].” AESC 2015 Report, page 1-16, http://www.ct.gov/deep/lib/deep/energy/aescinnewengland2015.pdf.

[46] ISO-NE Glossary: http://www.iso-ne.com/participate/support/glossary-acronyms.

[47] Assumptions for avoided energy and avoided capacity costs for years 2012-2015 were obtained from the Avoided Energy Supply Costs in New England: 2011 Report, Appendix B, Avoided Cost of Electricity Results, CT Statewide, Synapse Energy Economics, Inc., Hornby et al, Revised August 11, 2011.

[48] Note that these costs include DRIPE.

[49] Embedded avoided emissions costs are those already accounted for by existing policies and regulations, and are incorporated into utility avoided costs. Non-embedded emissions costs are those not currently reflected in market prices. This study uses the AESC 2015 Report estimate of $100/short ton which is considered to be a reasonable estimate of the total societal cost of carbon dioxide emissions (AESC 2015 Report, page 4-29). The non-embedded cost comes out to between 4-5 cents/kWh after subtracting out the embedded cost, a much smaller portion of the total $100/short ton estimated cost. The embedded cost of CO_2 is $6.28/short ton in 2015, estimated to rise to $33.94 by 2030 (AESC 2015 Report, page 4-3, Exhibit 4-1).

Table 11 shows avoided capacity costs used in the analysis.

Table 11. Summary of Avoided Capacity Costs

	2012 Value ($/kW)	Average Yearly Escalator
Avoided Generation Cost	$38.24	13.15%
Avoided T&D Costs	$35.18	1.90%

Peak Period Output of Residential PV Systems

As part of this analysis, Cadmus created an annual hourly profile of RSIP PV system electricity generation, as described below. Using this generation profile, Cadmus created capacity savings values by taking the average generation on weekdays between 1 pm and 5 pm in June, July, and August, and multiplying these by the avoided capacity costs to calculate the capacity benefit. For this peak period, we calculated AC capacity savings by multiplying the nameplate DC capacity by 0.33. For example, a PV system with a nameplate DC capacity of 10 kW would offset an average capacity of 3.3 kW-AC during the defined peak period[50]. A typical PV system installed through the RSIP, at an average nameplate capacity of approximately 7kW, offsets an average of 2.1kW-AC during the defined peak period.

Cadmus created an aggregate hourly generation profile for all RSIP projects (including steps 1 through 7) by looking at the following system characteristics of both PBI and EPBB incentive types as recorded in the Green Bank's PowerClerk database:

- Array tilt
- Array azimuth
- System capacity (nameplate kW_{DC})
- Solar access/shading

By conducting a bin analysis on these key characteristics, Cadmus created six PV profiles that represented 90% and 84% of EPBB and PBI projects in the dataset, respectively, shown in Table 12. Cadmus then ran six independent hourly models in PVWATTS based on these profiles. Using these hourly electricity generation profiles (analogous to load shapes for energy efficiency measures) of the six hourly generation models from PVWatts, Cadmus created a composite, average hourly generation profile that reflects the weighted mix of system characteristics. As previously stated, Cadmus reported capacity savings values by taking the average generation on weekdays between 1 pm and 5 pm in June, July, and August, and multiplying these by the avoided capacity costs.

[50] Approximately 11% of electricity generated by RSIP-supported PV systems was generated during the defined peak periods.

Table 12. PV System Characteristics Used in Hourly Modeling

Modeling Parameters													
Azimuth			Tilt		EPBB		PBI		PVWatts Inputs			% of Projects Represented	
From	To	Description	From	To	# of Systems	Percentage	# of Systems	Percentage	Azimuth	Tilt	Losses[51]	EPBB	PBI
-30	30	South	0	20	359	9%	513	10%	0	10	20%	9%	10%
-30	30	South	20	40	2114	55%	2024	39%	0	30	20%	55%	39%
30	90	Southwest	0	20	144	4%	315	6%	60	10	20%	4%	6%
30	90	Southwest	20	40	528	14%	1087	21%	60	30	20%	14%	21%
-90	-30	Southeast	0	20	144	4%	260	5%	-60	10	20%	4%	5%
-90	-30	Southeast	20	40	524	14%	981	19%	-60	30	20%	14%	19%
Total					**3813**		**5180**		**Projects Covered**			**90%**	**84%**

Retail Electricity Rates

For the cost tests requiring the use of retail electricity rates (PCT, RIM), this study used the U.S. DOE Energy Information Association (EIA) Electric Power Monthly average retail price to ultimate consumers, which for 2012 was $0.17 per kWh. The study assumed a 2.99% annual escalation rate.

Incentives

RSIP progressed through seven incentive steps during the period analyzed, with each step representing an incentive reduction. Table 13 shows each step, its start year, start date, and incentive details.

[51] These losses include factors such as DC to AC conversion and wiring losses.

Table 13. Program Step Year, Start Date, Incentive Details[52]

Program Step	Year	Start Date	Maximum Size (kW-PTC)	Incentive for first 5 kW-PTC	Incentive for second 5 kW-PTC	Incentive for > 10 kW-PTC up to 20 kW-PTC
EPBB Step 1	2012	3/2/2012	10 kW	$2.45/W	$1.25/W	
EPBB Step 2	2012	5/18/2012	10 kW	$2.275/W	$1.075/W	
EPBB Step 3	2013	1/4/2013	10 kW	$1.750/W	$0.55/W	
EPBB Step 4	2014	1/6/2014	10 kW	$1.250/W	$0.75/W	
EPBB Step 5	2014	9/1/2014	20 kW	$0.80/W		$0.40/W
EPBB Step 6	2015	1/1/2015	20 kW	$0.675/W		$0.40/W
EPBB Step 7[53]	2015	4/11/2015	20 kW	$0.54/W		$0.40/W
PBI Step 1	2012	3/2/2012	10 kW	$0.30/kWh		
PBI Step 2	2012	5/18/2012	10 kW	$0.30/kWh		
PBI Step 3	2013	4/1/2013	10 kW	$0.225/kWh		
PBI Step 4	2014	1/6/2014	10 kW	$0.18/kWh		
PBI Step 5	2014	9/1/2014	20 kW	$0.125/kWh		$0.060/kWh
PBI Step 6	2015	1/1/2015	20 kW	$0.08/kWh		$0.060/kWh
PBI Step 7	2015	4/11/2015	20 kW	$0.064/kWh		$0.060/kWh

[52] RSIP incentives are based on a solar PV system's PTC rating, which differs from the Standard Test Conditions (STC) or DC rating used for module "nameplate" values. The PTC rating, which is generally lower than the STC rating, is recognized to be a more realistic measure of PV output because the test conditions better reflect real-world conditions. The PTC rating is used by programs in California, Connecticut, and elsewhere as the basis of incentive calculations. PTC refers to PVUSA Test Conditions, which were developed to test and compare PV systems as part of the PVUSA or Photovoltaics for Utility Systems Applications project. PTC are defined as 1,000 watts per square meter solar irradiance, 20 degrees Celsius *air* temperature, and wind speed of 1 meter per second at 10 meters above ground level. STC are based on 25 degrees Celsius *cell* temperature. The PTC rating differs in that its test conditions of ambient temperature and wind speed will result in a PV cell temperature of about 50 degrees Celsius, instead of the 25 degrees Celsius assumed for STC. Consequently, for crystalline silicon PV systems with a power degradation due to temperature of -0.5% per degree Celsius, the PV module PTC power rating is generally about 88% of the PV module STC or nameplate rating.

[53] Step 7 end date was August 7, 2015, and step 8 start date was August 8, 2015. PowerClerk data was extracted on August 12, 2015 for this study and included 21.4 MW of step 7 projects in approved or later project statuses. Not all step 7 projects had been approved by August 12 when the data was extracted for this study. As of January 11, 2016, step 7 capacity was 21.3 MW, so projects that had not yet been approved as of August 12 ended up roughly balancing out with projects that had been approved but later cancelled.

The Green Bank provided Cadmus with data on actual system costs and RSIP incentives, estimated federal incentives, and estimated annual generation (calculated by PowerClerk[54] for each project and incorporating factors such as system size, azimuth, tilt, and shading). See Table 14, as well as Table 15, which provides project cost and incentive data on a per Watt basis.

Table 14. Solar PV Capacity, Total Solar PV Project Costs, Incentives, and Estimated Generation by Incentive Type and Program Step

Program Step	Solar PV Capacity (kW)	Total Solar PV Project Cost	RSIP Incentive	Estimated Federal Investment Tax Credit	Estimated Annual Generation (kWh)	Estimated Annual Generation (kWh/kW)[55]	System Life
EPBB Steps 1 & 2	5,419	$24,600,069	$8,628,939	$5,323,710	6,387,113	1179	25
EPBB Step 3	9,290	$38,039,591	$10,606,806	$9,144,262	10,839,917	1167	25
EPBB Step 4	8,471	$34,096,316	$7,382,147	$8,904,723	9,854,120	1163	25
EPBB Step 5	3,612	$15,207,396	$2,394,340	$4,271,019	4,241,127	1174	25
EPBB Step 6	4,381	$18,446,776	$2,443,077	$5,334,566	5,056,380	1154	25
EPBB Step 7	1,997	$8,569,145	$885,861	$2,561,095	2,243,292	1123	25
EPBB Total	**33,171**	**$138,959,293**	**$32,341,170**	**$35,539,374**	**38,621,949**	**1164**	25
PBI Steps 1 & 2	1,961	$9,632,004	$3,623,842	$2,002,721	2,038,522	1040	25
PBI Step 3	4,018	$18,707,273	$5,750,652	$4,318,873	4,313,225	1073	25
PBI Step 4	11,990	$55,545,603	$13,704,413	$13,947,063	12,856,183	1072	25
PBI Step 5	11,168	$50,828,635	$8,600,900	$14,075,912	11,781,319	1055	25
PBI Step 6	9,614	$43,865,470	$4,710,451	$13,051,673	10,035,135	1044	25
PBI Step 7	19,417	$85,298,075	$7,640,064	$25,886,004	20,188,179	1040	25
PBI Total	**58,169**	**$263,877,061**	**$44,030,323**	**$73,282,246**	**61,212,563**	1052	**25**

[54] PowerClerk is a program tracking and administrative software platform used for RSIP incentive applications.
[55] On average, PBI projects have a lower kWh/kW than EPBB projects due to system characteristics such as the solar PV panels used and design characteristics such as azimuth, tilt and shading.

Table 15. Solar PV Capacity, Total Solar PV Project Costs, and Incentives, by Incentive Type and Program Step (on a per Watt basis)

Program Step	Solar PV Capacity (kW)	Total Solar PV Project Cost ($/W)	RSIP Incentive ($/W)	Estimated Federal Investment Tax Credit ($/W)	RSIP incentive as % of Project Cost	Federal ITC as % of Project Cost	RSIP Incentive plus ITC as % of Project Cost
EPBB Steps 1 & 2	5,419	$4.54	$1.59	$0.98	35%	22%	57%
EPBB Step 3	9,290	$4.09	$1.14	$0.98	28%	24%	52%
EPBB Step 4	8,471	$4.03	$0.87	$1.05	22%	26%	48%
EPBB Step 5	3,612	$4.21	$0.66	$1.18	16%	28%	44%
EPBB Step 6	4,381	$4.21	$0.56	$1.22	13%	29%	42%
EPBB Step 7	1,997	$4.29	$0.44	$1.28	10%	30%	40%
EPBB Total	**33,171**	**$4.19**	**$0.97**	**$1.07**	**23%**	**26%**	**49%**
PBI Steps 1 & 2	1,961	$4.91	$1.85	$1.02	38%	21%	58%
PBI Step 3	4,018	$4.66	$1.43	$1.07	31%	23%	54%
PBI Step 4	11,990	$4.63	$1.14	$1.16	25%	25%	50%
PBI Step 5	11,168	$4.55	$0.77	$1.26	17%	28%	45%
PBI Step 6	9,614	$4.56	$0.49	$1.36	11%	30%	41%
PBI Step 7	19,417	$4.39	$0.39	$1.33	9%	30%	39%
PBI Total	**58,169**	**$4.54**	**$0.76**	**$1.26**	**17%**	**28%**	**44%**

The PBI pays out RSIP incentives over six years to third party owners for each installation. One-sixth of the PBI incentive values shown in Table 14 were apportioned to the first year of each given step, with another one-sixth for each of the five years thereafter.

For the PBI incentive type, third party system owners can also take advantage of accelerated depreciation under the MACRS program, thus the model included these additional federal tax benefits. System owners could claim depreciation on 85% of a project's total cost as a tax benefit over the six-years following installation. Table 16 shows the percentage of the 85% of total costs that can be claimed by year after installation. These benefits significantly affect the TRC and PCT. The analysis used a 30% tax rate assumption for third party system owners.

Table 16. PBI Depreciation Percent by Year

Year	Percent of Depreciation Claimed
1	20.00%
2	32.00%
3	19.20%
4	11.52%
5	11.52%
6	5.76%

Program Administrative Costs

Table 17 shows administrative costs associated with each step of the PBI and EPBB incentive types. Due to the PBI program's nature[56], Cadmus modeled 80% of a given step's costs occurring in the first year, with the remaining 20% occurring equally over the next five years. For EPBB, all administrative costs were assigned to the step's first year.

Table 17. Administrative Costs by Program Step

Program Step	Administrative Costs
EPBB Steps 1 & 2	$464,207
EPBB Step 3	$707,139
EPBB Step 4	$351,374
EPBB Step 5	$152,252
EPBB Step 6	$165,147
EPBB Step 7	$79,907
EPBB Total	**$1,920,026**
PBI Steps 1 & 2	$164,957
PBI Step 3	$297,529
PBI Step 4	$502,942
PBI Step 5	$451,068
PBI Step 6	$336,031
PBI Step 7	$742,112
PBI Total	**$2,494,639**

Discounting Rates and Reporting Basis

For purposes of this analysis, Cadmus has converted all costs and benefits into 2012 dollars. This date coincides with the start of the RSIP and its use as a consistent basis allows a more straightforward comparison of benefits and costs across incentive steps, while eliminating discount rates as a possible obfuscating factor when comparing the results from individual steps.

The discount rate specified in the 2015 Annual Update to the 2013-2015 Electric and Natural Gas Conservation and Load Management (CL&M) Plan was applied to the TRC, PACT, and RIM tests.[57] The SCT rate used a 10-year Treasury bill rate to discount future benefits. The PCT used a 10% discount rate, which Cadmus has used on numerous similar cost-effectiveness analyses. Table 18 shows the discount rate applied to each benefit-cost test.

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[56] Payment processing occurs for five additional years after the initial administrative work completed by the Green Bank for each project.

[57] 2015 Annual Update of the 2013-2015 Electric and Natural Gas Conservation and Load Management Plan, Chapter Six: Benefit/Cost Analysis, http://www.energizect.com/about/eeboard/plans.

Table 18. Nominal Discount Rates

Benefit-Cost Test	Discount Rate
TRC	5.50%
SCT	1.99%
PACT	5.50%
RIM	5.50%
PCT	10.00%

Program Attribution

For RSIP, Cadmus assumed a net to gross ratio[58] of one. This was a simplifying assumption based on net to gross (NTG) ratios for solar PV programs generally being close to 100%, based on experience with solar incentive programs in other jurisdictions, a prior RSIP evaluation conducted by Cadmus, and Cadmus' general experience and understanding of the solar PV industry:

- In impact evaluations Cadmus has completed in New York, Wisconsin, and other states, the portion of incentive recipients who would have installed a PV system without the incentive (known as free ridership) has been approximately balanced by the tendency of incentive recipients to take additional energy savings/conservation measures as a result of their participation in the incentive program (spillover). For example, the NYSERDA Customer Sited Tier solar PV projects[59] had a NTG ratio of 93.4% for residential projects.
- Federal incentives have been available in jurisdictions that do not offer RSIP-like incentives or marketing and outreach programs for solar PV (e.g., municipal utility service territories). Anecdotally, these territories have far less PV development than observed under the RSIP.
- In the RSIP evaluation conducted previously[60], Cadmus found through survey questions posed to RSIP participants that 88% of EPBB and 82% of PBI customers, respectively, would not have installed PV systems without the RSIP incentive and 30%-45% of customers also adopted additional energy efficiency measures[61] that provide savings beyond the direct generation of the PV systems.

[58] The net to gross ratio represents the ratio of savings attributable to the program, That is, net savings are gross savings minus those that would have happened in the absence of the program.

[59] http://www.nyserda.ny.gov/About/Publications/Program-Planning-Status-and-Evaluation-Reports/Evaluation-Contractor-Reports/2013-Reports, NYSERDA Renewable Portfolio Standard Customer-Sited Tier Impact Evaluation Report: Solar Electric (PV) and On-Site Wind Programs, see pages 2-25 through 2-34 for results and discussion on net to gross ratio.

[60] "Residential Solar Investment Program Evaluation," Shawn Shaw, Danielle Kolp, Mary Knipe, Ryan Fahey, Kathleen Higgins, The Cadmus Group, January 28, 2015. http://www.ctgreenbank.com/wp-content/uploads/2016/02/RSIP_Evaluation_I_Final_Report_and_cvr_ltr.pdf

[61] RSIP participants are required to obtain a Home Energy Solutions (HES) or equivalent Buildings Performance Institute (BPI) certified energy audit in order to receive the RSIP incentive. Most audits are performed through the HES Program which currently buys down the cost of the energy audit to $99. HES is a residential energy efficiency program operated by the Connecticut utilities and includes a wide variety of energy efficiency measures and activities beginning with an in-home energy assessment. Core measures include a blower door test before and

- Even with incentives, PV systems are large purchases for most customers and the incentives are generally a key driver. In addition to incentives, RSIP provides marketing and educational support for the industry, qualification of contractors and third party system owners, and inspection of solar PV systems.

Nevertheless, a rigorous analysis of attribution for the RSIP was outside the scope of this study. Though the authors believe the NTG assumptions are valid for this study, a more rigorous analysis of attribution could be conducted for the RSIP to examine the impact of other drivers such as financing, marketing, outreach and educational efforts, federal tax incentives (ITC, MACRS)[62], net metering, the steady decrease in system prices, high electricity prices, and improvement in the economy in recent years. Going forward, RSIP incentives will continue to decrease, and this will need to be taken into consideration with respect to program attribution.[63] Lastly, as the solar PV market transitions from dependence on RSIP incentives to sustaining itself without these incentives, RSIP will have met its mandate to: "provide incentives that decline over time and will foster the sustained, orderly development of a state-based solar industry."

Potential Forward Capacity Market Revenues

In order to assess the possibility of an additional revenue stream for the RSIP, Cadmus examined the current market rules and procedures related to the ISO-NE Forward Capacity Market (FCM) to determine if RSIP generation resources could be bid into the FCM, either individually or in aggregate. To research this issue, we conducted a literature review and several informal interviews with ISO-NE staff members. The results of this review are discussed in the Results section, with full findings provided in Appendix A.

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after implementation of air and duct sealing. The assessment also includes lighting upgrades and identification of further and deeper energy savings opportunities in the home such as insulation, appliance and HVAC upgrades for which participants have access to incentives and financing.

[62] Federal tax incentives for solar PV are significant. The federal investment tax credit (ITC) is currently 30% of the cost of a solar PV system, while third party solar PV system owners benefit from accelerated depreciation (MACRS) as well. The federal tax incentives for energy efficiency are much lower. Certain energy efficiency projects qualify for a 10% federal tax credit but with a maximum credit of $500 or lower depending on the measure. Federal incentives are included in the cost-effectiveness calculations for RSIP as a benefit for the TRC and PCT tests. They are not included in the cost-effectiveness calculations for the Connecticut energy efficiency programs. Tax credits can be modeled either as a transfer payment with neutral impact on cost effectiveness, or as a reduction in costs or as an increase in benefits.

[63] The question is that as incentives decrease, will the program play as large a role in a customer's decision to adopt solar PV. On the other hand, in measuring program attribution, programs may have market transformation impacts that persist into the future, i.e., that "today's free-riders may have been caused by yesterday's market transformation" as stated in the report "All these Years Measuring Free Ridership and Now We Measure a Portion of These as Caused by Market Transformation." Lori Megdal, Ph.D., Megdal & Associates, Steve Pertusiello, Consolidated Edison Company of New York, Bonnie Jacobson, Energy Access, 1996, http://www.anevaluation.com/pubs/aesp_96m.pdf.

Results

In this section, we summarize key findings from the cost-effectiveness analysis, as well as ancillary research related to combining RSIP with other types of resources, such as energy storage and energy efficiency, in a bundled configuration. This section also presents a summary of findings related to the eligibility of the RSIP to participate in the FCM process.

Cost-Effectiveness Findings

We have assessed the cost-effectiveness of the RSIP, including both incentive types and as the overall program. We first present the EPBB and PBI results, followed by results for RSIP overall and the Green Bank Objective Function calculations for RSIP.

EPBB

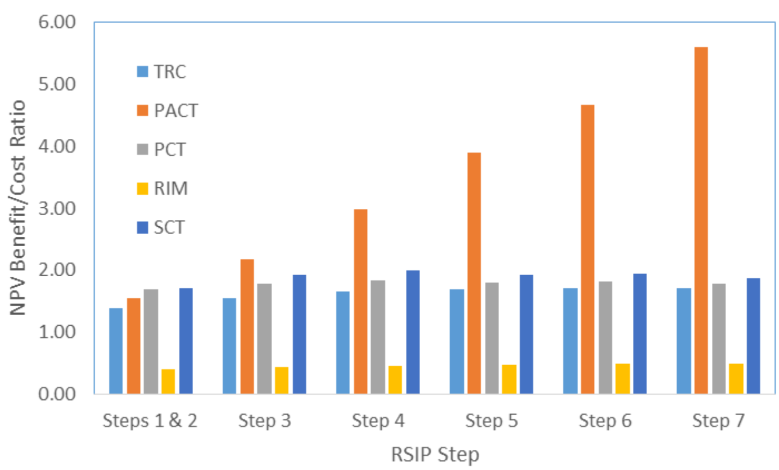
Overall, the EPBB incentive type passes all cost-effectiveness tests, except the RIM test, which most programs, including most energy efficiency programs, do not pass[64]. Cadmus examined the EPBB's cost-effectiveness as a whole (see Table 19) and for each individual step (Figure 2 and Table 20).

Table 69. EPBB Cost-Effectiveness for RSIP Steps 1-7 Combined

	TRC	PACT	PCT	RIM	SCT
NPV Benefits	$205,945,832	$82,125,323	$213,907,209	$82,125,323	$259,219,802
NPV Costs	$129,756,377	$32,097,118	$120,225,846	$182,694,195	$136,633,821
NPV Net Benefits	$76,189,455	$50,028,206	$93,681,363	-$100,568,872	$122,585,981
B/C Ratio	1.59	2.56	1.78	0.45	1.90

The EPBB's cost-effectiveness trends over time reflect a policy of reducing the amount of Green Bank resources spent on incentives, while continuing to support market growth through marketing, outreach, education and financing. From a participant perspective, although RSIP incentives decreased from steps 1 through 7, **Error! Reference source not found.** and Table 20 show that

Figure 2. EPBB Benefit/Cost Ratio Results



[64] The RIM test, as noted previously, accounts only for the lost utility revenue and assumes that the cost is therefore redistributed among all ratepayers. More often than not, any measure that reduces the utility's sale of electricity will fail to pass the RIM test, regardless of societal or total resource cost-effectiveness. Load shifting and demand reduction programs are more likely to pass the RIM test.

the PCT remained relatively constant across all seven steps, reflecting relatively flat customer economics. Over the EPBB's life, the PACT has increased from 1.55 in Steps 1 & 2 to 5.60 in Step 7.

Table 20. EPBB Cost-Effectiveness by Step

Steps 1 & 2	TRC	PACT	PCT	RIM	SCT
NPV Benefits	$34,743,121	$14,120,229	$41,472,738	$14,120,229	$42,806,790
NPV Costs	$25,064,277	$9,093,146	$24,600,069	$34,654,168	$25,064,277
NPV Net Benefits	$9,678,844	$5,027,083	$16,872,669	-$20,533,939	$17,742,514
B/C Ratio	1.39	1.55	1.69	0.41	1.71
Step 3	**TRC**	**PACT**	**PCT**	**RIM**	**SCT**
NPV Benefits	$56,913,295	$23,371,897	$61,671,069	$23,371,897	$72,715,401
NPV Costs	$36,726,759	$10,724,119	$34,581,446	$53,386,070	$37,986,991
NPV Net Benefits	$20,186,536	$12,647,778	$27,089,622	-$30,014,173	$34,728,410
B/C Ratio	1.55	2.18	1.78	0.44	1.91
Step 4	**TRC**	**PACT**	**PCT**	**RIM**	**SCT**
NPV Benefits	$51,268,841	$20,728,638	$51,536,448	$20,728,638	$66,031,269
NPV Costs	$30,949,610	$6,948,201	$28,178,773	$45,141,707	$33,110,044
NPV Net Benefits	$20,319,231	$13,780,437	$23,357,675	-$24,413,069	$32,921,225
B/C Ratio	1.66	2.98	1.83	0.46	1.99
Step 5	**TRC**	**PACT**	**PCT**	**RIM**	**SCT**
NPV Benefits	$23,247,585	$8,921,424	$22,621,034	$8,921,424	$28,328,044
NPV Costs	$13,799,912	$2,287,991	$12,568,096	$18,726,142	$14,763,214
NPV Net Benefits	$9,447,673	$6,633,433	$10,052,939	-$9,804,717	$13,564,831
B/C Ratio	1.68	3.90	1.80	0.48	1.92
Step 6	**TRC**	**PACT**	**PCT**	**RIM**	**SCT**
NPV Benefits	$27,206,189	$10,378,607	$25,155,976	$10,378,607	$33,915,965
NPV Costs	$15,850,168	$2,221,199	$13,859,336	$21,438,003	$17,538,431
NPV Net Benefits	$11,356,021	$8,157,408	$11,296,639	-$11,059,396	$16,377,534
B/C Ratio	1.72	4.67	1.82	0.48	1.93
Step 7	**TRC**	**PACT**	**PCT**	**RIM**	**SCT**
NPV Benefits	$12,566,801	$4,604,528	$11,449,944	$4,604,528	$15,188,290
NPV Costs	$7,365,651	$822,461	$6,438,125	$9,348,106	$8,150,195
NPV Net Benefits	$5,201,151	$3,782,067	$5,011,819	-$4,743,578	$7,038,095
B/C Ratio	1.71	5.60	1.78	0.49	1.86

In addition to these cost-effectiveness test results, Cadmus calculated the Green Bank Objective Function value of 32.2 kWh/$ for EPBB overall, and values for EPBB steps 1-7, with a steady increase over progressive steps consistent with improvement in the PACT scores.

Table 21. Objective Function Results by Step for EPBB

	Lifetime kWh	Program Administration Costs	Objective Function (kWh/$)
Steps 1 & 2	170,855,273	$9,093,146	18.79
Step 3	289,967,780	$10,724,119	27.04
Step 4	263,597,710	$6,948,201	37.94
Step 5	113,450,147	$2,287,991	49.59
Step 6	135,258,165	$2,221,199	60.89
Step 7	60,008,061	$822,461	72.96
Overall	**1,033,137,136**	**$32,097,118**	**32.19**

PBI

Like the EPBB, the PBI incentive type passed all cost-effectiveness tests except the RIM test which most programs including energy efficiency programs do not pass[65]. Compared to EPBB, PBI generally used the Green Bank's resources more cost-effectively (i.e., had a higher PACT result), while maintaining similar results for participant cost-effectiveness. The PBI performed better (on all tests except the SCT) because third party owned systems can take advantage of accelerated depreciation under the MACRS program, which is not available to direct ownership PV customers. Notably, the EPBB proved initially more cost-effective for the PACT, but the PBI surpassed it in Step 6 of the program. Any benefits that accrue due to depreciation are not reflected in the SCT as they are treated as transfer payments.

Table 22. PBI Cost-Effectiveness for RSIP Steps 1-7 Combined

	TRC	PACT	PCT	RIM	SCT
NPV Benefits	$413,048,730	$128,285,100	$382,607,179	$128,285,100	$426,242,221
NPV Costs	$235,081,510	$36,960,574	$211,593,693	$272,450,141	$254,345,891
NPV Net Benefits	$177,967,220	$91,324,525	$171,013,486	-$144,165,042	$171,896,330
B/C Ratio	1.76	3.47	1.81	0.47	1.68

As with the EPBB, the effectiveness of Green Bank funds disbursed through the PBI, as reflected by the PACT, increased over the program's life. The PACT for the PBI grew from 1.35 in Step 1 to 6.58 by Step 7, amounting to nearly a five-fold increase in leverage of the Green Bank's investment, while generally maintaining cost-effectiveness for participants.

In Step 7, the Green Bank reduced participant cost-effectiveness slightly, coinciding with a large increase in the PACT ratio. Despite Step 7's relatively low incentive, Step 7 was fully subscribed in less than four months, with over 2,600 projects funded.

[65] The RIM test, as noted previously, accounts for lost utility revenue and assumes that the cost is redistributed among all ratepayers. More often than not, any measure that reduces the utility's sale of electricity will fail to pass the RIM test, regardless of societal or total resource cost-effectiveness. Load shifting and demand reduction programs are more likely to pass the RIM test.

Figure 3. PBI Benefit/Cost Ratio Summary

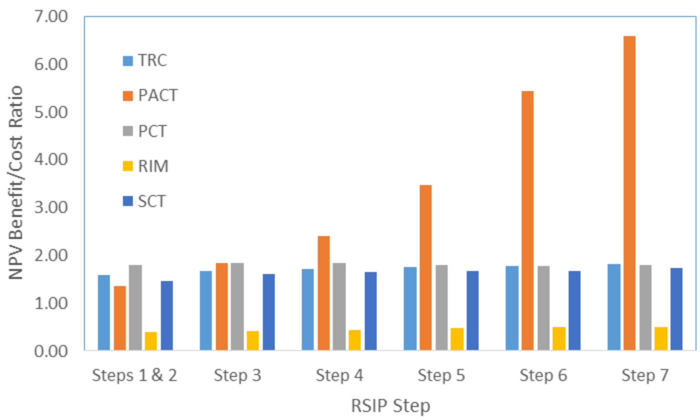


Table 23. PBI Cost-Effectiveness by Step

Steps 1 & 2	TRC	PACT	PCT	RIM	SCT
NPV Benefits	$15,472,594	$4,526,495	$17,245,264	$4,526,495	$14,342,450
NPV Costs	$9,791,438	$3,342,547	$9,632,004	$11,500,647	$9,794,770
NPV Net Benefits	$5,681,155	$1,183,948	$7,613,260	-$6,974,152	$4,547,680
B/C Ratio	1.58	1.35	1.79	0.39	1.46
Step 3	**TRC**	**PACT**	**PCT**	**RIM**	**SCT**
NPV Benefits	$30,166,951	$9,342,362	$31,175,284	$9,342,362	$29,887,824
NPV Costs	$18,004,587	$5,060,502	$17,006,612	$22,035,779	$18,628,283
NPV Net Benefits	$12,162,364	$4,281,860	$14,168,672	-$12,693,417	$11,259,541
B/C Ratio	1.68	1.85	1.83	0.42	1.60
Step 4	**TRC**	**PACT**	**PCT**	**RIM**	**SCT**
NPV Benefits	$86,980,583	$27,172,556	$84,326,103	$27,172,556	$88,896,370
NPV Costs	$50,341,821	$11,252,034	$45,905,457	$61,081,212	$53,865,689
NPV Net Benefits	$36,638,762	$15,920,522	$38,420,646	-$33,908,656	$35,030,681
B/C Ratio	1.73	2.41	1.84	0.44	1.65
Step 5	**TRC**	**PACT**	**PCT**	**RIM**	**SCT**
NPV Benefits	$80,865,046	$24,900,746	$75,731,239	$24,900,746	$81,948,996
NPV Costs	$46,058,804	$7,179,381	$42,007,137	$52,842,502	$49,282,690
NPV Net Benefits	$34,806,242	$17,721,365	$33,724,103	-$27,941,756	$32,666,306
B/C Ratio	1.76	3.47	1.80	0.47	1.66
Step 6	**TRC**	**PACT**	**PCT**	**RIM**	**SCT**
NPV Benefits	$67,302,223	$20,699,908	$59,065,610	$20,699,908	$69,915,568
NPV Costs	$37,633,021	$3,800,197	$32,956,777	$41,938,789	$41,647,855
NPV Net Benefits	$29,669,203	$16,899,711	$26,108,833	-$21,238,881	$28,267,713
B/C Ratio	1.79	5.45	1.79	0.49	1.68
Step 7	**TRC**	**PACT**	**PCT**	**RIM**	**SCT**
NPV Benefits	$132,710,393	$41,643,032	$115,468,800	$41,643,032	$140,991,499
NPV Costs	$73,251,838	$6,325,914	$64,085,706	$83,051,212	$81,092,192
NPV Net Benefits	$59,458,554	$35,317,119	$51,383,093	-$41,408,179	$59,899,307
B/C Ratio	1.81	6.58	1.80	0.50	1.74

For the PBI, the CGB OF returned a result of 44.3 kWh/$, with strong growth observed in each subsequent step of the program.

Table 24. Objective Function Results by Step for PBI

	Lifetime kWh	Program Administration Costs	Objective Function (kWh/$)
Steps 1 & 2	54,530,464	$3,342,547	16.31
Step 3	115,378,769	$5,060,502	22.80
Step 4	343,902,895	$11,252,034	30.56
Step 5	315,150,283	$7,179,381	43.90
Step 6	268,439,861	$3,800,197	70.64
Step 7	540,033,788	$6,325,914	85.37
Total	**1,637,436,060**	**$36,960,574**	**44.30**

RSIP Overall

Overall, the RSIP provided far more benefits than costs from a variety of perspectives. RSIP passed all cost-effectiveness tests except the RIM test which most programs, including energy efficiency programs, do not pass[66]. In terms of leveraging non-Green Bank funds, RSIP provided $3.05 of benefits for every $1.00 spent on programs and related costs (reflected in the PACT result), while still supporting strong industry growth and maintaining positive customer economics for residential PV installations (see PCT result).

Table 25. EPBB and PBI Combined Cost-Effectiveness

	TRC	PACT	PCT	RIM	SCT
Installed Capacity (MW)	91.3 MW_{DC}				
NPV Benefits	$618,994,562	$210,410,423	$596,514,388	$210,410,423	$685,462,023
NPV Costs	$364,837,887	$69,057,692	$331,819,540	$455,144,337	$390,979,712
NPV Net Benefits	$254,156,675	$141,352,731	$264,694,849	-$244,733,913	$294,482,311
B/C Ratio	1.70	3.05	1.80	0.46	1.75

As with the separate RSIP EPBB and PBI results, the effectiveness of Green Bank funds disbursed for the program as a whole, as reflected by the PACT, increased over the program's life, growing from 1.50 in Step 1 to 6.47 by Step 7. Leveraging in Step 7 is approaching 7:1 for the PACT, while generally maintaining cost-effectiveness for participants.

[66] The RIM test, as noted previously, accounts for lost utility revenue and assumes that the cost is redistributed among all ratepayers. More often than not, any measure that reduces the utility's sale of electricity will fail to pass the RIM test, regardless of societal or total resource cost-effectiveness. Load shifting and demand reduction programs are more likely to pass the RIM test.

Table 26. EPBB and PBI Combined Cost-Effectiveness by Step

Steps 1 & 2	TRC	PACT	PCT	RIM	SCT
NPV Benefits	$50,215,714	$18,646,724	$58,718,002	$18,646,724	$57,193,553
NPV Costs	$34,855,715	$12,435,693	$34,232,074	$46,154,815	$34,859,057
NPV Net Benefits	$15,359,999	$6,211,031	$24,485,929	-$27,508,091	$22,334,496
B/C Ratio	1.44	1.50	1.72	0.40	1.64
Step 3	**TRC**	**PACT**	**PCT**	**RIM**	**SCT**
NPV Benefits	$87,080,246	$32,714,259	$92,846,353	$32,714,259	$102,690,567
NPV Costs	$54,731,346	$15,784,621	$51,588,058	$75,421,848	$56,620,843
NPV Net Benefits	$32,348,900	$16,929,638	$41,258,295	-$42,707,590	$46,069,723
B/C Ratio	1.59	2.07	1.80	0.43	1.81
Step 4	**TRC**	**PACT**	**PCT**	**RIM**	**SCT**
NPV Benefits	$138,148,269	$47,901,194	$135,769,504	$47,901,194	$155,070,461
NPV Costs	$81,291,431	$18,200,235	$74,084,230	$106,222,919	$86,992,820
NPV Net Benefits	$56,856,838	$29,700,959	$61,685,273	-$58,321,725	$68,077,640
B/C Ratio	1.70	2.63	1.83	0.45	1.78
Step 5	**TRC**	**PACT**	**PCT**	**RIM**	**SCT**
NPV Benefits	$103,975,954	$33,822,171	$98,226,550	$33,822,171	$110,377,878
NPV Costs	$59,858,717	$9,467,372	$54,575,232	$71,568,644	$64,058,491
NPV Net Benefits	$44,117,237	$24,354,799	$43,651,318	-$37,746,474	$46,319,387
B/C Ratio	1.74	3.57	1.80	0.47	1.72
Step 6	**TRC**	**PACT**	**PCT**	**RIM**	**SCT**
NPV Benefits	$94,297,186	$31,078,515	$84,035,236	$31,078,515	$103,934,514
NPV Costs	$53,483,189	$6,021,396	$46,816,113	$63,376,792	$59,203,717
NPV Net Benefits	$40,813,996	$25,057,119	$37,219,122	-$32,298,277	$44,730,797
B/C Ratio	1.76	5.16	1.80	0.49	1.76
Step 7	**TRC**	**PACT**	**PCT**	**RIM**	**SCT**
NPV Benefits	$145,277,194	$46,247,561	$126,918,744	$46,247,561	$156,195,051
NPV Costs	$80,617,489	$7,148,375	$70,523,832	$92,399,318	$89,244,784
NPV Net Benefits	$64,659,705	$39,099,186	$56,394,912	-$46,151,757	$66,950,267
B/C Ratio	1.80	6.47	1.80	0.50	1.75

The Green Bank Objective Function results for EPBB and PBI combined parallel the findings from the cost-effectiveness tests, in particular the PACT, with increasing efficiency in the use of program funds over the life of the program. The energy produced for every dollar invested increases from 18.1 kWh/$ in Steps 1&2 to 83.9 kWh/$ in Step 7, and 38.7 kWh/$ to date for RSIP overall.

Table 27. RSIP EPBB and PBI Combined Results for Connecticut Green Bank Objective Function

CGB RSIP 2012-2015 Objective Function	Residential Solar PV Capacity (MW)	Lifetime kWh	Program Costs	Objective Function (kWh/$)
Steps 1 & 2	7.4	225,385,736	$12,435,693	18.1
Step 3	13.3	405,346,549	$15,784,621	25.7
Step 4	20.5	607,500,605	$18,200,235	33.4
Step 5	14.8	428,600,431	$9,467,372	45.3
Step 6	14.0	403,698,026	$6,021,396	67.0
Step 7	21.4	600,041,849	$7,148,375	83.9
Total	91.3	2,670,573,196	$69,057,692	38.7

Taken together, the cost-effectiveness tests and the Green Bank Objective Function tell a consistent story – that efficiency in the use of program funds is increasing as the program progresses from step 1 through step 7, as represented by PACT and Green Bank Objective Function results, while the PCT which reflects the benefit/cost ratio for the participant stays level.

Table 28. RSIP Cost-Effectiveness Results for the Five Standard Tests and the Connecticut Green Bank Objective Function

CGB RSIP 2012-2015	TRC	PACT	PCT	RIM	SCT		CGB OF (kWh/$)
Steps 1 & 2	1.44	1.50	1.72	0.40	1.64		18.1
Step 3	1.59	2.07	1.80	0.43	1.81		25.7
Step 4	1.70	2.63	1.83	0.45	1.78		33.4
Step 5	1.74	3.57	1.80	0.47	1.72		45.3
Step 6	1.77	5.16	1.80	0.49	1.76		67.0
Step 7	1.58	6.47	1.57	0.50	1.75		83.9
Total	1.65	3.05	1.75	0.46	1.75		38.7

Costs and Benefits of Net Metering

Though not the focus of this study, the costs and benefits of net metering programs is closely related to the cost-effectiveness of the RSIP, and similar programs. In this section, we provide a brief discussion of net metering costs and benefits, as they apply to residential PV systems in Connecticut. This is intended only as an overview, however, and additional research is required to fully explore and quantify the costs and benefits of net metering and such an analysis is beyond the scope of the present study. The information in this section is provided for informational reference only.

The costs and benefits of net metering are widely debated by utilities, solar advocates, and others. For the purpose of this study, we did not attempt to directly assess the cost effectiveness of the utility's net metering programs. However, the discussion below explains that the majority of both the benefits and costs of net metering are already incorporated in the cost-effectiveness calculations in this study, with some exceptions described below.

Net Metering Benefits

The benefits of net metering include an offset of electricity purchases by program participants (i.e., participants who have solar PV systems are purchasing less electricity from the utility). This benefit is already included in the PCT. For purposes of this report, we have assumed that generation does not exceed consumption on an annual basis for any customer.[67] This precludes the possibility of utilities providing a payment (on a net, annual basis) to customers and the need to discern at what rate that payment would be made. All bill reduction benefits are accrued at the rate the customer otherwise would have paid to their utility for the equivalent amount of electricity (i.e., the retail rate).

The broader benefits of net metering include an offset of (avoided) energy and capacity costs, with associated embedded environmental benefits and non-energy benefits; these benefits are included in the TRC and SCT tests. We have not included in any of the tests the benefits of reducing the utility's alternative compliance payments (ACP) for failing to meet relevant Renewable Portfolio Standard targets.

Net Metering Costs

While we did not survey the Connecticut utilities to gather cost data, we have generally accounted for the costs of net energy metering (NEM) to participating utilities. Note that it is likely that participating utilities have not fully assessed the costs of administering NEM programs. We note that:

[67] There are solar PV systems sized larger than needed to meet customer usage. RSIP experience is that these customers usually anticipate greater electricity usage in the future; possible reasons for this are installation of ductless mini-split heat pumps, geothermal systems, purchase of an electric vehicle, other equipment purchases or upgrades and/or an increase in family size. If, however, electricity generation did exceed usage on an annual basis, net metering would compensate the customer for any excess credits at year end (March billing period) at the wholesale (not retail) electricity rate.

- The vast majority of the cost to utilities for NEM programs is the lost energy and distribution system revenue associated with not selling kWh. For general scale, the lifetime generation of a 7 kW PV system[68] results in savings of roughly $30,000-$40,000 in lost revenue for the utility, based on lifetime generation times the utility retail rate. Line losses need not be included as the basis of comparison (electricity consumption) and generation both occur on the customer side of the meter. This lost revenue is included as a cost on the RIM test.
- Other administrative costs are typically small compared to the lost revenue and include about $280 of costs per system, as follows. In context, this $280 is approximately 1% of the cost associated with lost revenue.
    - Application processing (approximately $140): Eversource CT charges a $100 fee for residential application reviews, which covers the majority (but not all) of the labor associated with processing residential interconnection applications.
    - Billing ($0): Since these are residential customers, not remote net metering applications, we are assuming there is no additional billing cost associated with NEM vs. non NEM customers.
    - Metering (approximately $140): Most customers require a meter change from a regular to a "net meter". Since utilities regularly maintain/replace metering and this process is not time-consuming for their technicians, the estimated cost of meter exchange labor is $42. The incremental cost of a net meter is $98.

Our analysis has not incorporated the administrative costs of net metering but, as noted above, incorporates the majority of net metering costs through the treatment of participant bill savings as a cost (i.e., lost revenue) on the RIM test. To more accurately assess the cost-effectiveness of the utility net metering programs is outside the scope of the current study.

[68] The average system size in the RSIP dataset analyzed for this study was 7.44 kW.

Cost-Effectiveness of Energy Efficiency Programs

To provide results that would be meaningful to policymakers looking at cost-effectiveness broadly for all programs in Connecticut, the aim was to conduct this evaluation using assumptions as consistent as possible with those used in the analysis of the energy efficiency programs delivered by the Connecticut IOU utilities. However, there remained differences between the processes used to derive the solar PV cost-effectiveness ratios in this report and those used by the utilities to calculate cost-effectiveness for energy efficiency. As a result, although solar PV and energy efficiency were both shown to be cost-effective, a direct comparison is not presented in this report.

This report section presents the cost-effectiveness results for energy efficiency and explains some of the differences in the assumptions and methodologies used to determine solar PV and energy efficiency benefit/cost ratios. The energy efficiency results are also included in the subsequent report section "Cost-Effectiveness of Bundled Technologies" in which an example calculation illustrates that one can combine measures that are cost-effective (e.g., solar PV and energy efficiency) with those not yet cost-effective (e.g., energy storage) to encourage adoption of more comprehensive energy solutions for participants while maintaining cost-effectiveness.

Table 29 presents cost-effectiveness ratios for Eversource's[69] energy efficiency programs for 2016 from the 2016-2018 Electric and Natural Gas Conservation and Load Management (CL&M) Plan[70], almost all of which are shown to be cost-effective.[71]

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[69] Three years ago, Northeast Utilities and its operating companies Connecticut Light & Power, Public Service of New Hampshire, Western Massachusetts Electric and Yankee Gas merged with NSTAR Electric & Gas. In 2015, the company and all of its subsidiaries changed their names to Eversource Energy. Eversource currently serves approximately 85% of electricity customers in Connecticut and is considered representative of the state's market.

[70] As provided in the 2016-2018 Electric and Natural Gas Conservation and Load Management (CL&M) plan filed with the Connecticut Department of Energy and Environmental Protection on October 1, 2015, available at http://www.energizect.com/about/eeboard/plans (the numbers could be updated before the Plan is finalized), Table B1, Eversource CT Electric – Costs and Benefits 2016. The PACT and M-PACT correspond to the Electric Utility Cost Test and Modified Utility Cost Test from the CL&M Plan. The electric utility cost test includes electric benefits and costs, while the modified utility cost test includes oil and propane savings and costs. The electric utility cost test is used as an example for combining with solar PV benefits and costs (in the next section on technology bundling) but both tests are shown here to illustrate that the EE measures have non-electric impacts (that usually increase the ratios). The residential EE programs are designed to maximize not just electricity, but all fuel savings, including oil, gas and propane. If the technology bundle considered in the next section included non-electric impacts, the M-PACT could be more appropriate for use in calculating the cost-effectiveness of the technology bundle.

[71] A few exceptions are: the TRC ratio for HES HVAC, and the UCT/PACT and modified UCT/PACT ratios for HES Income Eligible. The HVAC measure costs tend to be higher than those for other EE programs. For the HES Income Eligible program, incentives typically cover 100% of the measure costs, resulting in lower UCT/PACT ratios.

Table 29. Eversource 2016 Residential Energy Efficiency Program Cost-Effectiveness

Program, Year		Test	Benefits	Costs	Net Benefits	Ratio
EE 2016 Eversource	Residential Total	TRC	$186,853,379	$76,049,054	$110,804,325	2.46
		PACT	$89,622,927	$40,686,706	$48,936,221	2.20
		M-PACT	$133,786,974	$56,458,769	$77,328,205	2.37
	Residential Retail Products	TRC	$82,271,005	$24,792,006	$57,478,999	3.32
		PACT	$51,489,640	$13,622,165	$37,867,475	3.78
		M-PACT	$51,489,640	$13,622,165	$37,867,475	3.78
	Home Energy Solutions (HES)	TRC	$62,298,317	$19,090,656	$43,207,661	3.26
		PACT	$17,138,430	$9,467,560	$7,670,870	1.81
		M-PACT	$51,721,547	$17,965,248	$33,756,299	2.88
	HES HVAC	TRC	$5,794,248	$6,679,885	($885,637)	0.87
		PACT	$3,982,333	$2,000,000	$1,982,333	1.99
		M-PACT	$3,982,333	$2,000,000	$1,982,333	1.99
	HES Income Eligible	TRC	$22,914,543	$17,713,445	$5,201,098	1.29
		PACT	$8,853,029	$10,728,336	($1,875,307)	0.83
		M-PACT	$16,873,190	$17,459,712	($586,522)	0.97
	New Construction	TRC	$6,442,405	$4,773,062	$1,669,343	1.35
		PACT	$3,198,174	$1,868,646	$1,329,528	1.71
		M-PACT	$4,758,944	$2,411,645	$2,347,299	1.97
	Behavior	TRC	$7,132,861	$3,000,000	$4,132,861	2.38
		PACT	$4,961,321	$3,000,000	$1,961,321	1.65
		M-PACT	$4,961,321	$3,000,000	$1,961,321	1.65

As previously stated, RSIP cost-effectiveness is not directly compared to those of energy efficiency programs in this report because of differences in the methodologies used to calculate these benefit/cost ratios and the contexts in which these ratios are generated and utilized, as further described here.

First, RSIP and Connecticut's energy efficiency programs operate under different mandates. RSIP has a legislative target to install 300 MW of residential solar PV by 2022. The legislation also specifies that incentives are to decline over time to foster sustained, orderly development of a state solar PV industry.[72] Incentives are the dominant program cost for RSIP and reducing these incentives over time

[72] In 2011, Connecticut's legislature passed Public Act 11-80, which created the Connecticut Green Bank pursuant to Connecticut General Statute (CGS) 16-245n and tasked it with creation of the Residential Solar Investment Program (RSIP) (CGS 16-245ff) which was to result in installation of 30 MW of new residential solar PV by 2022, funded by no more than one-third of the total annual surcharge collected from customers of electric services, and providing "incentives that decline over time and will foster the sustained, orderly development of a state-based solar industry." RSIP met the 30 MW target eight years ahead of schedule, in 2014. Governor's Bill No. 6838, "An Act Concerning the Encouragement of Local Economic Development and Access to Residential Renewable Energy,"

by increasing project financing by program participants is expected to result in lower program costs and lower program costs relative to benefits, resulting in an increasing cost-effectiveness ratio from a program administrator (i.e., CGB) perspective (the program administrator cost test).[73] Simultaneous to lowering incentives, the Green Bank has supported strategic initiatives within RSIP to encourage increased deployment of residential solar PV, including Green Bank financing products such as the Smart-E Loan[74], the CT Solar Loan[75] and the CT Solar Lease[76], the Solarize Program (a volume discount program that pairs up installers and municipalities to provide lower prices the more customers sign up for solar PV), as well as marketing, outreach and educational efforts within and outside of Solarize. The Green Bank looks at this from the perspective of how can the Green Bank deploy more with less, an approach also reflected by the Green Bank focus on leveraging financing, in particular private capital, to deploy more clean energy with fewer public resources.

The Connecticut's two investor-owned utilities administer the state's energy efficiency programs with a different mandate, with the goal of acquiring all cost-effective energy efficiency. This necessitates that the programs be delivered within the residential, commercial, and industrial sectors within the Eversource and UI service territories. Measures with cost-effectiveness ratios of 1.0 or greater (and under specific conditions measures with lower ratios) are all included in the energy efficiency planning effort. In Connecticut, as overseen by the Energy Efficiency Board (EEB), energy efficiency plans are developed by the utilities for three year periods, including budgets, deployment targets, and anticipated benefits and costs for the entire portfolio of energy efficiency measures. This planning effort is informed by impact evaluations and other research studies, and there is consideration of appropriate incentive levels for measures in the portfolio. Therefore, the benefit/cost ratios for energy efficiency programs are calculated and utilized in a context that considers a different set of complexities than does the RSIP.

A second key difference between the cost-effectiveness analysis of RSIP and that of the energy efficiency programs conducted by the utilities pertains to program attribution assumptions. As stated in

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was signed into law July 2, 2015 by Governor Malloy, expanding the RSIP target from 30MW to 300MW by 2022 and establishing the Solar Home Renewable Energy Credit (SHREC) a new type of Class I REC which utilities are to purchase from the Green Bank through 15-year contracts as a funding source for RSIP (this bill updates CGS 16-245ff). Governor's Bill No. 6838: https://www.cga.ct.gov/2015/TOB/h/pdf/2015HB-06838-R00-HB.pdf, and CGS chapter 283, section 16-245ff: https://www.cga.ct.gov/current/pub/chap_283.htm.

[73] Taking into account program attribution considerations as incentives decrease, as well as potential market transformation effects described in the Program Attribution section (in the Methodology section of this report).

[74] Smart-E Loans offer no money down, low-interest financing with flexible terms for almost any residential energy improvement project including solar PV, and energy efficiency measures such as insulation, window replacement, HVAC and water heating upgrades, and purchase of Energy Star appliances. Lower rates are offered for Smart-E technology bundles that combine two or more qualifying measures. The loans are provided through local, participating lenders. See: www.energizect.com/SmartE, or www.energizect.com/SmartEBundle.

[75] The CT Solar Loan is no longer available and has been transitioned to a private capital partner. Read more about this at: http://www.prnewswire.com/news-releases/ct-solar-loan-partner-graduates-from-connecticut-green-bank-280780492.html.

[76] The CT Solar Lease is no longer available, though other leases and power purchase agreements are available in the Connecticut market for customers who choose to adopt solar PV through a third-party provider.

an earlier section of the report, for RSIP, Cadmus made a simplifying assumption to use a net to gross ratio of one for this study. Net to gross ratios for residential energy efficiency measures are obtained within the context of an independent impact evaluation of the residential programs for a specified program period. The ratios typically do not equal 1.0, and are often less than 1.0. These values are used as inputs in the program planning process, unless program design or the target market are expected to change sufficiently that they would no longer represent the expected future interplay of free riders and spillover; net to gross ratio values would then be re-assessed as needed.

A third aspect of difference between this RSIP evaluation and the evaluation of Connecticut energy efficiency programs conducted by the utilities pertains to the existence and treatment of federal tax credits and accelerated depreciation in cost-effectiveness tests. Solar PV projects are afforded significant federal tax incentives, which are included in the cost-effectiveness calculations for RSIP, including a 30% investment tax credit (ITC) and an accelerated depreciation benefit called MACRS[77] for third party owned projects, treated as benefits in the TRC and PCT tests**.** Federal tax incentives for energy efficiency are generally lower. Certain energy efficiency projects qualify for a 10% federal tax credit but with a maximum credit of $500 or lower depending on the measure, and there is no accelerated depreciation benefit.[78] Connecticut energy efficiency program cost-effectiveness tests do not account for federal tax credits or accelerated depreciation.[79]

[77] MACRS (Modified Accelerated Cost Recovery System) is a Federal tax benefit that allows businesses to claim the depreciated value of solar assets as a tax deduction over a five year period. For more information: http://www.seia.org/policy/finance-tax/depreciation-solar-energy-property-macrs.

[78] https://www.energystar.gov/about/federal_tax_credits

[79] Treatment of tax credits varies among jurisdictions and can be modeled either as a transfer payment with neutral impact on cost effectiveness, or as a reduction in costs or as an increase in benefits.

Cost-Effectiveness of Bundled Technologies

With both residential solar PV and residential energy efficiency programs shown to be cost-effective, the Green Bank wanted to consider the opportunity to bring together a suite of technologies that could provide more comprehensive energy solutions for customers and benefits to the grid while still maintaining overall cost-effectiveness. Bundling technologies together would leverage the cost-effectiveness of more mature technologies, solar PV and energy efficiency, to support investment in promising technologies such as energy storage that are of strong interest to customers but have not yet achieved commercial cost-effectiveness.[80] This strategy works because the benefits of solar PV and energy efficiency far enough outweigh the costs to provide the opportunity to add additional costs into the ratio.

For a typical residential customer in Connecticut, we have bundled energy efficiency, solar PV, and energy storage into a single combined resource and calculated the cost-effectiveness of the resulting resource mix. For energy efficiency and PV, we calculated average benefits and costs per participant for the Home Energy Solutions and RSIP (Step 7), respectively.

Home Energy Solutions (HES) is a residential energy efficiency program operated by the Connecticut utilities and includes a wide variety of energy efficiency measures and activities beginning with an in-home energy assessment. Core measures include a blower door test before and after implementation of air and duct sealing. The assessment also includes lighting upgrades and identification of further and deeper energy savings opportunities in the home such as insulation, appliance and HVAC upgrades for which participants have access to incentives and financing. Although our analysis does not stipulate exactly which measures are installed, we are using the average benefits and costs per participant, which represents a mix of basic and more advanced efficiency measures.

For modeling purposes, we have assumed the energy storage portion of the bundle is the leased Tesla PowerWall 7 kWh home energy storage system. Although this unit is somewhat more expensive than current lead acid based battery systems, the popularity of the product line and offerings by major vendors make it a reasonable choice for potential future residential scale energy storage products that may be of interest to typical Connecticut customers.

[80] During an earlier evaluation of the RSIP completed by Cadmus in January 2015, Cadmus found that approximately 59% of customers surveyed indicated that they were also interested in energy storage. Of the customers surveyed, however, only 5% had actually installed an energy storage system. (Note that these findings were collected as part of the survey but not presented in the report, referenced below). This high level of interest suggests that customers want to combine energy storage with their PV systems, though there is not enough information to gauge the value they would place on such an offering. Based on the preliminary analysis presented here, customers would be interested in energy storage and the excess cost-effectiveness of RSIP and energy efficiency technologies may be able to support the deployment of storage technologies while maintaining cost-effectiveness. "Residential Solar Investment Program Evaluation," Shawn Shaw, Danielle Kolp, Mary Knipe, Ryan Fahey, Kathleen Higgins, The Cadmus Group, January 28, 2015. http://www.ctgreenbank.com/wp-content/uploads/2016/02/RSIP_Evaluation_I_Final_Report_and_cvr_ltr.pdf

Table 30 shows the RSIP and energy efficiency benefit and cost data used as a starting point in the technology bundling analysis. These benefits and costs were then divided by the number of participants for each program to derive per-participant benefits and costs, shown in Table 31.

Table 30. RSIP and Energy Efficiency Benefits and Costs

Program	Test	# Participants	Benefits	Costs	Net Benefits
RSIP 2015 Step 7	TRC	2,639	$145,277,194	$80,617,489	$64,659,705
	PACT	2,639	$46,247,561	$7,148,375	$39,099,186
	PCT	2,639	$126,918,744	$70,523,832	$56,394,912
EE 2016 Eversource – Home Energy Solutions (HES)[81]	TRC	17,320	$62,298,317	$19,090,656	$43,207,661
	PACT	17,320	$17,138,430	$9,467,560	$7,670,870
	PCT	17,320	$33,476,738	$1,125,408	$32,351,330

For example, for the TRC, taken on a per-participant basis, the RSIP and Home Energy Solutions programs provide lifetime net benefits of approximately $24,500 and $2,500, respectively, or almost $27,000 in total (see Table 31).

Table 31 shows the TRC, PACT and PCT ratios for the technology bundle that includes solar PV, energy efficiency, and energy storage. The cost of energy storage is based on a reported customer cost of $5,000 for a nine year leased PowerWall[82]. For the PACT, Cadmus assumed an 8% or $400 program administration cost. The benefits are conservatively estimated to be zero since we did not attempt to monetize the value of storage (see the next section of this report on valuing energy storage). The resulting net benefits of the technology bundle are still almost $21,600, and the resulting TRC ratio is still over unity, specifically 1.58. Similarly, the PACT and PCT ratios also exceed unity for the technology bundle. In fact, the ratios could absorb additional cost; the amount of net benefits for the RSIP plus Home Energy Solutions programs for each ratio indicates the amount of additional cost that could be added and still achieve a ratio of at least unity.

[81] The total customer costs and number of measures/participants for HES were taken from the 2016-2018 CL&M Plan, Table B2 – Eversource CT Electric – Resource Summary 2016. Benefits were estimated by multiplying the lifetime savings in MWh attributed to HES and multiplying by 19.23 cents per kWh, the Energy Information Administration (EIA) average residential price of electricity in CT for September 2015 (from the Electric Power Monthly Table 5.6.A. Average Price of Electricity to Ultimate Customers by End-Use Sector, by State, September 2015 and 2014).

[82] Note that the installed cost of $5000 used here is for a system leased over nine years. In comparison to a 7 kWh system provided through a Green Mountain Power program in Vermont which has a purchase and a lease option, this cost is lower than the purchase price of $6501 and higher than the lease option of $1.25/day (which amounts to $4106.25 over a nine year period). Additionally, there is sufficient benefit from the RSIP and HES programs to accommodate a higher cost in the case of a larger or more expensive energy storage system, or the addition of other measures.

Effectively, the high level of benefits provided by the RSIP and HES programs can be used to offset the lower cost-effectiveness of an emerging technology such as energy storage. While the benefits of energy storage were assumed to be zero in this example, indication of value is provided by customer interest and willingness to pay. Depending on how energy storage is configured with solar PV, and the presence of energy management software, energy storage along with solar PV could contribute to peak load reduction more than solar PV by itself, and there are additional values to the grid that could potentially be monetized in the future (e.g., supporting time of use rate structures for solar PV + storage customers). Energy storage could therefore be an important component of a technology bundle that provides a comprehensive energy solution to customers and value to the electricity system.

Table 31. Cost-Effectiveness of a Technology Bundle[83]

Program	Test	Benefits/ Participant	Costs/ Participant	Net Benefits/ Participant	Ratio
RSIP 2015 Step 7	TRC	$55,050	$30,548	$24,502	1.80
	PACT	$17,525	$2,709	$14,816	6.47
	PCT	$48,093	$26,724	$21,370	1.80
EE 2016 Eversource – Home Energy Solutions (HES)	TRC	$3,597	$1,102	$2,495	3.26
	PACT	$990	$547	$443	1.81
	PCT	$1,933	$65	$1,868	29.75
RSIP 2015 Step 7 + EE 2016 Eversource HES	TRC	$58,647	$31,651	$26,996	1.85
	PACT	$18,514	$3,255	$15,259	5.69
	PCT	$50,026	$26,789	$23,238	1.87
Energy Storage	TRC	$0	$5,400	($5,400)	0.00
	PACT	$0	$400	($400)	0.00
	PCT	$0	$5,000	($5,000)	0.00
RSIP 2015 Step 7 + Storage	TRC	$55,050	$35,948	$19,102	1.53
	PACT	$17,525	$3,109	$14,416	5.64
	PCT	$48,093	$31,724	$16,370	1.52
RSIP 2015 Step 7 + EE 2016 Eversource HES + Storage	TRC	$58,647	$37,051	$21,596	1.58
	PACT	$18,514	$3,655	$14,859	5.06
	PCT	$50,026	$31,789	$18,238	1.57

[83] Though the PCT is not calculated in the EE CL&M plans, enough data were provided to estimate the PCT for the HES Program for the purposes of this example bundling calculation. The total customer costs and number of measures/participants for HES were taken from the 2016-2018 CL&M Plan, Table B2 – Eversource CT Electric – Resource Summary 2016. Benefits were estimated by multiplying the lifetime savings in MWh attributed to HES and multiplying by 19.23 cents per kWh, the Energy Information Administration (EIA) average residential price of electricity in CT for September 2015 (from the Electric Power Monthly Table 5.6.A. Average Price of Electricity to Ultimate Customers by End-Use Sector, by State, September 2015 and 2014). This resulted in HES per participant benefits of $1933, and costs of $65, resulting in a highly favorable PCT of 29.75. The ratio could have been higher if the benefits estimate calculation included an escalator for the price of electricity and if the peak kW impact was included benefit estimate, but the simplified calculation already yielded highly favorable results that were sufficient to illustrate the benefit of bundling technologies. The per participant HES cost of $65 is lower than the expected $99 (the per participant contribution to the HES Program as typically advertised); this is because some of the costs for homes utilizing gas are allocated to the respective gas budget in the CL&M plan.

Noteworthy technology bundling programs are being implemented in Vermont, deploying energy efficiency, solar PV, energy storage, and renewable heating technologies in various combinations to provide comprehensive energy improvements to customers.

- Green Mountain Power (GMP) is offering energy storage using the Tesla Powerwall with or without solar PV[84]: "The Tesla home battery can be paired with small-scale solar such as rooftop panels to store locally generated energy, or it can be used without solar as a battery to store power from the grid. During a storm or emergency, the battery is able to power essential parts of the home like lights, a refrigerator, and heat pump (or heating system). GMP will partner with customers to utilize the batteries during peak energy times to directly lower costs for customers by reducing transmission and capacity costs." The 7 kWh Powerwall offered by GMP provides four to six hours of backup power and can be purchased for $6501, or leased for $1.25 per day.
- Zero Energy Now! (ZEN)[85] is a comprehensive home energy improvement program in Vermont offered through the Building Performance Professionals Association of Vermont in collaboration with Green Mountain Power. The program offers energy efficiency upgrades, renewable heating options, solar photovoltaics, and energy storage in order to significantly reduce each customer's energy costs. Participating ZEN contractors assist customers to develop a comprehensive package of energy improvements. The threshold for participation includes the ability to obtain at least a 10% reduction in the heating load, a reduction in annual MMBtu per year of total fossil fuel and electric energy usage of at least 50%, and adoption of a renewable heating system (such as those based on biomass or heat pump technology) designed to meet at least 50% of the load of the house. The ZEN web site illustrates the use of financing to pay for the package, using an example of a home equity product available from a local lender.

Also note that the Green Bank Smart-E Loan Program[86] mentioned earlier in the report offers financing for almost any residential energy improvement project including solar PV, and energy efficiency measures such as insulation, window replacement, HVAC and water heating upgrades, and purchase of Energy Star appliances, with lower rates offered for Smart-E technology bundles that combine two or more qualifying measures. These loans are provided through local, participating lenders.

Valuing Energy Storage

Note that, in the analysis of RSIP, we have assumed no monetized benefits for energy storage. As of this report, there is no market in Connecticut for the many grid support and ancillary services that can be provided by distributed energy storage technologies. Examples of these services include:

- Frequency regulation
- Reactive power
- Voltage support
- Arbitrage

[84] http://products.greenmountainpower.com/tesla-powerwall.html, http://www.triplepundit.com/2015/12/green-mountain-power-now-leasing-selling-teslas-powerwall.

[85] http://zen-vt.com.

[86] www.energizect.com/SmartE, or www.energizect.com/SmartEBundle.

The value of these ancillary services varies widely and is a rapidly developing aspect of the changing electricity market. Well-known utility restructuring programs, such as New York's REV initiative, are working to understand and develop a market-based approach to funding energy storage projects but these efforts have not yet been fully realized and, absent these revenue streams, a customer purchasing a residential energy storage system in Connecticut today can expect to realize only the benefits associated with having backup power available in the event of a utility outage. As these outages are typically infrequent and of short duration, we have not assigned a monetary benefit, though many customers do express a willingness to pay for this convenience so there is an indeterminate customer-driven value placed on energy resilience.

During Cadmus' evaluation of the RSIP, completed in January 2015, approximately 59% of customers surveyed indicated that they were also interested in energy storage[87]. Of the customers surveyed, however, only 5% had actually installed an energy storage system. This high level of interest suggests that customers want to combine energy storage with their PV systems, even though there is not enough information to gauge the value they would place on such an offering. Attempting to monetize this benefit is beyond the scope of this study but may be worth further research as the energy storage industry develops in Connecticut. Based on the preliminary analysis presented here, customers would be interested in energy storage and the excess cost-effectiveness of the RSIP may be able to support the deployment of storage technologies, while maintaining programmatic cost-effectiveness.

The Role of Enabling Technologies in PV Market Development

As noted previously, the large net benefits associated with residential PV projects under the RSIP may afford an opportunity for the bundling of emerging technologies that can capitalize on these net benefits and, in turn, provide a mutually beneficial resource bundle that promotes long term growth of several distributed energy technologies.

Enabling technologies, which can ultimately make PV more cost-effective, include:

Energy Storage

Energy storage, most commonly in the form of batteries at the residential scale, has been used for many years in combination with solar PV, particularly in off-grid or niche applications requiring minimal downtime. Historically, these applications have not sought to provide cost-effective energy or demand savings to the host site but have been installed to meet other objectives. More recently, the cost of energy storage has declined rapidly, while new utility revenue sources have simultaneously become available. This combination, supported by favorable public policies in California and elsewhere, has made cost-effective distributed energy storage feasible in some applications. While Connecticut has not yet developed the infrastructure to allow for some of the possible benefits associated with distributed energy storage, key synergies with solar PV systems include:

[87] Note that these data were not included in the final report.

- Peak load shifting: For most PV systems in Connecticut, the peak output occurs from approximately 11AM to 2PM, while the utility peak demand period occurs from approximately 3PM to 6PM. An appropriately sized battery system could be configured to charge during peak solar output and dispatch that same electricity (less conversion losses) a few hours later when the electricity is much more valuable to the grid. Combined with smart metering (discussed below) and time of use rates, this presents a potential opportunity to increase the net value of PV systems to customers and utilities. In commercial settings, solar PV plus energy storage can provide value in reducing demand charges for customers whose utilities allow the connection of grid-parallel energy storage systems.
- Backup power: This is the most traditional application for PV systems with built in battery storage. While in residential applications the monetary value of this benefit is difficult to calculate, in commercial/industrial applications the value of backup power is quantifiable in terms of otherwise lost productivity.
- Grid support: Many utilities are implementing large-scale energy storage systems (e.g., vanadium redox flow batteries) as means of grid support. These large battery systems, with long cycle lifetimes and rapid cycling capability, can provide a variety of grid support benefits including voltage regulation, frequency regulation, and reactive power. While this application is probably a mid-term option for residential systems, further investigation may suggest more near term applicability.

Smart Metering

Smart metering is a broad term describing an infrastructure consisting of communication-enabled customer energy meters, data centers, internet connectivity, and software for managing and analyzing large sets of data. The purpose of the technology, overall, is to provide real-time data on customer electricity use. This can facilitate several important benefits:

- Reduced billing costs: Smart meters, with an advanced metering infrastructure (AMI) can automatically report customer consumption for billing purposes, allowing utilities to reduce administrative costs associated with collecting and documenting meter readings.
- Energy conservation: By providing customers with real-time feedback on consumption and, in some cases, pricing, customers may adjust their energy-consuming behavior. This can provide both cost savings to the customer and relief for utilities during peak usage periods.
- Time of use pricing: With smart meter technologies, residential time of use rates become much more feasible to implement. This presents a more realistic value proposition for large-scale adoption of solar PV, since the generated electricity will be valued based on system needs rather than a flat net metering rate. It also presents the PV industry with a differing set of design constraints. For example, if peak afternoon pricing is sufficiently attractive, customers may elect to orient systems in a south-western direction to take advantage of pricing signals, even though overall annual production may be slightly lower than for a south facing PV system of the same size.
- Other benefits: An integrated AMI can also provide more rapid feedback on outages, targeted data for distribution upgrades, reduction in unaccounted for energy consumption, remote service disconnect/re-connect functions, and enhanced customer satisfaction.

Smart meters and AMI have been gaining traction and some utilities are finding that the benefits of this technology substantially exceed the costs, even when not combined with other cost-effective technologies. In addition to its cost-effectiveness, an integrated AMI can provide the foundation for deploying other distributed energy technologies, such as PV and energy storage, in a way that supports utility operational needs.

RSIP Eligibility in the ISO-NE Forward Capacity Market

In addition to the costs and benefits discussed previously, Cadmus examined the feasibility of an additional revenue stream associated with bidding the RSIP generation into the ISO New England Forward Capacity Market. As summarized in a memorandum to the Green Bank, and appended to this report in Appendix A, the current rules for the Forward Capacity Auction preclude participation by the RSIP portfolio of projects, primarily due to the minimum 100 kW generating capacity requirement for each participating site.[88] In addition, the non-dispatchable nature of solar PV generation, inability to participate in both the capacity and energy market, and the seasonal peak period delivery requirements make participation even more problematic.

In order for the RSIP portfolio to participate in the FCA process, there would have to be a significant shift in current ISO-NE policies to accommodate distributed non-dispatchable generation assets in the capacity market. These issues are further discussed in Appendix A.

Data Availability and Ongoing Tracking

We understand that the Green Bank may benefit from tracking some cost-effectiveness elements on an ongoing basis. While performing the detailed calculations used for this report is likely unnecessary for regular tracking purposes, the Green Bank collects substantial amounts of data from PowerClerk, and other sources, that could facilitate a simplified ongoing cost-effectiveness metric. Key data collected and reported regularly under the existing program includes:

- Nameplate capacity
- Expected electricity generation
- Incentive cost

Based on our analysis, these regularly tracked numbers, with some conversion factors to account for additional costs and benefits, could be used to approximate ongoing cost-effectiveness from at least the program administrator perspective.

Calculating Approximate Benefits

The primary benefits that accrue to the Green Bank are based on avoided energy and avoided capacity costs. Both of these metrics can be approximated based on the expected generation and nameplate capacity reported through the Green Bank's PowerClerk system:

[88] The average solar PV system size is 7.44 kW for the full RSIP dataset used in this study.

- **Energy Benefits:** PowerClerk includes a field for expected annual energy generation for each PV project. The sum of these results can be multiplied by a 25-year lifetime to approximate lifetime generation.[89] This lifetime generation can be used directly for calculating the objective function or can be multiplied by an up to date avoided cost of energy to be used in a PACT calculation. Updated cost of energy numbers can be obtained from the Avoided Cost of Energy Supply in New England report series, as was done for this evaluation.
- **Capacity Benefits:** Based on the load shapes analyzed for this evaluation, every MW of DC capacity added contributes approximately 330 kW of AC capacity savings based on peak demand periods. At an avoided capacity cost of $73.42/kW, this avoided capacity can be converted into a basic financial indicator.

In both cases, the value assigned to these benefits may change over time. For an approximate calculation, we recommend reviewing the avoided energy and capacity costs on, at least, an annual basis to ensure the correct values are being used. As noted previously, the energy benefits are expected to escalate each year by 2.23%, and capacity benefits by 1.9% and 13.15% for T&D and generation,[90] respectively, while the incentive costs continue to decline.

Calculating Approximate Costs

Compared to the incentive payments, which the Green Bank carefully tracks, the administrative costs of the program are modest, typically in the range of 5% to 6%. To estimate approximate total program costs, the Green Bank could simply multiply incentive payments by 1.06 to account for additional administrative costs. Depending on the availability of administrative budgets and accounting information, other alternatives are possible. Also, as incentive amounts decrease and administrative costs remain relatively fixed, the percentage will likely increase over time. However, so long as the total program budget remains similar, this assumed administrative cost adder is likely sufficient for general program tracking purposes.

Potential Metrics

Based on these approximate benefits and costs, the Green Bank could calculate a modified objective function using the following equation:

$$OF_M = \frac{Lifetime\ Generation}{1.06 * Incentive\ Payments}$$

[89] Note that we are disregarding performance degradation for simplicity.

[90] Escalation rates are nominal, unless otherwise noted.

Alternatively, the Green Bank could also track a simplified approximation of the PACT with the following equation:[91]

$$PACT_M = \frac{Lifetime\ Generation * avoided\ energy\ cost + nameplate\ capacity * 0.33 * avoided\ capacity\ cost}{1.06 * Incentive\ Payments}$$

We do recommend that the Green Bank also track Cost of Conserved Energy (CCE). This measure is very similar to the OF, but is more comparable to what utilities track for energy efficiency program cost effectiveness. It also provides an easy way to assess overall simplified cost effectiveness through comparison to the avoided cost of energy. For example, the average avoided cost for a power plant may be 5 cents per kWh per year. If the equation below for solar or energy efficiency produces a CCE of 4 cents, then they are economically superior options to the power plant. CCE may also be used to compare options with different initial cost, lives, and savings as they all can be summarized and compared based on their CCE. CCE can be estimated using either TRC or PACT costs as follows:

$$\frac{initial\ cost * CRF}{savings}$$

Where CRF is the capital recovery factor[92] that can be computed using Excel or any financial calculator and automated to work with the Green Bank’s existing data exports. CCE is expressed as cents per kWh per year (either generated through a renewable option or saved through an energy efficiency program). Initial cost includes administration and incentive cost for PACT. For TRC, they include customer contribution.

[91] The value 0.33 in the equation comes from the report section “Peak Period Output of Residential PV Systems.”

[92]

$$CRF = \frac{i(1+i)^n}{(1+i)^n - 1}$$

Appendix A. Memorandum Regarding FCA Eligibility

CADMUS

To: Connecticut Green Bank
From: Birud Jhaveri, Shawn Shaw
RE: Eligibility of RSIP Assets to Participate in ISO-NE Forward Capacity Market
Date: September 18, 2015

As requested by the Connecticut Green Bank (CGB), Cadmus has investigated the feasibility of including residential solar photovoltaic (PV) assets in ISO-New England's (ISO-NE) Forward Capacity Auction (FCA). While we have attempted to ensure the accuracy of this memo, integrating renewables in the Forward Capacity Market (FCM) continues to evolve through changing regulations. Should any discrepancy arise between the information provided herein and ISO-NE's Market Rule 1[1], Market Rule 1 should be relied upon. Additionally, this memo summarizes select minimum criteria for CGB's participation in the FCA; it does not attempt to provide a complete FCM qualification guideline.[2]

By the end of 2014, the New England region had achieved 900 MW of solar PV resources (AC nameplate capacity) and the ISO-NE's solar PV forecast projects the region will realize nearly 2,500 MW by 2024.[3] Nevertheless, based on our assessment, we find CGB's current residential portfolio disqualified from participating in an ISO-NE FCA. We also find it to be disadvantageous for the CGB to aggregate any newly installed solar PV resources and participate in an ISO-NE FCA in the foreseeable future based on current market rules. Solar PV resources, particularly small aggregated systems, face significant barriers to effectively participate in Forward Capacity Auctions. This is highlighted by the fact that only 1.2 MW of distributed solar PV has cleared in the FCA.[4] This memo provides a background on the capacity and energy markets, abbreviated participation requirements, and other considerations leading to our conclusion.

Capacity and Energy Market Background

The capacity market is a forward market intended to ensure New England has adequate resources to meet all electricity demand plus reserve requirements three years into the future. Beginning in June 2018, capacity payments will be based on an individual resource's (or aggregated resources in the case of Demand Resources) performance during scarcity conditions (times when the system is unable to meet its energy or reserve requirements). The capacity market fulfills two primary objectives: ensuring resource adequacy and providing appropriate incentives for resource performance. The ISO obtains the resources needed through annual forward capacity auctions; bidders will price their offers in the

[1] http://iso-ne.com/participate/rules-procedures/tariff/market-rule-1
[2] ISO-NE now provides a simplified FCM Participation guide to assist market participants in understanding participation in the FCM. The simplified guide should be consulted in combination with Market Rule 1, Market Manuals, Operating Procedures and Planning Procedures. The simplified guide can be found at http://iso-ne.com/markets-operations/markets/forward-capacity-market/fcm-participation-guide.
[3] Final 2015 PV Forecast, April 2015; http://www.iso-ne.com/static-assets/documents/2015/05/final_2015_pv_forecast.pdf
[4] ISO-NE FCA Auction Results filings

capacity market based on the expected net energy market revenues earned in the capacity delivery period. The two markets, FCM and the Energy Market are linked; market participants receive their total revenue requirement through the combination of revenues earned in the capacity and energy markets.

Participation in the FCA for existing CGB solar assets

The existing market rules provide four options for capacity resources to participate in the FCA. Resources can either qualify as a New or Existing 'Generating Capacity Resource' or a New or Existing 'Demand Resource'. In order to qualify as a Generating Capacity Resource, each resource site (i.e. not in aggregate) must have a minimum alternating current output size (i.e. not nameplate capacity) of 100 kW.[5] Qualifying as a Demand Resource requires the capacity offered to be a minimum of 100 kW aggregated output within an ISO predefined local Dispatch Zone and a nameplate rating less than 5 MW or a nameplate rating less than the non-coincident peak load at the facility for the prior 12 months, whichever is greater.[6] With individual sites in the CGB residential solar program unable to meet the minimum capacity output threshold deemed necessary for registering as a Generating Capacity, participating as a Demand Resource becomes the only viable option for the CGB solar portfolio to partake in the FCA.

Demand Resource is defined by the ISO to include energy efficiency, distributed generation and load management.[7] Demand Resources are further categorized into two categories – passive and active. Passive Demand Resources include capacity resources that are non-dispatchable (e.g. solar photovoltaic). Since the CGB solar portfolio has not previously been registered with the ISO to fulfill a Capacity Supply Obligation, by clearing in a past FCA, the portfolio capacity must be registered as New Passive Demand Resource.

The ISO defines New Demand Resource as a Demand Resource that has not been in service prior to the applicable Existing Capacity Qualification Deadline of the FCA, or distributed generation that has operated only to address an electric power outage due to failure of the electrical supply, on-site disaster, local equipment failure or public service emergencies during the 12-month period prior to the applicable Existing Capacity Qualification Deadline of the FCA.[8] As the next applicable Existing Capacity Qualification Deadline is for FCA #11 on June 6, 2016 for the 2020-2021 FCM, and since none of the CGB portfolio resources are utilized to solely address power outage events, the market rules disallow any capacity that has been in service prior to June 6, 2016 to participate in FCA #11, disqualifying all of CGB's current portfolio assets.

Considerations for participation in the FCA for new CGB solar assets

The CGB does have the option to attempt to qualify new capacity, with an in-service date after June 6, 2016 and with a minimum of 100 kW aggregated output, in FCA #11 for the 2020-2021 FCM. FCA #11

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[5] ISO-NE Market Rule 1 Section III.13.1
[6] ISO-NE Market Rule 1 Section III.13.4.1; ISO-NE Presentation: Distributed Generation/PV in the Forward Capacity Market, September 15, 2014
[7] ISO-NE Presentation: Distributed Generation/PV in the Forward Capacity Market, September 15, 2014
[8] ISO-NE Market Rule 1 Section III.13.1.4.1.2

will take place on February 6, 2017. In order to qualify any new capacity, CGB must submit a Show of Interest filing by March 8, 2016 and a completed qualification package by June 21, 2016.[9] There are, however, at least two more considerations that hinder participation in the FCA. First, all Demand Resources are required to commit capacity during both summer peak and winter peak periods as well as during supply scarcity events. Second, while Passive Demand Resources are able to earn revenues through the capacity market, they are ineligible to earn revenues through the energy market as these resources are non-dispatchable.

Passive Demand Resource can be categorized as On-Peak or Seasonal Peak and are required to perform during specified performance hours, in the applicable seasonal performance months. The table below displays the performance requirements[10]:

Resource Type	Performance Months	Days	Performance Hours
On-Peak	Summer: June, July, August Winter: December, January	Mon-Fri, non-holidays	Summer: 14:00-17:00 Winter: 18:00-19:00
Seasonal Peak	Summer: June, July, August Winter: December, January	Mon-Fri, non-holidays	Hours where load is ≥ 90% of the most recent 50/50 system peak load

Since solar PV resources would be unable to perform during the winter performance hours or during possible winter peak events in the evening hours, it would be subject to performance penalties related to non-performance during those hours. While this issue was the subject of a recent FERC docket[11], the Commission ordered that energy efficiency resources be exempt from such non-performance penalties, although making no such exceptions for other non-dispatchable demand resources. Application of such performance penalties would be economically disadvantageous to CGB. Calculation of the penalties is formulaic and based on hourly real-time locational marginal prices (LMPs), capacity zone and other factors.[12] Penalty for a single shortage event can be excessive as LMPs often spike during peak system and/or scarcity events. Penalties are assessed by the hour with a maximum daily penalty of 10% of the resource's annualized FCA revenues for that Capacity Commitment Period.[13] Accumulation of the hourly penalties can wipe away a resource's entire annualized FCA revenues, leaving the market participant with no revenues and significant out-of-pocket participation expenses.

The ISO market rules do provide an option to submit a composite offer by participating in the FCA with other resource types (e.g. wind, CHP, gas). However, in the summer period only one resource type can be used to supply the amount of capacity offered during the entire summer period; the winter period would allow multiple resource types to combine to supply the amount of capacity offered.[14] The winter

[9] ISO-NE Master Forward Capacity Auction #11 Schedule, revised 8/6/2015
[10] ISO-NE Presentation: Distributed Generation/PV in the Forward Capacity Market, September 15, 2014
[11] FERC Docket ER14-1050-000
[12] Market Rule 1 Section III.13.7.2.7.1.2
[13] Market Rule 1 Section III.13.7.2.7.1.3
[14] Market Rule 1 Section III.13.1.5(a)

resource in such arrangements would have to forgo participation in summer months, thereby reducing its revenues.

While non-dispatchable demand resources that participate in the FCM are eligible to receive capacity payments, they are unable to earn payments through the energy market, reducing the revenue stream for such resources. This may change based on a Supreme Court ruling on FERC Order 745 in the future. Nevertheless, the current compensation model, coupled with non-performance penalties, significantly reduces any economic gain for CGB from participating in the ISO markets. In order to assess the profitability of such an endeavor, Cadmus would need to model the penalty liability based on historical shortage events for Seasonal Peak Passive Demand Resources and/or model a composite offer under an On-Peak Demand Resource scenario. Unfortunately, this modeling is outside the scope of our current efforts and may not be justified based on the general findings noted above.

While the vast majority of installed or forecasted distributed solar PV resources do not currently participate in the ISO-NE FCA, these resources do impact ISO-NE's Installed Capacity Requirement (ICR)[15] by informally reducing the load forecast below levels that would have otherwise been required without the resources. Formal consideration of the resources in the ICR can be realized to the extent they meet the qualification process rules, including monitoring and verification plan and financial assurance requirements.[16] Additionally, ISO-NE's Distributed Generation Forecasting Working Group[17] is currently developing and formalizing forecasts that project the anticipated growth and impact of distributed generation resources on New England's power system. This DG forecast is regularly updated and is used in long-range planning activities, such as transmission planning and resource adequacy.

[15] Installed Capacity Requirement (ICR) is a measure of the installed resources that are projected to be necessary to meet the peak demand forecast and reserve requirement by both ISO-NE and the Northeast Power Coordination Council's.
[16] ISO-NE Market Rule 1 Section III.12.8
[17] ISO-NE Distribution Generation Forecasting Working Group is a regional forum for interested parties, including policymakers, DG program administrators and distribution companies to provide input on ISO-NE's long-term DG forecast.

American Council for an Energy-Efficient Economy
Published on *ACEEE* (http://aceee.org)

Solar and energy efficiency need to work together like peanut butter and jelly

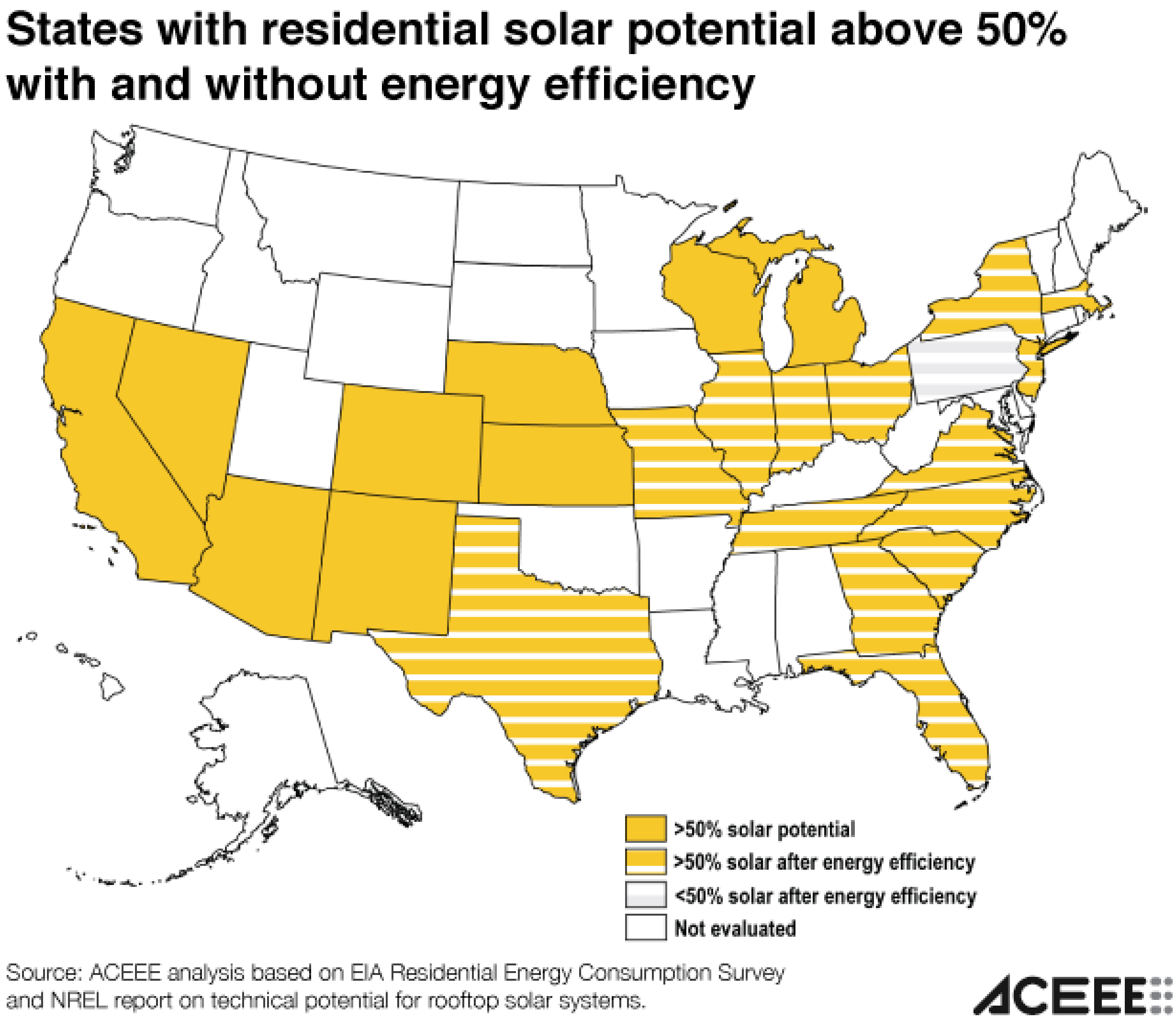
Energy efficiency and solar advocates have on occasion butted heads over which option should be implemented in homes and buildings *first* and how much should be installed before the other is considered. Here at ACEEE we believe that, like market solutions vs. energy efficiency programs, this is a false choice. Both are valuable and can, and should, work together as an integrated solution to create cleaner and cheaper energy. While energy efficiency is just as clean as solar when it comes to emissions, efficiency by itself can't produce energy for customers looking for a clean energy option, and solar without energy efficiency can't reach the full extent of its potential.

However, in recent years, some solar companies and some consumers have been employing a solar-first strategy in the residential sector—installing solar systems without paying much attention to energy efficiency. This strategy has been spurred in part by substantial solar tax credits, net-metering rules in place in most states, and the availability of solar financing that reduces or even eliminates the initial purchase price, replacing the up-front cost with monthly payments that extend over many years.

Despite these incentives, it still generally makes sense to implement as much efficiency as possible when installing generation. To look more closely at this issue, we conducted two illustrative analyses. The first compares the cost per kWh produced or saved from solar and energy efficiency when done individually or together. The second compares solar technical potential and residential electricity use, with and without efficiency. We find that when efficiency and solar are implemented in tandem, costs are lower, and solar can meet a larger share of residential loads.

Cost per kWh

For this comparison, we looked at the average cost per kWh produced from a typical solar system today, the average cost per kWh from residential energy efficiency, and the cost per kWh when efficiency and solar are done together. Our results are summarized in the table below. A solar system costs about 17-23 cents per kWh produced (the low-end estimate is based on very sunny Las Vegas, the high-end on Washington, DC). Energy efficiency costs less—about 8 cents per kWh. But when solar and efficiency are combined, the cost is 3-6 cents less per kWh than solar alone. Energy efficiency has a lower cost, and it also reduces the size and cost of the needed solar system. PB&J (solar and efficiency) is less expensive than PB (solar) alone.



This analysis ignores the federal 30% solar tax credit and also ignores utility incentives that are commonly available for energy efficiency measures. If tax credits and incentives are included, the overall result is still generally the same—a combined approach is less expensive per kWh than solar alone. This is just a simple analysis for typical measures and hence is only useful as a rough approximation.

Solar production relative to residential electricity use

For this analysis, we compared estimates of the technical potential for rooftop solar systems in each state (as estimated in a GIS-based analysis by the National Renewable Energy Laboratory) with residential electricity use (from the most recent EIA Residential Energy Consumption Survey or RECS). We looked for states where the solar technical potential in the residential sector was at least 50% of current residential consumption, or of residential consumption if energy efficiency were to reduce consumption by an average of 30%.

Our analysis only covers 24 states, as those are the states with detailed data in RECS at the single- or two-state level. Results of our analysis are shown in the map below. With efficiency, 23 out of the 24 states could hit the 50% solar threshold, including six reaching 75% solar (California, Colorado, Kansas, Nebraska, New Mexico, and Nevada). Without energy efficiency, only nine of the 24 states could meet at least half of the residential load with rooftop solar. Only in two states (California and Colorado) does solar potential exceed 75% of residential consumption. In other words, solar can meet a much larger proportion of residential loads if efficiency is included.

Cost per kWh of solar, energy efficiency, and the two combined

Item	Cost	kWh saved	Life (years)	Cost/kWh
Solar	$18,500		20	
Washington, DC		6451		$0.23
Las Vegas		8795		0.17
Energy efficiency	$2,943	3414	15.7	$0.08
Combined	$15,893			
Washington, DC		7930	18.1	$0.17
Las Vegas		9571	18.5	0.14

Source: ACEEE analysis based on the following assumptions and sources:

- Base solar system has a peak output of 5 kW; cost is $3.70/kW (both from Energy Sage).
- Solar kWh production from National Renewable Energy Laboratories' PVWatts Calculator using default assumptions.
- Energy efficiency costs and lifetime derived from ACEEE's New Horizons for Energy Efficiency study (new central AC with quality installation plus electric share of weatherization). Savings are about 30% of average kWh/home from EIA.
- Combined assumes that solar system downsized 30% due to energy efficiency, reducing both cost and production. Life is weighted average based on kWh savings.

ACEEE

This analysis doesn't include potential growth in electric loads such as from increased use of electric vehicles, or conversion of gas and oil space- and water-heating systems to heat pumps. Details of our analysis, including a case where all gas and oil space-heating systems are converted to heat pumps can be found here. In this alternative case, only two states meet the 50% threshold without efficiency, while 12 states meet the threshold with efficiency.

As with our first analysis, this is a rough analysis that assumes all of the solar potential is achieved and that all homes implement energy efficiency. Also, this simple analysis ignores the fact that some homes can produce more solar power than they use while other homes are not suitable for solar, such as those heavily shaded by trees or that do not face south. This analysis should be considered a yardstick and not a definitive analysis.

Conclusion

Energy efficiency will generally be less expensive per kWh than solar. And by lowering consumption, energy efficiency will stretch the available rooftop solar resource farther, allowing solar to serve a higher percent of residential consumption while also allowing a smaller and less expensive solar system. These are two simple analyses but they make a clear case that jelly (efficiency) is needed to help peanut butter (solar) do its best.

Search...

Blog

Hot Showers and Cool Rides: Wind, Sun, and the Duck Curve

Jim Lazar

On July 7, 2016

As we look out over the power sector transformation that is unmistakably upon us, there are those who warn of the sacrifices, the risks, and the costs that could come with more and more intermittent electricity generation—wind and solar energy, for example—on the grid.

They show us the "duck curve" that suggests that balancing supply and demand is more challenging with more stop-and-go power.

However, in our recent work *Teaching the Duck to Fly*, we point out that the net load curve can be flattened, with simple strategies and with positive results.

Let's look at just a couple of strategies on the customer side, starting in America's basements.

Across the country, there are about 45 million electric water heaters. With active control systems that are available today, these heaters can heat water when electricity is plentiful and cheap (maybe from 10 am to 3 pm when the sun is high, or from midnight to 6 am when demand is low) and hold it for hours, so it's ready to supply a hot shower after an afternoon soccer practice—during the electric system peak. Then, late at night, the heater can charge again when there is surplus electricity on the grid. Maybe it's wind, or nuclear—but there's plenty of it at 2 am.

Operating on schedules like this, the water heaters can be controlled to reduce peak demand and to augment demand at slack times. If we controlled all of them, we would reduce peak demand by about 22,000 MW. (With the average new coal plant at 500 MW, that's about 44 coal plants worth). And we could find a ready market for off-peak power. Companies such as Steffes Corporation, Sequentric, and Power Over Time are already deploying this technology today on water heaters in dozens of utility service territories, but this only scratches the surface of the full potential.

But wait—there's more. We can convert many of these water heaters to high-efficiency heat pump models that use about one-third as much electricity. This won't work everywhere—heat pump water heaters are generally not a good choice for apartments or mobile homes—but probably half of the electric water heater fleet across the United States are candidates for this conversion. That's 22 million water heaters.

Because a conventional electric water heater uses about 4,000 kWh/year and a heat pump unit about 1,500 kWh/year, each of these more efficient hot water heaters could free up about 2,500 kWh per year of electricity per household. That's essentially "found" electricity. So what do we do with this new energy from 22 million converted water heaters?

Let's move to the garage.

Guess how much the average electric vehicle uses in a year? That's right, about 2,500 kWh, the same we save by improving each hot water heater. If we did half of the water heaters, that would free up enough electricity to supply 22 million cars. But there is even more value here.

Electric cars (like all cars) are normally just parked most of the time. Like the hot water heaters, they can be controlled to pull electricity when power is plentiful (often in the middle of the night, and increasingly in the middle of the solar day). The necessary controls are already installed in all new electric vehicles, making them perfectly suited to take advantage of low demand times. That means they, too, can help contend with the duck curve, staying off the grid during peak periods and soaking up power when the sun is shining, the wind is blowing, or people are sleeping.

So, first we reduce peak demand by controlling water heaters. Then we add a market for off-peak power. Then we conserve a big part of the water heating load, and use that power to displace gasoline. And we control the electric car charging, so that it also is done at low-cost hours.

What all of this illustrates is that households can effectively cash in wasteful hot water heating for cleaner, cheaper mobility. And what this also means for power sector transformation generally is that these particular fixtures of life in America—hot water heaters and automobiles—may be among the most important tools in managing demand on the grid during the course of the day, to adapt to more and more intermittent power. They help flatten the "duck curve."

So, what big-picture, power sector conventional wisdom does this all challenge?

- It challenges the idea that the system can't handle large amounts of variable energy and that the system is less reliable with more renewables. (We just need to direct that power to suitable tasks.)
- It challenges the notion that the grid needs massive investment in new distribution to serve solar and to serve electric vehicles. (We can do that with the grid we have today if we manage it carefully.)
- And it challenges the belief that to add renewable energy, we need to also add gas peaking plants to back up the wind and solar. (Remember the "found" electricity?)

So even in an era of change, we can have hot showers and cool rides. In fact, modern hot water heaters and electric cars may be a key part of a less costly, less risky, more reliable, and cleaner grid.

More on this Topic

Report February 01, 2016

Teaching the "Duck" to Fly - Second Edition

By Jim Lazar

Read now

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CONNECTICUT
GREEN BANK

Memo

To: Members of the Connecticut Green Bank (the "Green Bank")) Audit Committee

From: George Bellas

CC: Bryan Garcia, Brian Farnen, Bert Hunter, Mackey Dykes

Date: October 21, 2016

Re: Results of annual financial audit of the Green Bank and the Green Bank 2016 draft CAFR

Dear Committee members:

Results of Annual Financial Audit:

Blum Shapiro and Company Performed the annual financial audit of the Green Bank for the fiscal year ending June 30, 2016. They will be presenting the results of their audit to the Committee during the meeting. A copy of their presentation is included in the materials you have received. The audit itself went well with no material internal control weaknesses identified or material adjustments to the financial books and records recorded.

Green Bank 2016 draft CAFR:

I am enclosing the draft Green Bank 2016 CAFR for your review. The major sections of the CAFR are as follows:

1. Financial Audit Section

2. Statistical Section

Financial Section:

This section contains Management's Discussion and Analysis of the results of operations for the current and prior fiscal years as well as the audited financial statements and related footnotes.

The financial statements themselves, comprised of the Statement of Net Position, the Statement of Revenues, Expenses and Changes in Net Position and the Statement of

Cash Flows have been completed except for some additional disclosures in the Statement of Cash Flows which will be completed by the date of the Committee meeting. The related footnotes are materially complete except for the following additional disclosures which will be complete by the date of the Committee meeting:

- Note 8 – Program Loans: Completion of the repayment schedule for program loans.
- Note 9 – Financing Activities – Updating the Solar Mosaic note payment schedule and adding narrative and a repayment schedule for the Reinvestment Fund note payable.
- Note 15 Commitments and Loan Guarantees – Adding narrative and a schedule for program loan guarantees of the Green Bank.

In addition, there is general clean-up for typos and grammar in the footnote narratives. We do not anticipate any further adjustments to the financial statements themselves which would have a material impact on the financial position of the Green Bank.

Statistical Section

The statistical section is broken out into two subsections:

Financial Statistics:

Financial Statistics are organized in tables as follows:

- Net Position by Component
- Changes in Net Position
- Operating Revenue by Source
- Significant Sources of Operating Revenue
- Outstanding Debt by Type
- Demographic and Economic Information
- Principal Employers for the State of Connecticut
- FTE’s by Function
- Operating Indicators by Function

No additional changes to the data in these tables is anticipated.

Non-Financial Statistics:

The non-financial statistical section contains statistical data and narrative pertaining to the Green Bank's current programs. There is a table of contents in the front of this section for the reader's use.

In conclusion I wish to thank the committee members for their effort in reviewing this document. Our goal is to provide readers with a comprehensive overview of the financial and programmatic activities of the Green Bank on an annual basis.

RESOLUTION:

WHEREAS, Article V, Section 5.3.1(ii) of the Connecticut Green Bank ("Green Bank") Operating Procedures requires the Audit, Compliance, and the Governance Committee (the "Committee") to meet with the auditors to review the annual audit and formulation of an appropriate report and recommendations to the Board of Directors of the Green Bank (the "Board") with respect to the approval of the audit report;

NOW, therefore be it:

RESOLVED, that the Committee hereby recommends to the Board of Directors for approval the proposed draft Comprehensive Annual Financial Report (CAFR) contingent upon no further adjustments to the financial statements or additional required disclosures which would materially change the financial position of the Green Bank as presented.

CONNECTICUT GREEN BANK
(A Component Unit of the State of Connecticut)

COMPREHENSIVE ANNUAL
FINANCIAL REPORT

FISCAL YEAR ENDED JUNE 30, 2016
(With Summarized Totals as of and for Fiscal Year Ended June 30, 2015)

Department of Finance and Administration
845 Brook Street
Rocky Hill, Connecticut

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INTRODUCTORY SECTION

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CONNECTICUT
GREEN BANK

October XX, 2016

We are pleased to present a Comprehensive Annual Financial Report (CAFR) of the Connecticut Green Bank ("Green Bank") for the fiscal year ending June 30, 2016 accompanied by summarized totals as of and for the fiscal year ended June 30, 2015.

Management assumes full responsibility for the completeness and reliability of the information contained in this report based upon a comprehensive framework of internal controls that it has established for this purpose. To provide a reasonable basis for making these representations, the management of Green Bank has established a comprehensive internal control framework that is designed both to protect the entity's assets from loss, theft, or misuse, and to compile sufficient reliable information for the preparation of Green Bank's financial statements in conformity with accounting principles generally accepted in the United States of America (GAAP). Because the cost of internal controls should not outweigh the benefits, Green Bank's comprehensive framework of internal controls has been designed to provide reasonable, rather than absolute assurance that the financial statements will be free from material misstatement. As such, management asserts that this financial report is complete and reliable in all material respects to the best of managements' knowledge and belief.

Blum Shapiro & Company has issued an unmodified opinion on the Green Bank's financial statements for the fiscal year ending June 30, 2016. The independent auditors' report is presented in the financial section of this report. This letter of transmittal is designed to complement the Management's Discussion and Analysis (MD&A) and should be read in conjunction with it. The Green Bank's MD&A can be found immediately following the report of the independent auditors.

The Government Finance Officers Association of the United States and Canada (GFOA) awarded a Certificate of Achievement for Excellence in Financial Reporting to the Connecticut Green Bank for its comprehensive annual report for the fiscal year ended June 30, 2015 and June 30, 2014. In order to be awarded a Certificate of Achievement, a government must publish an easily readable and efficiently organized comprehensive annual financial report. This report must satisfy both generally accepted accounting principles and applicable legal requirements.

A Certificate of Achievement is valid for a period of one year only. We believe that our current comprehensive annual financial report continues to meet the Certificate of Achievement Program's requirements and we are submitting it to the GFOA to determine its eligibility for another certificate.

Profile of the Connecticut Green Bank

The Green Bank[1] was established in a bipartisan manner by the Governor and Connecticut's General Assembly on July 1, 2011 through Public Act 11-80 as a quasi-public agency that supersedes the former Connecticut Clean Energy Fund. As the nation's first state green bank, the Connecticut Green Bank makes green energy more accessible and affordable for all Connecticut citizens and businesses by creating a thriving marketplace to accelerate the growth of green energy. We facilitate green energy deployment by leveraging a public-private financing model that uses limited public dollars to attract private capital investments. By partnering with the private sector, we create solutions that result in long-term, affordable financing to increase the number of green energy projects statewide.

The Green Bank's vision is to lead the green bank movement by accelerating private investment in clean energy deployment for Connecticut to achieve economic prosperity, create jobs, promote energy security and address climate change. By accelerating the growth of green energy we contribute to a better quality of life, a better environment and a better future for Connecticut. The Green Bank's mission is to support the Governor's and Legislature's energy strategy to achieve cleaner, cheaper and more reliable sources of energy while creating jobs and supporting local economic development.

To achieve its vision and mission, the Green Bank has established the following three goals:

1. To attract and deploy capital to finance the clean energy[2] goals for Connecticut, including:

2. To develop and implement strategies that bring down the cost of clean energy in order to make it more accessible and affordable to consumers.

3. To reduce reliance on grants, rebates, and other subsidies and move towards innovative low-cost financing of clean energy deployment.

These goals support the implementation of Connecticut's clean energy policies be they statutory (i.e., Public Act 11-80, Public Act 13-298, Public Act 15-194), planning (i.e., Comprehensive Energy Strategy, Integrated Resources Plan), or regulatory in nature. The powers of the Green Bank are vested in and exercised by a Board of Directors that is comprised of eleven voting and two non-voting members each with knowledge and expertise in matters related to the purpose of the organization. The Board of Directors and Staff are governed through the statute, as well as an Ethics Statement and Ethical Conduct Policy, Resolutions of Purposes, Bylaws, and Comprehensive Plan.

[1] Public Act 11-80 repurposed the Connecticut Clean Energy Fund (CCEF) administered by Connecticut Innovations, into a separate quasi-public organization called the Clean Energy Finance and Investment Authority (CEFIA). Per Public Act 14-94, CEFIA was renamed to the Connecticut Green Bank.

[2] Public Act 11-80 defines "clean energy" broadly and includes familiar renewable energy sources such as solar photovoltaic, solar thermal, geothermal, wind and low-impact hydroelectric energy, but also includes fuel cells, energy derived from anaerobic digestion (AD), combined heat and power (CHP) systems, infrastructure for alternative fuels for transportation and financing energy efficiency projects.

Initiatives and Results

Accelerate the Growth of Green Energy
The Green Bank makes green energy more accessible and affordable for all Connecticut citizens and businesses by creating a thriving marketplace to accelerate the growth of green energy. As a result of the efforts undertaken over the past five years, we are deploying more green energy in our state than ever before (see Table 1).[3]

Table 1. Project Investments between FY 2012 through FY 2016[4]

	FY 2016	FY 2015	FY 2014	FY 2013	FY2012	Total
Total Investment ($ MM)	$ 314.1	$ 335.5	$ 140.2	$ 111.1	$ 15.0	$ 915.8
Green Bank Investment ($ MM)	$ 48.0	$ 55.7	$ 37.8	$ 18.6	$ 4.8	$ 165.0
Leverage Ratio	6.6 : 1.0	6.1 : 1.0	3.7 : 1.0	6.0 : 1.0	3.1 : 1.0	5.6 : 1.0
% of Funding Approved as Grants	43%	50%	48%	67%	100%	51%
Installed Capacity (MW)	74.4	65.5	26.1	23.5	2.9	192.3

By using $165.0 million of ratepayer funds, we have attracted over $750.8 million of private investment in clean energy for a total investment of $915.8 million. This is supporting the deployment of 192.3 MW of renewable energy and producing and saving an estimated 1.3 million MMBtu of clean energy while creating over 11,000 job-years and reducing an estimated 2.1 million tons of CO_2 emissions over the life of the projects.

We Grow Businesses and We Help People Thrive
As leaders in the green bank movement – through innovation, education, and activation – we accelerate the growth of green energy. By generating a robust, flourishing green energy marketplace, we grow businesses and help people thrive. Within this marketplace the Green Bank partners with contractors and capital providers to offer a diverse portfolio of programs that benefit homeowners, businesses, and institutions. The Green Bank is demonstrating how public resources can be better invested in ways that attract more private investment in our communities, lead to the deployment of more green energy by local contractors, and most importantly providing positive value to our consumers.

The Green Bank helps make homes more energy efficient and sustainable by promoting awareness and offering flexible financing solutions to homeowners and multifamily building owners who seek assistance to make green energy upgrades. We make green energy more attractive to everyone so that residents can integrate it into their lives. The benefits are many – from reducing the burden of energy costs, to improving comfort and health in the home, to a cleaner environment. More green homes mean greener, healthier communities.

The Green Bank makes green energy investments smarter and safer for businesses, including commercial and industrial customers, and institutions, including multifamily and not-for-profit

[3] Connecticut Green Bank – Investment and Public Benefit Performance from Clean Energy Projects from FY 2012 through FY 2015 – Board of Director Memo of October 16, 2015

[4] Includes approved, closed and completed transactions approved by the Board of Directors consistent with its Comprehensive Plan and Budget.

organizations, with affordable, long-term financing for energy upgrades. We demonstrate how green energy improvements are smart investments that lower operating costs. We inspire them to embrace cleaner and more reliable sources of energy to power their buildings which stimulates a healthier local economy. Healthy buildings mean healthy businesses and institutions.

The Green Bank makes green energy more accessible and affordable to grow businesses and help people thrive.

Leading the Green Bank Movement

The Connecticut Green Bank is a leader in the green bank movement. The Connecticut Green Bank and its programs serve as models for other states across the country.

This year, we have seen several of our programs serving as replicable and scalable models, including:

- Commercial Property Assessed Clean Energy (C-PACE) for commercial, industrial, multifamily, and non-profit buildings with Hannon Armstrong
- Solar for All residential solar PV lease and energy efficiency energy savings agreement for low-to-moderate income households with PosiGen

The Connecticut Green Bank is leading a movement to use public funds more responsibly by attracting and deploying more private investment in green energy for the state's economy and environment.

In a study done by the Center for America Progress,[5] it is estimated that the U.S. needs at least $200 billion in efficient and renewable energy annually for 20 years to reduce carbon emissions and avert climate disaster. The Natural Resources Defense Council and Coalition for Green Capital estimate that based on Connecticut, its market size, growth rate, and private-public leverage ratio, that a green bank – like the Connecticut Green Bank – successfully operating in every state in America would yield $200 billion in national annual investment within 5 years, with 90% of funds coming from private sources and all public contributions returned over 10 to 20 years.

Responsible Public Investment in Green Energy

The Green Bank receives funding through a number of sources, including a Systems Benefit Charge, the Regional Greenhouse Gas Initiative (RGGI), renewable energy certificate (REC) sales and the federal government. The Green Bank's predecessor organization's programs were all structured as grants, which meant the funds were spent with no expectation of return. This model put the organization at the mercy of these funding streams which, while reliable, are largely determined by activities outside of our control such as levels of state electricity use and RGGI allowance prices. With the transition to a new financing model, the Green Bank is able to invest its funds in activities that earn a return and begin to build revenue streams that can be reinvested in green energy in Connecticut.

[5] Green Growth: A U.S. Program for Controlling Climate Change and Expanding Job Opportunities by the Center for American Progress (September 2014)

Acknowledgements

First and foremost, we would like to thank the Staff of the Connecticut Green Bank. In our first five years, through their hard work, commitment and innovation, we have built a model that is delivering results for our state and serving as a model across the country and around the world.

We are grateful to our independent auditors, Blum Shapiro & Company, for their assistance and advice during the course of this audit, and for supporting our interests in continuing to disclose not only our financial position, but also the public benefits to society resulting from our public-private investments.

Finally, we thank the Board of Directors for their continued leadership and guidance as we continue to prove that there is a new model for how government is able to play a part in deploying more green energy at a faster pace while using public resources responsibly.

Respectfully submitted,

Bryan T. Garcia President and CEO	George Bellas Vice President – Finance and Administration

Board of Directors

Connecticut Green Bank

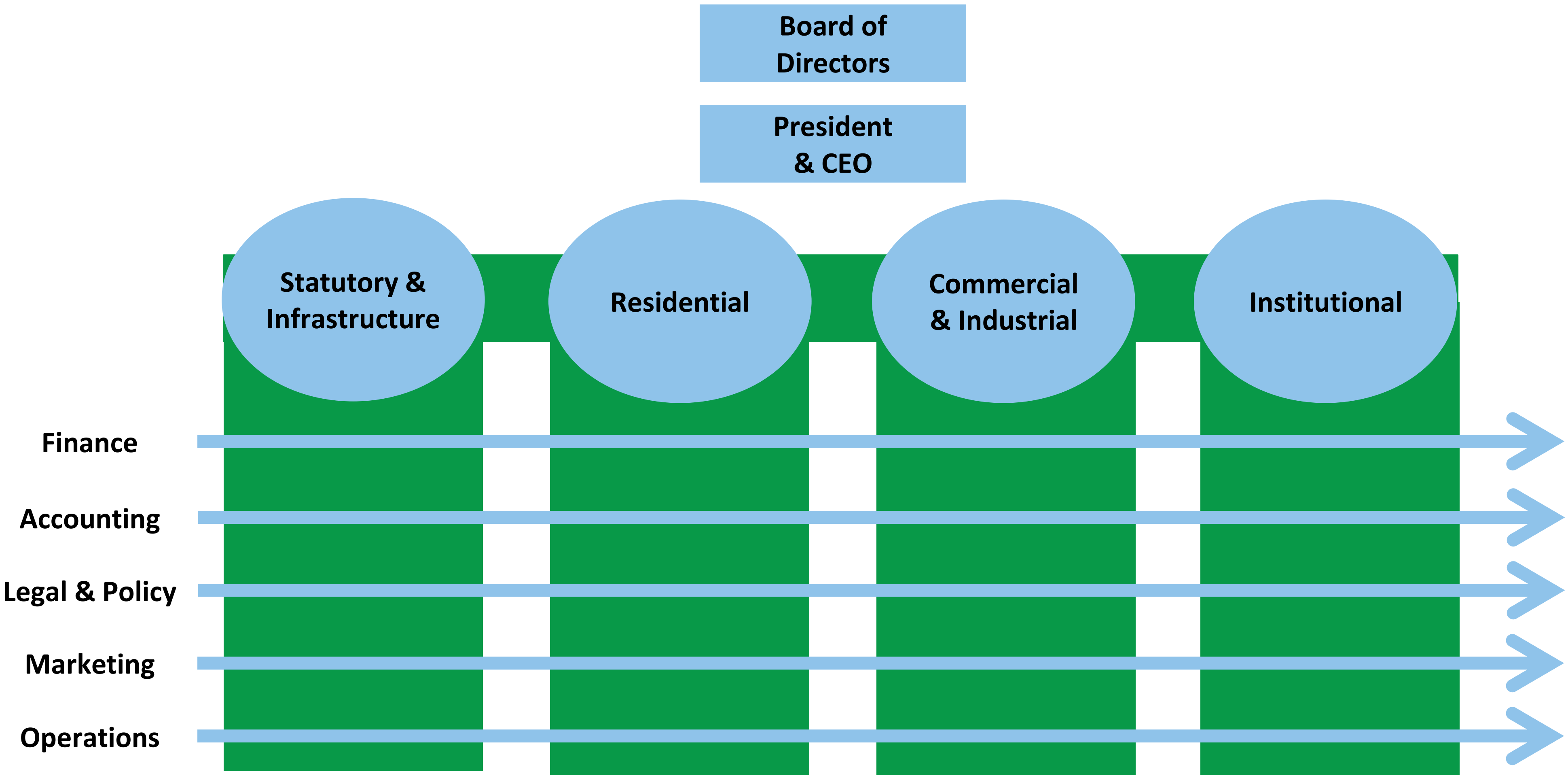
Position	Status	Voting	Name	Organization
State Treasurer (or designee)	Ex Officio	Yes	Bettina Ferguson	Treasurer's Office
Commissioner of DEEP[6] (or designee)	Ex Officio	Yes	Robert Klee[7]	DEEP
Commissioner of DECD[8] (or designee)	Ex Officio	Yes	Catherine Smith[9]	DECD
Residential or Low Income Group	Appointed	Yes	Pat Wrice	Operation Fuel
Investment Fund Management	Appointed	Yes	Norma Glover	NJG Associates
Environmental Organization	Appointed	Yes	Matthew Ranelli[10]	Shipman & Goodwin
Finance or Deployment	Appointed	Yes	Thomas Flynn	Environmental Data Resources
Finance of Renewable Energy	Appointed	Yes	Reed Hundt[11]	Coalition for Green Capital
Finance of Renewable Energy	Appointed	Yes	Kevin Walsh	GE Energy Financial Services
Labor	Appointed	Yes	John Harrity	IAM Connecticut
R&D or Manufacturing	Appointed	Yes	Mun Choi	University of Connecticut
President of the Green Bank	Ex Officio	No	Bryan Garcia	Connecticut Green Bank
Board of Connecticut Innovations[12]	Ex Officio	No	(unfilled)	(unfilled)

Discretely Presented Component Units

Position	Name
President	Bryan Garcia
Treasurer	George Bellas
Secretary	Brian Farnen
Chief Investment Officer	Roberto Hunter

[6] Department of Energy and Environmental Protection
[7] Vice Chairperson of the Board of Directors and Chairperson of the Budget and Operations Committee
[8] Department of Economic and Community Development
[9] Chairperson of the Board of Directors
[10] Secretary of the Board of Directors and Chairperson of the Audit, Compliance and Governance Committee
[11] Chairperson of the Deployment Committee
[12] It should be noted that several members of the Board of Directors of the Green Bank currently serve on the Board of Directors of Connecticut Innovations, including Mun Choi and Catherine Smith.

Organizational Chart



Government Finance Officers Association

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Presented to

Connecticut Green Bank

For its Comprehensive Annual Financial Report for the Fiscal Year Ended

June 30, 2015

Executive Director/CEO

FINANCIAL SECTION

INDEPENDENT AUDITORS' REPORT

To the Board of Directors
Connecticut Green Bank

Report on the Financial Statements

We have audited the accompanying financial statements of the business-type activities and discretely presented component units of the Connecticut Green Bank (CGB) (a component unit of the State of Connecticut) as of and for the fiscal year ended June 30, 2016, and the related notes to the financial statements, which collectively comprise CGB's basic financial statements, as listed in the table of contents.

Management's Responsibility for the Financial Statements

Management is responsible for the preparation and fair presentation of these financial statements in accordance with accounting principles generally accepted in the United States of America; this includes the design, implementation, and maintenance of internal control relevant to the preparation and fair presentation of financial statements that are free from material misstatement, whether due to fraud or error.

Auditors' Responsibility

Our responsibility is to express opinions on these financial statements based on our audits. We conducted our audits in accordance with auditing standards generally accepted in the United States of America and the standards applicable to financial audits contained in *Government Auditing Standards*, issued by the Comptroller General of the United States. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free from material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the financial statements. The procedures selected depend on the auditors' judgment, including the assessment of the risks of material misstatement of the financial statements whether due to fraud or error. In making those risk assessments, the auditor considers internal control relevant to the entity's preparation and presentation of the financial statements in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the entity's internal control. Accordingly, we express no such opinion. An audit also includes evaluating the appropriateness of accounting policies used and the reasonableness of significant accounting estimates made by management, as well as evaluating the overall presentation of the financial statements.

We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinions.

Opinions

In our opinion, the financial statements referred to above present fairly, in all material respects, the respective financial position of the business-type activities and the discretely presented component units of the Connecticut Green Bank as of June 30, 2016, and the respective changes in financial position and cash flows for the year then ended in accordance with accounting principles generally accepted in the United States of America.

Change in Method of Accounting for Pensions

As described in Note 2 to the financial statements, CGB changed its method for accounting and financial reporting for pensions as a result of the adoption of Governmental Accounting Standards Board (GASB) Statement No. 68, *Accounting and Financial Report Reporting for Pensions – an Amendment of GASB Statement No. 27* and GASB Statement No. 71, *Pension Transition for Contributions Made Subsequent To the Measurement Date – an Amendment of GASB Statement No. 68*, both effective July 1, 2014. Our opinion is not modified with respect to this matter.

Other Matters

Required Supplementary Information

Accounting principles generally accepted in the United States of America require that the Management's Discussion and Analysis and schedule of Green Bank's proportionate share of the net pension liability and proportionate share of contributions to the state employees' retirement system (SERS) be presented to supplement the financial statements. Such information, although not a part of the financial statements, is required by the Governmental Accounting Standards Board who considers it to be an essential part of financial reporting for placing the financial statements in an appropriate operational, economic, or historical context. We have applied certain limited procedures to the required supplementary information in accordance with auditing standards generally accepted in the United States of America, which consisted of inquiries of management about the methods of preparing the information and comparing the information for consistency with management's responses to our inquiries, the financial statements, and other knowledge we obtained during our audit of the financial statements. We do not express an opinion or provide any assurance on the information because the limited procedures do not provide us with sufficient evidence to express an opinion or provide assurance.

Other Information

The introductory section, financial statistical section and other statistical section have not been subjected to the auditing procedures applied in the audit of the basic financial statements, and accordingly, we do not express an opinion or provide any assurance on them.

Other Reporting Required by Government Auditing Standards

In accordance with *Government Auditing Standards*, we have also issued our report dated XXXX XX, 2016, on our consideration of the Connecticut Green Bank's internal control over financial reporting and on our tests of its compliance with certain provisions of laws, regulations, contracts, and grant agreements and other matters. The purpose of that report is to describe the scope of our testing of internal control over financial reporting and compliance and the results of that testing, and not to provide an opinion on internal control over financial reporting or on compliance. That report is an integral part of an audit performed in accordance with *Government Auditing Standards* in considering the Connecticut Green Bank's internal control over financial reporting and compliance.

Hartford, CT
XXXX XX, 2016

The following Management's Discussion and Analysis (MD&A) provides an overview of the financial performance of the Connecticut Green Bank (CGB), formerly known as the Clean Energy Finance and Investment Authority, (a component unit of the State of Connecticut) for the fiscal year ended June 30, 2016. The information contained in this MD&A should be considered in conjunction with the information contained in the financial statements and notes to the financial statements included in the "Financial Statements" section of this report.

CBG as a reporting entity is comprised of the primary government and two discretely presented component units as defined under Government Auditing Standards Board Statement No. 61: *The Financial Reporting Entity: Omnibus and Amendment of GASB Statements No. 14 and No. 34*.

FINANCIAL STATEMENTS PRESENTED IN THIS REPORT

On June 6, 2014, Public Act 14-94 of the State of Connecticut changed the name of the Clean Energy Finance and Investment Authority to the Connecticut Green Bank.

CGB is a quasi-public agency of the State of Connecticut established on July 1, 2011 by Section 16-245n of the Connecticut General Statutes, created for the purposes of, but not limited to: (1) implementing the Comprehensive Plan developed by CGB pursuant to Section 16-245n(c) of the Connecticut General Statutes, as amended; (2) developing programs to finance and otherwise support clean energy investment in residential, municipal, small business and larger commercial projects, and such others as CGB may determine; (3) supporting financing or other expenditures that promote investment in clean energy sources to foster the growth, development and commercialization of clean energy resources and related enterprises; and (4) stimulating demand for clean energy and the deployment of clean energy sources within the state that serve end-use customers in the State. CGB constitutes the successor agency to Connecticut Innovations for the purposes of administering the Connecticut Clean Energy Fund in accordance with section 4-38d of the Connecticut General Statutes and therefore the net position of such fund were transferred to the newly created CGB as of July 1, 2011.

The financial statements include: Statement of Net Position, Statement of Revenues, Expenses and Changes in Net Position, and the Statement of Cash Flows. The Statement of Net Position provides a measure of CGB's economic resources. The Statement of Revenues, Expenses and Changes in Net Position measures the transactions for the periods presented and the impact of those transactions on the resources of CGB. The Statement of Cash Flows reconciles the changes in cash and cash equivalents with the activities of CGB for the period presented. The activities are classified as to operating, noncapital financing, capital and related financing, and investing activities.

Notes to the financial statements provide additional detailed information to supplement the basis for reporting and nature of key assets and liabilities.

FINANCIAL HIGHLIGHTS OF FISCAL 2016

NET POSITION

Net position increased by $18.2 million to $127.4 million at June 30, 2016 and cash and cash equivalents increased by $9.1 million in 2016 to $57.8 million.

The acquisition of $3.5 million in bonds was a part of the proceeds received by CGB as a result of the sale of CPACE program loans during fiscal years 2014 through 2016. See Note 6. Solar lease notes decreased $811,000 as a result of scheduled principal repayments. See Note 7. The decrease in program loans in 2016 to $33.3 million as compared to $40.5 million in 2015 was primarily a result of the sale of CPACE loans held in the CGB portfolio to an outside investor. See Note 8. Capital assets increased to $57.9 million in 2016 compared to $27.0 million in 2015 as a result of the continued acquisition of solar equipment by CT Solar Lease 2 LLC. See Note 1 for further discussion of CT Solar Lease 2 LLC’s operations.

As of June 30, 2016, the Board of Directors designated $95.3 million in net position to fund contingent grant, loan and investment commitments as described in Note 15. These grants, loans and investments are expected to be paid or funded over the next one to six fiscal years.

The following table summarizes the net position of the reporting entity at June 30, 2016 and 2015 (in thousands):

	2016	2015	Increase (Decrease)
Cash and cash equivalents	$ 57,822	$ 48,693	$ 9,129
Bonds receivable	3,492	1,600	1,892
Portfolio investments	1,000	1,000	--
Solar lease notes	9,008	9,819	(811)
Program loans	33,268	40,518	(7,250)
Capital assets, net	65,927	26,971	38,956
Other assets	6,061	8,972	(2,911)
Total Assets	176,578	137,573	39,005
Deferred Outflows of Resources			
Deferred amount for pensions	2,573	1,669	904
Total Deferred Outflows of Resources	2,573	1,669	904
Current liabilities	6,612	6,825	(213)
Unrearned revenue	6,258	2,519	3,739
Pension liabilities	16,096	14,900	1,196
Other long term liabilities	2,528	1,093	1,435
Long term debt, less current maturities	18,648	3,546	15,102
Total Liabilities	50,142	28,883	21,259
Deferred Inflows of Resources			
Fair value of interest rate swap	1,628	660	968
Deferred amount for pensions	(3)	532	(535)
Total Deferred Outflows of Resources	1,625	1,192	433
Invested in capital assets	57,864	26,971	30,893
Restricted Net Position:			
Non-expendable	1	1	--
Restricted - energy programs	9,750	8,799	951
Unrestricted	59,769	73,396	(13,627)
Total Net Position	$ 127,384	$ 109,167	$ 18,217

CHANGES IN NET POSITION

Revenue from interest on cash deposits and promissory notes increased $ 705,000 to $3.0 million in 2016. CGB received $6.5 million from the State in RGGI auction proceeds during the year as compared to RGGI auction proceeds of $16.6 million in 2015. Public Act 13-247, see Note 11, allowed the Commissioner of the Connecticut Department of Energy and Environmental Protection to transfer additional RGGI auction proceeds to CGB to be used to support energy efficiency financing opportunities. This increase in RGGI auction proceeds helped offset payments to the State by CGB required under Public Act 13-247 during fiscal year 2015.

Total expenditures for grants and programs in 2016 were $27.2 million, an increase of $5.1 million when compared to the total expenditures of $22.1 million in 2015. Included in these totals are payments representing financial incentives to residential and commercial property owners to install renewable energy or energy efficiency measures of $12.8 million in 2016 and 11.3 million in 2015. These financial incentives and the associated costs to administer these payments fluctuate from year to year as they are based on the achievement of contract milestones established by each CGB program.

General and administrative expenses increased by $1.5 million in 2016 to $4.6 million compared to $3.1 million in 2015 primarily as a result of new marketing and branding initiatives undertaken in 2016.

The following table summarizes the changes in net position between June 30, 2016 and 2015 (in thousands):

Changes in Net Position
(in thousands)

	2016	2015	Increase (Decrease)
Revenues	$ 37,788	$ 46,294	$ (8,506)
Operating Expenses			
Grants and programs	27,228	22,131	5,097
General and administrative expense	4,630	3,117	1,513
Total Operating Expenses	31,858	25,248	6,610
Operating Income	5,930	21,046	(15,116)
Non-Operating Revenues (Expenses)			
Interest earned	3,017	2,312	705
Interest expense	(731)	(119)	(612)
Investment loss	(3)	(1,180)	1,177
Unrealized loss on interest rate swap	(968)	(660)	(308)
Provision for loan losses	(1,022)	(564)	(458)
Capital contribution	12,294	6,844	5,450
Distribution to member	(301)	(105)	(196)
Payments to State of Connecticut	--	(19,200)	19,200
Net Change	$ 18,216	$ 8,374	$ 9,842

FINANCIAL HIGHLIGHTS OF FISCAL 2015

NET POSITION

Net position increased by $8.4 million to $109.1 million at June 30, 2015 and cash and cash equivalents decreased by $32 million in 2015 to $48.7 million.

The acquisition of $1.6 million in bonds was a part of the proceeds received by CGB as a result of the sale of CPACE program loans during fiscal year 2014. See Note 6. Solar lease notes decreased $0.7 million as a result of scheduled principal repayments. See Note 7. The increase in program loans in 2015 to $40.5 million as compared to $13.4 million in 2014 was primarily a result of increased CGB financings of CPACE and residential solar projects. See Note 8. Capital assets increased to $27.0 million from $3.1 million in 2015 as a result of the continued acquisition of solar equipment by CT Solar Lease 2 LLC. See Note 1 for further discussion of CT Solar Lease 2 LLC's operations.

As of June 30, 2015, the Board of Directors designated $89.5 million in net position to fund contingent grant, loan and investment commitments as described in Note 15. These grants, loans and investments are expected to be paid or funded over the next one to six fiscal years. In addition to these commitments, an additional $23 million has been designated by the Board to fund future program commitments.

The following table summarizes the net position at June 30, 2015 and 2014 (in thousands):

	2015	2014	Increase (Decrease)
Cash and cash equivalents	$ 48,693	$ 80,925	$ (32,232)
Bonds receivable	1,600	1,600	--
Portfolio investments	1,000	1,000	--
Solar lease notes	9,819	10,544	(725)
Program loans	40,518	13,403	27,115
Capital assets, net	26,971	3,074	23,897
Other assets	8,971	9,943	(972)
Total Assets	137,572	120,489	17,083
Deferred Outflows of Resources			
Deferred amount for pensions	1,669	--	1,669
Total Deferred Outflows of Resources	1,669	--	1,669
Current liabilities	6,825	4,801	2,024
Unrearned revenue	2,519	469	2,050
Pension liabilities	14,900	14,305	595
Other long term liabilities	1,093	--	1,093
Long term debt, less current maturities	3,546	121	3,425
Total Liabilities	28,883	19,696	9,187
Deferred Inflows of Resources			
Fair value of interest rate swap	660	--	660
Deferred amount for pensions	532	--	532
Total Deferred Outflows of Resources	1,192	--	1,192
Invested in capital assets	26,971	3,074	23,897
Restricted Net Position:			
Non-expendable	1	1	--
Restricted - energy programs	8,799	9,096	(297)
Unrestricted	73,396	88,622	(15,226)
Total Net Position	$ 109,167	$ 100,793	$ 8,374

Changes in Net Position

Revenue from interest on cash deposits and promissory notes increased $1.2 million to $2.3 million in 2015. CGB received $16.6 million from the State in RGGI auction proceeds during the year as compared to RGGI auction proceeds of $20.1 million in 2014. Public Act 13-247, see Note 11, allowed the Commissioner of the Connecticut Department of Energy and Environmental Protection to transfer additional RGGI auction proceeds to CGB to be used to support energy efficiency financing opportunities. This increase in RGGI auction proceeds helped offset payments to the State by CGB required under Public Act 13-247 during fiscal year 2015.

Total expenditures for grants and programs in 2015 were $22.1 million, a decrease of $1.3 million from the prior year. Grant and program expenditures fluctuate from year to year as they are based on the achievement of contract milestones by the grantee.

General and administrative expenses increased by $580 thousand from $2.5 million to $3.1 million.

The following table summarizes the changes in net position between June 30, 2015 and 2014 (in thousands):

Changes in Net Position
(in thousands)

	2015	2014	Increase (Decrease)
Revenues	$ 46,294	$ 48,754	$ (2,460)
Operating Expenses			
Grants and programs	22,131	23,439	(1,308)
General and administrative expense	3,117	2,537	580
Total Operating Expenses	25,248	25,976	(728)
Operating Income	21,046	22,778	(1,732)
Non-Operating Revenues (Expenses)			
Interest earned	2,312	1,142	1,170
Interest expense	(119)	--	(119)
Investment loss	(1,180)	--	(1,180)
Unrealized loss on interest rate swap	(660)	--	(660)
Provision for loan losses	(564)	(1,311)	747
Capital contribution	6,844	201	6,643
Distribution to member	(105)	(12)	(93)
Payments to State of Connecticut	(19,200)	(6,200)	(13,000)
Net Change	$ 8,374	$ 16,598	$ (8,224)

REQUESTS FOR INFORMATION

This financial report is designed to provide a general overview of CGB's finances. Questions concerning any of the information provided in this report or request for additional financial information should be addressed to the Office of Finance and Administration, 845 Brook Street, Rocky Hill, Connecticut 06067.

CONNECTICUT GREEN BANK

STATEMENT OF NET POSITION

JUNE 30, 2016
(With Summarized Totals for June 30, 2015)

	Total Primary Government	Discretely Presented Component Units CT Solar Lease 2 LLC	CEFIA Solar Services Inc.	Eliminating Entries	2016 Total Reporting Entity	2015 Total Reporting Entity
Assets						
Current Assets						
Cash and cash equivalents	$ 41,569,388	$ 1,381,506	$ 5,121,165	$ --	$ 48,072,060	$ 39,893,649
Accounts receivable	1,408,922	21,700	--	--	1,430,621	35,155
Utility remittance receivable	2,670,634	--	--	--	2,670,634	2,518,850
Other receivables	264,197	165,805	--	--	430,002	313,228
Due from component units	44,346,437	574,723	4,407,273	(49,328,433)	--	--
Prepaid expenses and other assets	3,286,803	959,003	--	--	4,245,806	1,030,251
Contractor loans	2,272,906	--	--	--	2,272,906	3,112,663
Current portion of solar lease notes	845,479	--	--	--	845,479	803,573
Current portion of portfolio investments	884,739	--	--	--	884,739	10,264,825
Total Current Assets	97,549,505	3,102,737	9,528,438	(49,328,433)	60,852,247	57,972,194
Noncurrent Assets						
Portfolio investments	1,000,000	--	--	--	1,000,000	1,000,000
Bonds receivable	3,492,282	--	--	--	3,492,282	1,600,000
Solar Lease Notes, less current portion	8,162,635	--	--	--	8,162,635	9,015,437
Program loans, less current portion	32,382,778	--	--	--	32,382,778	30,253,119
Renewable Energy Certificates	812,772	--	--	--	812,772	933,054
Investment in component units	100	--	20,982,892	(20,982,992)	--	--
Capital assets, net of depreciation and amortization	248,752	65,678,491	--	(8,063,456)	57,863,787	26,971,087
Asset retirement obligation,net	--	2,261,472	--	--	2,261,472	1,029,196
Restricted assets:	--	--	--	--	--	--
Cash and cash equivalents	5,249,983	4,500,000	--	--	9,749,983	8,799,005
Total Noncurrent Assets	51,349,302	72,439,963	20,982,892	(29,046,448)	115,725,709	79,600,898
Total Assets	$ 148,898,807	$ 75,542,701	$ 30,511,330	$ (78,374,881)	$ 176,577,957	$ 137,573,092
Deferred Outflows of Resources						
Deferred amount for pensions	2,572,833	--	--	--	2,572,833	1,669,961
Total Deferred Outflows of Resources	$ 2,572,833	$ -	$ -	$ -	$ 2,572,833	$ 1,669,961

The accompanying notes are an integral part of these financial statements.

CONNECTICUT GREEN BANK

STATEMENT OF NET POSITION (CONTINUED)

JUNE 30, 2016
(With Summarized Totals for June 30, 2015)

	Total Primary Government	Discretely Presented Component Units: CT Solar Lease 2 LLC	Discretely Presented Component Units: CEFIA Solar Services Inc.	Eliminating Entries	2016 Total Reporting Entity	2015 Total Reporting Entity
Liabilities and Net Position						
Liabilities						
Current maturities of long-term debt	$ 152,619	$ 1,560,600	$ --	$ --	$ 1,713,219	$ 307,203
Accounts payable and accrued expenses	1,962,712	745,107	4,500	--	2,712,319	5,820,169
Due to component units	574,723	18,593,259	30,160,451	(49,328,433)	--	--
Due to outside agency	30,127	--	--	--	30,127	49,516
Custodial liability	2,155,130	--	--	--	2,155,130	647,964
Deferred revenue	5,337,477	920,727	--	--	6,258,204	2,518,537
Total Current Liabilities	10,212,787	21,819,694	30,164,951	(49,328,433)	12,868,998	9,343,389
Asset retirement obligation	--	2,528,335	--	--	2,528,335	1,094,125
Long-Term Debt, less current maturities	3,041,297	15,607,075	--	--	18,648,372	3,546,321
Pension liability	16,096,113	--	--	--	16,096,113	14,899,766
Total Liabilities	29,350,197	39,955,104	30,164,951	(49,328,433)	50,141,818	28,883,601
Deferred Inflows of Resources						
Fair value of interest rate swap	--	1,627,864	--	--	1,627,864	660,073
Deferred amount for pensions	(2,535)	--	--	--	(2,535)	532,135
Total Deferred Inflows of Resources	(2,535)	1,627,864	--	--	1,625,329	1,192,208
Net Position						
Invested in capital assets	248,752	65,678,491	--	(8,063,456)	57,863,787	26,971,087
Restricted Net Position						
Non-expendable	1,000	17,482,892	100	(17,482,992)	1,000	1,000
Restricted for energy programs	5,249,983	4,500,000	--	--	9,749,983	8,799,005
Unrestricted (deficit)	116,624,244	(53,701,650)	346,280	(3,500,000)	59,768,873	73,396,151
Total Net Position	122,123,978	33,959,733	346,380	(29,046,448)	127,383,643	109,167,243

The accompanying notes are an integral part of these financial statements.

CONNECTICUT GREEN BANK

STATEMENT OF REVENUES, EXPENSES, AND CHANGES IN NET POSITION

FOR THE YEAR ENDED JUNE 30, 2016
(With Summarized Totals for the Year Ended June 30, 2015)

		Discretely Presented Component Units				
	Total Primary Government	CT Solar Lease 2 LLC	CEFIA Solar Services, Inc.	Eliminations	2016 Total Reporting Entity	2015 Total Reporting Entity
Operating Revenues						
Utility remittances	$ 26,605,084	$ --	$ --	$ --	$ 26,605,084	$ 27,233,987
Grant revenue	589,917	--	--	--	589,917	192,274
RGGI auction proceeds	6,481,562	--	--	--	6,481,562	16,583,545
Energy system sales	32,767,009	--	--	(32,767,009)	0	16,688
REC sales	2,419,990	233,793	--	--	2,653,783	1,474,488
Other income	387,320	2,182,803	126,075	(1,238,311)	1,457,887	793,435
Total Operating Revenues	69,250,883	2,416,595	126,075	(34,005,320)	37,788,234	46,294,417
Operating Expenses						
Cost of goods sold - energy systems	28,826,976	--	--	(28,826,976)	--	--
Grants and program expenditures	25,261,516	3,078,633	--	(1,112,236)	27,227,913	22,130,677
General and administrative expenses	4,445,648	305,217	4,750	(126,075)	4,629,540	3,117,376
Total Operating Expenses	58,534,141	3,383,850	4,750	(30,065,287)	31,857,453	25,248,053
Operating Income	10,716,743	(967,254)	121,325	(3,940,033)	5,930,780	21,046,364
Nonoperating Revenue (Expenses)						
Interest income - prommisory notes	2,895,503	--	--	--	2,895,503	2,217,368
Interest income - short term cash deposits	92,536	27,777	300	--	120,613	93,949
Interest expenses LT debt	(61,795)	(669,043)	--	--	(730,838)	(119,345)
Interest income - component units	60,127	--	--	(60,127)	--	--
Interest expense - component units	--	(60,127)	--	60,127	--	--
Payments to State of Connecticut	--	--	--	--	--	(19,200,000)
Distributions to member	--	(301,548)	--	--	(301,548)	(104,579)
Realized loss on investments	(2,936)	--	--	--	(2,936)	(1,180,285)
Unrealized gain (loss) on interest rate swap	--	(967,791)	--	--	(967,791)	(660,073)
Provision for loan losses	(1,021,826)	--	--	--	(1,021,826)	(563,825)
Total Nonoperating Revenue (Expenses)	1,961,609	(1,970,732)	300	--	(8,823)	(19,516,790)

The accompanying notes are an integral part of these financial statements.

CONNECTICUT GREEN BANK

STATEMENT OF REVENUES, EXPENSES, AND CHANGES IN NET POSITION (CONTINUED)

FOR THE YEAR ENDED JUNE 30, 2016

(With Summarized Totals for the Year Ended June 30, 2015)

		Discretely Presented Component Units				
	Total Primary Government	CT Solar Lease 2 LLC	CEFIA Solar Services, Inc.	Eliminations	2016 Total Reporting Entity	2015 Total Reporting Entity
Change in Net Position before Payments to State of Connecticut and Capital Contributions	12,678,352	(2,937,987)	121,625	(3,940,033)	5,921,958	1,529,574
Capital contributions	--	21,770,182	--	(9,475,739)	12,294,443	6,844,430
Change in Net Position	12,678,352	18,832,195	121,625	(13,415,772)	18,216,401	8,374,004
Net Position - Beginning of Year	109,445,627	15,127,538	224,754	(15,630,677)	109,167,242	100,793,237
Net Position - End of Year	$ 122,123,979	$ 33,959,733	$ 346,379	$ (29,046,449)	$ 127,383,643	$ 109,167,241

The accompanying notes are an integral part of these financial statements.

CONNECTICUT GREEN BANK

STATEMENT OF CASH FLOWS

FOR THE YEAR ENDED JUNE 30, 2016
(With Summarized Totals for the Year Ended June 30, 2015)

	Total Primary Government	Discretely Presented Component Units					
		CT Solar Lease 2 LLC	CEFIA Solar Services, Inc.	Eliminating Entries	2016	2015	2014
Cash Flows from Operating Activities							
Sales of energy systems	$ 35,128,140	$ --	$ --	(35,128,140)	$ --	$ 10,943	$ --
Sales of Renewable Energy Certificates	2,443,524	-	-	-	2,443,524	1,705,932	378,444
Utility company remittances	26,453,300	--	--	--	26,453,300	28,117,538	26,981,768
Grants	1,050,204	--	--	--	1,050,204	139,487	400,766
RGGI auction proceeds	5,313,666	--	--	--	5,313,666	21,078,165	17,520,889
Other income	454,393	865,226	--	--	1,319,620	688,944	204,322
Lease payments received	--	977,337	--	--	977,337	519,377	451,339
Grant and program expenditures	(13,219,423)	(1,543,473)	--	--	(14,762,895)	(11,331,214)	(7,897,133)
Grants, incentives and credit enhancements	(10,718,424)	--	--	--	(10,718,424)	(9,800,594)	(13,313,611)
Purchases of energy equipment	(34,278,293)	--	--	--	(34,278,293)	(19,989,550)	--
General and administrative expenditures	(4,350,882)	(179,791)	(4,450)	--	(4,535,123)	(3,806,822)	(2,354,525)
Net Cash Provided by (Used in) Operating Activities	8,276,206	119,300	(4,450)	(35,128,140)	(26,737,083)	7,332,206	22,372,259
Cash Flows from Non-capital Financing Activities							
Payments to State of Connecticut	--	--	--	--	--	(19,200,000)	(6,200,000)
Advances to CGB component units	(15,762,500)	--	(3,413,198)	19,175,698	--	--	--
Advances from CGB and component units	217,500	3,413,198	15,545,000	(19,175,698)	--	--	--
Repayments of Advances (to) from component units	--	(8,350,000)	8,350,000	--	--	--	--
Net Cash Provided by (Used in) Non-capital Financing Activities	(15,545,000)	(4,936,802)	20,481,802	--	--	(19,200,000)	(6,200,000)
Cash Flows from Capital and Related Financing Activities							
Purchase of capital assets	(67,645)	(35,128,140)	--	35,128,140	(67,645)	(89,808)	(79,713)
Proceeds from long-term debt	2,510,837	15,000,000	--	--	17,510,837	3,932,272	122,463
Repayment of long-term debt	(170,445)	(702,275)	--	--	(872,720)	(232,432)	--
Interest expense	(61,795)	(705,522)	--	--	(767,318)	(89,585)	--
Capital contributions from/(to) component entities	--	15,425,739	(15,425,739)	--	--	--	--
Capital contributions from Firststar Development, LLC	--	12,294,443	--	--	12,294,443	6,844,430	201,434
Return of capital to Firststar Development, LLC	--	(219,969)	--	--	(219,969)	(86,336)	(12,584)
Net Cash Provided by (Used in) Capital and Related Financing Activities	2,210,952	5,964,275	(15,425,739)	35,128,140	27,877,628	10,278,541	231,600
Cash Flows from Investing Activities							
Return of principal on WC & program loans	26,646,236	--	--	--	26,646,236	2,332,356	7,022,954
Interest on short-term investments, cash, solar lease notes and loans	2,200,748	14,016	300	--	2,215,065	887,457	450,899

The accompanying notes are an integral part of these financial statements.

CONNECTICUT GREEN BANK

STATEMENT OF CASH FLOWS (CONTINUED)

FOR THE YEAR ENDED JUNE 30, 2016
(With Summarized Totals for the Year Ended June 30, 2015)

		Discretely Presented Component Units					
	Total Primary Government	CT Solar Lease 2 LLC	CEFIA Solar Services, Inc.	Eliminating Entries	2016	2015	2014
Cash Flows from Investing Activities (Continued)							
Interest on short-term investments and cash deposits	--	--	--	--	--	--	--
Interest on solar lease notes	--	--	--	--	--	--	--
Program loan disbursements	--	--	--	--	--	--	--
CPACE program loan disbursements	$ (14,888,372)	$ --	$ --	$ --	$ (14,888,372)	$ (22,181,032)	$ (14,700,337)
Grid Tied program loan disbursements	(911,249)	--	--	--	(911,249)	(1,166,205)	(2,375,000)
AD/CHP program loan disbursements	--	--	--	--	--	--	(150,000)
Alpha/Operational Demo program loan disbursements	(350,000)	--	--	--	(350,000)	(100,000)	(516,200)
Energy Efficiency program loan disbursements	--	--	--	--	--	(89,000)	(75,000)
Campus Efficiency NOW program loan disbursements	--	--	--	--	--	(396,662)	(315,669)
HOPBI program loan disbursements	(1,684,862)	--	--	--	(1,684,862)	(4,443,148)	--
Residential Solar Loan program disbursements	(3,037,973)	--	--	--	(3,037,973)	(5,486,610)	(805,484)
Net Cash Used in Investing Activities	7,974,529	14,016	300	--	7,988,845	(30,642,844)	(11,463,837)
Net Increase (Decrease) in Cash and Cash Equivalents	2,916,686	1,160,790	5,051,913	--	9,129,390	(32,232,097)	4,940,022
Cash and Cash Equivalents - Beginning of Year	43,902,687	4,720,716	69,252	--	48,692,655	80,924,749	77,641,671
Cash and Cash Equivalents - End of Year	$ 46,819,373	$ 5,881,506	$ 5,121,165	$ --	$ 57,822,045	$ 48,692,652	$ 82,581,693
Reconciliation of Operating Loss to Net Cash Provided by (Used in) Operating Activities:							
Operating income (loss)	$ 10,716,743	$ --	$ --	$ --	$ 10,716,743	$ 21,046,364	$ 22,221,885
Adjustments to reconcile operating loss to net cash provided by (used in) operating activities:							
Depreciation	--	--	--	--	--	519,502	141,343
Other	--	--	--	--	--	--	671,994
Changes in operating assets and liabilities:							
(Increase)decrease in operating assets	--	--	--	--	--	(16,743,102)	(7,812,250)
(Decrease)increase in operating liabilities	--	--	--	--	--	2,509,442	7,149,287
Net Cash Provided by (Used in) Operating Activities	$ 10,716,743	$ --	$ --	$ --	$ 10,716,743	$ 7,332,206	$ 22,372,259

The accompanying notes are an integral part of these financial statements.

NOTE 1 – NATURE OF OPERATIONS AND SIGNIFICANT ACCOUNTING POLICIES

NATURE OF OPERATIONS

The Connecticut Green Bank (CGB) was established in July 2011 under Title 16, Sec. 16-245n of the General Statutes of the State of Connecticut as the successor entity of the Connecticut Clean Energy Fund. CGB, a component unit of the State of Connecticut, was created to promote energy efficiency and investment in renewable energy sources in accordance with a comprehensive plan developed by it to foster the growth, development and commercialization of renewable energy sources and related enterprises and stimulate demand for renewable energy and deployment of renewable energy sources which serve end-use customers in the State. CGB constitutes the successor agency to Connecticut Innovations Incorporated (CI), a quasi-public agency of the State of Connecticut, for the purposes of administering the Clean Energy Fund in accordance with section 4-38d of the Connecticut General Statutes and therefore the net position of such fund were transferred to the newly created CGB as of July 1, 2011. Pursuant to Connecticut General Statute 4-38f, CGB is within CI for administrative purposes only.

On June 6, 2014 Public Act 14-94 of the State of Connecticut changed the name of the Clean Energy Finance and Investment Authority to the Connecticut Green Bank.

PRIOR-PERIOD SUMMARIZED FINANCIAL INFORMATION

The basic financial statements include certain prior-year summarized comparative information in total but not at the level of detail required for a presentation in conformity with accounting principles generally accepted in the United States of America. Accordingly, such information should be read in conjunction with CGB's financial statements for the year ended June 30, 2015, from which the summarized information was derived.

NOTE 1 – NATURE OF OPERATIONS AND SIGNIFICANT ACCOUNTING POLICIES (CONTINUED)

RECENTLY ADOPTED ACCOUNTING PRONOUNCEMENTS

In June 2012, the GASB issued Statement No. 68, *Accounting and Financial Reporting for Pensions* (GASB 68). The primary objective of this Statement is to improve the accounting and financial reporting by state and local governments for pensions. It also improves information provided by state and local governmental employers about financial support for pensions that are provided by other entities. The provisions of this Statement are effective for financial statements for periods beginning after June 15, 2014. The implementation of this standard resulted in an adjustment to reduce CGB's beginning net position by $15,430,912 as of July 1, 2014.

In November 2013, GASB issued Statement No. 71, *Pension Transaction for Contributions Made Subsequent to the Measurement Date, an amendment of GASB 68* (GASB 71). The objective of this statement is to address an issue regarding application of the transition provisions of GASB 68. The issue relates to amounts associated with contributions, if any, made by a state or local government employer on non-employer contributing entity to a defined benefit pension plan after the measurement date of the government's beginning net pension liability. The provisions of this Statement are effective for financial statements for the periods beginning after June 15, 2015. The implementation of this standard resulted in an adjustment to increase CGB's beginning net position by $1,125,502 as of July 1, 2014.

PRINCIPAL REVENUE SOURCES

The Public Utility Regulatory Authority (PURA) assesses a charge per kilowatt-hour to each end-use customer of electric services provided by utility companies (excluding municipally owned entities) in the state, which is paid to CGB and is the principal source of CGB's revenue. CGB may deploy the funds for loans, direct or equity investments, contracts, grants or other actions that support energy efficiency projects and research, development, manufacture, commercialization, deployment and installation of renewable energy technologies.

NOTE 1 – NATURE OF OPERATIONS AND SIGNIFICANT ACCOUNTING POLICIES (CONTINUED)

PRINCIPAL REVENUE SOURCES (CONTINUED)

REPORTING ENTITY

CGB, as the primary government, follows the reporting requirements of Governmental Accounting Standards Board (GASB) Statement No. 61 (*The Financial Reporting Entity Omnibus – an Amendment of GASB Statements No. 14 and No. 34*) (the Statement) regarding presentation of component units. The Statement modifies certain requirements for including component units in the reporting entity, either by blending (recording their amounts as part of the primary government), or discretely presenting them (showing their amounts separately in the reporting entity's financial statements). To qualify as a blended component unit, the unit must meet one of the following criteria: (1) have substantively the same governing body as that of the primary government, and either (A) a financial benefit or burden relationship exists between the unit and the primary government, or (B) management of the primary government (below the level of the governing body) has operational responsibility of the unit; (2) the unit provides services or benefits exclusively or almost exclusively to the primary government; or (3) the unit's total debt outstanding, including leases, is expected to be repaid by resources of the primary government. A unit which fails to meet the substantively the same governing requirement may still be included as a discretely presented component unit, if the primary government has appointed the voting majority of the component unit's governance or met other criteria specified in the Statement such as whether or not it would be misleading were the entity to be excluded.

NOTE 1 – NATURE OF OPERATIONS AND SIGNIFICANT ACCOUNTING POLICIES (CONTINUED)

REPORTING ENTITY (CONTINUED)

CGB established four legally separate for-profit entities whose collective purpose, at the present time, is to administer the CGB's solar energy programs. CGB believes to exclude any of the entities from these financial statements would be misleading. Each entity is listed below, along with whether it is included as a blended component unit (blended) or qualifies as a discretely presented component unit (discrete) within these financial statements based on the criteria previously described.

CEFIA Holdings LLC (blended)

A Connecticut limited liability company (LLC), 99% owned by CGB (1% owned by CI), established to fund a portfolio of residential solar loans and, through its CT Solar Lease 2 program, to enable investment in solar photovoltaic and solar thermal equipment for the benefit of Connecticut homeowners, businesses, not-for-profits and municipalities (the "End Users"). CEFIA Holdings LLC acquires the initial title to the solar assets and contracts with independent solar installers to complete the installation of the solar assets and arrange for the leasing of the solar assets (or sale of energy under power purchase agreements) to the End Users. CEFIA Holdings LLC is also responsible for procuring insurance for the solar assets, operation and maintenance services as well as warranty management services for the ultimate owner of the solar assets, CT Solar Lease 2 LLC, to which CEFIA Holdings LLC sells the residential and commercial projects before the projects are placed in service. After acquiring the residential and commercial projects, CT Solar Lease 2 LLC administers the portfolio of projects with the assistance of AFC First Financial Corporation. CGB's board of directors acts as the governing authority of CEFIA Holdings LLC. CGB appoints CGB employees to manage the operations of CEFIA Holdings LLC. CGB is also financially responsible (benefit/burden) for CEFIA Holdings LLC's activities.

CT Solar Loan I LLC (blended)

A limited-liability company, wholly-owned by CEFIA Holdings LLC, CT Solar Loan I LLC was established to make loans to residential property owners for the purpose of purchasing and installing solar photovoltaic equipment. CGB's board of directors acts as the governing authority of CT Solar Loan I LLC. CGB appoints CGB employees to manage the operations of CT Solar Loan I LLC. CGB is also financially responsible (benefit/burden) for CT Solar Loan I LLC's activities.

NOTE 1 – NATURE OF OPERATIONS AND SIGNIFICANT ACCOUNTING POLICIES (CONTINUED)

REPORTING ENTITY (CONTINUED)

CEFIA Solar Services, Inc. (discrete)

A Connecticut corporation, 100% owned by CEFIA Holdings LLC, established to share in the ownership risks and benefits derived from the leasing of solar photovoltaic and solar thermal equipment and the sale of energy under power purchase agreements as managing member of CT Solar Lease 2 LLC. CEFIA Solar Services, Inc. ("Solar Services") has a one percent ownership interest in CT Solar Lease 2 LLC and is its managing member. Solar Services is responsible for performing all management and operational functions pursuant to the Operating Agreement of CT Solar Lease 2 LLC. CGB through CEFIA Holdings LLC directly appoints the board of directors of Solar Services. The primary government's intent for owning a controlling interest in Solar Services is to enhance its ability to offer financing options to commercial entities and residents of Connecticut wishing to install renewable energy equipment. CGB believes that to exclude Solar Services from these financial statements would be misleading.

CT Solar Lease 2 LLC (discrete)

A Connecticut limited-liability company, CT Solar Lease 2 LLC acquires title to the residential and commercial solar projects from the developer, CEFIA Holdings LLC, using capital from its members along with non-recourse funding from participating banks. Repayment to participating banks is predicated upon the property owner's payment to CT Solar Lease 2 LLC of their obligations under leases and power purchase agreements, as well as revenue earned from production-based incentives. CT Solar Lease 2 LLC is owned ninety-nine percent (99%) by Firstar Development, LLC, a Delaware limited liability company, as the Investor Member and one percent (1%) by CEFIA Solar Services Inc., as the Managing Member. The primary government's intent to provide management services through Solar Services is to directly enhance its ability to provide financing options to commercial entities and residents of Connecticut wishing to install renewable energy equipment. Although CGB has a minority membership interest in CT Solar Lease 2 LLC, CGB believes that to exclude it from these financial statements would be misleading.

Advances between the primary government (CGB) and its component units, or between the component units themselves, involved establishment of funds to provide for loan loss reserves as well as pay certain organizational costs. Advances were eliminated in preparing the combining and reporting entity financial statements.

Condensed combining information for the primary government (CGB) and its two blended component units (CEFIA Holdings LLC and CT Solar Loan I LLC) is presented as follows:

NOTE 1 – NATURE OF OPERATIONS AND SIGNIFICANT ACCOUNTING POLICIES (CONTINUED)

CONDENSED, COMBINING INFORMATION – STATEMENT OF NET POSITION

	CGB	CT Solar Loan I LLC	CEFIA Holdings LLC	Eliminating Entries	Total Primary Government
Assets					
Current Assets					
Cash and cash equivalents	$ 34,513,689	$ 3,042,146	$ 4,013,553	$ --	$ 41,569,388
Accounts receivable	1,408,922	--	--	--	1,408,922
Utility remittance receivable	2,670,634	--	--	--	2,670,634
Other receivables	189,894	--	74,303	--	264,197
Due from component units	40,965,279	--	20,269,002	(16,887,844)	44,346,437
Prepaid expenses and other assets	503,585	21,851	2,761,368	--	3,286,803
Contractor loans	2,272,906	--	--	--	2,272,906
Current portion of solar lease notes	845,479	--	--	--	845,479
Current portion of portfolio investments	690,557	194,182	--	--	884,739
Total Current Assets	84,060,944	3,258,179	27,118,226	(16,887,844)	97,549,505
Noncurrent Assets					
Portfolio investments	1,000,000	--	--	--	1,000,000
Bonds receivable	3,492,282	--	--	--	3,492,282
Solar Lease Notes, less current portion	8,162,635	--	--	--	8,162,635
Program loans, less current portion	28,509,165	3,873,614	--	--	32,382,778
Renewable Energy Certificates	812,772	--	--	--	812,772
Investment in component units	99,000	--	100	(99,000)	100
Capital assets, net of depreciation and amortization	248,752	--	--	--	248,752
Asset retirement obligation,net	--	--	--	--	--
Restricted assets:	--	--	--	--	--
Cash and cash equivalents	4,949,139	300,844	--	--	5,249,983
Total Noncurrent Assets	47,273,744	4,174,458	100	(99,000)	51,349,302
Total Assets	$ 131,334,689	$ 7,432,636	$ 27,118,326	$ (16,986,844)	$ 148,898,807
Deferred Outflows of Resources					
Deferred amount for pensions	$ 2,572,833	--	--	--	2,572,833
Total Deferred Outflows of Resources	$ 2,572,833	$ -	$ -	$ -	$ 2,572,833

NOTE 1 – NATURE OF OPERATIONS AND SIGNIFICANT ACCOUNTING POLICIES (CONTINUED)

CONDENSED, COMBINING INFORMATION – STATEMENT OF NET POSITION (CONTINUED)

	CGB	CT Solar Loan I LLC	CEFIA Holdings LLC	Eliminating Entries	Total Primary Government
Liabilities and Net Position					
Liabilities					
Current maturities of long-term debt	$ --	$ 152,619	$ --	$ --	$ 152,619
Accounts payable and accrued expenses	1,739,809	3,041	219,862	--	1,962,712
Due to component units	574,723	4,072,500	12,815,344	(16,887,844)	574,723
Due to outside agency	30,127	--	--	--	30,127
Custodial liability	1,327,343	--	827,787	--	2,155,130
Deferred revenue	--	--	5,337,477	--	5,337,477
Total Current Liabilities	3,672,002	4,228,160	19,200,470	(16,887,844)	10,212,787
Asset retirement obligation	--	--	--	--	--
Long-Term Debt, less current maturities	--	3,041,297	--	--	3,041,297
Pension liability	16,096,113	--	--	--	16,096,113
Total Liabilities	19,768,115	7,269,457	19,200,470	(16,887,844)	29,350,197
Deferred Inflows of Resources					
Fair value of interest rate swap	--	--	--	--	--
Deferred amount for pensions	(2,535)	--	--	--	(2,535)
Total Deferred Inflows of Resources	(2,535)	--	--	--	(2,535)
Net Position					
Invested in capital assets	248,752	--	--	--	248,752
Restricted Net Position					
Non-expendable	--	--	100,000	(99,000)	1,000
Restricted for energy programs	4,949,139	300,844	--	--	5,249,983
Unrestricted (deficit)	108,944,051	(137,664)	7,817,857	--	116,624,244
Total Net Position	114,141,942	163,180	7,917,857	(99,000)	122,123,978

NOTE 1 – NATURE OF OPERATIONS AND SIGNIFICANT ACCOUNTING POLICIES (CONTINUED)

CONDENSED, COMBINING INFORMATION – STATEMENT OF REVENUES, EXPENSES AND CHANGES IN NET POSITION

	CGB	CT Solar Loan I LLC	CEFIA Holdings LLC	Eliminating Entries	Total Primary Government
Operating Revenues					
Utility remittances	$ 26,605,084	$ --	$ --	$ --	$ 26,605,084
Grant revenue	807,417	--	--	(217,500)	589,917
RGGI auction proceeds	6,481,562	--	--	--	6,481,562
Energy system sales	--	--	32,767,009	--	32,767,009
REC sales	2,419,990	--	--	--	2,419,990
Other income	380,245	388	6,687	--	387,320
Total Operating Revenues	36,694,299	388	32,773,696	(217,500)	69,250,883
Operating Expenses					
Cost of goods sold - energy systems	--	--	28,826,976	--	28,826,976
Grants and program expenditures	24,948,249	319,816	210,951	(217,500)	25,261,516
General and administrative expenses	4,417,256	17,142	11,250	--	4,445,648
Total Operating Expenses	29,365,506	336,958	29,049,177	(217,500)	58,534,141
Operating Income	7,328,793	(336,570)	3,724,519	--	10,716,743
Nonoperating Revenue (Expenses)					
Interest income - prommisory notes	2,585,070	310,432	--	--	2,895,503
Interest income - short term cash deposits	83,372	338	8,826	--	92,536
Interest expenses LT debt	--	(61,795)	--	--	(61,795)
Interest income - component units	60,127	--	--	--	60,127
Interest expense - component units	--	--	--	--	--
Payments to State of Connecticut	--	--	--	--	--
Distributions to member	--	--	--	--	--
Realized loss on investments	(2,936)	--	--	--	(2,936)
Unrealized gain (loss) on interest rate swap	--	--	--	--	--
Provision for loan losses	(1,021,826)	--	--	--	(1,021,826)
Total Nonoperating Revenue (Expenses)	1,703,808	248,975	8,826	--	1,961,609

NOTE 1 – NATURE OF OPERATIONS AND SIGNIFICANT ACCOUNTING POLICIES (CONTINUED)

CONDENSED, COMBINING INFORMATION – STATEMENT OF REVENUES, EXPENSES AND CHANGES IN NET POSITION (CONTINUED)

	CGB	CT Solar Loan I LLC	CEFIA Holdings LLC	Eliminating Entries	Total Primary Government
Change in Net Position before Payments to State of Connecticut and Capital Contributions	9,032,601	(87,594)	3,733,345	--	12,678,352
Capital contributions	--	--	--	--	--
Change in Net Position	9,032,601	(87,594)	3,733,345	--	12,678,352
Net Position - Beginning of Year	105,109,340	250,775	4,184,512	(99,000)	109,445,627
Net Position - End of Year	$ 114,141,941	$ 163,181	$ 7,917,857	$ (99,000)	$ 122,123,979

NOTE 1 – NATURE OF OPERATIONS AND SIGNIFICANT ACCOUNTING POLICIES (CONTINUED)

CONDENSED, COMBINING INFORMATION – STATEMENT OF CASH FLOWS

	CGB	CT Solar Loan I LLC	CEFIA Holdings LLC	Eliminating Entries	Total Primary Government
Cash Flows from Operating Activities					
Sales of energy systems	$ --	$ --	$ 35,128,140	$ --	$ 35,128,140
Sales of Renewable Energy Certificates	2,443,524	-	-	-	2,443,524
Utility company remittances	26,453,300	--	--	--	26,453,300
Grants	1,050,204	--	--	--	1,050,204
RGGI auction proceeds	5,313,666	--	--	--	5,313,666
Other income	454,393	--	--	--	454,393
Lease payments received	--	--	--	--	--
Grant and program expenditures	(12,646,408)	(364,597)	(208,417)	--	(13,219,423)
Grants, incentives and credit enhancements	(10,718,424)	--	--	--	(10,718,424)
Purchases of energy equipment	--	--	(34,278,293)	--	(34,278,293)
General and administrative expenditures	(4,327,471)	(17,094)	(6,317)	--	(4,350,882)
Net Cash Provided by (Used in) Operating Activities	8,022,784	(381,692)	635,113	--	8,276,206
Cash Flows from Non-capital Financing Activities					
Payments to State of Connecticut	--	--	--	--	--
Advances to CGB component units	(15,762,500)	--	--	--	(15,762,500)
Advances from CGB and component units	--	217,500	--	--	217,500
Repayments of Advances (to) from component units	10,389	(219,239)	208,850	--	--
Net Cash Provided by (Used in) Non-capital Financing Activities	(15,752,111)	(1,739)	208,850	--	(15,545,000)
Cash Flows from Capital and Related Financing Activities					
Purchase of capital assets	(67,645)	--	--	--	(67,645)
Proceeds from long-term debt	--	2,510,837	--	--	2,510,837
Repayment of long-term debt	--	(170,445)	--	--	(170,445)
Interest expense	--	(61,795)	--	--	(61,795)
Capital contributions from/(to) component entities	--	--	--	--	--
Capital contributions from Firststar Development, LLC	--	--	--	--	--
Return of capital to Firststar Development, LLC	--	--	--	--	--
Net Cash Provided by (Used in) Capital and Related Financing Activities	(67,645)	2,278,597	--	--	2,210,952
Cash Flows from Investing Activities					
Return of principal on WC & program loans	25,636,808	1,009,428	--	--	26,646,236
Interest on short-term investments, cash, solar lease notes and loans	1,923,774	268,148	8,826	--	2,200,748

NOTE 1 – NATURE OF OPERATIONS AND SIGNIFICANT ACCOUNTING POLICIES (CONTINUED)

CONDENSED, COMBINING INFORMATION – STATEMENT OF CASH FLOWS (CONTINUED)

	CGB	CT Solar Loan I LLC	CEFIA Holdings LLC	Eliminating Entries	Total Primary Government
Cash Flows from Investing Activities (Continued)					
Interest on short-term investments and cash deposits	--	--	--	--	--
Interest on solar lease notes	--	--	--	--	--
Program loan disbursements	--	--	--	--	--
CPACE program loan disbursements	$ (14,888,372)	$ --	$ --	$ --	$ (14,888,372)
Grid Tied program loan disbursements	(911,249)	--	--	--	(911,249)
AD/CHP program loan disbursements	--	--	--	--	--
Alpha/Operational Demo program loan disbursements	(350,000)	--	--	--	(350,000)
Energy Efficiency program loan disbursements	--	--	--	--	--
Campus Efficiency NOW program loan disbursements	--	--	--	--	--
HOPBI program loan disbursements	(1,684,862)	--	--	--	(1,684,862)
Residential Solar Loan program disbursements	(2,489,159)	(548,813)	--	--	(3,037,973)
Net Cash Used in Investing Activities	7,236,939	728,763	8,826	--	7,974,529
Net Increase (Decrease) in Cash and Cash Equivalents	(560,033)	2,623,929	852,789	--	2,916,686
Cash and Cash Equivalents - Beginning of Year	40,022,862	719,061	3,160,764	--	43,902,687
Cash and Cash Equivalents - End of Year	$ 39,462,829	$ 3,342,990	$ 4,013,553	$ --	$ 46,819,373
Reconciliation of Operating Loss to Net Cash Provided by (Used in) Operating Activities:					
Operating income (loss)	$ 7,328,793	$ (336,570)	$ 3,724,519	$ --	$ 10,716,743
Adjustments to reconcile operating loss to net cash provided by (used in) operating activities:					
Depreciation	--	--	--	--	--
Other	--	--	--	--	--
Changes in operating assets and liabilities:					
(Increase)decrease in operating assets	--	--	--	--	--
(Decrease)increase in operating liabilities	--	--	--	--	--
Net Cash Provided by (Used in) Operating Activities	$ 7,328,793	$ (336,570)	$ 3,724,519	$ --	$ 10,716,743

NOTE 1 – NATURE OF OPERATIONS AND SIGNIFICANT ACCOUNTING POLICIES (CONTINUED)

MEASUREMENT FOCUS, BASIS OF ACCOUNTING AND FINANCIAL STATEMENT PRESENTATION

All entities are enterprise funds. Enterprise funds are used to account for governmental activities that are similar to those found in the private sector in which the determination of net income is necessary or useful to sound financial administration.

BASIS OF PRESENTATION

These financial statements are reported using the economic resources measurement focus and accrual basis of accounting. Revenues are recognized when earned, and expenses are recognized when the liability is incurred, regardless of the timing of the related cash flows.

REVENUE RECOGNITION

CGB, in addition to utility assessments and RGGI auction income, recognizes revenue from grants as expenses are incurred.

CT Solar Loan I LLC derives revenue from interest earned on residential solar loan products.

CEFIA Holdings LLC derives revenue from the sales of photovoltaic energy systems to CT Solar Lease 2, LLC. This amount was eliminated to arrive at the total reporting entity revenue.

CEFIA Solar Services, Inc. revenue consists of an administrative fee from CGB. This amount was eliminated to arrive at the total reporting entity revenue.

CT Solar Lease 2 LLC derives revenue from the following sources: operating leases, energy generation, performance based incentives (PBIs) and the sale of Solar Renewable Energy Certificates (SRECs) to third parties.

Rental income from operating leases for residential and certain commercial scale solar facilities is recognized on a straight-line basis over the term of each underlying lease.

Energy generation revenue will be recognized as electricity is generated, based on actual output and contractual prices set forth in long term PPAs associated with certain commercial scale facilities.

Revenue from the sale of SRECs to third parties is recognized upon the transfer of title and delivery of the SRECs to third parties and is derived from contractual prices set forth in SREC sale agreements associated with commercial scale facilities.

NOTE 1 – NATURE OF BUSINESS AND SIGNIFICANT ACCOUNTING POLICIES (CONTINUED)

OPERATING VS. NON-OPERATING REVENUE (EXPENSE)

All entities distinguish operating revenues and expenses from non-operating items. Operating revenues consist of utility customer assessments, grants for operating activities, and other revenue generated in connection with investments in clean energy programs. Operating expenses consist of operating costs, including depreciation on capital assets and grants and programs. Non-operating revenue (expense) consists of investment earnings, and other items not considered operational by management.

USE OF ESTIMATES

Management uses estimates and assumptions in preparing these financial statements in accordance with accounting principles generally accepted in the United States of America. Those estimates and assumptions affect certain reported amounts and disclosures in the financial statements. Actual results could vary from the estimates that were used.

USE OF RESTRICTED VS. NON-RESTRICTED RESOURCES

When both restricted and unrestricted amounts are available for use, the policy is to use restricted resources for their intended purposes first and then unrestricted resources.

CASH AND CASH EQUIVALENTS

Cash equivalents consist of cash and highly liquid short-term investments with an original term of 90 days when purchased and are recorded at cost, which approximates fair value.

CAPITAL ASSETS

Capital asset acquisitions exceeding $500 are capitalized at cost. Maintenance and repair expenses are charged to operations when incurred. Depreciation is computed using straight-line methods over the estimated useful lives of the assets, which range from two to thirty years. Leasehold improvements are amortized over the shorter of their useful life or the lease term.

NOTE 1 – NATURE OF BUSINESS AND SIGNIFICANT ACCOUNTING POLICIES (CONTINUED)

CAPITAL ASSETS (CONTINUED)

The estimated useful lives of capital assets are as follows:

Asset	Years
Solar lease equipment	30 years
Furniture and equipment	5 years
Leasehold improvements	5 years
Computer hardware and software	2-3 years

For capital assets sold or otherwise disposed of, the cost and related accumulated depreciation and amortization are removed from the accounts, and any related gain or loss is reflected in income for the period.

All solar facilities are owned by CT Solar Lease 2 LLC and are stated at cost and include all amounts necessary to construct them. Systems are placed in service when they are ready for use and all necessary approvals have been received from local utility companies. Additions, renewals, and betterments that significantly extend the life of an asset are capitalized. Expenditures for warranty maintenance and repairs to solar facilities are charged to expense as incurred. Solar facilities in process represent facilities which are in various stages of construction or have not yet received the necessary utility company approvals.

IMPAIRMENT OF LONG-LIVED ASSETS

CT Solar Lease 2 LLC reviews its solar facilities for impairment whenever events or changes in circumstances indicate that the carrying value of an asset may not be recoverable. When recovery is reviewed, if the undiscounted cash flows estimated to be generated by an asset is less than its carrying amount, management compares the carrying amount of the asset to its fair value in order to determine whether an impairment loss has occurred. The amount of the impairment loss is equal to the excess of the asset's carrying value over its estimated fair value. No impairment loss was recognized during the fiscal year ending June 30, 2016.

NOTE 1 – NATURE OF BUSINESS AND SIGNIFICANT ACCOUNTING POLICIES (CONTINUED)

ASSET RETIREMENT OBLIGATIONS

CT Solar Lease 2 LLC (CT SL2) is required to recognize its liability related to asset retirement obligations when it has the legal obligation to retire long-lived assets. Upon the expiration of operating leases or a PPA's initial or extended terms, customers generally have the option to purchase the solar facilities at fair market value or require CT SL2 to remove the solar facilities at its expense.

Asset retirement obligations are recorded in the period in which they are incurred and reasonably estimable, including those obligations for which the timing method of settlement are conditional on a future event that may or may not be in the control of CT SL2. Retirement of assets may involve efforts to remove the solar facilities depending on the nature and location of the assets. In identifying asset retirement obligations, CT SL2 considers identification of legally enforceable obligations, changes in existing law, estimates of potential settlement dates, and the calculation of an appropriate discount rate to be used in calculating the fair value of the obligations. For those assets where a range of potential settlement dates may be reasonably estimated, obligations are recorded. CT SL2 routinely reviews and reassesses its estimates to determine if an adjustment to the value of asset retirement obligations is required.

The aggregate carrying amount of asset retirement obligations recognized by CT SL2 was $2,528,335 and $1,094,125 at June 30, 2016 and June 30, 2015 respectively. The following table shows changes in the aggregate carrying amount of CT SL2's asset retirement obligation for the year ended June 30, 2016:

Balance - June 30, 2015	$ 1,094,125
Additional accruals	1,328,366
Accretion expense	105,843
Balance - June 30, 2016	$ 2,528,334

NOTE 1 – NATURE OF BUSINESS AND SIGNIFICANT ACCOUNTING POLICIES (CONTINUED)

PORTFOLIO INVESTMENTS

CGB carries all investments at fair value. Fair value is defined as the price that would be received to sell an asset or paid to transfer liability by in an orderly transaction between market participants at the measurement date. As discussed in Note 4, CGB's portfolio investments are managed by CI. Fair value is determined by CI's independent valuation committee ("Committee") using United States Private Equity Valuation Guidelines promulgated by the Private Equity Investment Guidelines Group. In the absence of readily determinable market values, the Committee gives consideration to pertinent information about the companies comprising these investments, including, but not limited to, recent sales prices of the issuer's securities, sales growth, progress toward business goals and other operating data. CI has applied procedures in arriving at the estimate of the value of such securities that it believes are reasonable and appropriate. CGB management reserves the right to establish a reserve in addition to the reserve recommended by the Committee to further account for current market conditions and volatility. Due to the inherent uncertainty of valuation, those estimated values may differ significantly from the amounts ultimately realized from the investments, and the differences could be material. CGB reports gains as realized and unrealized consistent with the practice of venture capital firms. The calculation of realized gains and losses is independent of the calculation of the net change in investment value.

All of CGB's portfolio investments are uninsured against loss and unregistered, and are held in the administrator's name.

NET POSITION

Net position is presented in the following three categories:

- *Investment in Capital Assets* represent capital assets, net of accumulated depreciation and amortization that are attributable to those particular assets.
- *Restricted Net Position* represent assets whose use is restricted through external restrictions imposed by creditors, grantors, contributors and the like, or through restrictions imposed by laws or through constitutional provisions or enabling legislature, and includes equity interest within CGB's component units by outside entities.
- *Unrestricted Net Position* represents assets which do not meet the definition of the two preceding categories.

NOTE 1 – NATURE OF BUSINESS AND SIGNIFICANT ACCOUNTING POLICIES (CONTINUED)

GRANTS AND PROGRAMS

Expenditures for grants and programs are recorded upon the submission of invoices and other supporting documentation and approval by management. Salaries, benefits and overhead expenses are allocated to program expenses based on job functions.

RECLASSIFICATIONS

Certain amounts in the 2015 summarized information have been reclassified to conform to the 2016 presentation.

SUBSEQUENT EVENTS

CGB has performed a review of events subsequent to the statement of net position date through October xx, 2016, the date of the financial statements where available to be issued. Except as described below, no additional events requiring recording or disclosure in the financial statements were identified.

NOTE 2 – CHANGE IN METHOD FOR ACCOUNTING FOR PENSIONS

On July 1, 2014, CGB adopted GASB 68 and GASB 71. GASB 68 requires cost-sharing employers to recognize liabilities, deferred outflows of resources, deferred inflows of resources, and expenses for their proportionate share of the pension plan's total. As the State Employees' Retirement System (SERS) did not have a practical way to provide each of its cost-sharing employers with all of the information needed to fully restate their prior period financial statements, CGB has elected to apply the "cumulative effect" method, as discussed in GASB 68, by restating beginning net position as of July 1, 2014. As of July 1, 2014, CGB recorded an adjustment to reduce beginning net position by $15,430,912 in accordance with GASB 68, as amended.

NOTE 2 – CHANGE IN METHOD FOR ACCOUNTING FOR PENSIONS (CONTINUED)

GASB 71 requires that, at transition, a government recognize a deferred outflow of resources for its pension contributions, if any, made subsequent to the measurement date of the net pension liability and the end of the government's report period. The provisions of the Statement are required to be applied simultaneously with the provisions of GASB 68. As of July 1, 2014, CGB recorded an adjustment to increase beginning net position by $1,923,687 for contributions made to SERS from July 1, 2013 through June 30, 2014.

As of July 1, 2014, the cumulative effect of adopting GASB 68 was a $14,305,410 reduction to beginning net position. The following table shows the impact of the "cumulative effect" method of adopting and implementing GASB 68 and GASB 71 on beginning net position.

Statement of Revenue, Expenses and Changes in Net Position	
Net position, beginning of period, July 1, 2014 (as previously started)	$ 98,500,605
Cumulative effect of adopting GASB 68 and GASB 71	(14,305,410)
Net position, beginning of period, July 1, 2014 (as restated)	$ 84,195,195

NOTE 3 – FAIR VALUE MEASUREMENTS

The framework for measuring fair value provides a fair value hierarchy that prioritizes the inputs to valuation techniques used to measure fair value. The hierarchy gives the highest priority to unadjusted quoted prices in active markets for identical assets or liabilities (Level 1) and the lowest priority to unobservable inputs (Level 3). In determining fair value, CGB utilizes valuation techniques that maximize the use of observable inputs and minimize the use of unobservable inputs. CGB also considers nonperformance risk in the overall assessment of fair value.

Investments are measured at fair value utilizing valuation techniques based on observable and/or unobservable inputs. Observable inputs reflect readily obtainable data from independent sources, while unobservable inputs reflect market assumptions. These inputs are classified into the following hierarchy:

Level 1 – Unadjusted quoted prices in active markets that are accessible at the measurement date for identical assets of liabilities. CGB's Level 1 securities were valued at the closing price reported on the active markets on which the individual securities are traded.

NOTE 3 – FAIR VALUE MEASUREMENTS (CONTINUED)

Level 2 – Inputs other than quotes prices in active markets for identical assets and liabilities that are observable either directly or indirectly for substantially the full term of the asset or liability. Level 2 inputs include the following:

- Quotes prices for similar assets and liabilities in active markets
- Quotes prices for identical or similar assets or liabilities in markets that are not active
- Observable inputs other than quotes prices that are used in the valuation of the asset or liability (e.g., interest rate and yield curve quotes at commonly quotes intervals)
- Inputs that are derived principally from or corroborated by observed market data by correlation or other means

Level 3 – Unobservable inputs for the asset or liability (supported by little or no market activity). Level 3 inputs include management's own assumptions about the assumptions that market participants would use in pricing the asset or liability (including assumptions about risk).

The asset or liability's fair value measurement level within the fair value hierarchy is based on the lowest level of any input that is significant to the fair value measurement. Valuation techniques used need to maximize the use of observable inputs and minimize the use of unobservable inputs.

NOTE 3 – FAIR VALUE MEASUREMENTS (CONTINUED)

The following table sets forth by level, within the fair value hierarchy, CGB's fair value measurements at June 30, 2016:

	Investment assets at Fair Value as of June 30, 2016			
	Level 1	Level 2	Level 3	Total
Cash and cash equivalents	$ 57,822,043	$ --	$ --	$ 57,822,043
Portfolio investments	--	--	1,000,000	1,000,000
	$ 57,822,043	$ --	$ 1,000,000	$ 58,822,043

	Level 1	Level 2	Level 3	Total
Primary Government:				
Cash and cash equivalents	$ 46,819,372	$ --	$ --	$ 46,819,372
Portfolio investments	--	--	1,000,000	1,000,000
Discretely Presented Component Units:				
CEFIA Solar Services, Inc.	5,121,165	--	--	5,121,165
CT Solar Lease 2 LLC				
Cash and cash equivalents	5,881,506	--	--	5,881,506
	$ 57,822,043	$ --	$ 1,000,000	$ 58,822,043

NOTE 3 – FAIR VALUE MEASUREMENTS (CONTINUED)

The following table sets forth by level, within the fair value hierarchy, CGB's fair value measurements at June 30, 2015:

	Investment assets at Fair Value as of June 30, 2015			
	Level 1	Level 2	Level 3	Total
Cash and cash equivalents	$ 48,692,654	$ --	$ --	$ 48,692,654
Portfolio investments	--	--	1,000,000	1,000,000
	$ 48,692,654	$ --	$ 1,000,000	$ 49,692,654

	Level 1	Level 2	Level 3	Total
Primary Government:				
Cash and cash equivalents	$ 43,902,687	$ --	$ --	$ 43,902,687
Portfolio investments	--	--	1,000,000	1,000,000
Discretely Presented Component Units:				
CEFIA Solar Services, Inc.	69,252	--	--	69,252
CT Solar Lease 2 LLC				
Cash and cash equivalents	4,720,716	--	--	4,720,716
	$ 48,692,655	$ --	$ 1,000,000	$ 49,692,655

There were no transfers between levels during the years ended June 30, 2016 and 2015.

Furthermore, there were no changes in level 3 assets during 2016 or 2015, respectively.

NOTE 4 – CASH AND CASH EQUIVALENTS

The following is a summary of cash and cash equivalents for the reporting entity at June 30:

	2016	2015
Checking	$ 4,499,264	$ 4,680,259
Money Market	$ 10,103,292	$ 2,616,390
State Treasurer's Short-Term Investment Fund	33,469,504	32,597,000
Unrestricted cash and cash equivalents	48,072,060	39,893,649
Checking - restricted	1,109,782	1,670,516
Money Market - restricted	5,001,190	3,500,000
State Treasurer's Short-Term Investment Fund - restricted	3,639,011	3,628,489
Total cash and cash equivalents	$ 57,822,043	$ 48,692,654

	Cash and cash equivalents as of June 30, 2016			
	Primary Government	CT Solar Lease 2 LLC	CEFIA Solar Services, Inc.	Total
Checking	$ 4,179,675	$ 244,856	$ 74,733	$ 4,499,263
Money Market	3,920,210	1,136,651	5,046,432	10,103,292
State Treasurer's Short-Term Investment Fund	33,469,504	--	--	33,469,504
Unrestricted Cash and Cash Equivalents	41,569,388	1,381,506	5,121,165	48,072,059
Restricted Cash				
Checking	109,783	1,000,000	--	1,109,783
Money market	1,501,190	3,500,000	--	5,001,190
State Treasurer's Short-Term Investment Fund	3,639,011	--	--	3,639,011
	$ 46,819,372	$ 5,881,506	$ 5,121,165	$ 57,822,043

NOTE 4 – CASH AND CASH EQUIVALENTS (CONTINUED)

	Cash and cash equivalents as of June 30, 2015			
	Primary Government	CT Solar Lease 2 LLC	CEFIA Solar Services, Inc.	Total
Checking	$ 4,495,298	$ 161,841	$ 23,120	$ 4,680,259
Money Market	2,511,383	58,875	46,132	2,616,390
State Treasurer's Short-Term Investment Fund	32,597,000	--	--	32,597,000
Unrestricted Cash and Cash Equivalents	39,603,681	220,716	69,252	39,893,649
Restricted Cash				
Checking	670,516	1,000,000	--	1,670,516
Money market	--	3,500,000	--	3,500,000
State Treasurer's Short-Term Investment Fund	3,628,489	--	--	3,628,489
	$ 43,902,686	$ 4,720,716	$ 69,252	$ 48,692,654

STATE TREASURER'S SHORT-TERM INVESTMENT FUND

The State Treasurer's Short-Term Investment Fund is a Standard & Poors AAAm investment pool of high-quality, short-term money market instruments managed by the Cash Management Division of the State Treasurer's Office, and operates in a manner similar to Money Market Mutual Funds. It is the investment vehicle for the operating cash of the State of Connecticut Treasury, state agencies and authorities, municipalities, and other political subdivisions of the State. The value of CGB's position in the pool is the same as the value of pool shares. Regulatory oversight is provided by an investment advisory council and the State Treasurer's Cash Management Board.

INVESTMENT MATURITIES

The State Treasurer's Short-Term Investment Fund itself has no maturity date and is available for withdrawal on demand.

NOTE 4 – CASH AND CASH EQUIVALENTS (CONTINUED)

INTEREST RATE RISK

CGB manages its exposure to declines in fair value by limiting the average maturity of its cash and cash equivalents to no more than one year.

CREDIT RISK

Connecticut General Statutes authorize CGB to invest in obligations of the U.S. Treasury including its agencies and instrumentalities, commercial paper, banker's acceptance, repurchase agreements and the State Treasurer's Short-Term Investment Fund.

Investment ratings for the Fund's investment are as follows:

	Standard & Poor's
State Treasurer's Short-Term Investment Fund	AAAm

CONCENTRATION OF CREDIT RISK

CGB's investment policy does not limit the investment in any one investment vehicle. The State Treasurer's Short-term Investment Fund is not subject to this disclosure.

CUSTODIAL CREDIT RISK - DEPOSITS

In the case of deposits, this represents the risk that, in the event of a bank failure, CGB's deposits may not be returned to it. CGB does not have a deposit policy for custodial credit risk. As of June 30, 2016 and 2015, $19,019,356 and $12,212,054, respectively, of CGB's bank balances were exposed to custodial credit risk. Primary government consisted of $8,727,950 and $7,795,388 as of June 30, 2016 and 2015, respectively. CT Solar Lease 2, LLC consisted of $5,420,241 and $4,416,666 as of June 30, 2016 and 2015, respectively. CEFIA Solar Services, Inc. consisted of $ 4,871,165 as of June 30, 2016. CEFIA Solar Services, Inc. had no balances exposed to credit risk as of June 30, 2015. Funds held by banks on behalf of CGB, CT Solar Lease 2 LLC and CEFIA Solar Services included contractual requirements to maintain $6,000,346 in deposits with financial institutions participating various lease and loan programs, representing loan loss and lease maintenance reserves and guaranty pledge accounts.

CUSTODIAL CREDIT RISK - INVESTMENTS

For an investment, this represents the risk that, in the event of the failure of the counterparty, CGB will not be able to recover the value of the investment. CGB does not have a policy relating to the credit risk of investments. As of June 30, 2016 and 2015, CGB had no reportable credit risk.

NOTE 5 – PORTFOLIO INVESTMENTS

The former Connecticut Clean Energy Fund (CCEF) invested in emerging technology companies as equity and debt investments in Operational Demonstration projects. Based on a memorandum of understanding between CGB and CI, CI manages these investments on behalf of CGB.

NOTE 6 – BONDS RECEIVABLE

Subordinate Series 2014B-1 and 2014C-1

This Series represents two $800,000 bonds received in connection with the CGB's May 2014 sale of C-PACE Loans to Clean Fund Holdings, LLC (CFH). CFH paid CGB approximately $6.4 million in cash along with two bonds issued to CGB through Public Finance Authority. The 2014 Series bonds carry interest of 5.30% per annum with a maturity date of September 10, 2034. The bonds are secured by the C-PACE Loans sold to CFH. CGB received a principal repayment of $8,858 for each bond as a result of a C-PACE loan payoff in 2016. At June 30, 2016, management believes no valuation allowance is necessary on these bonds.

Each bond required semi-annual interest-only payments to CGB starting September 10, 2014 and continuing to September 10, 2034. Starting March 10, 2030 and every six months thereafter, principal payments, along with the required interest is to be paid to CGB.

Subordinate Series 2015B-1 and 2015C-1

This Series represents two $955,000 bonds received in connection with the CGB's August 2015 sale of C-PACE Loans to Clean Fund Holdings, LLC (CFH). CFH paid CGB approximately $7.7 million in cash along with two bonds issued to CGB through Public Finance Authority. The 2015 Series bonds carry interest of 5.52% per annum with a maturity date of August 13, 2035. At June 30, 2016, management believes no valuation allowance is necessary on these bonds.

Each bond required semi-annual interest-only payments to CGB starting September 15, 2015 and continuing to August 13, 2035. Starting September 10, 2032 and every six months thereafter, principal payments, along with the required interest is to be paid to CGB.

Principal maturities of these bonds are as follows:

Year ended June 30,	2014B-1	2014C-1	2015B-1	2015B-1	Total
2017	--	--	--	--	--
2018	--	--	--	--	--
2019	--	--	--	--	--
2020	--	--	--	--	--
2021					
2022 - 2026	--	--	--	--	--
2027 - 2031	277,500	277,500	--	--	555,000
2032 - 2036	513,641	513,641	955,000	955,000	2,937,282
	$ 791,141	$ 791,141	$ 955,000	$ 955,000	$ 3,492,282

NOTE 7 – SOLAR LEASE NOTES

In June of 2008 the predecessor of the CGB, the Connecticut Clean Energy Fund (CCEF) entered into a Master Lease Program Agreement with CT Solar Leasing LLC, a third party leasing company, AFC First Financial Corporation, a third party servicer, and Firstar Development LLC, the tax equity investor, to develop a residential solar PV leasing program in Connecticut. CCEF purchased a total of $13,248,685 of promissory notes issued by CT Solar Leasing LLC during the period commencing in April of 2009 and ending in February of 2012 to fund the program. Each nonrecourse promissory note is secured by the payments under a specific PV equipment lease, with a rate of interest of 5% and a term of 15 years. Future principal repayments under the program and the current loss reserve are as follows:

Future principal repayments		
2017	$	845,479
2018		888,736
2019		934,205
2020		982,001
2021		1,032,242
2022-2025		4,416,442
		9,099,105
Less reserve for losses:		(90,991)
	$	9,008,114
Current portion	$	845,479
Non-current portion		8,162,635
	$	9,008,114

NOTE 8 – PROGRAM LOANS

Outstanding principal balances by program for the years ending June 30, 2016 and 2015 are as follows:

	2016	2015
Connecticut Green Bank		
CPACE Program benefit assessments	$ 19,335,073	$ 29,379,287
CPACE Promissory notes	1,553,884	$ --
Gried-Tied Program term loans	8,701,188	7,722,894
Multifamily/Affordable housing program loans	2,467,231	--
Alpha/Operational Demonstration program loans	1,136,421	836,421
Other program loans	680,737	1,746,443
CT Solar Loan I LLC		
Residential Solar PV Program loans-WIP	26,233	892,866
Residential Solar PV Program loans-Complete	4,041,563	3,584,829
	37,942,330	44,162,741
Reserve for loan losses	(4,674,813)	(3,644,796)
	$ 33,267,517	$ 40,517,945

Scheduled repayments of principal under these loans as of June 30, 2016 is as follows:

	2017	2018	2019	2020	2021	Thereafter	Total
Connecticut Green Bank							
CPACE Program benefit assessments- in repayment	--	--	--	--	--	--	--
Gried-Tied Program term loans	--	--	--	--	--	--	--
Multifamily/Affordable housing term loans	--	--	--	--	--	--	--
Alpha/Operational Demonstration program loans	--	--	--	--	--	--	--
Other program loans	--	--	--	--	--	--	--
CT Solar Loan I LLC							
Residential Solar PV Program loans - in repayment	--	--	--	--	--	--	--
	--	--	--	--	--	--	--
Reserve for loan losses	--	--	--	--	--	--	--
	$ --	$ --	$ --	$ --	$ --	$ --	$ --

NOTE 8 – PROGRAM LOANS (CONTINUED)

Benefits assessments under the C-PACE program will finance energy efficiency upgrades and the installation of renewable energy equipment on non-residential property. The assessments carry interest rates ranging from 5.0% to 6.0% with terms ranging from 10 to 20 years.

The grid–tied term loan represents the financing of two projects. The first project is the 15 megawatt Dominion Bridgeport Fuel Cell Park from Project 150. Interest is paid monthly on the outstanding principal balance at a rate of 5.0% until 2022 when principal payments commence over a 48-month period. The second project is the 5 megawatt wind turbine project in Colebrook. Interest on the revolving term loan is paid quarterly at prime plus 3%. Interest on the non-revolving term loan is paid quarterly based on the project's cash flows. The minimum rate of interest on the non-revolving term loan is 10%. Principal under both loans is repaid at maturity which is 15 years from the date the project was placed in service. The project was placed in service in November of 2015.

Pre development loans finance a clean energy facility developer's costs associated with acquiring site control, environmental assessments, impact studies, permitting costs and facility design. Repayments of principal begin when one of the following milestones is achieved: the closing of permanent financing of the project, commencement of commercial operation, or the sale of the project or its assets. Interest on repayments is at a rate of prime plus 1%. The projects financed continue to be under development and are investments of the organization that are consistent with its Comprehensive Plan and budget.

Operational demonstration program loans are residual transactions of the programs of the Connecticut Clean Energy Fund. The loans finance the development of emerging clean energy technologies. Repayment of each loan is based upon the commercial success of the technology and carries an interest rate of 6%. If commercial success is not achieved after ten years from the date of the loan agreement, the loan converts to a grant. Connecticut Innovations assists in overseeing these loans.

Other program loans represent the financing of feasibility studies for various renewable energy projects or energy efficiency upgrades and bridge loans to developers of solar PV projects for low to moderate income housing that fall inside the organization's Comprehensive Plan and Budget.

The residential solar PV loan program administered by CT Solar Loan I LLC, makes loans to residential property owners for the purpose of installing solar photovoltaic equipment. Loans carry an interest rate ranging from 6.49% to 6.75% with a term of 15 years.

NOTE 9 – FINANCING ACTIVITIES

LONG-TERM DEBT - LINE OF CREDIT – PRIMARY GOVERNMENT

(to be updated)

Solar Mosaic Line of Credit

During 2014, CT Solar Loan 1 LLC entered into a $4,000,000 line of credit (LOC) with Solar Mosaic, Inc. (Mosaic). The LOC was amended in June 2015 to $1,100,000. Borrowings on the LOC immediately turn into a term note with predefined repayment terms at the time of borrowing. No further borrowings are available after June 30, 2015. The LOC had $3,873,912 available at June 30, 2014. Borrowings on the LOC bear interest at 6.4586% (Base Rate) and have the option to buy-down the interest rate to 6.00% (Reduced Rate) by making a payment on the borrowing date of 2.875% of the principal amount of the loan (Rate Buy-down Amount). As of June 30, 2015 and 2014 there was $853,525 and $126,088, respectively, outstanding which matures in March 2029.

In connection with the LOC, CT Solar Loan 1 LLC is required to establish and maintain a collections account, debt service reserve account and a loan loss reserve account. Deposits shall be made into the collections account for all payments received by residential borrowers. The debt service reserve account is required to have no less than six months forward-looking principal and interest payments for the loans outstanding. The loan loss reserve account required a one-time deposit of $300,000 as of June 30, 2014 which was reduced to $82,500 as of June 30, 2015.

Future maturities on borrowings on the LOC are as follows:

Years ending June 30,	Principal	Interest	Total
2017	$ 50,129	$ 47,022	$ 97,151
2018	52,937	43,938	$ 96,875
2019	55,910	40,680	$ 96,590
2020	59,058	37,240	$ 96,298
2021	--	--	$ --
2022 - 2026	346,592	127,414	$ 474,006
Thereafter	241,796	24,495	$ 266,291
	$ 806,422	$ 320,789	$ 1,127,211

The Reinvestment Fund Line of Credit

(To be added)

NOTE 9 – FINANCING ACTIVITIES (CONTINUED)

LINE OF CREDIT –DISCRETELY PRESENTED COMPONENT UNIT – CT SOLAR LEASE 2, LLC

CT Solar Lease 2, LLC has a $24,000,000 line of credit agreement (Additional LOC) with First Niagara Bank, N.A. (First Niagara) as the Administrative Agent and Lender along with an additional participating lender. The additional LOC is broken down by lender as follows:

First Niagara Bank, N.A	$ 15,000,000
Webster Bank, National Association	9,000,000
	$ 24,000,000

Funds may be drawn down in no more than xxx total advances by October 1, 2016. With the exception of the final advance, each advance must be in the principal amount of $2,400,000 or a whole multiple of $100,000 in excess of $2,400,000. Each loan funding will be shared by all participating lenders in accordance with their pro-rata share of the total facility commitment. As of June 30, 2016 and 2015, $18,000,000 and $3,000,000, respectively, had been advanced under the additional LOC. Principal repayments of $832,325 were made as of June 30, 2016. No principal repayments were made as of June 30, 2015.

Each advance will be amortized separately. CT Solar Lease 2 LLC has the option with each advance of selecting between the LIBOR rate or the base rate which is defined as the highest of (a) the Federal Funds Effective Rate plus one-half of 1 percent, (b) First Niagara's prime rate, and (c) the LIBOR rate plus 1 percent. CT Solar Lease 2 LLC may also elect to convert an advance from one rate to the other by following the process outlined in the credit agreement.

Payments of interest with respect to any LIBOR rate advances are due on the 15th day of the month following each calendar quarter end. Payments of interest with respect to any base rate advances are due monthly. Payments of principal with respect to all advances are due on the 15th day of the month following each calendar quarter end. Principal payments on each advance will be based on a modified 15year amortization schedule as outlined in the credit agreement.

NOTE 9 – FINANCING ACTIVITIES (CONTINUED)

LINE OF CREDIT –DISCRETELY PRESENTED COMPONENT UNIT – CT SOLAR LEASE 2, LLC (CONTINUED)

Within one month of each advance, CT Solar Lease 2 LLC is required to enter into an interest rate swap contract with respect to a minimum amount of 75% of such advance. If one of the participating lenders is the counterparty to the swap contract, such contract will be secured by the collateral of the credit agreement; otherwise, the swap contract will be unsecured. See Note 10.

Certain obligations of CT Solar Lease 2 LLC under the credit agreement are guaranteed by CGB. This credit agreement is secured by all assets of CT Solar Lease 2 LLC as well as CEFIA Solar Services (the "Managing Member") interest in CT Solar Lease 2 LLC. There are no prepayment penalties. There are certain debt service coverage ratios CT Solar Lease 2 LLC must maintain related to each separate advance and which require the separate measurement of the net operating income with respect to the projects purchased with each advance.

NOTE 10 – INTEREST RATE SWAP AGREEMENT

CT Solar Lease 2 LLC entered into an interest rate swap agreement with First Niagara (the Swap Agreement) in September 2014 in anticipation of making its first draw down on the credit agreement. Payments made and received are based on a notional amount of $19,374,375 and $11,804,925 as of June 30, 2016 and 2015, respectively. The agreement provides for CT Solar Lease 2 LLC to receive payments based on the 1 month USD-LIBOR-BBA (0.44205% and 0.18550% at June 30, 2016 and 2015, respectively) and to make payments based on an interest rate of 2.78%. The agreement matures on December 15, 2025. The fair value of the interest rate swap agreement as of June 30, 2016 and 2015 were deferred inflows of $1,627,864 and $660,073, respectively which is represented as the fair value of the interest rate swap on the accompanying 2016 and 2015 Statement of Net Position. CGB used the dollar-offset method for evaluating effectiveness of the interest rate swap agreement.

NOTE 11 – PAYMENT TO STATE OF CONNECTICUT

The Connecticut Legislature passed Public Act 13-247 pertaining to the State's budget for the biennium ending June 30, 2015 and signed into law on June 19, 2013. This Act required the Connecticut Green Bank to transfer $19,200,000 to the State's General Fund during fiscal year 2015. No payments to the State were made in fiscal year 2016.

NOTE 12 – RELATED PARTY TRANSACTIONS AND OPERATING LEASES

DUE TO OUTSIDE AGENCY

CGB utilizes the services of CI, as provided in the General Statutes of the State of Connecticut. CI provides services to CGB, at cost, for its operations. Such services include, but are not limited to, staff for human resources and information technology support, office space, equipment, supplies and insurance. Expenses billed to CGB by CI totaled $58,401 and $477,161 for the years ended June 30, 2016 and 2015, respectively. As of June 30, 2016 and 2015, amounts due to CI were $30,127 and $49,516, respectively.

UNUSED COMMITMENT FEE

The Investor Member of CT Solar Lease 2 LLC is entitled to an annual fee due within 30 days of the end of each calendar year, calculated on a monthly basis, based on the amount of the Investor Member's unfunded capital contributions. The fee for each month is equal to 1.25 percent times the amount by which the Investor Member's contribution cap exceeds the total capital contributions funded as of the last day of the month in question divided by twelve. Amounts not paid timely accrue interest at the US Bank Prime Rate in effect on the due date plus 2 percent. The unused commitment fee totaled $99,486 and $252,135 for the years ended June 30, 2016 and 2015, respectively, and is included in accounts payable and accrued expenses on the accompanying statement of net position.

PRIORITY RETURN

The Investor Member is the Tax-Equity Investor and is entitled to substantially all of the tax benefits of CT Solar Lease 2 LLC until January I of the year which is five years after the date the last project is installed, which is anticipated to be January 1, 2021, the Flip Date.

NOTE 12 – RELATED PARTY TRANSACTIONS AND OPERATING LEASES (CONTINUED)

PRIORITY RETURN (CONTINUED)

The investor Member of CT Solar Lease 2 LLC shall be due a cumulative, quarterly distribution equal to 0.5% of its paid-in capital contributions in respect of projects beginning at the end of the first quarter after the first project acquisition capital contribution is made and continuing until the "Flip Date." To the extent the priority return is not paid in a quarter until the Flip Date, unpaid amounts will accrue interest at the lower of 24% per annum or the highest rate permitted by law.

In accordance with the Operating Agreement all amounts and accrued interest due on the Priority Return are to be paid from net cash flow prior to certain required payments due under the Credit Agreement. The Investor Member was paid a priority returns of $299,831 and $26,159 for the years ended June 30, 2016 and 2015, respectively.

ADMINISTRATIVE SERVICES FEE

The Managing Member of CT Solar Lease 2 LLC, CEFIA Solar Services, Inc. provides administrative and management services to the Company and earns a quarterly fee initially equal to $30,000 per quarter beginning July 1, 2013. The amount of the fee increased 2.5 percent each July 1st beginning July 1, 2014. The administrative services fee totaled $130,075 and $123,000 for the years ended June 30, 2016 and 2015, respectively, and is included in accounts payable and accrued expenses on the accompanying statement of net position.

PREPAID PRIORITY RETURN

The investor member of CT Solar Lease 2 LLC will be paid a prepaid priority return with respect to each residential energy system project where the customer has made a prepayment to CT Solar Lease 2 LLC. The prepaid priority return is a one-time distribution to the investor member equal to 4.2055% of each prepaid project's purchase price. The prepaid priority return will be paid to the investor member on the date it makes its initial acquisition capital contribution with respect to the purchase of the prepaid project. During the years ended June 30, 2016 and 2015, the investor member was paid $1,717 and $72,402, respectively, related to the prepaid priority return.

NOTE 12 – RELATED PARTY TRANSACTIONS AND OPERATING LEASES (CONTINUED)

PAYROLL TAXES AND FRINGE BENEFIT CHARGES

Pursuant to state statute, CGB is subject to fringe benefit charges for pension plan and medical plan contributions which are paid at the state level. CGB's employer payroll taxes are also paid at the state level. CGB reimburses the state for these payments. The reimbursement for 2016 and 2015 was $3,691,048 and $3,061,004, respectively, comprising 74.30% and 75.80%, respectively, of gross salaries.

OPERATING LEASES

During 2014, CGB entered into a non-cancellable operating lease with an unrelated entity for its main office space. The lease calls for monthly escalating payments beginning at $12,567 through December 31, 2020. Rent expense related to this lease for the years ended June 30, 2016 and 2015 was $ 159,498 and $154,572, respectively.

In addition, CGB has a non-cancelable operating lease for an additional office space from an unaffiliated entity which calls for initial monthly payments of $7,333, with escalating payments through December 2020. Rent expense related to this lease for the years ended June 30, 2016 and 2015 amounted to $ 105,422 and $97,723, respectively. CGB also began sub leasing additional office space from CI in March of 2016. Initial monthly payments are $5,665.50 with escalating payments through December 2020. Rent expense related to this sub lease was $22,662 for the year ended June 30, 2016.

In addition, CGB leases office equipment on a month-to-month basis. Rent expense related to the office equipment for the years ended June 30, 2016 and 2015 was $13,465 and $6,439, respectively.

Future minimum lease payments for office rentals are as follows:

Years ending June 30,		
2017	$	325,318
2018		333,379
2019		341,440
2020		349,501
2021		176,766
Thereafter		--
	$	1,526,404

NOTE 13 – CAPITAL ASSETS

Capital asset activity for reporting entity for the years ended June 30, 2016 and 2015 are as follows:

Primary Government

2016	Balance, July 1, 2015	Additions	Deletions	Adjustments	Balance, June 30, 2016
Capital assets being depreciated:					
Solar lease equipment	$ --	$ --	$ --	$ --	$ --
Furniture and equipment	222,701	11,417	(7,054)	(57,641)	169,423
Computer hardware and software	128,627	35,963	(9,400)	57,641	212,831
Leasehold improvements	153,657	72,187	--	--	225,844
Capital assets not being depreciated:					
WIP solar lease equipment	--	--	--	--	--
Construction in progress	7,141	23,090	(25,729)	--	4,502
	512,126	142,657	(42,184)	--	612,600
Less accumulated depreciation and amortization:					
Solar lease equipment	--	--	--	--	--
Furniture and equipment	122,149	60,653	(4,125)	(75,598)	103,078
Computer hardware and software	50,906	26,124	(1,055)	75,598	151,573
Leasehold improvements	75,232	33,964	--	--	109,196
	248,287	120,741	(5,181)	--	363,848
Capital assets, net	$ 263,839	$ 21,916	$ (37,003)	$ --	$ 248,752

2015	Balance, July 1, 2014	Additions	Deletions	Adjustments	Balance, June 30, 2015
Capital assets being depreciated:					
Solar lease equipment	$ --	$ --	$ --	$ --	$ --
Furniture and equipment	338,938	18,353	(134,590)	--	222,701
Computer hardware and software	88,337	57,480	(17,190)	--	128,627
Leasehold improvements	139,682	13,975	--	--	153,657
Capital assets not being depreciated:					
WIP solar lease equipment	--	--	--	--	--
Construction in progress	7,141	--	--	--	7,141
	574,098	89,808	(151,780)	--	512,126
Less accumulated depreciation and amortization:					
Solar lease equipment	--	--	--	--	--
Furniture and equipment	205,820	50,919	(134,590)	--	122,149
Computer hardware and software	33,845	34,250	(17,189)	--	50,906
Leasehold improvements	44,501	30,731	--	--	75,232
	284,166	115,900	(151,779)	--	248,287
Capital assets, net	$ 289,932	$ (26,092)	$ (1)	$ --	$ 263,839

NOTE 13 – CAPITAL ASSETS (CONTINUED)

Discretely Presented Component Units

2016	Balance, July 1, 2015	Additions	Deletions	Adjustments	Balance, June 30, 2016
Capital assets being depreciated:					
Solar lease equipment	$ 21,011,832	$ 29,240,167	$ --	$ (2,717,508)	$ 47,534,490
Furniture and equipment	--	--	--	--	--
Computer hardware and software	--	--	--	--	--
Leasehold improvements	--	--	--	--	--
Capital assets not being depreciated:					
WIP solar lease equipment	6,014,560	18,206,739	(11,067,035)	(1,222,525)	11,931,740
Construction in progress	--	--	--	--	--
	27,026,392	47,446,906	(11,067,035)	(3,940,033)	59,466,230
Less accumulated depreciation and amortization:					
Solar lease equipment	319,144	1,532,051	--	--	1,851,195
Furniture and equipment	--	--	--	--	--
Computer hardware and software	--	--	--	--	--
Leasehold improvements	--	--	--	--	--
	319,144	1,532,051	--	--	1,851,195
Capital assets, net	$ 26,707,248	$ 45,914,855	$ (11,067,035)	$ (3,940,033)	$ 57,615,035

2015	Balance, July 1, 2014	Additions	Deletions	Adjustments	Balance, June 30, 2015
Capital assets being depreciated:					
Solar lease equipment	$ 1,035,159	$ 22,753,915	$ --	$ (2,777,242)	$ 21,011,832
Furniture and equipment	--	--	--	--	--
Leasehold improvements	--	--	--	--	--
Computer hardware and software	--	--	--	--	--
Capital assets not being depreciated:					
WIP solar lease equipment	1,759,111	4,847,060	--	(591,611)	6,014,560
Construction in progress	--	--	--	--	--
	2,794,270	27,600,975	--	(3,368,853)	27,026,392
Less accumulated depreciation and amortization:					
Solar lease equipment	9,865	309,279	--	--	319,144
Furniture and equipment	--	--	--	--	--
Computer hardware and software	--	--	--	--	--
Leasehold improvements	--	--	--	--	--
	9,865	309,279	--	--	319,144
Capital assets, net	$ 2,784,405	$ 27,291,696	$ --	$ (3,368,853)	$ 26,707,248

NOTE 13 – CAPITAL ASSETS (CONTINUED)

Total Reporting Entity

2016	Balance, July 1, 2015	Additions	Deletions	Adjustments	Balance, June 30, 2016
Capital assets being depreciated:					
Solar lease equipment	$ 21,011,832	$ 29,240,167	$ --	$ (2,717,508)	$ 47,534,491
Furniture and equipment	222,701	11,417	(7,054)	(57,641)	169,423
Computer hardware and software	128,628	35,963	(9,400)	57,641	212,832
Leasehold improvements	153,657	72,187	--	--	225,844
Capital assets not being depreciated:					
WIP solar lease equipment	6,014,560	18,206,739	(11,067,035)	(1,222,525)	11,931,739
Construction in progress	7,141	23,090	(25,729)	--	4,502
	27,538,519	47,589,563	(11,109,218)	(3,940,033)	60,078,831
Less accumulated depreciation and amortization:					
Solar lease equipment	319,144	1,532,052	--	--	1,851,196
Furniture and equipment	122,149	60,653	(4,125)	(75,598)	103,079
Computer hardware and software	50,906	26,124	(1,055)	75,598	151,573
Leasehold improvements	75,232	33,964	--	--	109,196
	567,431	1,652,793	(5,180)	--	2,215,044
Capital assets, net	$ 26,971,088	$ 45,936,770	$ (11,104,038)	$ (3,940,033)	$ 57,863,787

2015	Balance, July 1, 2014	Additions	Deletions	Adjustments	Balance, June 30, 2015
Capital assets being depreciated:					
Solar lease equipment	$ 1,035,159	$ 22,753,915	$ --	$ (2,777,242)	$ 21,011,832
Furniture and equipment	338,938	18,353	(134,590)	--	222,701
Computer hardware and software	88,337	57,480	(17,189)	--	128,628
Leasehold improvements	139,682	13,975	--	--	153,657
Capital assets not being depreciated:					
WIP solar lease equipment	1,759,111	4,847,060	--	(591,611)	6,014,560
Construction in progress	7,141	--	--	--	7,141
	3,368,368	27,690,783	(151,779)	(3,368,853)	27,538,519
Less accumulated depreciation and amortization:					
Solar lease equipment	9,865	309,279	--	--	319,144
Furniture and equipment	205,820	50,919	(134,590)	--	122,149
Computer hardware and software	33,845	34,250	(17,189)	--	50,906
Leasehold improvements	44,501	30,731	--	--	75,232
	294,031	425,179	(151,779)	--	567,431
Capital assets, net	$ 3,074,337	$ 27,265,604	$ --	$ (3,368,853)	$ 26,971,088

NOTE 14 – GRANT PROGRAMS

CGB, the primary government, recognizes grant revenue based on expenditures or fulfillment of program requirements. For the year ended June 30, 2016 and 2015, CGB recognized related grant revenue of $589,917 and $143,615, respectively under Department of Energy programs.

NOTE 15 – COMMITMENTS AND LOAN GUARANTEES

As of June 30, 2016 and 2015, the Board of Directors designated a portion of CGB's unrestricted net position to fund financial incentives for specific commercial and residential projects in the following areas:

Commitments:

	2016	2015
Solar PV	$ 56,457,195	$ 45,017,128
AD/CHP programs	15,462,247	14,462,247
CPACE	11,563,681	15,178,559
Multifamily/LMI Solar PV and energy efficiency programs	9,510,841	12,000,000
Energy efficiency programs	1,130,000	277,763
Education and outreach	706,900	694,120
Other technologies	271,795	271,795
Alpha and operational demonstration programs	165,000	465,000
Wind	--	1,102,888
	$ 95,267,659	$ 89,469,500

These commitments are expected to be funded over the next one to six fiscal years and are contingent upon the completion of performance milestones by the recipient. All commitments are those of the primary government.

Loan Guarantees:
(to be updated)

NOTE 16 – PENSION PLAN

All employees of the CGB participate in the State Employees' Retirement System (SERS), which is administered by the State Employees' Retirement Commission. The CGB has no liability for pension costs other than the annual contribution. The latest actuarial study was performed on the plan as a whole, as of June 30, 2012, and does not separate information for employees of the CGB. Therefore, certain pension disclosures pertinent to CGB otherwise required pursuant to accounting principles generally accepted in the United States of America are omitted. Based upon the 2012 valuation, the Plan, as a whole, utilized the project unit credit cost method to develop employer contributions, and included the following actuarial assumptions: (1) investment return of 8% (previously 8.25%); (2) price inflation of 2.75% (previously 3%) for cost of living adjustments; (3) projected salary increases of 4% to 20%, Social Security wage base increases of 3.50% per annum; (4) payroll growth of 3.75% per annum; and (5) the RP-2000 Mortality Table. Information on the total plan funding status and progress, contribution required and trend information can be found in the State of Connecticut's Comprehensive Annual Financial Report available from the Office of the State Comptroller, 55 Elm Street, Hartford, CT 06106.

PLAN DESCRIPTION

SERS is a single-employer defined benefit public employee retirement system (PERS) established in 1939 and governed by Sections 5-152 and 5-192 of the Connecticut General Statutes. Employees are covered under one of three tiers. Tier I and Tier IIA are contributory plans, and Tier II is a noncontributory plan.

Members who joined the retirement system prior to July 1, 1984 are enrolled in Tier I. Tier I employees who retire at or after age 65 with 10 years of credited service, at or after age 55 with 25 years of service, or at age 55 with 10 years of credited service with reduced benefits are entitled to an annual retirement benefit payable monthly for life, in an amount of 2 percent of the annual average earnings (which are based on the three highest earning years of service) over $4,800 plus 1 percent of $4,800 for each year of credited service. Tier II employees who retire at or after age 60 with 25 years of service, or at age 62 with 10 years of service, or at age 65 with 5 years of service, are entitled to one and one-third percent of the average annual earnings plus one-half of one percent of the average annual earnings in excess of the salary breakpoint in the year of retirement for each year of credited service. Tier II employees between the ages of 55 and 62 with 10 years but less than 25 years of service may retire with reduced benefits. In addition, Tier II and Tier IIA members with at least five but less than ten years of actual state service who terminate their state employment July 2, 1997 or later and prior to attaining age 62 will be in deferred vested status and may commence receipt of normal retirement benefits on the first of the month on or following their sixty-fifth (65) birthday.

NOTE 16 – PENSION PLAN (CONTINUED)

Employees hired on and after July 1, 1997, will become members of Tier IIA. Tier IIA plan is essentially the existing Tier II plan with the exception that employee contributions of 2 percent of salary are required. Tier I members are vested after ten years of service, while Tier II and Tier IIA members may be vested after five years of service under certain conditions, and all three plans provide for death and disability benefits.

Employees hired on or after July 1, 2011 are covered under the Tier III plan. Tier III requires employee contributions of two percent of salary up to a $250,000 limit after which no additional contributions will be taken on earnings above this limit. The normal retirement date will be the first of any month on or after age 63 if the employee has at least 25 years of vested service or age 65 if the employee has at least 10 but less than 25 years of vested service. Tier III members who have at least 10 years of vested service can receive early reduced retirement benefits if they retire on the first of any month on or following their 58th birthday. Tier III normal retirement benefits include annual retirement benefits for life, in the amount of one and one-third percent of the five-year average annual earnings plus one-half of one percent of the five-year average annual earnings in excess of the salary breakpoint in the year of retirement for each year of credited service plus one and five-eighths of the five-year annual average salary times years of credited service over 35 years.

The total payroll for employees of the CGB covered by SERS for the years ended June 30, 2016 and 2015 was $4,695,647 and $4,013,411, respectively.

CONTRIBUTIONS MADE

CGB's contribution is determined by applying a State mandated percentage to eligible salaries and wages as follows for the years ended June 30:

	2016	2015	2014	2013
Contributions made:				
By employees	$ 208,516	$ 171,260	$ 139,217	$ 104,214
Percent of current year covered payroll	4.4%	4.3%	4.5%	4.1%
Percent of required contributions	100.0%	100.0%	100.0%	100.0%
By CGB	$ 2,474,182	$ 1,974,507	$ 1,669,961	$ 1,125,649
Percent of current year covered payroll	52.7%	49.2%	53.5%	44.7%
Percent of required contributions	100.0%	100.0%	100.0%	100.0%

CGB has contributed the required amount for each of the past three years.

NOTE 17 – PENSION LIABILITIES, PENSION EXPENSE, DEFERRED OUTFLOWS OF RESOURCES, AND DEFERRED INFLOWS OF RESOURCES

The implementation of GASB 68 resulted in CGB reporting an initial net pension liability for fiscal year 2015. The Statement required CGB to recognize a net pension liability for the difference between the present value of the projected benefits for the past service known as the Total Pension Liability (TPL) and the restricted resources held in trust for the payment of pension benefits, known as the Fiduciary Net Pension (FNP). For purposes of measuring the net pension liability, deferred outflows of resources and deferred inflows of resources related to pensions, and pension expense, information about the FNP of SERS and additions to/deductions from SERS FNP have been determined on the same basis as they are reported by SERS. For this purpose, benefit payments (including refunds of employee contributions) are recognized when due and payable in accordance with the benefit term. Investments are recorded at fair value.

At June 30, 2016 and 2015, CGB reported a liability of $16,096,113 and $14,899,766, respectively for its proportionate share of the net pension liability. The net pension liability as of June 30, 2016 was measured as of June 30, 2015, and the total pension liability used to calculate the net pension liability was determined by the actuarial valuation as of that date based on actuarial experience studies. CGB's allocation of the net pension liability was based on the 2015 covered payroll multiplied by the SERS 2015 contribution rate of 37.91 percent. As of June 30, 2016 and 2015, CGB's proportion was 0.09741 percent and 0.09304 percent respectively.

For the years ended June 30, 2016 and 2015, CGB recognized pension expense of $1,399,477 and $1,431,032, respectively. Pension expense is reported in CGB's financial statements as part of general and administration expense and grant and program expenditures. At June 30, 2016 and 2015, CGB reported deferred outflows of resources and deferred inflows of resources related to pension from the following sources:

As of June 30, 2016:

	Deferred Outflows of Resources	Deferred Inflows of Resources
Net Difference between projected and actual earnings on pension plan investments	$ -	$ (2,535)
CGB Contributions subsequent to the measurement date	2,552,833	-
	$ 2,552,833	$ (2,535)

As of June 30, 2015:

	Deferred Outflows of Resources	Deferred Inflows of Resources
Net Difference between projected and actual earnings on pension plan investments	$ -	$ (532,135)
CGB Contributions subsequent to the measurement date	1,669,961	-
	$ 1,669,961	$ (532,135)

NOTE 17 – PENSION LIABILITIES, PENSION EXPENSE, DEFERRED OUTFLOWS OF RESOURCES, AND DEFERRED INFLOWS OF RESOURCES (CONTINUED)

The amount recognized as deferred inflows of resources, representing the net difference between projected and actual earnings, is amortized over a five-year closed period beginning in the year in which the difference occurs and will be recognized in expense as follows:

Year 1 (2017)	$	92,310
Year 2 (2018)		92,310
Year 3 (2019)		92,308
Year 4 (2020)		231,591
Year 5 (2021)		92,342
	$	600,861

ACTUARIAL METHODS AND ASSUMPTION

The total pension liability in the June 30, 2014 actuarial valuation was determined based on the results of an actuarial experience study for the period July 1, 2007 through June 30, 2011. The key actuarial assumptions are summarized below:

Inflation:	2.75%
Salary increase:	4.00% -20% including inflation
Investment rate of return:	8%, net of pension plan investment expense, Including inflation
Cost of living adjustment:	2.30%-3.60% for certain tiers

Mortality rates were based on the RP-2000 Mortality Table for Males or Females, as appropriate, with adjustments for mortality improvements based on Scale AA.

Discount rate

The discount rate used to measure the total pension liability at June 30, 2015 was the long term expected rate of return, 8.00 percent. The projection of cash flows used to determine the discount rate assumed that employee contributions will be made at the current contribution rates and that employer contributions will be made equal to the difference between the projected actuarially determined contribution and member contributions. Projected future benefit payments for all current plan members were projected through the year 2015.

NOTE 17 – PENSION LIABILITIES, PENSION EXPENSE, DEFERRED OUTFLOWS OF RESOURCES, AND DEFERRED INFLOWS OF RESOURCES (CONTINUED)

Expected rate of return on investments

The long term expected rate of return on pension plan investments was determined using a log-normal distribution analysis in which best estimate ranges of expected future real rates of return (expected returns, net of pension plan investment expense and inflation) are developed for each major asset class. These ranges are combined to produce the long-term expected rate of return by weighing the expected future real rate of return by the target asset allocation percentage and by adding expected inflation.

The target asset allocation and best estimate of arithmetic real rates of return for each major asset class are summarized in the following table:

Asset Class	Target Allocation	Long-term Expected Real Rate of Return
Large Cap U.S. Equities	21.0%	5.8%
Developed Non-U.S. Equities	18.0%	6.6%
Emerging Market (non-U.S.)	9.0%	8.3%
Real Estate	7.0%	5.1%
Private Equity	11.0%	7.6%
Alternative Investments	8.0%	4.1%
Fixed Income (Core)	8.0%	1.3%
High Yield Bonds	5.0%	3.9%
Emerging Market Bond	4.0%	3.7%
TIPS	5.0%	1.0%
Cash	4.0%	0.4%

Sensitivity of CGB proportionate share of the net pension liability to changes in the discount rates

The following presents CGB's proportionate share of the net pension liability calculated using the discount rate of 8.00 percent, as well as the proportionate share of the net pension liability using a 1.00 percent increase or decrease from the current discount rate.

	1% Decrease	Discount Rate	1% Increase
	7.0%	8.0%	9.0%
CGB's proportionate share of the net pension liability	$ 19,146,790	$ 16,096,113	$ 13,525,960

NOTE 18 – RESTRICTED NET POSITION

Restricted net position at June 30, 2016 and 2015 consisted of the following:

	2016	2015
Primary Government		
Non-Expendable		
Connecticut Innovations, Inc. equity interest	$ 1,000	$ 1,000
Energy Programs		
CGB		
Assets restricted for maintaining loan loss and interest rate buydown reserves	3,748,793	3,999,005
Assets restricted by contractual obligations for maintaining pledge accounts for loan guarantees	1,200,346	--
CT Solar Loan I LLC		
Assets restricted by contractual obligations for maintaining loan loss reserve	300,844	300,000
	5,249,983	4,299,005
Discretely Presented Component Units		
CT Solar Lease 2 LLC		
Assets restricted for maintaining loan loss reserve	3,500,000	3,500,000
Assets restricted for operating and maintenance reserve	1,000,000	1,000,000
	$ 9,749,983	$ 8,799,005

NOTE 19 – RISK MANAGEMENT

CGB is subject to normal risks associated with its operations including property damage, personal injury and employee dishonesty. All risks are managed through the purchase of commercial insurance. There have been no losses exceeding insurance coverage, and there have been no decreases in insurance coverage over the last three years.

NOTE 20 – RENEWABLE ENERGY CREDITS (PRIMARY GOVERNMENT)

CGB owns Class 1 Renewable Energy Credits (RECs) that are generated by certain commercial renewable energy facilities for which CGB provided the initial funding. Through its Residential Solar Incentive Program, CGB owns the rights to future RECs generated by facilities installed on residential properties. On March 23, 2015 CGB entered into a contract to sell a total of 98,553 RECs generated during the period 2014 to 2016. For the year ended June 30, 2016 CGB sold its contractual obligation of 30,000 RECs. For the year ended June 30, 2015 CGB sold its contractual obligation of 23,553 RECs. CGB’s remaining obligation is to sell 45,000 RECs generated or to be generated in 2016 for $49.50 per REC. Based on historical performance, management believes that the RECs it will receive from funded commercial facilities and residential facilities will exceed the commitments to sell RECs under this agreement.

RECs trade on the New England Power Pool (NEPOOL) market. The market price of Connecticut Class 1 RECs as of June 30, 2016 ranged from $35.00 to $37.50. CGB’s inventory as of June 30, 2016 has been priced at its cost.

CONNECTICUT GREEN BANK
REQUIRED SUPPLEMENTARY INFORMATION

SCHEDULE OF GREEN BANK'S PROPORTIONATE SHARE OF THE NET PENSION LIABILITY

FOR THE YEAR ENDED JUNE 30, 2016

As of June 30,	2016	2015
Green Bank's portion of the net pension liability	0.97410%	0.09304%
Green Bank's proportionate share of the net pension liability	$ 16,096,113	$ 14,899,766
Green Bank's covered employee payroll	$ 4,695,647	$ 4,013,411
Green Bank's proportionate share of the net pension liability as a percentage of its covered-employee payroll	342.79%	371.25%
Plan fiducuary ner position as a percentage of the total pension liabilty	39.23%	39.54%

CONNECTICUT GREEN BANK
REQUIRED SUPPLEMENTARY INFORMATION

SCHEDULE OF GREEN BANK'S PROPORTIONATE CONTRIBUTIONS TO THE STATE EMPLOYEES' RETIREMENT SYSTEM (SERS)

FOR THE YEAR ENDED JUNE 30, 2016

	2016	2015	2014	2013	2012	2011	2010
Contractually required contribution	$2,474,182	$1,974,507	$1,669,961	$1,125,649	$ 601,014	N/A*	N/A*
Contributions in relatio to the contractually rerequired contribution	$2,474,182	$1,974,507	$1,669,961	$1,125,649	$ 601,014	N/A*	N/A*
Contribution deficency (excess)	$ -	$ -	$ -	$ -	$ -	N/A*	N/A*
Green Bank's covered employee payroll	$4,695,647	$4,013,411	$3,121,583	$2,517,190	$1,541,308	N/A*	N/A*
Contributions as a percentage of covered-employee payroll	52.70%	49.20%	53.50%	44.72%	38.99%	N/A*	N/A*

* The Green Bank had no employees prior to 2012 and accordingly there is no activity for 2011 and 2010.

STATISTICAL SECTION
(unaudited)

FINANCIAL STATISTICS

CONNECTICUT GREEN BANK

STATISTICAL SECTION INTRODUCTION

This part of the Connecticut Green Bank's (CGB) comprehensive annual financial report presents detailed information as a context for understanding what the information about the primary government and the discretely presented component units in the financial statements, note disclosures, and required supplementary information says about the benefits of CGB's investments.

FINANCIAL STATISTICS

CONTENTS **PAGE**

CONNECTICUT GREEN BANK

NET POSITION BY COMPONENT
Last Five Fiscal Years

	Year Ended June 30,				
	2016	2015	2014	2013	2012
Primary Government					
Invested in capital assets, net of related debt	$ 248,752	$ 263,839	$ 289,932	$ 362,505	$ 91,329
Restricted Net Position					
Non-expendable	1,000	1,000	1,000	1,000	--
Restricted - energy programs	5,249,983	4,299,005	4,595,715	5,036,656	176,974
Unrestricted	116,624,244	104,881,783	97,754,765	93,717,230	80,920,002
	122,123,978	109,445,626	102,641,412	99,117,391	81,188,305
CT Solar Lease 2 LLC					
Invested in capital assets, net of related debt	65,678,491	30,830,671	3,538,975	--	--
Restricted Net Position					
Non-expendable	17,482,892	8,007,153	1,294,801	100	--
Restricted - energy programs	4,500,000	4,500,000	4,500,000	4,500,000	--
Unrestricted (deficit)	(53,701,650)	(28,210,286)	(5,741,703)	(1,616,886)	--
	33,959,733	15,127,539	3,592,073	2,883,214	--
CEFIA Solar Services, Inc.					
Restricted Net Position					
Non-expendable	100	100	100	100	--
Restricted - energy programs	--	--	--	--	--
Unrestricted (deficit)	346,280	224,654	109,123	--	--
	346,380	224,754	109,223	100	--
Eliminations	(29,046,448)	(15,630,676)	(5,549,471)	(3,500,100)	--
Total Net Position	$ 127,383,643	$ 109,167,243	$ 100,793,237	$ 98,500,605	$ 81,188,305

CONNECTICUT GREEN BANK

CHANGES IN NET POSITION
Last Five Fiscal Years

	Year Ended June 30,				
	2016	2015	2014	2013	2012
Primary Government					
Operating Revenues	$ 69,250,883	$ 72,038,472	$ 52,301,283	$ 43,343,093	$ 39,753,684
Operating Expenses					
Cost of Goods Sold	28,826,976	22,526,874	2,794,270	--	--
Grants and program expenditures	25,261,516	21,111,751	22,948,676	23,634,465	31,122,355
General and administrative expenses	4,445,648	2,984,178	2,408,715	1,811,227	1,387,854
Total Operating Expenses	58,534,141	46,622,802	28,151,661	25,445,692	32,510,209
Operating Income (Loss)	10,716,743	25,415,669	24,149,622	17,897,401	7,243,475
Non-Operating Revenue and (Expenses)					
Interest on solar lease notes	2,895,503	2,217,368	1,034,953	583,575	589,007
Interest on short-term investments	92,536	83,761	98,383	103,928	140,786
Interest income	60,127	58,511	57,407	--	--
Interest expense	(61,795)	(26,985)	--	--	--
Realized gain (loss) on investments	(2,936)	(1,180,285)	(350,000)	(1,034,605)	--
Unrealized gain (loss) on investments	--	--	349,999	378,059	434,702
Provision for loan losses	(1,021,826)	(563,825)	(1,310,933)	--	--
Net Non-Operating Revenues	1,961,609	588,545	(120,191)	30,957	1,164,495
Income (Loss) Before Transfers, Capital Contributions and Member (Distributions)	12,678,352	26,004,215	24,029,431	17,928,358	8,407,970
Capital Contributions	--	--	--	1,000	--
Transfers to State of Connecticut	--	(19,200,000)	(6,200,000)	--	--
Increase in Net Position	$ 12,678,352	$ 6,804,215	$ 17,829,431	$ 17,929,358	$ 8,407,970

CONNECTICUT GREEN BANK

CHANGES IN NET POSITION (CONTINUED)
Last Five Fiscal Years

	Year Ended June 30,				
	2016	2015	2014	2013	2012
CT Solar Lease 2 LLC					
Operating Revenues	$ 2,416,595	$ 210,869	$ 1,770	$ --	$ --
Operating Expenses					
Grants and program expenditures	3,078,633	1,201,123	600,186	--	--
General and administrative expenses	305,217	124,748	127,511	853,480	--
Total Operating Expenses	3,383,850	1,325,871	727,697	853,480	--
Operating Loss	(967,254)	(1,115,002)	(725,927)	(853,480)	--
Non-Operating Revenue and (Expenses)					
Interest on short-term investments	27,777	9,207	8,642	--	--
Interest expense	(729,170)	(150,871)	(57,407)	--	
Unrealized gain (loss) on investments	(967,791)	(660,073)	--	--	--
Net Non-Operating Revenues	(1,669,184)	(801,737)	(48,765)	--	--
Income (Loss) Before Transfers, Capital Contributions and Member (Distributions)	(2,636,439)	(1,916,739)	(774,692)	(853,480)	--
Capital Contributions	21,770,182	13,556,783	1,496,135	3,736,694	--
Distributions to Members	(301,548)	(104,579)	(12,584)	--	--
Increase in Net Position	$ 18,832,195	$ 11,535,465	$ 708,859	$ 2,883,214	$ --

CONNECTICUT GREEN BANK

CHANGES IN NET POSITION (CONTINUED)
Last Five Fiscal Years

	Year Ended June 30,				
	2016	2015	2014	2013	2012
CEFIA Solar Services, Inc.					
Operating Revenues	$ 126,075	$ 123,000	$ 120,000	$ --	$ --
Operating Expenses					
General and administrative expenses	4,750	8,450	10,877	--	--
Total Operating Expenses	4,750	8,450	10,877	--	--
Operating Loss	121,325	114,550	109,123	--	--
Non-Operating Revenue and (Expenses)					
Interest on short-term investments	300	981	--	--	--
Net Non-Operating Revenues	300	981	--	--	--
Income (Loss) Before Transfers, Capital Contributions and Member (Distributions)	121,625	115,531	109,123	--	--
Capital Contributions	--	--	--	100	--
Increase in Net Position	$ 121,625	$ 115,531	$ 109,123	$ 100	$ --

CONNECTICUT GREEN BANK

OPERATING REVENUE BY SOURCE
Last Five Fiscal Years Ending June 30,

	Total Operating Revenues	Utility Remittances Revenue	Utility Remittances % of Annual	RGGI Auction Proceeds Revenue	RGGI Auction Proceeds % of Annual	Grant Revenue Revenue	Grant Revenue % of Annual	Sales of Energy Equipment Revenue	Sales of Energy Equipment % of Annual	Sales of Renewable Energy Certificates Revenue	Sales of Renewable Energy Certificates % of Annual	Other Revenues Revenue	Other Revenues % of Annual
Primary Government													
2016	$ 69,250,883	$26,605,084	38.4 %	$ 6,481,562	9.4 %	$ 589,917	0.9 %	$ 32,767,009	47.3 %	$ 2,419,990	3.5 %	$ 387,320	0.6 %
2015	72,038,472	27,233,987	37.8 %	16,583,545	23.0 %	192,274	0.3 %	25,912,414	36.0 %	1,474,488	2.0 %	641,763	0.9 %
2014	52,301,283	27,779,345	53.1 %	20,074,668	38.4 %	321,642	0.6 %	3,548,840	6.8 %	376,559	0.7 %	200,229	0.4 %
2013	43,343,093	27,621,409	63.7 %	4,744,657	10.9 %	10,035,250	23.2 %	--	-- %	147,000	0.3 %	794,777	1.8 %
2012	39,753,684	27,025,088	68.0 %	2,052,748	5.2 %	10,435,251	26.2 %	--	-- %	142,738	0.4 %	97,860	0.2 %
CT Solar Lease 2 LLC													
2016	$ 2,416,595	$ --	-- %	$ --	-- %	$ --	-- %	$ --	-- %	$ 233,793	9.7 %	$ 2,182,803	90.3 %
2015	210,869	--	-- %	--	-- %	--	-- %	--	-- %	--	-- %	210,869	100.0 %
2014	1,770	--	-- %	--	-- %	--	-- %	--	-- %	--	-- %	1,770	100.0 %
2013	--	--	-- %	--	-- %	--	-- %	--	-- %	--	-- %	--	-- %
2012	--	--	-- %	--	-- %	--	-- %	--	-- %	--	-- %	--	-- %
CEFIA Solar Services, Inc.													
2016	$ 126,075	$ --	-- %	$ --	-- %	$ --	-- %	$ --	-- %	$ --	-- %	$ 126,075	100.0 %
2015	123,000	--	-- %	--	-- %	--	-- %	--	-- %	--	-- %	123,000	100.0 %
2014	120,000	--	-- %	--	-- %	--	-- %	--	-- %	--	-- %	120,000	100.0 %
2013	--	--	-- %	--	-- %	--	-- %	--	-- %	--	-- %	--	-- %
2012	--	--	-- %	--	-- %	--	-- %	--	-- %	--	-- %	--	-- %
Eliminations													
2016	$(34,005,320)	$ --	-- %	$ --	-- %	$ --	-- %	$(32,767,009)	96.4 %	$ --	-- %	$(1,238,311)	3.6 %
2015	(26,077,923)	--	-- %	--	-- %	--	-- %	(25,895,727)	99.3 %	--	-- %	(182,196)	0.7 %
2014	(3,668,840)	--	-- %	--	-- %	--	-- %	(3,548,840)	96.7 %	--	-- %	(120,000)	3.3 %
2013	--	--	-- %	--	-- %	--	-- %	--	-- %	--	-- %	--	-- %
2012	--	--	-- %	--	-- %	--	-- %	--	-- %	--	-- %	--	-- %
Total Reporting Entity													
2016	$ 37,788,234	$26,605,084	70.4 %	$ 6,481,562	17.2 %	$ 589,917	1.6 %	$ --	-- %	$ 2,653,783	7.0 %	$ 1,457,887	3.9 %
2015	46,294,417	27,233,987	58.8 %	16,583,545	35.8 %	192,274	0.4 %	16,688	0.0 %	1,474,488	3.2 %	793,435	1.7 %
2014	48,754,213	27,779,345	57.0 %	20,074,668	41.2 %	321,642	0.7 %	--	-- %	376,559	0.8 %	201,999	0.4 %
2013	43,343,093	27,621,409	63.7 %	4,744,657	10.9 %	10,035,250	23.2 %	--	-- %	147,000	0.3 %	794,777	1.8 %
2012	39,753,684	27,025,088	68.0 %	2,052,748	5.2 %	10,435,251	26.2 %	--	-- %	142,738	0.4 %	97,860	0.2 %

CONNECTICUT GREEN BANK

SIGNIFICANT SOURCES OF OPERATING REVENUE
Last Five Fiscal Years

	Year Ended June 30,									
	2016		2015		2014		2013		2012	
	Revenue	% of Total	Revenue	% of Total	Revenue	% of Total	Revenue	% of Total	Revenue	% of Total
Utility Remittances*										
Eversource	$21,223,577	79.8 %	$21,899,541	80.4 %	$22,322,100	80.4 %	$22,144,093	80.2 %	$22,037,771	81.5 %
United Illuminating	5,381,507	20.2 %	5,334,446	19.6 %	5,457,245	19.6 %	5,477,316	19.8 %	4,987,317	18.5 %
Total	$26,605,084	100.0 %	$27,233,987	100.0 %	$27,779,345	100.0 %	$27,621,409	100.0 %	$27,025,088	100.0 %
RGGI Auction Proceeds #										
Renewables	$ 6,481,562	100.0 %	$ 5,631,156	34.0 %	$ 7,476,158	37.2 %	$ 4,744,657	100.0 %	$ 2,052,748	100.0 %
Energy Efficiency	--	-- %	10,952,389	66.0 %	12,598,510	62.8 %	--	-- %	--	-- %
Total	$ 6,481,562	100.0 %	$16,583,545	100.0 %	$20,074,668	100.0 %	$ 4,744,657	100.0 %	$ 2,052,748	100.0 %
Grant Revenue										
Federal ARRA Grants	$ --	-- %	$ --	-- %	$ --	-- %	$ 8,376,681	83.5 %	$ 8,738,726	83.8 %
DOE Grants	589,917	100.0 %	143,614	74.7 %	321,642	100.0 %	1,622,569	16.2 %	1,645,525	15.8 %
Private Foundation	--	-- %	48,660	25.3 %	--	-- %	36,000	0.4 %	50,000	0.5 %
Total	$ 589,917	100.0 %	$ 192,274	100.0 %	$ 321,642	100.0 %	$10,035,250	100.0 %	$10,434,251	100.0 %

* *Revenue based on Statutory rate of 1 mil per kWh generated by the utility.*

\# *The Regional Greenhouse Gas Initiative (RGGI) is a cooperative effort among nine Northeastern and Mid-Atlantic states to reduce greenhouse gas emissions. RGGI holds quarterly auctions of the member state's CO2 allowances. At auction, a market-based clearing price is determined from prices submitted in the winning bids and is used to value proceeds returned to the states. The Connecticut Green Bank receives a portion of Connecticut's auction proceeds which is recognized as revenue and invested in clean energy programs.*

CONNECTICUT GREEN BANK

OUTSTANDING DEBT BY TYPE
Last Five Fiscal Years

	Primary Government		CT Solar Lease 2 LLC		CEFIA Solar Services, Inc.		Total Reporting Entity	
	Line of Credit		Line of Credit		Line of Credit		Line of Credit	
Fiscal Year	Advances	Available	Advances	Available	Advances	Available	Advances	Available
2016	$ 2,510,837	$ -	$ 15,000,000	$ -	$ -	$ -	$ 17,510,837	$ 6,000,000
2015	$ 853,525	$ -	$ 3,000,000	$ 23,700,000	$ -	$ -	$ 3,853,525	$ 23,700,000
2014	$ 126,088	$ 3,873,912	$ -	$ 26,700,000	$ -	$ -	$ 126,088	$ 30,573,912
2013	$ -	$ -	$ -	$ 26,700,000	$ -	$ -	$ -	$ 26,700,000
2012	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -

CONNECTICUT GREEN BANK

DEMOGRAPHIC AND ECONOMIC INFORMATION
Last Five Fiscal Years

Fiscal Year	Population (1)	Median Age (1)	Per Capita Income (1)	Median Household Income (1)	Population 3 Years and Over Enrolled in Public School (1)	Unemployment Rate (2)
2016	n/a	n/a	n/a	n/a	n/a	5.8%
2015	3,590,886	40.6	39,430	$ 71,346	729,896	5.5%
2014	3,592,053	40.3	39,373	70,048	733,997	6.5%
2013	3,583,561	40.2	37,726	67,098	751,831	7.7%
2012	3,572,213	40.0	36,891	67,276	759,755	8.5%

Sources: (1) US Census Bureau
(2) US Department of Labor

CONNECTICUT GREEN BANK

PRINCIPAL EMPLOYERS – FOR THE STATE OF CONNECTICUT
Last Three Calendar Years

	2015			2014			2013		
Employer [1]	Employees	Rank	Percentage of Total State Employment [2]	Employees	Rank	Percentage of Total State Employment [2]	Employees	Rank	Percentage of Total State Employment [2]
State of Connecticut	51,646	1	2.89%	54,230	1	3.05%	53,951	1	3.10%
United Technologies	24,000	2	1.34	25,000	2	1.40	27,000	2	1.55
Yale New Haven Health System	20,071	3	1.12	18,869	3	1.06	18,639	3	1.07
Hartford Healthcare	18,107	4	1.01	18,597	4	1.05	16,951	4	0.98
Yale University	14,787	5	0.83	14,787	5	0.83	14,750	5	0.85
General Dynamics Electric Boat	9,583	6	0.54	8,896	7	0.50	8,817	6	0.51
Wal-Mart Stores Inc.	8,800	7	0.49	9,289	6	0.52	8,761	7	0.50
The Travelers Cos. Inc.	7,300	8	0.41	7,400	9	0.42	7,400	9	0.43
The Hartford Financial Services Group	7,000	9	0.39	7,000	11	0.39	7,700	11	0.44
Mohegan Sun	6,900	10	0.39	7,300	10	0.41	7,300	10	0.42
Foxwoods Resort Casino	5,301	14	0.30	7,600	8	0.43	7,667	8	0.44

CONNECTICUT GREEN BANK

FTEs BY FUNCTION
Last Five Fiscal Years

	Year Ended June 30,				
	2016	2015	2014	2013	2012
Program Services					
Statutory & Infrastructure	9.00	8.00	7.00	7.00	9.00
Residential	6.00	6.00	5.00	3.00	1.00
Commercial & Industrial	4.00	2.00	4.00	2.00	--
Institutional	--	1.00	1.00	1.00	1.00
Subtotal Program Services	19.00	17.00	17.00	13.00	11.00
Administrative & Support					
Executive	4.00	4.00	4.00	4.00	4.00
Finance	6.00	5.00	4.00	3.00	1.00
Accounting	6.00	5.30	3.50	2.75	2.20
Legal & Policy	3.00	3.00	2.00	2.00	2.00
Marketing	6.00	6.00	5.00	5.00	5.00
Operations	3.90	3.50	3.80	4.00	3.85
Subtotal Administrative & Support	28.90	26.80	22.30	20.75	18.05
Total FTEs by Function	47.90	43.80	39.30	33.75	29.05

CONNECTICUT GREEN BANK

OPERATING INDICATORS BY FUNCTION
Last Five Fiscal Years

	Year Ended June 30,				
	2016	2015	2014	2013	2012
Clean Energy Investment *($s in Millions)*					
CGB Dollars Invested	$ 48.0	$ 55.7	$ 37.8	$ 18.6	$ 4.8
Private Dollars Invested	268.3	281.9	102.8	92.7	10.2
Total Project Investment	314.1	335.5	140.2	111.1	15.0
Number of Clean Energy Projects	8,271	6,543	2,422	1,118	417
Annual Energy Savings of Clean Energy *(MMBtu)*	419,219	1,086,544	378,877	59,481	9,334
Installed Capacity of Clean Energy *(MW)*					
Anaerobic Digesters	1.0	3.0	3.2	--	--
Biomass	--	0.6	--	--	--
CHP	2.5	0.9	3.0	0.7	--
Fuel Cell	--	--	--	14.8	--
Geothermal	--	--	--	--	--
Hydro	--	0.5	--	--	--
Solar PV	70.9	55.4	19.9	8.0	2.9
Wind	--	5.0	--	--	--
Total	74.4	65.5	26.1	23.5	2.9
Lifetime Production of Clean Energy *(MWh)*					
Anaerobic Digesters	82,283	244,404	260,698	--	--
Biomass	--	14,257	--	--	--
CHP	229,129	86,611	274,955	62,781	--
Fuel Cell	--	--	--	1,166,832	--
Geothermal	295	38	84	--	--
Hydro	--	43,898	--	--	--
Solar PV	1,683,858	1,317,343	471,912	189,733	68,388
Wind	--	118,260	--	--	--
Total	1,995,564	1,824,810	1,007,648	1,419,346	68,388
Jobs Created by Year					
Direct Jobs *(# of Jobs)*	1,703	1,455	550	559	88
Indirect and Induced Jobs *(# of Jobs)*	2,740	2,340	885	1,132	142
Lifetime CO2 Emission Reductions					
Emission Reductions *(Tons)*	885,103	815,600	271,179	178,437	35,459
Home Equivalents *(# of Homes)*	10,491	10,116	6,499	15,293	326
Cars Off the Road Equivalents *(# of Cars)*	5,816	5,432	1,630	1,967	236
Acres of Trees Planted Equivalents *(# of Acres)*	11,643	10,875	3,263	3,937	473

	Year Ended June 30,				
	2016	2015	2014	2013	2012
Capital assets being depreciated:					
Solar lease equipment	$ 47,534,491	$ 21,011,832	$ 1,035,159	$ --	$ --
Furniture and equipment	169,423	222,701	338,938	335,744	13,049
Computer hardware and software	212,832	128,628	88,337	136,659	28,460
Leasehold improvements	225,844	153,657	139,682	71,470	56,224
Capital assets not being depreciated:					
WIP solar lease equipment	11,931,739	6,014,560	1,759,111	--	--
Construction in progress	4,502	7,141	7,141	--	--
	60,078,831	27,538,519	3,368,368	543,873	97,733
Less accumulated depreciation and amortization:					
Solar lease equipment	1,851,196	319,144	9,865	--	--
Furniture and equipment	103,079	122,149	205,820	146,560	626
Computer hardware and software	151,573	50,906	33,845	18,093	3,807
Leasehold improvements	109,196	75,232	44,501	16,715	1,971
	2,215,044	567,432	294,031	181,368	6,404
Capital assets, net	$ 57,863,787	$ 26,971,087	$ 3,074,337	$ 362,505	$ 91,329

NON-FINANCIAL STATISTICS

CONNECTICUT GREEN BANK

NON-FINANCIAL STATISTICS INTRODUCTION

This part of the Connecticut Green Bank's (CGB) comprehensive annual financial report presents detailed non-financial information as a context for understanding the methods management uses to measure CGB's success and CGB's efforts to transform the clean energy market in using its financial resources.

NON-FINANCIAL STATISTICS

CONTENTS **PAGE**

CONNECTICUT GREEN BANK

1. STATEMENT OF THE CONNECTICUT GREEN BANK

October XX, 2016

Re: Statement of the Connecticut Green Bank on the Non-Financial Statistics Contents of the Comprehensive Annual Financial Report for FY 2016 – Background and Market, Measures of Success, and Market Transformation

Dear Reader:

This is the "Non-Financial Statistics" section of the Comprehensive Annual Financial Report for FY 2016.

In this section, you will find the following information:

- **Background and Market** – an overview of the organization's governance, including engagement of its members at the board and committee levels, along with ethics compliance and financial interest disclosure requirements. You will also be able to see the level of investment, deployment and public benefits that are being created within our local communities, including distressed communities and low income census tracts. And last, you will see how the organization has made steady progress in terms of ensuring that Connecticut's small businesses and minority enterprises have an opportunity to bid on a portion of the purchases of goods and services that the organization procures.

- **Measures of Success** – as outlined in the organization's Comprehensive Plan,[13] we are reporting on the following measures of success:

  - **Attract & Deploy Capital** – how we are sourcing projects (as illustrated by projects in statuses from approved to completed), level of investment by both the Connecticut Green Bank and the end-use consumer or private investor, and the private to public leverage ratio being achieved by sector.

  - **Energy Saved and Generated** – how we are quantifying the energy generated and/or saved by each project. This includes the amount of clean energy deployed (i.e., MW), estimate of clean energy produced over the life of the projects (i.e., MWh), estimate of the annual amount of energy savings (i.e., MMBtu), and the variety of renewable energy technologies we have invested in by sector.

  - **Green Bank** – how we are building a balance sheet as a result of our financing focus in terms of asset management (i.e., current vs. non-current assets), ratio of public funds invested in grants and subsidies versus credit enhancements, loans, and leases, and the general credit quality of residential borrowers in our financing programs.

  - **Public Benefits** – how our investment activities are resulting in economic development (i.e., jobs) and environmental protection (i.e., GHG emission reductions and equivalencies) benefits.

[13] http://goo.gl/GhRL9t

- **Market Transformation** – an overview of the program logic model for the organization in terms of its goals:

    - **Attract and Deploy** – to attract and deploy capital to finance the clean energy policy goals for Connecticut;

    - **Affordable and Accessible** – to develop and implement strategies that bring down the cost of clean energy to make it more accessible and affordable to consumers; and

    - **From Reliance to Markets** – to reduce the market's reliance on grants, rebates, and other subsidies and move it towards innovative low-cost financing of clean energy deployment.

  The program logic model serves as a foundation for evaluating clean energy deployment through subsidy and financing programs of the Connecticut Green Bank. As we begin to evaluate our programs, the reader will see that we have applied the program logic model to the subsidy (i.e., Residential Solar Investment Program) and financing (i.e., CT Solar Loan, CT Solar Lease, Smart-E Loan, and C-PACE) programs.

The assembly of the "Non-Financial Statistics" section of the Comprehensive Annual Financial Report is a process of continuous improvement. For example, the reader can compare FY 2015 with FY 2016 to see that more information is being disclosed to better communicate the level of impact the Connecticut Green Bank is making.

[Paragraph here on findings from Marcum LLP assessment of the Non-Financial Statistics section of the CAFR – data collection systems, project status, and project reporting.]

Board of Directors

Pursuant to Section 16-245n of the General Statutes of Connecticut, the powers of the Connecticut Green Bank are vested in and exercised by the Board of Directors that is comprised by eleven voting and one non-voting member each with knowledge and expertise in matters related to the purpose of the organization (see Table 2).

Table 2. Composition of the Board of Directors of the Connecticut Green Bank for FY 2016

Position	Name	Status	Voting
Commissioner of DECD (or designee)	Catherine Smith	Ex Officio	Yes
Commissioner of DEEP (or designee)	Rob Klee	Ex Officio	Yes
State Treasurer (or designee)	Bettina Ferguson	Ex Officio	Yes
Finance of Renewable Energy	Reed Hundt	Appointed	Yes
Finance of Renewable Energy	Kevin Walsh	Appointed	Yes
Labor Organization	John Harrity	Appointed	Yes
R&D or Manufacturing	Mun Choi	Appointed	Yes
Investment Fund Management	Norma Glover	Appointed	Yes
Environmental Organization	Matthew Ranelli	Appointed	Yes
Finance or Deployment	Tom Flynn	Appointed	Yes
Residential or Low Income	Pat Wrice	Appointed	Yes
President of the Green Bank	Bryan Garcia	Ex Officio	No

The Board of Directors of the Connecticut Green Bank is governed through statute, as well as an Ethics Statement and Ethical Conduct Policy, Resolutions of Purposes, Bylaws, Joint Committee Bylaws, and Comprehensive Plan. The Comprehensive Plan for the Connecticut Green Bank provides a multiyear strategy to support the vision and mission of the organization and the public policy objective of delivering consumers cheaper, cleaner, and more reliable sources of energy while creating jobs and supporting local economic development. An Employee Handbook and Operating Procedures have also been approved by the Board of Directors and serve to guide the staff to ensure that it is following proper contracting, financial assistance, and other requirements.

The Board of Directors of the Connecticut Green Bank is comprised of eleven (11) ex officio and appointed voting members, and one (1) ex officio non-voting member. The leadership of the Board of Directors, includes:

- **Chair** – Catherine Smith, Commissioner of DECD (designated as the Chair of the Connecticut Green Bank by Governor Malloy)
- **Vice Chair** – Rob Klee, Commissioner of DEEP (voted in by his peers of the Connecticut Green Bank Board of Directors)
- **Secretary** – Matthew Ranelli, Partner at Shipman and Goodwin (voted in by his peers of the Connecticut Green Bank Board of Directors)

For FY 2016, the Board of Directors of the Connecticut Green Bank met nine (9) times, including six (6) regularly scheduled meetings and three (3) special meetings. There was an attendance rate of 76% by the Board of Directors and 49 approved resolutions. For a link to the materials from the Board of Directors meetings that is publicly accessible – click here.

Committees of the Board of Directors

There are four (4) committees of the Board of Directors of the Connecticut Green Bank, including:

- Audit, Compliance, and Governance
- Budget and Operations
- Deployment
- Joint Committee of the Energy Efficiency Board and the Connecticut Green Bank

Audit, Compliance and Governance Committee

The Audit, Compliance and Governance Committee (ACG Committee) of the Connecticut Green Bank is comprised of three (3) ex officio and appointed voting members. The leadership of the ACG Committee, includes:

- **Chair** – Matthew Ranelli, Partner and Shipman and Goodwin (designated as the Chair by Catherine Smith)
- **Members**[14] – John Harrity and Pat Wrice (designated as a member of the Committee by Catherine Smith)

For FY 2016, the ACG Committee of the Connecticut Green Bank met two (2) times, including two (2) regularly scheduled meetings and no special meetings. There was an attendance rate of 83% by the Audit, Compliance and Governance Committee and 5 approved resolutions. For a link to the materials from the ACG Committee meetings that is publicly accessible – click here.

Budget and Operations Committee

The Budget & Operations Committee (B&O Committee) of the Connecticut Green Bank is comprised of three (3) ex officio and appointed voting members. The leadership of the B&O Committee, includes:

- **Chair** – Rob Klee, Commissioner of DEEP (designated as the Chair by Catherine Smith)
- **Members**[15] – Mun Choi and Norma Glover (designated as a member of the Committee by Catherine Smith)

For FY 2016, the B&O Committee of the Connecticut Green Bank met three (3) times, including three (3) regularly scheduled meetings and no special meetings. There was an attendance rate of 77% by the Budget and Operations Committee and 2 approved resolutions. For a link to the materials from the B&O Committee meetings that is publicly accessible – click here.

Deployment Committee

The Deployment Committee of the Connecticut Green Bank is comprised of four (4) ex officio and appointed voting members. The leadership of the Deployment Committee, includes:

[14] Note – the Chair and/or Vice Chair of the Board of Directors of the Connecticut Green Bank can attend the Audit, Compliance, and Governance Committee meeting to establish a quorum

[15] Note – the Chair and/or Vice Chair of the Board of Directors of the Connecticut Green Bank can attend the Audit, Compliance, and Governance Committee meeting to establish a quorum

- **Chair**[16] – Reed Hundt, CEO of the Coalition for Green Capital (designated as the Chair by Catherine Smith)
- **Members**[17] – Bettina Ferguson (ex officio per bylaws), Matthew Ranelli, and Pat Wrice (designated as a member of the Committee by Catherine Smith)

For FY 2016, the Deployment Committee of the Connecticut Green Bank met five (5) times, including two (2) regularly scheduled meetings and three (3) special meetings. There was an attendance rate of 85% by the Deployment Committee and 16 approved resolutions. For a link to the materials from the Deployment Committee meetings that is publicly accessible – click here.

Joint Committee

Pursuant to Section 16-245m(d)(2) of the Connecticut General Statutes, there is hereby created a Joint Committee of the Energy Efficiency Board (EEB) and the Connecticut Green Bank. Per bylaws established and approved by the EEB and the Connecticut Green Bank, the Joint Committee is comprised of four (4) appointed and voting members, one (1) ex officio and voting member, and four (4) ex officio and non-voting members. The leadership of the Joint Committee, includes:

- **Chair** – Eric Brown, Attorney with CBIA (voted in by his peers of the EEB and the Connecticut Green Bank)
- **Vice Chair** – Diane Duva, DEEP (voted in by her peers of the EEB and the Connecticut Green Bank)
- **Secretary** – Bryan Garcia, Connecticut Green Bank, and Craig Diamond, Connecticut Energy Efficiency Fund (voted in by their peers of the EEB and the Connecticut Green Bank)
- **Members**[18] – Bryan Garcia (non-voting), Norma Glover, Bert Hunter (non-voting), and John Harrity (designated as members of the Committee by Catherine Smith)

For FY 2016, the Joint Committee of the EEB and the Connecticut Green Bank met five (5) times, including four (4) regularly scheduled meetings and one (1) special meeting. There was an attendance rate of 95% by the Joint Committee and 3 approved resolutions. For a link to the materials from the Joint Committee meetings that is publicly accessible – click here.

Statement of Financial Interest

It is required by state ethics laws and a determination of the Governor's standard that senior-level staff (i.e., Director level and above) and members of the Board of Directors annually file a Statement of Financial Interest (SFI). The Governor's standard is the following:

> Governor Malloy has established a standard which requires "filing of Annual Statements of Financial Interests by all persons in the Executive Branch and Quasi-Public Agencies who exercise (i) significant policy-making, regulatory or

[16] Matthew Ranelli, Partner and Shipman and Goodwin for 11/14/14 & 11/21/14 only*
[17] Bettina Ferguson, Reed Hundt, Rob Klee, Patricia Wrice, & Catherine Smith for 11/14/14 & 11/21/14 only*
[18] Note – these members are representatives from the Connecticut Green Bank.

contractual authority; (ii) significant decision-making and/or supervisory responsibility for the review and/or award of State contracts; or (iii) significant decision-making and/or supervisory responsibility over staff that monitor State contracts."

These statements include information such as names of all associated business, income over $1,000 and a list of all real property as well as any creditors. SFIs that have been filed are available to the public under the Freedom of Information Act. The SFIs serve two purposes. First, the financial disclosure provides a checklist or reminder to the official/employee to be mindful of potential conflicts of interest. Second, the statements serve as a tool to maximize public confidence in governmental decision making.

With respect to the 2016 SFI filing – required by May 2, 2016 – the Connecticut Office of State Ethics received the following from the Connecticut Green Bank (see Table 3):

Table 3. Summary of State of Financial Interest Filings with the Office of State Ethics for FY 2016

	Number of SFIs Submitted	**% Submitted on Time**
Senior Staff	10	100%
Board of Directors	7	100%

The Connecticut Green Bank received a Certificate of Excellence Ethics Compliance from the Connecticut Office of State Ethics.

Fiscal Year 2016 Approved/Closed/Completed Projects

Communities across Connecticut are demonstrating leadership in their support of green energy. The Connecticut Green Bank distributes reports to communities on an annual basis to provide them with a breakdown of their performance. There are many leaders of green energy deployment across the state, and we have assembled the "Top 5" in energy, environment, and economy for both FY 2016 as well as FY 2012 through FY 2016.

Table 4. The "Top 5" Energy, Environment, and Economy Metrics for FY 2016[19]

Municipality	Watts/ Capita
Canaan	171.8
Kent	165.4
Windsor	90.3
Bloomfield	85.9
Orange	72.4

Municipality	Lifetime CO2 Emissions (tons)
Bridgeport	29,949
Manchester	24,760
Bloomfield	21,685
Milford	20,802
Waterbury	19,596

Municipality	Investment/ Capita
Canaan	$777.61
Kent	$498.93
Southington	$358.57
Windsor	$346.60
Chester	$326.25

Table 5. Clean Energy Performance by Municipality (FY 2016)

Municipality	# Projects	Average Investment (Project Cost)	Median Investment (Project Cost)	Total Investment (Project Cost)	Investment /Capita	MW	Watts/ Capita	Annual MMBTU	Total Job Years	Lifetime CO2 Emissions (tons)
Andover	5	$43,707	$37,128	$218,534	$66.16	0.0	15.1	173	3	615
Ansonia	50	$30,368	$27,000	$1,518,394	$78.88	0.4	18.9	1,181	23	4,474
Ashford	21	$31,493	$31,618	$661,347	$153.20	0.1	32.9	464	10	1,749
Avon	35	$32,430	$35,490	$1,135,042	$62.72	0.3	15.4	978	18	3,432
Barkhamsted	17	$35,580	$34,627	$604,867	$159.22	0.2	41.4	510	9	1,936
Beacon Falls	7	$30,049	$27,300	$210,345	$34.77	0.1	8.5	167	3	636
Berlin	47	$32,806	$30,240	$1,541,875	$77.61	0.4	18.2	1,190	24	4,444
Bethany	15	$34,207	$36,855	$513,106	$92.24	0.1	22.6	408	8	1,552
Bethel	41	$34,899	$31,942	$1,430,846	$76.99	0.3	17.6	1,063	22	4,040
Bethlehem	15	$29,877	$29,016	$448,148	$124.24	0.1	26.5	310	7	1,177
Bloomfield	103	$49,138	$22,155	$5,061,227	$247.06	1.8	85.9	5,713	61	21,685
Bolton	28	$28,336	$30,776	$793,412	$159.32	0.2	45.3	768	12	2,777
Branford	65	$33,724	$31,395	$2,192,068	$78.22	0.5	17.6	1,618	34	6,068
Bridgeport	316	$34,114	$27,000	$10,779,927	$74.74	2.3	15.8	9,486	142	29,949
Bridgewater	7	$44,624	$39,028	$312,369	$180.87	0.1	37.8	212	5	805
Bristol	167	$36,867	$31,395	$6,156,742	$101.80	1.4	23.3	4,590	92	17,381
Brookfield	26	$39,157	$35,870	$1,018,073	$61.88	0.2	14.3	764	15	2,901
Brooklyn	42	$27,446	$25,636	$1,152,742	$140.41	0.3	36.9	982	18	3,729
Burlington	31	$68,606	$40,950	$2,126,799	$228.66	0.6	62.1	1,915	27	7,120
Canaan	15	$63,971	$39,312	$959,570	$777.61	0.2	171.8	815	13	3,045
Canterbury	21	$41,368	$32,604	$868,726	$169.28	0.2	39.2	652	13	2,478
Canton	8	$42,236	$38,753	$337,887	$32.83	0.1	8.0	286	5	1,010

[19] It should be noted that both Bridgeport and Colebrook are in the "Top 5" in several categories as a result of large investments in the Dominion Bridgeport Fuel Cell Park and Colebrook Wind Project respectively.

Municipality	# Projects	Average Investment (Project Cost)	Median Investment (Project Cost)	Total Investment (Project Cost)	Investment /Capita	MW	Watts/ Capita	Annual MMBTU	Total Job Years	Lifetime CO2 Emissions (tons)
Chaplin	3	$37,573	$40,950	$112,718	$48.90	0.0	9.3	70	2	265
Cheshire	59	$34,510	$31,000	$2,036,063	$69.58	0.5	17.3	1,737	33	6,237
Chester	16	$81,441	$36,855	$1,303,059	$326.25	0.1	30.4	406	9	1,498
Clinton	39	$48,406	$32,760	$1,887,829	$142.37	0.5	35.8	1,551	25	5,844
Colchester	46	$38,424	$36,375	$1,767,515	$110.00	0.4	25.1	1,338	27	4,963
Colebrook	4	$41,606	$40,159	$166,425	$112.07	0.0	26.5	128	3	485
Columbia	9	$34,120	$40,065	$307,080	$55.99	0.1	12.9	229	5	871
Cornwall	5	$24,128	$25,935	$120,640	$84.96	0.0	20.2	93	2	353
Coventry	36	$32,319	$29,090	$1,163,477	$93.56	0.3	22.1	891	18	3,384
Cromwell	50	$32,915	$30,043	$1,645,742	$117.51	0.4	29.4	1,334	25	5,068
Danbury	80	$37,629	$36,087	$3,010,357	$37.21	0.7	8.4	2,217	46	8,421
Darien	6	$32,244	$28,002	$193,463	$9.33	0.0	2.2	149	3	565
Deep River	22	$34,214	$27,983	$752,713	$162.61	0.1	32.4	504	12	1,846
Derby	34	$31,194	$30,823	$1,060,581	$82.20	0.3	20.9	874	16	3,319
Durham	20	$44,394	$44,145	$887,879	$120.18	0.2	27.2	651	14	2,473
East Granby	20	$37,814	$38,679	$756,283	$146.91	0.1	28.1	480	12	1,780
East Haddam	24	$33,491	$30,608	$803,783	$88.08	0.2	19.8	586	12	2,228
East Hampton	39	$36,502	$35,490	$1,423,582	$109.85	0.3	24.7	1,058	22	3,950
East Hartford	222	$24,024	$21,960	$5,333,228	$104.06	1.4	26.7	4,630	83	16,862
East Haven	117	$28,236	$27,225	$3,303,651	$112.92	0.8	26.5	2,615	52	9,545
East Lyme	51	$33,574	$30,340	$1,712,290	$89.37	0.4	20.0	1,241	26	4,716
East Windsor	33	$47,442	$35,490	$1,565,578	$140.26	0.3	25.8	939	25	3,517
Eastford	6	$38,334	$40,268	$230,003	$131.51	0.1	36.9	209	4	794
Easton	8	$45,211	$43,816	$361,689	$48.29	0.1	9.7	347	5	897
Ellington	53	$38,488	$35,490	$2,039,878	$130.74	0.5	30.3	1,534	31	5,829
Enfield	66	$25,678	$24,570	$1,694,775	$37.95	0.4	8.3	1,215	26	4,541
Essex	16	$37,160	$37,538	$594,564	$88.97	0.1	18.5	400	9	1,520
Fairfield	116	$35,681	$30,748	$4,138,963	$69.67	1.0	17.3	3,359	61	12,644
Farmington	39	$31,400	$27,030	$1,224,594	$48.33	0.3	11.1	928	19	3,466
Franklin	7	$34,426	$27,269	$240,981	$125.38	0.1	28.5	177	4	674
Glastonbury	76	$31,919	$32,000	$2,425,863	$70.46	0.6	18.0	2,091	38	7,664
Goshen	5	$32,617	$32,130	$163,083	$54.80	0.0	13.1	126	3	479
Granby	23	$34,286	$30,030	$788,588	$69.90	0.2	17.3	634	12	2,408
Greenwich	24	$37,528	$29,282	$900,674	$14.72	0.2	3.3	686	14	2,461
Griswold	79	$36,193	$32,760	$2,859,267	$239.25	0.7	54.6	2,158	44	8,040
Groton	10	$141,438	$37,360	$1,414,385	$35.26	0.1	1.3	5,313	26	680
Guilford	69	$35,784	$33,768	$2,469,078	$110.35	0.6	26.4	1,972	38	7,284
Haddam	32	$42,828	$37,529	$1,370,506	$164.21	0.3	37.1	1,082	21	3,810
Hamden	170	$28,647	$27,150	$4,870,068	$79.89	1.1	18.2	3,630	76	13,670
Hampton	6	$38,553	$41,362	$231,318	$124.16	0.1	32.1	194	4	738
Hartford	117	$38,552	$19,110	$4,510,554	$36.15	1.1	8.6	5,758	67	19,514
Hartland	6	$36,504	$28,665	$219,023	$103.61	0.0	21.8	150	3	569
Harwinton	32	$35,338	$32,405	$1,130,811	$200.43	0.3	50.4	955	17	3,506
Hebron	29	$37,998	$38,220	$1,101,947	$113.77	0.3	27.2	854	17	3,246
Kent	11	$135,119	$48,195	$1,486,311	$498.93	0.5	165.4	1,598	16	6,070
Killingly	78	$34,808	$26,147	$2,714,986	$156.30	0.7	40.3	2,285	40	8,644
Killingworth	23	$33,552	$30,533	$771,688	$118.27	0.2	30.9	666	12	2,486
Lebanon	19	$32,218	$24,570	$612,147	$83.76	0.2	20.8	494	9	1,877
Ledyard	57	$31,462	$28,109	$1,793,320	$119.15	0.4	29.7	1,565	28	5,499
Lisbon	14	$34,476	$34,808	$482,670	$111.27	0.1	23.0	323	7	1,228
Litchfield	19	$28,501	$28,080	$541,528	$63.97	0.1	17.2	472	8	1,792
Lyme	5	$36,442	$40,308	$182,208	$75.73	0.0	15.8	123	3	468
Madison	24	$36,736	$35,295	$881,659	$48.26	0.2	11.0	705	14	2,534
Manchester	108	$62,626	$24,063	$6,763,588	$116.13	2.0	34.1	6,585	82	24,760

Municipality	# Projects	Average Investment (Project Cost)	Median Investment (Project Cost)	Total Investment (Project Cost)	Investment /Capita	MW	Watts/ Capita	Annual MMBTU	Total Job Years	Lifetime CO2 Emissions (tons)
Mansfield	30	$34,481	$32,630	$1,034,444	$38.97	0.2	9.1	785	16	2,982
Marlborough	8	$39,727	$40,365	$317,818	$49.63	0.1	11.6	242	5	918
Meriden	132	$31,889	$28,639	$4,209,327	$69.16	1.0	16.4	3,244	65	12,306
Middlebury	8	$39,056	$35,984	$312,444	$41.25	0.1	10.5	259	5	982
Middlefield	26	$33,701	$31,497	$876,234	$198.02	0.2	52.1	747	13	2,839
Middletown	127	$41,125	$32,760	$5,222,895	$109.61	1.3	26.4	4,158	76	15,527
Milford	223	$32,485	$28,080	$7,244,229	$137.31	1.7	32.0	5,642	110	20,802
Monroe	36	$44,563	$43,290	$1,604,267	$82.36	0.4	18.7	1,183	25	4,496
Montville	78	$35,342	$32,786	$2,756,651	$140.85	0.6	31.6	2,042	43	7,612
Morris	6	$39,229	$34,058	$235,373	$98.56	0.0	20.5	159	4	604
Naugatuck	119	$31,982	$30,056	$3,805,881	$119.45	0.9	29.7	3,095	59	11,640
New Britain	127	$65,851	$23,205	$8,363,077	$114.24	3.3	45.3	121,401	52	10,033
New Canaan	10	$53,201	$47,901	$532,010	$26.95	0.1	5.6	357	8	1,357
New Fairfield	23	$47,524	$47,775	$1,093,061	$78.75	0.2	16.7	753	17	2,859
New Hartford	18	$36,214	$34,605	$651,851	$93.52	0.2	23.5	532	10	2,022
New Haven	112	$33,292	$24,661	$3,728,701	$28.73	0.8	6.5	3,599	55	10,419
New London	45	$26,511	$20,475	$1,192,999	$43.19	0.3	9.6	939	20	3,263
New Milford	68	$40,312	$35,198	$2,741,210	$97.41	0.6	21.3	1,947	42	7,397
Newington	107	$30,334	$24,570	$3,245,746	$106.20	0.8	27.1	2,733	48	10,220
Newtown	37	$119,927	$36,173	$4,437,281	$161.00	0.7	25.6	5,537	47	8,823
Norfolk	5	$38,996	$38,919	$194,979	$114.09	0.0	26.4	146	3	556
North Branford	15	$39,660	$40,950	$594,893	$41.29	0.1	8.8	411	9	1,560
North Canaan	2	$59,725	$59,725	$119,450	$36.03	0.0	7.5	81	2	306
North Haven	126	$33,454	$30,202	$4,215,176	$174.95	1.1	46.4	3,626	65	13,775
North Stonington	20	$52,305	$37,253	$1,046,109	$197.49	0.3	55.0	1,008	14	3,804
Norwalk	109	$26,658	$24,692	$2,905,716	$33.94	0.8	9.4	2,645	45	9,866
Norwich	25	$11,570	$10,175	$289,254	$7.14	0.0	0.0	305	9	0
Old Lyme	35	$32,793	$32,760	$1,147,752	$150.96	0.3	34.9	872	18	3,267
Old Saybrook	42	$31,617	$29,060	$1,327,929	$129.66	0.3	28.8	958	20	3,640
Orange	53	$66,574	$31,824	$3,528,429	$252.83	1.0	72.4	3,338	42	12,450
Oxford	34	$42,329	$35,997	$1,439,193	$113.47	0.3	27.1	1,116	22	4,240
Plainfield	60	$33,181	$32,760	$1,990,859	$129.23	0.4	29.0	1,447	31	5,496
Plainville	67	$40,337	$29,172	$2,702,555	$152.55	0.7	41.0	2,494	37	9,297
Plymouth	60	$41,162	$35,768	$2,469,727	$201.73	0.5	42.2	1,675	37	6,363
Pomfret	19	$36,402	$33,278	$691,632	$162.85	0.2	40.1	560	11	2,098
Portland	12	$31,728	$29,249	$380,731	$40.04	0.1	11.6	370	6	1,360
Preston	21	$36,981	$34,125	$776,594	$164.32	0.2	38.1	604	12	2,221
Prospect	23	$36,608	$34,808	$841,988	$89.53	0.2	19.0	653	13	2,207
Putnam	46	$32,719	$28,822	$1,505,077	$157.04	0.4	41.8	1,304	23	4,933
Redding	13	$52,799	$42,000	$686,381	$74.95	0.1	13.4	399	11	1,517
Ridgefield	21	$48,609	$45,045	$1,020,779	$41.43	0.2	8.4	677	16	2,554
Rocky Hill	54	$34,664	$30,498	$1,871,857	$94.97	0.4	21.0	1,342	29	5,097
Roxbury	5	$40,790	$34,125	$203,950	$90.16	0.0	21.7	159	3	605
Salem	27	$41,514	$36,855	$1,120,876	$270.03	0.2	56.3	771	17	2,878
Salisbury	13	$31,473	$24,570	$409,155	$109.37	0.1	26.6	322	6	1,225
Scotland	4	$46,269	$39,741	$185,075	$107.23	0.0	24.9	140	3	530
Seymour	33	$28,134	$22,100	$928,430	$56.13	0.2	15.0	816	15	3,057
Sharon	3	$82,392	$48,600	$247,176	$88.85	0.1	20.6	186	4	705
Shelton	118	$35,005	$32,587	$4,130,618	$104.42	1.0	25.1	3,215	64	12,215

Municipality	# Projects	Average Investment (Project Cost)	Median Investment (Project Cost)	Total Investment (Project Cost)	Investment /Capita	MW	Watts/ Capita	Annual MMBTU	Total Job Years	Lifetime CO2 Emissions (tons)
Sherman	9	$37,408	$36,855	$336,669	$94.02	0.1	20.4	237	5	902
Simsbury	15	$39,350	$38,363	$590,255	$25.11	0.1	5.0	378	9	1,435
Somers	18	$41,849	$39,418	$753,288	$65.82	0.2	14.8	564	12	2,087
South Windsor	96	$31,294	$31,142	$3,004,268	$116.86	0.8	30.7	2,563	45	9,737
Southbury	45	$37,309	$33,885	$1,678,907	$84.35	0.5	22.8	1,472	26	5,591
Southington	147	$105,057	$32,760	$15,443,413	$358.57	2.2	51.7	48,977	77	14,970
Sprague	12	$43,127	$44,796	$517,529	$173.43	0.1	35.9	359	8	1,319
Stafford	29	$33,112	$30,030	$960,242	$79.44	0.2	18.2	714	15	2,712
Stamford	77	$76,021	$32,382	$5,853,634	$47.73	0.8	6.5	9,601	97	9,815
Sterling	14	$35,614	$38,558	$498,602	$130.18	0.1	27.6	342	8	1,300
Stonington	90	$33,751	$31,133	$3,037,598	$163.80	0.7	39.1	2,350	46	8,929
Stratford	207	$30,188	$27,000	$6,248,991	$121.61	1.4	27.7	5,118	96	19,491
Suffield	47	$36,090	$33,278	$1,696,230	$107.80	0.4	24.8	1,272	26	4,813
Thomaston	23	$32,479	$26,602	$747,008	$94.71	0.2	22.7	590	12	2,210
Thompson	41	$40,481	$25,500	$1,659,728	$175.48	0.5	50.5	1,568	22	5,880
Tolland	46	$33,673	$30,345	$1,548,935	$102.91	0.4	27.1	1,344	24	5,019
Torrington	53	$31,851	$28,550	$1,688,116	$46.40	0.4	10.9	1,284	26	4,877
Trumbull	86	$37,887	$34,125	$3,258,323	$90.46	0.7	20.6	2,447	49	9,158
Union	2	$20,389	$20,389	$40,777	$47.75	0.0	12.5	35	1	131
Vernon	95	$36,068	$26,887	$3,426,415	$117.43	0.9	30.6	2,998	49	11,009
Voluntown	17	$27,379	$28,080	$465,444	$178.81	0.1	50.5	426	7	1,620
Wallingford	2	$19,925	$19,925	$39,850	$0.88	0.0	0.0	56	1	0
Warren	8	$44,237	$43,567	$353,894	$242.23	0.1	64.7	306	5	1,164
Washington	11	$42,166	$31,224	$463,824	$129.63	0.1	29.7	345	7	1,310
Waterbury	207	$34,121	$28,270	$7,062,995	$64.00	1.6	14.4	5,241	112	19,596
Waterford	92	$33,592	$29,389	$3,090,426	$158.35	0.7	37.9	2,484	48	9,102
Watertown	64	$37,147	$34,125	$2,377,404	$105.60	0.5	23.8	1,740	37	6,610
West Hartford	145	$27,928	$24,383	$4,049,535	$64.01	1.0	15.3	3,185	62	11,905
West Haven	182	$28,842	$26,559	$5,249,261	$94.47	1.3	23.7	4,282	81	16,204
Westbrook	20	$41,956	$40,440	$839,122	$120.95	0.2	27.1	609	13	2,315
Weston	11	$39,682	$33,768	$436,506	$42.88	0.1	9.6	384	7	1,202
Westport	22	$48,344	$40,446	$1,063,572	$40.30	0.2	9.5	1,205	17	3,102
Wethersfield	81	$36,224	$28,330	$2,934,176	$110.03	0.8	28.6	2,541	42	9,387
Willington	21	$36,373	$35,960	$763,838	$126.44	0.2	30.1	589	12	2,237
Wilton	40	$40,322	$38,450	$1,612,899	$89.30	0.4	22.7	1,408	25	5,053
Winchester	16	$24,279	$22,170	$388,457	$34.55	0.1	9.5	348	6	1,322
Windham	44	$28,527	$25,486	$1,255,200	$49.68	0.3	12.5	995	19	3,780
Windsor	152	$28,499	$24,660	$4,331,842	$346.60	1.1	90.3	3,700	67	13,906
Windsor Locks	70	$32,260	$21,799	$2,258,231	$77.75	0.6	21.5	2,180	31	7,892
Wolcott	66	$37,779	$34,808	$2,493,426	$149.49	0.5	32.3	1,846	39	6,641
Woodbridge	37	$52,064	$32,634	$1,926,384	$214.28	0.6	66.0	1,935	26	7,306
Woodbury	13	$37,278	$38,936	$484,615	$48.58	0.1	11.7	378	7	1,437
Woodstock	25	$31,611	$35,316	$790,284	$99.23	0.2	24.5	664	12	2,403
Unknown	4	$305,400	$300,640	$1,221,600	-	0.2	0	609	5	2,315
Total	8,271	$37,974	$29,172	$314,086,243	$87.94	74.4	20.8	419,219	4,444	885,103

Approved/Closed/Completed Projects Fiscal Year 2012 - 2016

Table 6. The "Top 5" Energy, Environment, and Economy Metrics for FY 2012 - 2016[20]

Municipality	Watts/ Capita
Colebrook	3,426.9
Canaan	249.5
Woodbridge	213.7
Hampton	208.9
Durham	187.6

Municipality	Lifetime CO2 Emissions (tons)
Bridgeport	127,288
Colebrook	62,532
Putnam	57,622
Middletown	48,781
Bristol	42,312

Municipality	Investment/ Capita
Colebrook	$15,426.21
Canaan	$1,188.07
Southington	$1,022.74
Bridgeport	$1,010.29
Windsor	$856.09

Table 7. Clean Energy Performance by Municipality (FY 2012-2016)

Municipality	# Projects	Average Investment (Project Cost)	Median Investment (Project Cost)	Total Investment (Project Cost)	Investment /Capita	MW	Watts/ Capita	Annual MMBTU	Total Job Years	Lifetime CO2 Emissions (tons)
Andover	19	$36,684	$36,507	$697,003	$211.02	0.2	45.6	516	11	1,855
Ansonia	84	$34,616	$26,816	$2,907,745	$151.06	0.7	34.2	2,245	43	8,352
Ashford	86	$39,947	$32,664	$3,435,428	$795.79	0.8	185.0	2,613	50	9,838
Avon	96	$49,328	$37,063	$4,735,447	$261.66	1.0	53.0	5,393	74	11,898
Barkhamsted	33	$34,278	$32,898	$1,131,158	$297.75	0.3	72.7	896	17	3,404
Beacon Falls	28	$31,730	$30,585	$888,435	$146.87	0.2	33.4	655	14	2,489
Berlin	127	$33,794	$33,600	$4,291,814	$216.04	0.9	46.8	3,117	66	11,454
Bethany	53	$35,965	$35,000	$1,906,147	$342.65	0.4	76.7	1,408	30	5,258
Bethel	85	$33,132	$31,590	$2,816,242	$151.54	0.6	33.7	2,031	43	7,716
Bethlehem	35	$32,795	$29,453	$1,147,825	$318.22	0.2	66.4	776	18	2,950
Bloomfield	179	$41,037	$25,074	$7,345,671	$358.57	2.3	110.8	7,385	96	27,957
Bolton	56	$32,753	$30,776	$1,834,150	$368.30	0.5	92.2	1,526	28	5,660
Branford	111	$33,660	$31,395	$3,736,217	$133.31	0.8	30.0	2,769	58	10,364
Bridgeport	448	$325,252	$27,000	$145,713,095	$1,010.29	20.9	145.2	838,304	1,398	127,288
Bridgewater	9	$41,193	$38,680	$370,737	$214.67	0.1	44.0	246	6	935
Bristol	356	$40,287	$30,488	$14,342,157	$237.15	3.4	56.5	11,196	204	42,312
Brookfield	101	$54,867	$37,118	$5,541,613	$336.84	1.0	61.6	6,287	80	15,593
Brooklyn	96	$32,024	$30,000	$3,074,328	$374.46	0.7	89.2	2,394	47	9,018
Burlington	123	$46,271	$37,750	$5,691,360	$611.91	1.4	153.6	4,674	82	17,604
Canaan	28	$52,360	$37,729	$1,466,084	$1,188.07	0.3	249.5	1,125	21	4,226
Canterbury	52	$38,945	$32,719	$2,025,128	$394.61	0.4	87.7	1,459	31	5,543
Canton	73	$33,845	$29,400	$2,470,718	$240.06	0.6	58.0	2,033	38	7,356
Chaplin	29	$31,753	$29,168	$920,823	$399.49	0.2	91.0	680	14	2,584
Cheshire	194	$34,578	$33,445	$6,708,084	$229.25	1.6	55.4	5,384	105	19,983
Chester	37	$51,915	$31,200	$1,920,864	$480.94	0.3	65.8	863	18	3,236
Clinton	86	$39,630	$32,845	$3,408,152	$257.03	0.8	62.4	2,698	49	10,199
Colchester	114	$36,764	$33,480	$4,191,041	$260.83	0.9	53.9	2,875	65	10,666
Colebrook	11	$2,082,538	$36,464	$22,907,918	$15,426.21	5.1	3,426.9	288	6	62,532
Columbia	71	$32,536	$32,130	$2,310,077	$421.16	0.5	95.1	1,713	35	6,430
Cornwall	17	$28,676	$28,286	$487,498	$343.31	0.1	76.7	353	8	1,341
Coventry	129	$46,107	$31,395	$5,947,788	$478.31	1.5	120.7	4,882	79	18,517
Cromwell	117	$49,555	$30,240	$5,797,968	$413.99	0.9	62.0	6,904	97	10,709

[20] Ibid

Municipality	# Projects	Average Investment (Project Cost)	Median Investment (Project Cost)	Total Investment (Project Cost)	Investment /Capita	MW	Watts/ Capita	Annual MMBTU	Total Job Years	Lifetime CO2 Emissions (tons)
Danbury	196	$37,072	$35,464	$7,266,156	$89.82	1.5	19.0	5,870	113	18,971
Darien	25	$41,263	$39,592	$1,031,567	$49.76	0.2	9.8	659	16	2,503
Deep River	39	$52,780	$31,244	$2,058,418	$444.68	0.5	107.9	1,760	27	6,152
Derby	57	$30,574	$29,451	$1,742,694	$135.07	0.4	32.5	1,375	27	5,172
Durham	165	$34,032	$31,500	$5,615,243	$760.05	1.4	187.6	4,495	86	17,077
East Granby	68	$36,923	$36,334	$2,510,747	$487.71	0.5	103.2	1,779	39	6,543
East Haddam	60	$45,131	$31,735	$2,707,849	$296.72	0.6	70.7	2,110	37	7,859
East Hampton	91	$37,080	$35,490	$3,374,322	$260.38	0.7	55.7	2,358	52	8,887
East Hartford	317	$25,469	$24,098	$8,073,769	$157.53	1.9	37.8	6,493	125	23,863
East Haven	175	$27,775	$26,774	$4,860,704	$166.14	1.1	38.8	3,871	76	13,970
East Lyme	135	$35,052	$33,885	$4,731,982	$246.98	1.0	53.8	3,406	72	12,961
East Windsor	82	$58,965	$34,902	$4,835,110	$433.18	1.1	103.0	4,015	65	14,848
Eastford	19	$34,441	$30,791	$654,375	$374.14	0.2	97.3	552	10	2,096
Easton	54	$50,773	$33,885	$2,741,742	$366.05	0.7	97.5	2,516	36	8,997
Ellington	118	$40,822	$35,121	$4,817,046	$308.75	1.1	70.3	3,903	72	14,312
Enfield	240	$31,891	$27,338	$7,653,765	$171.40	1.7	38.5	5,860	113	21,752
Essex	45	$31,372	$28,560	$1,411,726	$211.24	0.3	47.0	1,018	22	3,867
Fairfield	288	$35,778	$30,015	$10,304,046	$173.46	2.5	41.3	8,149	163	30,205
Farmington	162	$31,868	$30,725	$5,162,681	$203.74	1.2	49.1	4,093	80	15,357
Franklin	19	$35,970	$31,044	$683,428	$355.58	0.2	81.2	506	11	1,924
Glastonbury	212	$33,721	$29,761	$7,148,914	$207.65	1.7	49.2	5,874	107	21,969
Goshen	17	$37,354	$41,000	$635,023	$213.38	0.1	47.9	462	10	1,756
Granby	72	$33,202	$31,257	$2,390,576	$211.89	0.5	47.5	1,740	37	6,609
Greenwich	103	$30,672	$27,895	$3,159,165	$51.64	0.7	11.3	2,273	49	8,490
Griswold	166	$36,630	$33,953	$6,080,617	$508.80	1.3	111.4	4,369	94	16,398
Groton	25	$76,212	$32,785	$1,905,304	$47.50	0.1	3.6	5,600	34	1,770
Guilford	150	$35,799	$34,199	$5,369,828	$239.99	1.2	54.5	4,011	82	15,032
Haddam	159	$33,762	$31,590	$5,368,236	$643.21	1.3	161.3	4,538	82	16,585
Hamden	360	$27,937	$26,316	$10,057,186	$164.98	2.3	37.1	7,566	157	27,893
Hampton	34	$43,352	$29,458	$1,473,974	$791.18	0.4	208.9	1,285	20	4,795
Hartford	175	$42,638	$19,854	$7,461,708	$59.80	1.5	12.3	8,295	113	25,605
Hartland	21	$31,654	$30,030	$664,728	$314.44	0.2	72.1	513	10	1,878
Harwinton	60	$33,973	$33,274	$2,038,384	$361.29	0.5	87.4	1,640	32	6,079
Hebron	77	$34,891	$34,091	$2,686,591	$277.37	0.6	63.2	1,985	41	7,543
Kent	18	$95,354	$33,808	$1,716,376	$576.16	0.5	183.5	1,772	20	6,734
Killingly	142	$33,235	$29,226	$4,719,429	$271.70	1.2	67.4	3,833	71	14,446
Killingworth	95	$41,608	$37,050	$3,952,751	$605.79	1.0	157.7	3,434	59	12,674
Lebanon	83	$31,188	$30,038	$2,588,627	$354.22	0.6	84.6	2,027	40	7,613
Ledyard	112	$32,813	$30,236	$3,675,039	$244.17	0.8	55.7	2,888	57	10,338
Lisbon	40	$36,133	$35,295	$1,445,317	$333.18	0.3	70.4	1,002	22	3,762
Litchfield	41	$32,001	$33,885	$1,312,030	$154.98	0.3	37.9	1,040	20	3,949
Lyme	17	$34,663	$32,881	$589,270	$244.92	0.1	59.0	460	9	1,748
Madison	83	$33,583	$31,962	$2,787,401	$152.58	0.6	34.5	2,100	43	7,831
Manchester	260	$44,037	$25,707	$11,449,653	$196.59	3.2	54.1	10,485	149	39,426
Mansfield	152	$30,896	$28,835	$4,696,166	$176.93	1.1	39.6	3,407	72	12,943
Marlborough	26	$37,722	$32,641	$980,774	$153.15	0.2	33.8	701	15	2,663
Meriden	241	$40,151	$28,665	$9,676,504	$158.98	1.8	29.7	12,497	158	35,448
Middlebury	26	$37,240	$36,172	$968,235	$127.82	0.2	28.6	731	15	2,672
Middlefield	54	$35,625	$33,323	$1,923,742	$434.74	0.5	102.2	1,467	30	5,573
Middletown	282	$63,089	$32,060	$17,791,132	$373.39	3.8	80.3	44,930	211	48,781
Milford	394	$89,866	$28,793	$35,407,071	$671.11	5.8	109.4	142,849	191	34,155

Municipality	# Projects	Average Investment (Project Cost)	Median Investment (Project Cost)	Total Investment (Project Cost)	Investment /Capita	MW	Watts/ Capita	Annual MMBTU	Total Job Years	Lifetime CO2 Emissions (tons)
Monroe	83	$39,782	$39,015	$3,301,899	$169.51	0.7	37.8	2,390	51	9,078
Montville	180	$34,127	$32,786	$6,142,821	$313.87	1.4	69.9	4,631	96	16,846
Morris	17	$38,777	$36,720	$659,208	$276.05	0.1	53.8	416	10	1,582
Naugatuck	190	$34,312	$30,066	$6,519,282	$204.61	1.4	43.9	4,674	103	17,239
New Britain	233	$57,925	$23,205	$13,496,533	$184.36	4.9	66.9	127,472	115	32,357
New Canaan	51	$41,567	$39,102	$2,119,899	$107.40	0.4	22.1	1,418	33	5,375
New Fairfield	76	$42,073	$38,738	$3,197,582	$230.36	0.7	48.6	2,187	49	8,308
New Hartford	70	$35,625	$33,908	$2,493,753	$357.78	0.6	84.6	1,944	39	7,268
New Haven	200	$30,201	$24,661	$6,040,290	$46.54	1.3	10.2	5,193	91	16,299
New London	80	$54,013	$23,352	$4,321,046	$156.45	1.1	40.9	3,980	55	15,192
New Milford	136	$41,282	$37,743	$5,614,403	$199.50	1.2	42.4	3,867	86	14,692
Newington	219	$33,848	$27,300	$7,412,730	$242.55	1.8	57.4	5,837	110	21,885
Newtown	123	$62,027	$34,400	$7,629,349	$276.83	1.5	53.5	8,113	96	18,304
Norfolk	19	$38,214	$34,475	$726,069	$424.85	0.2	91.6	508	11	1,929
North Branford	49	$36,540	$34,503	$1,790,467	$124.28	0.4	27.9	1,303	28	4,951
North Canaan	7	$40,761	$34,644	$285,324	$86.07	0.1	18.0	193	4	734
North Haven	227	$33,527	$31,434	$7,610,695	$315.89	1.9	77.9	6,122	118	23,116
North Stonington	44	$44,657	$38,360	$1,964,925	$370.95	0.5	91.6	1,637	28	6,192
Norwalk	173	$69,347	$26,950	$11,996,993	$140.15	4.3	50.7	147,247	86	17,839
Norwich	126	$13,055	$9,350	$1,644,978	$40.62	0.2	4.1	2,260	44	2,090
Old Lyme	83	$35,623	$33,885	$2,956,737	$388.89	0.7	90.0	2,250	46	8,433
Old Saybrook	104	$32,066	$30,853	$3,334,875	$325.61	0.7	70.0	2,333	51	8,834
Orange	105	$51,254	$33,614	$5,381,697	$385.62	1.4	100.6	4,636	71	17,291
Oxford	70	$41,431	$37,850	$2,900,149	$228.66	0.7	52.7	2,168	45	8,237
Plainfield	139	$33,002	$32,016	$4,587,230	$297.78	1.0	66.9	3,343	71	12,701
Plainville	163	$48,302	$29,936	$7,873,293	$444.42	2.0	114.8	7,818	106	26,443
Plymouth	126	$38,762	$34,172	$4,883,979	$398.92	1.0	83.9	3,333	75	12,662
Pomfret	57	$32,299	$30,561	$1,841,022	$433.49	0.4	104.4	1,446	28	5,465
Portland	87	$31,128	$28,800	$2,708,097	$284.82	0.7	69.7	2,161	41	8,166
Preston	45	$37,278	$32,868	$1,677,502	$354.95	0.4	80.4	1,251	26	4,679
Prospect	54	$34,214	$32,125	$1,847,553	$196.44	0.4	43.1	1,387	28	4,995
Putnam	86	$55,469	$27,720	$4,770,301	$497.74	1.2	125.7	11,410	87	57,622
Redding	38	$45,706	$43,493	$1,736,827	$189.65	0.3	37.6	1,117	28	4,242
Ridgefield	64	$43,696	$40,832	$2,796,553	$113.51	0.6	23.9	1,916	43	7,261
Rocky Hill	118	$32,951	$30,874	$3,888,169	$197.28	0.9	43.4	2,781	60	10,547
Roxbury	28	$35,799	$33,580	$1,002,359	$443.13	0.3	114.8	842	15	3,199
Salem	50	$38,948	$35,741	$1,947,394	$469.14	0.4	97.9	1,350	30	5,007
Salisbury	38	$32,963	$30,327	$1,252,601	$334.83	0.3	69.7	882	19	3,212
Scotland	9	$37,714	$33,987	$339,426	$196.65	0.1	45.8	259	5	974
Seymour	67	$27,589	$26,458	$1,848,477	$111.76	0.4	26.9	1,457	29	5,490
Sharon	25	$45,492	$38,250	$1,137,312	$408.81	0.2	86.1	777	18	2,953
Shelton	230	$35,878	$31,826	$8,252,015	$208.60	1.8	46.4	6,609	129	22,624
Sherman	23	$36,210	$36,855	$832,835	$232.57	0.2	48.1	572	13	2,121
Simsbury	130	$39,035	$31,797	$5,074,608	$215.84	1.0	41.7	4,032	79	12,089
Somers	51	$56,387	$35,414	$2,875,740	$251.29	0.7	59.7	2,109	38	7,919
South Windsor	222	$32,380	$32,065	$7,188,374	$279.61	1.7	65.9	5,605	110	20,862
Southbury	91	$38,468	$36,926	$3,500,622	$175.88	0.8	42.2	2,725	54	10,353
Southington	325	$135,534	$33,885	$44,048,596	$1,022.74	5.3	123.6	125,133	176	33,914

Municipality	# Projects	Average Investment (Project Cost)	Median Investment (Project Cost)	Total Investment (Project Cost)	Investment /Capita	MW	Watts/ Capita	Annual MMBTU	Total Job Years	Lifetime CO2 Emissions (tons)
Sprague	28	$36,905	$35,807	$1,033,330	$346.29	0.2	75.7	745	16	2,785
Stafford	110	$31,736	$31,020	$3,490,922	$288.82	0.8	66.0	2,636	54	9,827
Stamford	175	$56,381	$29,438	$9,866,644	$80.45	1.5	12.5	15,919	159	18,761
Sterling	40	$34,838	$33,013	$1,393,533	$363.85	0.3	80.1	994	21	3,778
Stonington	193	$33,009	$31,752	$6,370,823	$343.53	1.5	80.8	4,876	96	18,453
Stratford	348	$29,852	$27,000	$10,388,474	$202.17	2.3	45.4	8,149	159	30,703
Suffield	153	$37,945	$38,085	$5,805,627	$368.96	1.3	82.5	4,304	89	15,987
Thomaston	47	$33,615	$32,130	$1,579,889	$200.32	0.4	44.8	1,153	25	4,352
Thompson	85	$36,654	$26,263	$3,115,549	$329.41	0.8	85.2	2,634	44	9,928
Tolland	141	$36,613	$33,885	$5,162,466	$342.98	1.2	79.4	3,900	80	14,728
Torrington	157	$34,049	$31,044	$5,345,747	$146.93	1.2	31.7	3,855	83	14,203
Trumbull	200	$39,869	$31,872	$7,973,804	$221.38	1.8	51.1	6,304	116	23,551
Union	14	$29,287	$29,793	$410,024	$480.12	0.1	113.1	325	6	1,190
Vernon	183	$33,480	$27,541	$6,126,848	$209.97	1.5	51.3	4,972	90	18,445
Voluntown	33	$49,589	$30,188	$1,636,452	$628.68	0.5	175.4	1,481	21	5,626
Wallingford	3	$25,274	$25,275	$75,822	$1.68	0.0	0.2	86	2	115
Warren	16	$38,302	$31,603	$612,836	$419.46	0.1	101.2	479	9	1,821
Washington	26	$36,330	$30,627	$944,585	$264.00	0.2	57.9	671	15	2,551
Waterbury	369	$36,804	$27,885	$13,580,579	$123.05	3.1	28.0	10,364	209	38,670
Waterford	168	$34,294	$31,398	$5,761,323	$295.20	1.3	67.2	4,400	88	16,158
Watertown	141	$41,100	$35,029	$5,795,125	$257.40	1.4	60.1	4,592	84	17,191
West Hartford	380	$27,737	$23,799	$10,540,100	$166.59	2.4	37.3	7,864	166	29,084
West Haven	298	$29,152	$25,983	$8,687,337	$156.35	2.1	37.8	6,852	134	26,312
Westbrook	45	$34,686	$32,175	$1,560,872	$224.97	0.4	50.6	1,177	24	4,321
Weston	57	$44,929	$42,984	$2,560,967	$251.59	0.6	57.5	1,986	40	7,211
Westport	116	$39,924	$29,316	$4,631,230	$175.49	0.9	34.9	3,382	72	11,373
Wethersfield	159	$33,553	$28,675	$5,334,988	$200.05	1.3	48.3	4,314	80	15,882
Willington	40	$39,423	$38,906	$1,576,902	$261.03	0.4	58.7	1,154	24	4,382
Wilton	62	$38,863	$38,105	$2,409,505	$133.40	0.6	32.6	1,987	37	7,251
Winchester	39	$30,828	$27,200	$1,202,292	$106.95	0.3	23.5	857	18	3,257
Windham	115	$33,132	$25,740	$3,810,211	$150.79	0.8	33.6	3,228	55	10,349
Windsor	272	$39,336	$27,352	$10,699,403	$856.09	2.0	163.4	10,241	169	24,602
Windsor Locks	143	$32,668	$28,080	$4,671,505	$160.84	1.1	39.4	3,941	69	14,303
Wolcott	133	$39,053	$34,808	$5,194,009	$311.39	1.1	66.7	3,706	81	13,705
Woodbridge	78	$78,392	$33,885	$6,114,606	$680.16	1.9	213.7	6,279	72	23,668
Woodbury	36	$38,223	$35,629	$1,376,032	$137.95	0.3	30.6	1,058	21	3,765
Woodstock	98	$38,655	$34,561	$3,788,219	$475.67	0.8	100.6	2,629	58	9,869
Unknown	4	$305,400	$300,640	$1,221,600	-	0.2	0	609	5	2,315
Total	18,771	$48,790	$30,188	$915,828,602	$256.43	192.3	53.9	1,953,454	11,594	2,185,779

DISTRESSED COMMUNITIES[21]

Connecticut's "distressed communities" are particularly affected by the state's high energy prices. On average, Connecticut's neediest households owe $2,560 more in annual energy bills than they can afford[22]. CGB financing products and marketing efforts seek to bring lower and more predictable energy costs to homes and businesses in distressed communities.

Table 8. Overview of Distressed and Not Distressed Municipalities, Population, and Households in Connecticut

	Distressed %	Not Distressed	Distressed	Total
# Towns	15%	144	25	169
Population	33%	2,406,785	1,167,312	3,574,097
Households	33%	899,083	438,675	1,337,758

CGB has steadily increased its percentage of projects deployed each year in distressed municipalities. This has led to nearly $300 million in clean energy projects in these communities, creating over 3,600 jobs.

[21] Distressed Communities as defined by the Department of Economic and Community Development (DECD). DECD Methodology: Weighted components are summed to measure the rank of the 169 towns. For each component, every town is ranked from 1 to 169, with the best town scoring 1 and worst 169. The top 25 towns with highest total scores are designated distressed municipalities.

DECD's components and weights:

1. Per capita income for 2014, weight 1;
2. % of poverty in population for 2014, weight 1;
3. Unemployment rate for 2015, weight 2;
4. % change in population from 2000 to 2010, weight 1;
5. % change in employment from 2005 to 2015, weight 1;
6. % change in per capita income from 2000 to 2014, weight 1;
7. % of house stock built before 1939 in 2014, weight 1/3;
8. % population with high school degree and higher in 2014, weight 1; and
9. Per Capita Adjusted Equalized Net Grand List in 2016-2017, weight 1.

According to C.G.S. Section 32-9p, a distressed municipality should be based on "high unemployment and poverty, aging housing stock and low or declining rates of growth in job creation, population, and per capita income."

DECD additionally included 1) Level of Per Capita Income, 2) % of population with high school degree and higher and 3) Per Capita Adjusted Equalized Net Grand List (AENGL) to arrive at its ranking.

Data sources: Census 2000, Census 2010, 2010-2014 Census American Community Survey (ACS) 5-year Estimates, DOL, DOE
Prepared by DECD Research
August 18, 2016

http://www.ct.gov/ecd/cwp/view.asp?a=1105&q=251248

[22] Home Energy Affordability in Connecticut, http://www.operationfuel.org/wp-content/uploads/Connecticut-2014-HEAG-Final.pdf.

Table 9. Project Performance – Clean Energy Approved, Closed, and Completed Projects in Connecticut (FY 2016)[23]

	# Projects	Investment (Project Cost)	Investment /Capita*	MW	Watts /Capita*	Annual MMBTU	Total Job Years	Lifetime CO2 Emissions (tons)
Not Distressed	5,719	$226,847,885	$194.33	52.9	45.3	232,607	3,212	642,677
Distressed	2,548	$86,016,759	$35.74	21.3	8.9	186,002	1,227	240,111
Unknown	4	$1,221,600	-	0.2	-	609	5	2,315
Total	8,271	$314,086,243	$87.54	74.4	20.8	419,219	4,444	885,103
% Distressed	31%	27%		29%				

Table 10. Project Performance – Clean Energy Approved, Closed, and Completed Projects in Connecticut (FY 2012-2016)

	# Projects	Investment (Project Cost)	Investment /Capita*	MW	Watts /Capita*	Annual MMBTU)	Total Job Years	Lifetime CO2 Emissions (tons)
Not Distressed	14,039	$616,511,153	$528.15	135.1	115.8	863,166	7,933	1,573,531
Distressed	4,728	$298,095,849	$123.86	57.0	23.7	1,089,678	3,655	609,933
Unknown	4	$1,221,600	-	0.2	-	609	5	2,315
Total	18,771	$915,828,602	$255.90	192.3	53.8	1,953,454	11,594	2,185,779
% Distressed	25%	33%		30%				

* Calculated using the 2016 distressed community designations

[23] The Connecticut Green Bank tracks projects through three phases as they move through the pipeline to construction completion and operation – Approved, Closed, and Completed. Approved signifies that the appropriate authority within the Connecticut Green Bank, whether President & CEO, Deployment Committee, or Board of Directors, has approved the Connecticut Green Bank's investment in the project. Closed indicates all financial and legal documents have been executed and any additional funding has been secured. Completion indicates all construction and installation is complete and the project is operational.

2. BACKGROUND AND MARKET – INCOME

In addition to looking at funding and clean energy deployment in distressed municipalities, CGB works to ensure that low to moderate income (LMI) census tracts across the entire state are benefiting from its programs. CGB defines low to moderate income as 100% or less of area median income. Tables 11 through 12 group CGB's projects based upon the average income of their census tract.

Table 11. Projects by Area Median Income – Clean Energy Deployment in the Residential Sector (FY 2016)

	FY 2016			
Income Bands	**# Projects**	**Projects /1,000 Households**	**Installed Capacity (MW)**	**Watts /Household**
<60% AMI	633	2.8	6.4	28.4
60%-80% AMI	1,057	4.9	7.3	33.9
80%-100% AMI	1,477	6.4	11.7	50.5
100%-120% AMI	2,223	8.0	17.4	62.7
>120% AMI	2,672	6.6	22.4	55.2
Unknown	122	-	1.0	-
Total	8,184	6.0	66.2	48.8

Table 12. Projects by Area Median Income – Clean Energy Deployment in the Residential Sector (FY 2012-2016)

	FY 2012 -2016			
Income Bands	**# Projects**	**Projects /1,000 Households**	**Installed Capacity (MW)**	**Watts /Household**
<60% AMI	1,011	5.4	25.6	114.1
60%-80% AMI	1,906	8.8	13.2	61.1
80%-100% AMI	3,110	13.5	24.5	106.1
100%-120% AMI	5,004	18.0	45.6	164.1
>120% AMI	7,430	18.3	61.8	152.1
Unknown	125	-	1.0	-
Total	18,586	13.6	171.7	125.9

Through such products and initiatives as the LMI solar incentive, it's partnership with PosiGen, and its affordable multifamily housing energy financing products, CGB has focused on increasing its penetration in the LMI market. Tables 13 through 15 illustrate that CGB has made progress on this goal but still has work to do.

Table 13. Projects by Area Median Income – Number of Clean Energy Projects Above or Below 100% (FY 2012-2016)

# Projects	100% or Below AMI	Over 100% AMI	Total		100% or Below AMI
FY 2012	62	355	417		15%
FY 2013	184	934	1,118		16%
FY 2014	649	1,773	2,422		27%
FY 2015	1,995	4,545	6,540		31%
FY 2016	3,209	4,925	8,134		39%
Unknown AMI	-	-	140		-
Total	6,099	12,532	18,771		32%

Table 14. Deployment – Clean Energy Installed Capacity (MW) Above or Below 100% (FY 2012-2016)

MW	100% or Below AMI	Over 100% AMI	Total		100% or Below AMI
FY 2012	0.4	2.5	2.9		14%
FY 2013	16.6	6.9	23.5		71%
FY 2014	9.5	16.6	26.1		36%
FY 2015	17.1	48.3	65.5		26%
FY 2016	28.1	43.3	72.1		40%
Unknown AMI	-	-	2.4		-
Total	72.4	117.5	192.3		38%

Table 15. Investment – Clean Energy Investment Above or Below 100% Area Median Income (FY 2012-2016)

Investment (Project Cost)	100% or Below AMI	Over 100% AMI	Total		100% or Below AMI
FY 2012	$1,901,884	$13,087,685	$14,989,569		13.%
FY 2013	$79,017,723	$32,046,769	$111,064,486		71%
FY 2014	$69,598,876	$70,553,491	$140,152,366		50%
FY 2015	$113,254,360	$222,190,050	$335,444,411		34%
FY 2016	$125,461,942	$179,261,682	$304,723,625		41%
Unknown AMI	-	-	$9,454,145		-
Total	$389,234,786	$517,139,671	$915,828,602		38%

2. BACKGROUND AND MARKET
SMALL TO MINORITY OWNED BUSINESS PROCUREMENT

The State of Connecticut's Supplier Diversity Program was established to ensure Connecticut small businesses have an opportunity to bid on a portion of the State's purchases. Through Fiscal Year 2015, the program required agencies and political subdivisions to set aside 25% of their annual budgets for construction, housing rehabilitation, and purchasing goods and services (after approved exemptions by the Department of Administrative Services) to be awarded to certified small businesses, with 25% of this amount to be awarded to certified minority business enterprises. Although reporting is no longer required, the Connecticut Green Bank is performing the analysis to ensure we are still committed to voluntarily meeting our set aside goals.

Table 16. Small Business Procurement (FY 2012-2016)

	Small Business		
Year	**Goal**	**Actual**	**Percentage**
FY 2012	$ 59,775	$ 39,520	66%
FY 2013	$ 62,598	$ 59,340	95%
FY 2014	$ 135,320	$ 120,560	89%
FY 2015	$ 221,750	$ 251,980	113%
FY 2016	$ 238,550	$ 510,797	214%

Table 17. Minority Business Enterprise Procurement (FY 2012-2016)

	Minority Business Enterprises		
Year	**Goal**	**Actual**	**Percentage**
FY 2012	$ 14,944	$ 31,474	211%
FY 2013	$ 15,649	$ 52,308	334%
FY 2014	$ 33,830	$ 88,427	261%
FY 2015	$ 55,438	$ 153,319	277%
FY 2016	$ 59,638	$ 96,020	161%

3. MEASURES OF SUCCESS – ATTRACT AND DEPLOY CAPITAL

Project Status

The Connecticut Green Bank tracks projects through three phases as they move through the pipeline to construction completion and operation – Approved, Closed, and Completed. Approved signifies that the appropriate authority within the Connecticut Green Bank, whether President & CEO, Deployment Committee, or Board of Directors, has approved the Connecticut Green Bank's investment in the project per the Comprehensive Plan and Budget. Closed indicates all financial and legal documents have been executed and any additional funding has been secured. Completion indicates all construction and installation is complete and the project is operational. The table highlights the fact that projects can take some time to move through this pipeline (see Table 18). The full energy, economic, and environmental benefits from these projects begin to be fully realized after they are completed.

Table 18. Clean Energy Project Status (FY 2012-2016)

# PROJECTS	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	Total
Approved	0	0	12	43	63	118
Closed	2	2	60	587	4,186	4,837
Completed	415	1,116	2,350	5,913	4,022	13,816
Total	417	1,118	2,422	6,543	8,271	18,771

Clean Energy Investment

The Connecticut Green Bank's vision is to lead the green bank movement by accelerating private investment in clean energy deployment for Connecticut to achieve economic prosperity, create jobs, promote energy security, and address climate change. The Green Bank tracks its progress towards this vision as "E3" metrics – Energy, Economic, and Environmental. Investment represents the total amount of private and public funding for clean energy projects, shown in Tables 19 and 20 below.

Table 19. Clean Energy Investment by Source - Public and Private (FY 2012-2016)

	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	Total
Total CGB Investment	$4,809,813	$18,595,710	$37,834,791	$55,698,896	$48,042,380	$164,981,590
Total Private Investment	$10,179,757	$92,655,897	$102,829,679	$281,861,775	$268,299,049	$755,826,156
Total Project Investment	$14,989,569	$111,064,486	$140,152,366	$335,535,937	$314,086,243	$915,828,602

Leverage Ratio

One of the main goals of the Connecticut Green Bank is to attract and deploy private capital to finance the green energy goals for Connecticut. To that end, the greater the leverage ratio of private to public funds, the better. The leverage ratios for the Connecticut Green Bank are increasing over time. Not only that, but a greater percentage of public funds being used are in the form of loans and leases rather than subsidies and grants.

3. MEASURES OF SUCCESS – ATTRACT AND DEPLOY CAPITAL

Table 20. Leverage Ratio of Private to Public Funds by Sector

Leverage Ratio of Public to Private Funds by Sector	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	Total
Commercial, Industrial & Institutional [24]	0.0	3.7	1.8	4.5	2.0	2.9
Statutory and Infrastructure	3.1	6.1	4.3	6.4	10.9	6.6
Residential	0.0	0.8	10.5	6.3	5.6	6.2
Total	3.1	6.0	3.7	6.1	6.6	5.6

Clean Energy Produced and Energy Saved

The Connecticut Green Bank's vision is to lead the green bank movement by accelerating private investment in clean energy deployment for Connecticut to achieve economic prosperity, create jobs, promote energy security, and address climate change. The Connecticut Green Bank tracks its progress towards this vision as "E3" metrics – Energy, Economic, and Environmental. The data below show the energy benefits in terms of capacity (megawatts [MW]), clean energy production (lifetime megawatt hours [MWh]), and annual energy savings (MMBTU) – see Tables 21 through 23.

Table 21. Installed Capacity (MW) of Clean Energy (FY 2012-2016)

MW	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	Total
Approved	0.0	0.0	3.2	3.8	3.5	10.5
Closed	0.0	0.0	0.3	10.6	38.8	49.7
Completed	2.9	23.5	22.6	51.1	32.1	132.1
Total	2.9	23.5	26.1	65.5	74.4	192.3

Table 22. Lifetime Production (MWh) of Clean Energy (FY 2012-2016)

MWh (lifetime)	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	Total
Approved	0	0	260,864	318,157	252,554	831,575
Closed	408	143	6,258	282,920	979,350	1,269,078
Completed	67,980	1,419,204	740,526	1,223,733	763,659	4,215,103
Total	68,388	1,419,346	1,007,648	1,824,810	1,995,564	6,315,757

Table 23. Annual Energy Savings (MMBtu) of Clean Energy (FY 2012-2016)

MMBTU (annual)	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	Total
Approved	0	0	143,872	438,296	134,684	716,851
Closed	56	19	1,905	464,980	176,220	643,181
Completed	9,278	59,462	233,100	183,267	108,315	593,421
Total	9,334	59,481	378,877	1,086,544	419,219	1,953,454

[24] Leverage ratio does not reflect private funding warehouse created in fiscal year 2016. Green Bank C-PACE assets will be transferred to this warehouse, shifting the leverage ratio towards private funding.

Renewable Energy Technology Deployment

The Connecticut Green Bank takes a technology agnostic approach to its financing products, with any commercially available technology that meets eligibility guidelines (see Table 24).

Table 24. Renewable Energy Technology Deployment (FY 2012-2016)

RENEWABLE ENERGY TECHNOLOGY*	Commercial & Industrial Sector		Statutory and Infrastructure Sector		Residential Sector		Total	
	MW	MWh (lifetime)	MW	MWh (lifetime)	MW	MWh (lifetime)	MW	MWh (lifetime)
Anaerobic Digesters			7.2	587,384			7.2	587,384
Biomass	0.6	14,257					0.6	14,257
CHP	0.1	6,874	7.1	646,601			7.1	653,475
Fuel Cell			14.8	1,166,832			14.8	1,166,832
Hydro	0.5	43,898					0.5	43,898
Solar PV	17.9	426,062	119	2,836,940	16.0	380,030	153.3	3,643,032
Wind			5.0	118,260			5.0	118,260
Total	19.1	491,090	157.2	5,444,220	16.0	380,030	192.3	6,315,340

*Residential solar projects that receive financing also receive an incentive under the Residential Solar Incentive Program so they are counted in each sector's results. They have been removed from the total to avoid double counting.

The Connecticut Green Bank's efforts have led to a significant amount of solar PV deployment in the state (about 80% of all green energy projects deployed is from solar PV). When comparing deployment to green energy production, solar PV produces the most energy (58% of all green energy production), fuel cells also contribute a large proportion given the efficiency of the technology (over 18% of all green energy production).

Assets – Current and Non-Current

The Connecticut Green Bank's success in shifting to a financing model from a subsidy model is evident in the change in assets since its inception. The growth of the Green Bank's financing programs has led to a steady increase in non-current assets over time as more and more loans and leases are closed.

Table 25: Current and Non-Current Assets (FY 2013-2016)

	Year Ended June 30,				
	2016	2015	2014	2013	2012
Current Assets					
Cash and Cash Equivalents	$ 48,072,060	$ 39,893,649	$ 71,411,034	$ 68,105,014	$ 64,672,910
Receivables	4,531,258	2,867,233	8,253,318	4,545,661	3,305,301
Prepaid Expenses	4,245,806	1,030,251	619,639	520,814	350,302
Contractor Loans	2,272,906	3,112,663	--	--	--
Current portion of solar lease notes	845,479	803,573	766,086	704,032	670,645
Current portion of program loans	884,739	10,264,825	652,447	--	--
Total Current Assets	60,852,247	57,972,194	81,702,524	73,875,521	68,999,158
Non-Current Assets					
Portfolio Investments	1,000,000	1,000,000	1,000,000	1,000,000	2,155,525
Bonds Receivable	3,492,282	1,600,000	1,600,000	--	--
Solar Lease Notes - Less current portion	8,162,635	9,015,437	9,778,315	10,536,136	11,064,879
Program Loans - Less current portion	32,382,778	30,253,119	12,750,457	3,788,094	--
Renewable Energy Certificates	812,772	933,054	1,069,390	1,217,491	1,324,614
Capital Assets, Net of Depreciation and Amortization	57,863,787	26,971,087	3,074,337	362,505	91,329
Asset retirement obligation, net	2,261,472	1,029,196	--	--	--
Restricted Assets:					
Cash and Cash Equivalents	9,749,983	8,799,005	9,513,715	9,536,656	8,540,684
Total Non-Current Assets	115,725,709	79,600,898	38,786,214	26,440,882	23,177,031
Total Assets	$176,577,957	$137,573,092	$120,488,738	$100,316,403	$ 92,176,189

Ratio of Public Funds Invested

As the first Green Bank in the country, the Connecticut Green Bank seeks to use limited public resources to attract private capital investment in clean energy. The Connecticut Green Bank does this by moving away from the subsidy-based model of supporting clean energy and towards a financing model. As highlighted below (see Table 26), the Connecticut Green Bank has quickly moved towards this model, with fewer and fewer funds devoted to subsidies. This trend has developed even as total investment in clean energy has increased to over $915 million in total from 2012 through 2016, enabling the Connecticut Green Bank to do more at a faster pace while managing ratepayer resources more efficiently.

Table 26. Ratio of Capital Invested as Subsidies, Credit Enhancements, and Loans and Leases (FY 2012-2016)

GREEN BANK FUNDS INVESTED*	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	Total
Subsidies *(Grants)*	$4,809,813	$12,419,798	$17,992,300	$27,816,544	$20,552,219	$83,590,674
% Green Bank Funds Invested in Subsidies	100%	67%	48%	50%	43%	51%
Credit Enhancements *(LLR & IRBS)*	$0	$187,122	$512,104	$2,024,733	$2,255,186	$4,979,145
% Green Bank Funds Invested in Credit Enhancements	0%	1%	1%	4%	5%	3%
Loans and Leases *(includes sell downs)*	$0	$5,988,790	$19,330,387	$25,857,619	$25,234,975	$76,411,772
% Green Bank Funds Invested in Loans and Leases	0%	32%	51%	46%	53%	46%
Total	$4,809,813	$18,595,710	$37,834,791	$55,698,896	$48,042,380	$164,981,590

* Approved/Closed/Completed

Credit Quality of Residential Borrowers

The credit quality of Green Bank's residential borrowers reflects the relatively high FICO scores in the state; 78% of single family house households have a FICO of 680 or higher. The Green Bank has recently begun to focus on ensuring that credit challenged customers have access to energy financing products through such initiatives as its partnership with PosiGen and bringing Capital 4 Change, which has experience serving this market, into the Smart-E program.

Table 27. Credit Quality of Residential Borrowers by product (FY 2012-2016)

	Credit Score Ranges						
	Below 640	**640-679**	**680-699**	**700-719**	**720+**	**Unknown**	**Total**
Smart-E Loan	26	75	45	65	501	25	737
CT Solar Lease	1	45	39	78	1,029		1,192
CT Solar Loan	-	-	11	15	253		279
Total	27	120	95	158	1,783	25	2,208
	1%	5%	4%	7%	82%	1%	

Jobs Created

The Connecticut Green Bank's vision is to lead the green bank movement by accelerating private investment in clean energy deployment for Connecticut to achieve economic prosperity, support the creation of jobs, promote energy security, and address climate change. The Connecticut Green Bank tracks its progress towards this vision as "E3" metrics – Energy, Economic, and Environmental. The data below highlights the economic benefits of the Connecticut Green Bank's projects (see Tables 28 through 29). Investment represents the total amount of private and public funding for clean energy projects and direct and indirect and induced jobs quantifies the resulting job creation[25].

Table 28. Direct Job-Years Supported (FY 2012-2016)

Direct Jobs	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	Total
Approved	0	0	0	6	37	43
Closed	1	0	10	148	871	1,030
Completed	88	559	540	1,301	795	3,283
Total	88	559	550	1,455	1,703	4,355

Table 29. Indirect and Induced Job-Years Supported (FY 2012-2016)

Indirect & Induced Jobs	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	Total
Approved	0	0	0	9	61	70
Closed	1	0	16	237	1,400	1,655
Completed	142	1,131	868	2,093	1,279	5,514
Total	142	1,132	885	2,340	2,740	7,239

[25] Jobs estimates are based on multipliers determined as a result of work performed by Navigant Consulting for the Connecticut Renewable Energy and Energy Efficiency Economy Baseline Study completed in March 2009 and subsequently updated in 2010. This Navigant Study was an independent, third party analysis of Connecticut's clean energy economy. Data were acquired as a result of primary research. Navigant performed a census of over 300 companies, institutions, and organizations identified as active players in Connecticut's renewable energy and energy efficiency economy. Seventy-four (74) key renewable energy and energy efficiency companies were interviewed; 95 additional key companies were researched in detail. All renewable companies in Connecticut were identified and analyzed. Key energy efficiency companies were identified and analyzed, with the overall market size estimated by extrapolation. Company interviews included questions about customers, supply chain, number of jobs, corresponding salaries, and revenue. Detailed interview questionnaires are available in the Methodology section of the Baseline Study, pages 58-81.

http://www.ctcleanenergy.com/Portals/0/Phase%201%20Deliverable%20Final%20Full.pdf

DECD has approved of the methodology for estimating the economic development benefits (i.e., job-years created) from the investment in clean energy projects.

http://ctcleanenergy.com/Portals/0/board-materials/4_DECD%20Findings_Economic%20Development%20Estimates_FY%202013%20Results_CEFIA_121613.pdf

CO2 Emission Reductions Supported and Equivalencies

The data below highlight the environmental benefits of these projects as a reduction in carbon (CO2) emissions and standard equivalencies[26] (see Tables 30 through 33).

Table 30. Lifetime CO2 Emissions Reductions (FY 2012-2016)

Lifetime CO2 Emission Reductions (Tons)	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	Total
Approved	0	0	86	462	14,769	15,317
Closed	211	74	3,240	173,149	473,491	650,166
Completed	35,248	178,363	267,853	641,990	396,843	1,520,297
Total	35,459	178,437	271,179	815,600	885,103	2,185,779

[26] All emissions reductions from renewable energy projects are determined using ISO-New England information, because that is where the energy will be displaced. This produces results that may be significantly different from emissions savings based on a comparison to national averages. In addition, the generation characteristics of each technology have an impact on the emissions reduction that can be expected. Solar-powered systems will produce only during the daylight hours, which normally coincide with the peak demand period for the utilities. The generating fleet during this time may include peaking plants and reserve plants, which will have lower efficiencies than the "baseload" plants which run 24 hours per day. Consequently, emissions are higher, and the renewable energy systems look better by comparison. The calculations are based on the results of the 2007 New England Marginal Emission Rate Analysis (http://www.iso-ne.com/genrtion_resrcs/reports/emission/2007_mea_report.pdf). The appropriate marginal emissions rates for Connecticut are used to determine the net avoided emissions for each of the technologies evaluated.

a. PV systems are analyzed using the average of the Marginal Emission Rates (in Lbs/MWh) for "On-Peak Ozone Season" and "On-Peak Non-Ozone Season". The underlying assumptions are that PV systems will be operating primarily during the on-peak periods, and that their output in the five months of the "Ozone Season" (May – September) is about the same as in the seven months of the "Non-Ozone Season."
b. Fuel cells are also evaluated using the "Annual Average (all hours) Marginal Emission Rates", because they are expected to produce power continually as "base load" generators. Fuel Cell emissions assume that 50% of the thermal output ("waste heat") is used to displace natural gas used for heating. This is conservative, since 50% thermal utilization is the minimum standard for CCEF's acceptance of a fuel cell project.

Emissions estimates for anaerobic digester, wind, and energy efficiency projects were not estimated.

To determine the exact avoided CO2 for CHP projects one needs to know what the CHP system is displacing (i.e. boiler, grid, etc.), as well as the efficiencies, in order to determine the existing CO2 emissions and then do the calculation to get the avoided emissions. For general purposes a typical 3.7 MW system operating on natural gas would generate about 13,000 tons of CO2 annually and 195,000 tons over its 15-year life. Typically avoiding 35-50% CO2 overall from the existing infrastructure. Not factoring in the utility transmission and distribution losses.

It should be noted that a methodology for estimating the environmental protection benefits from the investment in clean energy projects (i.e., GHG emissions reduced) has not yet been proposed to or approved by DEEP. The Connecticut Green Bank is currently looking into the EPA's AVERT (Avoided Emissions and Generation Tool) for future estimations of emissions reductions - http://www3.epa.gov/avert/

Table 31. Lifetime CO2 Emissions Reduction Energy for Home Equivalents (FY 2012-2016)

Energy for # of Homes	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	Total
Approved	0	0	2,070	2,522	1,930	6,522
Closed	2	1	30	1,723	4,925	6,680
Completed	324	15,292	4,399	5,871	3,636	29,522
Total	326	15,293	6,499	10,116	10,491	42,724

Table 32. Lifetime CO2 Emissions Reduction Cars Off the Road Equivalents (FY 2012-2016)

Cars off the Road	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	Total
Approved	0	0	1	3	81	85
Closed	1	0	22	1,251	3,098	4,372
Completed	235	1,966	1,608	4,178	2,637	10,624
Total	236	1,967	1,630	5,432	5,816	15,080

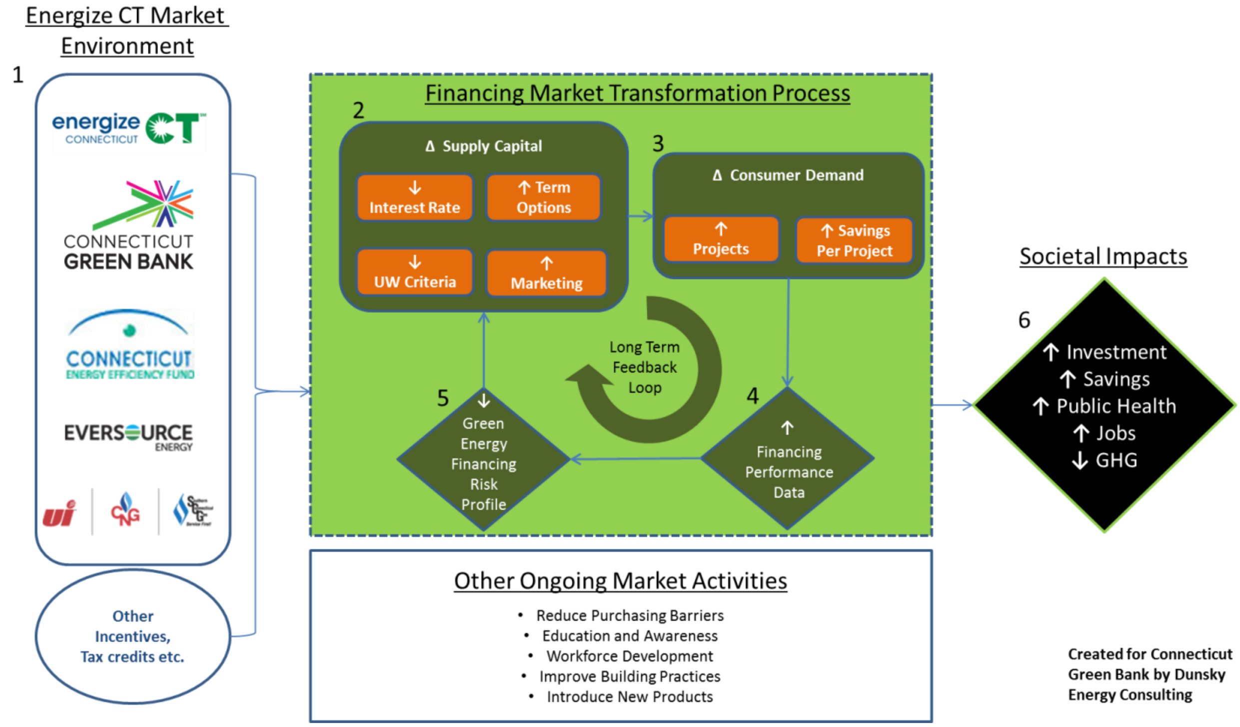
Table 33. Lifetime CO2 Emissions Reduction Acres of Trees Planted Equivalents (FY 2012-2016)

Planting # Acres of Trees	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	Total
Approved	0	0	1	6	162	169
Closed	3	1	43	2,504	6,202	8,753
Completed	470	3,936	3,219	8,365	5,279	21,269
Total	473	3,937	3,263	10,875	11,643	30,191

4. MARKET TRANSFORMATION – PROGRAM LOGIC MODEL

The Connecticut Green Bank has published an Evaluation Framework[27] and developed a Program Logic Model (PLM) that presents the green bank model of attracting and deploying private capital through financing (see Figure 1). This PLM serves as a foundation for evaluating clean energy deployment through subsidy and financing programs of the Connecticut Green Bank.

Figure 1. Connecticut Green Bank Program Logic Model – Including Subsidies and Financing



This figure is a generalized market transformation and impact logic model that can be adapted to apply to a specific program of a green bank, as its market transformation strategies and associated evaluation frameworks are developed. An example of the green bank model and the financing market transformation process is the CT Solar Loan.[28]

As the Green Bank's capital availability expands to support further clean energy deployment, one can anticipate that there will be increased coordination between the Green Bank's programs and those administered by the utilities. It is thus important to include the various other key participants in this overall logic model, in order to be able to identify the variety of interactions that can occur between them, that over the short, medium, and long term can lead to the transformation of the funding of clean energy projects. In addition, it is important to identify known interventions in the clean energy environment which can influence the ways in which the Green Bank's financing efforts might play out over time.

[27] Evaluation Framework – Assessing, Monitoring, and Reporting of Program Impacts and Processes by Opinion Dynamics and Dunsky Energy Consulting for the Connecticut Green Bank (July 2016)

[28] Comprehensive Annual Financial Report for FY 2015 – Market Transformation: Financial Warehouse and Credit Enhancement Structures Case of the CT Solar Loan (pp. 133-136)

The PLM includes three (3) components – Energize CT Market Environment (including Other Ongoing Market Activities), Green Bank Financing Market Transformation Process, and Societal Impacts.

<u>Energize CT Market Environment</u>

Energize CT is an initiative of the Green Bank, the Connecticut Energy Efficiency Fund, the State, and the local electric and gas utilities. It provides Connecticut consumers, businesses and communities the resources and information they need to make it easy to save energy and build a clean energy future for everyone in the state. Under this umbrella, the electric and gas investor owned utilities (IOUs) provide information, marketing, and deliver the energy efficiency programs that have been approved by the State and supported by the Connecticut Energy Efficiency Fund. Operating under a statutory mandate that all cost-effective energy efficiency be acquired, with guidance from the Connecticut Energy Efficiency Board and its consultants, the utilities offer a variety of programs and encouragements for residential, commercial, and industrial customers to make decisions to participate in these cost-reducing opportunities. A range of methods are used to incent customers to participate in the programs, among them targeted information, low cost/no cost measures, financial incentives, discounted retail products, and product and project financing. The Connecticut Green Bank, with a statutorily established residential solar PV target of 300MW by 2022, also markets and delivers its clean energy programs to residential customers. It too relies on information, marketing, direct incentives, and financing opportunities. [29]

Of the Green Bank programs, currently only participants in the Residential Solar Investment Program (RSIP) are required to receive a home energy assessment (i.e., supported by the utility efficiency programs), BPI audit, or equivalent. The program participants in the RSIP, with their individual energy saving projects, may thus receive rebates or incentives from the utilities (which are intended to overcome barriers to customer participation and to encourage increased selection of energy efficient measures), the Green Bank, or other levels of government (e.g., state incentives and Federal tax credits for solar PV and other technologies) as well as opportunities to finance some or all of the remaining portion of their clean energy project. In the context of a PLM, one can anticipate similar links between the Green Bank programs and those of the investor owned utilities (IOU's).

An impetus for coordination between the utility administered energy efficiency programs and the Green Bank programs is threefold: 1) more energy savings, and resulting emissions reductions, could potentially be acquired more economically both to the programs and to the project participants, 2) delivery efficiencies and greater savings could be found in coordinating financing that each entity offers to common customer segments within the sphere of program activities that they offer, and 3) coordination through a Joint Committee of the Energy Efficiency Board and the Connecticut Green Bank is required by statute.[30] It is important to note that there are a number

[29] Per Public Act 15-194 "An Act Concerning the Encouragement of Local Economic Development and Access to Residential Renewable Energy," the Connecticut Green Bank administers a rebate and performance-based incentive program to support solar PV.

[30] Pursuant to Section 15-245m(d)(2) of Connecticut General Statutes, the Joint Committee shall examine opportunities to coordinate the programs and activities contained in the plan developed under Section 16-245n(c) of the General Statutes [Comprehensive Plan of the Connecticut Green Bank] with the programs and activities contained in the plan developed under section 16-245m(d)(1) of the General Statutes [Energy Conservation and Load Management Plan] and to provide financing to

of other ongoing market activities that are occurring through Energize CT or outside of the Green Bank's market transformation process. From introducing new products, reducing purchasing barriers, education and awareness programs to workforce development, and improving building practices – there are a variety of activities that help move the market towards more clean energy deployment.

Finance Market Transformation Process

The efforts of the Green Bank are exemplified through the financing market transformation process, which focuses on accelerating the deployment of clean energy – more customers and "deeper" more comprehensive measures being undertaken – by securing increasingly affordable and attractive private capital. The Green Bank can enter the process at a number of points (i.e., from numbers 2 through 4 in the above PLM figure), such as supplying capital through financing offers, marketing clean energy financing, or offsetting clean energy financing risk by backstopping loans, or sharing loan performance data.

Here is a breakdown of each component of the financing market transformation process of the Green Bank:

- **Supply of Capital –** financing programs aim to increase the supply of affordable and attractive capital available to support energy savings and clean energy production in the market place. This is done at the Green Bank by:

  a. Providing financing (loans or leases) to customers using Green Bank capital; and/or
  b. Establishing structures, programs, and public-private partnerships that connect third-party capital to support energy savings projects.

Beyond ensuring that financing is available for clean energy projects, the benefits of the Green Bank's Supply of Capital interventions can lead to, but are not limited to:

a. Reduced interest rates, which lower the cost of capital for clean energy projects;
b. More loan term options to better match savings cash flows (e.g., longer terms for longer payback projects, early repayment, or deferred first year payments);
c. Less restrictive underwriting criteria to increase eligibility for and expand access to financing; and
d. Increased marketing by lenders to leverage clean energy investment opportunities.

Each of these features is intended to increase uptake of clean energy projects, leading to increased energy savings, clean energy production, and other positive societal impacts. The long-term goal of the Green Bank's efforts is to achieve these attractive features in the market with a reduced need for Green Bank intervention, through the provision of performance data that convinces private capital providers to offer such features on their own.

increase the benefits of programs funded by the plan developed under section 16-245m(d)(1) of the General Statutes so as to reduce the long-term cost, environmental impacts, and security risks of energy in the state.

- **Consumer Demand –** in combination with a comprehensive set of clean energy programs under the Energize CT initiative, the Green Bank drives demand for clean energy by marketing financing programs and increasing awareness of the potential benefits stemming from clean energy projects. Green Bank programs that deliver rebates and incentives – or connect with customers to support energy savings projects that are eligible for rebates and incentives – can further help to drive demand for natural gas conversions (e.g., Energize Norwich in partnership with Norwich Public Utilities)[31] as well as reduce the installed costs of and drive demand for solar PV projects (e.g., Solarize Connecticut). It should also be noted that through channel marketing strategies (e.g., contractor channels to the customer) success will be determined by an increase in demand for financing. The results of the increased demand are expected to, but are not limited to:

    a. Increase the number of clean energy projects; and
    b. Increase the average savings and/or clean energy production per project.

    Increasing affordable and attractive financing offerings in the marketplace is an important component of unlocking consumer demand and driving greater energy savings and clean energy production, and is central to the Green Bank's market transformation efforts.

- **Financing Performance Data –** Green Bank gathers and communicates the performance of clean energy financing either through its own programs or for other financing options in the market place. This increases access to valuable information that can help lenders and customers identify promising clean energy investments. Enabling access to this information (i.e., data transparency) is important to encouraging market competition.

    Ultimately, data on financing performance is expected to play a central part in attracting more private capital investment to offer affordable and attractive financing offerings on their own. As the Green Bank increases the access to affordable and attractive capital, and more customers use financing for their clean energy projects, data demonstrating strong and reliable performance of these projects may indicate lower and more predictable risk.

- **Financing Risk Profile –** Green Bank can help reduce clean energy financing risk profiles in a number of ways. For example, it can absorb a portion or all of the credit risk by providing loan loss reserve (LLR) funds and guarantees or taking the first-loss position on investments (i.e., subordinated debt). It can also channel or attract rebates and incentives to finance energy saving projects thus improving their economic performance and lowering the associated performance risk. In the long run, by making clean energy financing performance data available to the market, Green Bank programs increase lenders' and borrowers' understanding of clean energy investment risk profiles, which may allow them to (1) design more affordable and attractive financing products and (2) select projects for financing to reduce risks.

    This element of the PLM plays the key linking role in the Market Transformation feedback loop, leading to longer term impacts, as the market (1) recognizes the potentially advantageous risk/return profile associated with clean energy investments and (2) takes

[31] Section 52 of Public Act 13-298

further steps to increase the supply of affordable and attractive capital with less Green Bank credit enhancement needed to support demand for clean energy investments.

Ensuring that financing performance and risk profile data are available to the market is important from various perspectives. For a deeper examination and presentation, please see the report by the State Energy Efficiency Action Network.[32]

Societal Impact

The efforts to accelerate and scale-up investment in clean energy deployment by the Green Bank, lead to a myriad of societal impacts and benefits.

All of the PLM elements ultimately aim to contribute to Green Bank program impacts and benefits. These include the direct impacts resulting from more clean energy investments supported by Green Bank financing that result in an increase in energy savings and improvement of public health (e.g., asbestos remediation, lead abatement, etc.) to the customer,[33] increase in the creation of local in-state jobs,[34] and the reduction of greenhouse gas emissions[35] for society. The impacts may also include consideration of secondary or indirect benefits such as GDP growth and energy savings supported by lenders who have leveraged Green Bank data or marketing efforts. Figure 2 below represents the transition over time of the Green Bank's clean energy impacts and associated creation of societal benefits.

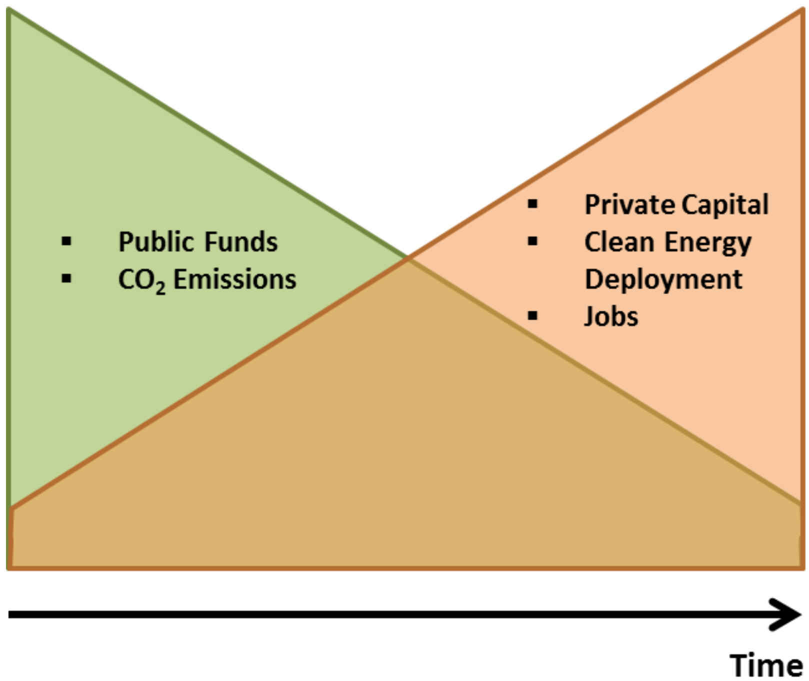
[32] State and Local Energy Efficiency Action Network. (2014). *Energy Efficiency Finance Programs: Use Case Analysis to Define Data Needs and Guidelines.* Prepared by: Peter Thompson, Peter Larsen, Chris Kramer, and Charles Goldman of Lawrence Berkeley National Laboratory. click here

[33] Green Bank will be working with the Connecticut Department of Energy and Environmental Protection and the U.S. Environmental Protection Agency to develop and approve a methodology for estimating public health benefits from the reduction of criteria pollutants as a result of the production of clean energy and reduction of energy consumption through the use of the Co-Benefits Risk Assessment (COBRA) model – https://www.epa.gov/statelocalclimate/co-benefits-risk-assessment-cobra-screening-model

[34] Green Bank is working with the Connecticut Department of Economic and Community Development and Navigant Consulting to update and approve a methodology for estimating economic development benefits from the investment in clean energy projects.

[35] Green Bank is working with the Connecticut Department of Energy and Environmental Protection to develop and approve a methodology for estimating greenhouse gas emission reduction benefits from the production of clean energy and reduction of energy consumption through the use of the AVoided Emissions and geneRation Tool (AVERT) - https://www.epa.gov/statelocalclimate/avoided-emissions-and-generation-tool-avert

Figure 2. Societal Benefits – Environmental Protection and Economic Development – from Greater Private Capital Investment

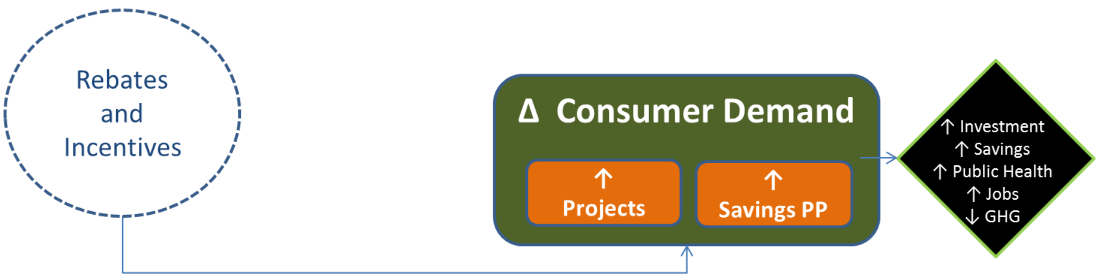


As the Green Bank continues to attract more private investment in Connecticut's clean energy economy through the issuance of green bonds, the deployment of clean energy will be accelerated. The more clean energy that is being deployed, the greater the societal benefits will be.

4. MARKET TRANSFORMATION – COST EFFECTIVENESS OF SUBSIDIES CASE OF THE RESIDENTIAL SOLAR INVESTMENT PROGRAM

The Connecticut Green Bank contracted with Cadmus Group, Inc., to conduct a cost-effectiveness analysis of its Residential Solar Investment Program (RSIP).[36] As the Connecticut Green Bank's only subsidy program, we are applying the Program Logic Model that focuses on rebates and incentives as the financial driver for customer action rather than financing (see Figure 3).

Figure 3. Program Logic Model for the Residential Solar Investment Program



RSIP Growth and Cost Trends

To provide perspective on program growth, cost and incentive trends, Table 34 illustrates the increase in RSIP project volume while installed costs and incentives have decreased from fiscal years 2012 through 2016, grouped by non-Solarize projects, Solarize[37] projects and RSIP in total.

Table 34. RSIP Volume, Capacity and Cost Data by Fiscal Year[38]

	Non-Solarize				Solarize				RSIP Total			
Fiscal Year	# Projects	Installed Capacity (kW)	Installed Cost ($/W)	Incentive ($/W)	# Projects	Installed Capacity (kW)	Installed Cost ($/W)	Incentive ($/W)	# Projects	Installed Capacity (kW)	Installed Cost ($/W)	Incentive ($/W)
2012	290	1,956	$5.11	$1.75					290	1,956	$5.11	$1.75
2013	788	5,481	$4.65	$1.54	327	2,444	$3.84	$1.45	1,115	7,924	$4.32	$1.51
2014	1,677	12,116	$4.27	$1.18	715	5,070	$3.80	$1.15	2,392	17,186	$4.07	$1.17
2015	5,631	42,275	$3.91	$0.67	940	7,864	$3.88	$0.74	6,571	50,139	$3.90	$0.68
2016	7,598	59,088	$3.42	$0.35	103	916	$3.84	$0.43	7,701	60,004	$3.43	$0.35
Total	15,984	120,917	$3.76	$0.62	2,085	16,294	$3.85	$0.96	18,069	137,211	$3.78	$0.66

Tables 35 and 36 provide program growth and cost trend data by installer for fiscal years 2016 and for 2012-2016 combined, grouped by non-Solarize and Solarize projects, and RSIP in total. Data points provided include # Projects, Installed Capacity (kW), Installed Cost ($/W), and Incentive ($/W). Installed costs vary widely and depend on many factors including equipment/panel quality

[36] Per Section 106 of Public Act 11-80 (and revised through Public Act 15-194), the Connecticut Green Bank administers the Residential Solar Investment Program.

[37] Solarize is a community-based marketing program (visit www.solarizect.com for more information)

[38] Based on RSIP Market Watch data as of June 30, 2016, end of FY 2015. Cost data includes all reported installed costs without including those projects where financing costs for some third party ownership installers are included as part of the total system cost. Installed capacity data is provided in kW-STC.

and efficiency, type of installation (e.g., roof-mount, ground-mount, pole-mount), project location, site and installation characteristics and other factors.

Table 35. RSIP FY 2016 Volume, Capacity and Cost Data by Installer[39]

	Non-Solarize				Solarize				RSIP Total			
Installer	# Projects	Installed Capacity (kW)	Installed Cost ($/W)	Incentive ($/W)	# Projects	Installed Capacity (kW)	Installed Cost ($/W)	Incentive ($/W)	# Projects	Installed Capacity (kW)	Installed Cost ($/W)	Incentive ($/W)
31Solar	1	11	$3.44	$0.49	-	-	$0.00	$0.00	1	11	$3.44	$0.49
Aegis Electrical Systems, LLC	90	803	$3.92	$0.43	-	-	$0.00	$0.00	90	803	$3.92	$0.43
All Electric Const. & Comm. LLC	1	15	$3.51	$0.45	-	-	$0.00	$0.00	1	15	$3.51	$0.45
AllGreenIT, Inc.	19	182	$3.46	$0.46	2	14	$3.54	$0.49	21	197	$3.47	$0.46
Apex Solar Energy	2	24	$2.76	$0.45	-	-	$0.00	$0.00	2	24	$2.76	$0.45
BeFree Green Energy, LLC	51	471	$3.78	$0.43	15	130	$3.84	$0.48	66	601	$3.79	$0.44
Bonner Electric	2	18	$3.85	$0.42	-	-	$0.00	$0.00	2	18	$3.85	$0.42
Boston Solar	13	120	$3.51	$0.43	-	-	$0.00	$0.00	13	120	$3.51	$0.43
Consulting Engineering Services, Inc.	1	13	$3.55	$0.46	1	9	$4.12	$0.12	2	22	$3.78	$0.32
CT Solar Power, LLC	2	17	$3.71	$0.48	-	-	$0.00	$0.00	2	17	$3.71	$0.48
C-TEC Solar LLC	164	1,468	$3.76	$0.43	5	44	$3.78	$0.45	169	1,512	$3.76	$0.43
Direct Energy Solar	175	1,552	$3.56	$0.39	-	-	$0.00	$0.00	175	1,552	$3.56	$0.39
Dow Solar	3	16	$7.84	$0.34	-	-	$0.00	$0.00	3	16	$7.84	$0.34
Duck Feet Solar	-	-	$0.00	$0.00	1	11	$3.71	$0.47	1	11	$3.71	$0.47
Earthlight Technologies	111	997	$4.03	$0.46	1	13	$4.25	$0.58	112	1,010	$4.03	$0.46
Eastern CT Solar	5	45	$3.37	$0.46	-	-	$0.00	$0.00	5	45	$3.37	$0.46
EcoSolar Installations, LLC	2	8	$4.07	$0.47	-	-	$0.00	$0.00	2	8	$4.07	$0.47
Emmett O'Brien Technical High School	1	5	$2.14	$0.47	-	-	$0.00	$0.00	1	5	$2.14	$0.47
Encon, Inc.	15	144	$4.68	$0.43	23	156	$3.91	$0.42	38	300	$4.28	$0.43
Evergreen Energy, LLC	3	25	$3.47	$0.48	-	-	$0.00	$0.00	3	25	$3.47	$0.48
Florenton River LLC	1	13	$4.25	$0.47	-	-	$0.00	$0.00	1	13	$4.25	$0.47
Green Earth Energy	14	132	$3.75	$0.38	-	-	$0.00	$0.00	14	132	$3.75	$0.38
JD Solar Solutions, LLC	36	291	$3.46	$0.47	-	-	$0.00	$0.00	36	291	$3.46	$0.47
Litchfield Hills Solar, LLC	11	114	$4.26	$0.45	-	-	$0.00	$0.00	11	114	$4.26	$0.45
Modern Solar Company	1	14	$5.33	$0.46	-	-	$0.00	$0.00	1	14	$5.33	$0.46
New England Clean Energy	1	7	$5.87	$0.50	-	-	$0.00	$0.00	1	7	$5.87	$0.50
Northeast Energy Design Solutions	1	9	$3.25	$0.49	1	8	$4.37	$0.49	2	17	$3.77	$0.49
Northeast Smart Energy LLC	-	-	$0.00	$0.00	1	13	$3.75	$0.47	1	13	$3.75	$0.47
One Roof Energy / Direct Energy Solar	41	276	$3.77	$0.29	-	-	$0.00	$0.00	41	276	$3.77	$0.29
One Source Solar, LLC	2	15	$4.00	$0.48	-	-	$0.00	$0.00	2	15	$4.00	$0.48
OneRoof Energy, Inc.	97	734	$4.36	$0.30	-	-	$0.00	$0.00	97	734	$4.36	$0.30
PosiGen	334	2,205	$4.48	$0.42	-	-	$0.00	$0.00	334	2,205	$4.48	$0.42
PurePoint Energy, LLC	30	247	$4.74	$0.47	1	21	$5.99	$0.44	31	268	$4.84	$0.47
R. Pelton Builders	8	94	$3.41	$0.45	-	-	$0.00	$0.00	8	94	$3.41	$0.45
Real Goods Solar, Inc	20	159	$4.14	$0.36	-	-	$0.00	$0.00	20	159	$4.14	$0.36
Roof Diagnostics Solar and Electric of CT	457	3,019	$3.20	$0.37	-	-	$0.00	$0.00	457	3,019	$3.20	$0.37
Ross Solar Group	124	1,300	$3.92	$0.44	30	306	$3.67	$0.42	154	1,606	$3.87	$0.44
Shippee Solar and Construction LLC	5	45	$3.98	$0.44	-	-	$0.00	$0.00	5	45	$3.98	$0.44

[39] Based on RSIP Market Watch data as of June 30, 2016. Cost data includes all reported installed costs without including those projects where financing costs for some third party ownership installers are included as part of the total system cost. Installed capacity data is provided in kW-STC.

4. MARKET TRANSFORMATION – COST EFFECTIVENESS OF SUBSIDIES CASE OF THE RESIDENTIAL SOLAR INVESTMENT PROGRAM

	Non-Solarize				Solarize				RSIP Total			
Installer	# Projects	Installed Capacity (kW)	Installed Cost ($/W)	Incentive ($/W)	# Projects	Installed Capacity (kW)	Installed Cost ($/W)	Incentive ($/W)	# Projects	Installed Capacity (kW)	Installed Cost ($/W)	Incentive ($/W)
Sicuranza Electric	1	10	$4.53	$0.38	-	-	$0.00	$0.00	1	10	$4.53	$0.38
Skyline Solar	8	56	$4.09	$0.40	-	-	$0.00	$0.00	8	56	$4.09	$0.40
SolarCity	3,023	22,462	$5.21	$0.33	-	-	$0.00	$0.00	3,023	22,462	$5.21	$0.33
SON Energy Systems, LLC	1	9	$3.00	$0.49	-	-	$0.00	$0.00	1	9	$3.00	$0.49
Sound Solar Systems, LLC	1	6	$5.52	$0.49	-	-	$0.00	$0.00	1	6	$5.52	$0.49
Summer Hill Solar	8	74	$2.92	$0.44	-	-	$0.00	$0.00	8	74	$2.92	$0.44
SunEdison	96	603	$2.74	$0.33	-	-	$0.00	$0.00	96	603	$2.74	$0.33
Sungevity, Inc.	365	2,871	$3.67	$0.36	-	-	$0.00	$0.00	365	2,871	$3.67	$0.36
Sunlight Solar Energy, Inc.	43	386	$3.61	$0.43	11	83	$3.77	$0.43	54	469	$3.64	$0.43
Sunrun Inc	777	6,039	$2.31	$0.30	-	-	$0.00	$0.00	777	6,039	$2.31	$0.30
Sun-Wind Solutions, LLC	2	16	$3.59	$0.48	-	-	$0.00	$0.00	2	16	$3.59	$0.48
The Roofing Store, LLC	1	7	$5.50	$0.47	-	-	$0.00	$0.00	1	7	$5.50	$0.47
Trinity Solar	1,410	11,817	$3.44	$0.34	10	97	$3.83	$0.36	1,420	11,914	$3.45	$0.34
Tuscany Design Build, Inc.	1	20	$3.84	$0.44	1	11	$4.22	$0.31	2	30	$3.98	$0.39
Vivint Solar Developer, LLC	13	85	$4.97	$0.29	-	-	$0.00	$0.00	13	85	$4.97	$0.29
Waldo Renewable Electric, LLC	3	17	$3.98	$0.52	-	-	$0.00	$0.00	3	17	$3.98	$0.52
White Oak Development, LLC	1	5	$4.30	$0.46	-	-	$0.00	$0.00	1	5	$4.30	$0.46
Total	7,598	59,088	$4.10	$0.35	103	916	$3.84	$0.43	7,701	60,004	$4.10	$0.35

4. MARKET TRANSFORMATION – COST EFFECTIVENESS OF SUBSIDIES CASE OF THE RESIDENTIAL SOLAR INVESTMENT PROGRAM

Table 36. RSIP FY 2012-2016 Volume, Capacity and Cost Data by Installer[40]

	Non-Solarize				Solarize				RSIP Total			
Installer	# Projects	Installed Capacity (kW)	Installed Cost ($/W)	Incentive ($/W)	# Projects	Installed Capacity (kW)	Installed Cost ($/W)	Incentive ($/W)	# Projects	Installed Capacity (kW)	Installed Cost ($/W)	Incentive ($/W)
31Solar	19	154	$3.88	$1.02	-	-	$0.00	$0.00	19	154	$3.88	$1.02
A Better Way Solar	1	10	$3.37	$0.59	-	-	$0.00	$0.00	1	10	$3.37	$0.59
Aegis Electrical Systems, LLC	381	3,066	$4.18	$0.77	-	-	$0.00	$0.00	381	3,066	$4.18	$0.77
All Electric Const. & Comm. LLC	3	33	$3.61	$0.65	-	-	$0.00	$0.00	3	33	$3.61	$0.65
AllGreenIT, Inc.	75	629	$3.68	$0.83	116	939	$3.53	$0.91	191	1,568	$3.59	$0.88
Alteris, Inc.	1	5	$3.00	$1.05	-	-	$0.00	$0.00	1	5	$3.00	$1.05
American Solar Partners	3	16	$3.55	$1.73	-	-	$0.00	$0.00	3	16	$3.55	$1.73
Apex Solar Energy	5	39	$3.04	$0.61	-	-	$0.00	$0.00	5	39	$3.04	$0.61
Astrum Solar	27	238	$4.32	$1.84	2	21	$4.21	$1.85	29	258	$4.31	$1.84
Atlantic Solar	1	6	$4.41	$1.11	-	-	$0.00	$0.00	1	6	$4.41	$1.11
BeFree Green Energy, LLC	129	1,156	$4.02	$0.75	363	3,181	$3.74	$0.98	492	4,337	$3.82	$0.92
Bella Casa Verde	2	15	$4.35	$1.13	-	-	$0.00	$0.00	2	15	$4.35	$1.13
Bonner Electric	14	123	$3.95	$0.88	-	-	$0.00	$0.00	14	123	$3.95	$0.88
Boston Solar	25	225	$3.59	$0.45	-	-	$0.00	$0.00	25	225	$3.59	$0.45
Bright Side Solar, LLC	1	4	$5.07	$1.93	-	-	$0.00	$0.00	1	4	$5.07	$1.93
Burrington Solar Edge	1	6	$3.88	$0.72	-	-	$0.00	$0.00	1	6	$3.88	$0.72
CatchinRays 2 LLC	30	235	$4.04	$0.76	-	-	$0.00	$0.00	30	235	$4.04	$0.76
Centurion Solar	16	110	$4.05	$0.83	31	193	$3.98	$1.18	47	303	$4.01	$1.05
Chabot Electric	2	16	$3.14	$0.90	-	-	$0.00	$0.00	2	16	$3.14	$0.90
Connecticut Solar Electric, LLC	2	14	$3.71	$1.24	-	-	$0.00	$0.00	2	14	$3.71	$1.24
Consulting Engineering Services, Inc.	4	33	$3.43	$0.72	1	9	$4.12	$0.12	5	42	$3.58	$0.59
CS Energy Systems, Inc.	2	26	$3.75	$0.73	-	-	$0.00	$0.00	2	26	$3.75	$0.73
CT Electrical, LLC	14	94	$5.39	$1.24	-	-	$0.00	$0.00	14	94	$5.39	$1.24
CT Solar Power, LLC	19	165	$4.18	$0.90	-	-	$0.00	$0.00	19	165	$4.18	$0.90
C-TEC Solar LLC	371	3,032	$3.99	$0.70	421	2,952	$3.99	$0.90	792	5,984	$3.99	$0.80
DCS	34	185	$4.09	$1.54	1	7	$3.50	$0.61	35	192	$4.07	$1.50
Deak Electric, Inc.	2	16	$5.20	$1.02	-	-	$0.00	$0.00	2	16	$5.20	$1.02
Direct Energy Solar	434	3,733	$3.73	$0.61	199	1,608	$3.54	$1.08	633	5,341	$3.68	$0.75
Dow Solar	6	29	$7.99	$0.62	-	-	$0.00	$0.00	6	29	$7.99	$0.62
Duck Feet Solar	-	-	$0.00	$0.00	1	11	$3.71	$0.47	1	11	$3.71	$0.47
Earthlight Technologies	178	1,594	$4.08	$0.56	55	450	$4.00	$0.85	233	2,044	$4.06	$0.63
Eastern CT Solar	7	66	$3.39	$0.52	-	-	$0.00	$0.00	7	66	$3.39	$0.52
EcoSolar Installations, LLC	15	84	$4.51	$1.18	-	-	$0.00	$0.00	15	84	$4.51	$1.18
Elektron Solar, LLC	8	64	$4.75	$1.39	-	-	$0.00	$0.00	8	64	$4.75	$1.39

[40] Based on RSIP Market Watch data as of June 30, 2016. Cost data includes all reported installed costs without including those projects where financing costs for some third party ownership installers are included as part of the total system cost. Installed capacity data is provided in kW-STC.

	Non-Solarize				Solarize				RSIP Total			
Installer	**# Projects**	**Installed Capacity (kW)**	**Installed Cost ($/W)**	**Incentive ($/W)**	**# Projects**	**Installed Capacity (kW)**	**Installed Cost ($/W)**	**Incentive ($/W)**	**# Projects**	**Installed Capacity (kW)**	**Installed Cost ($/W)**	**Incentive ($/W)**
Emmett O'Brien Technical High School	1	5	$2.14	$0.47	-	-	$0.00	$0.00	1	5	$2.14	$0.47
Encon, Inc.	95	743	$5.41	$0.98	280	1,945	$3.95	$0.96	375	2,688	$4.35	$0.96
Endless Mountains Solar Services	10	74	$4.86	$1.38	-	-	$0.00	$0.00	10	74	$4.86	$1.38
Evergreen Energy, LLC	17	137	$3.89	$0.95	1	9	$3.48	$0.61	18	146	$3.87	$0.93
Executive Electric	1	7	$3.91	$1.37	-	-	$0.00	$0.00	1	7	$3.91	$1.37
Florenton River LLC	1	13	$4.25	$0.47	-	-	$0.00	$0.00	1	13	$4.25	$0.47
Giuffrida Electric Company, Inc.	4	26	$4.59	$1.43	-	-	$0.00	$0.00	4	26	$4.59	$1.43
GM Industries, Inc.	26	256	$8.00	$1.37	-	-	$0.00	$0.00	26	256	$8.00	$1.37
Green Earth Energy	23	199	$3.93	$0.58	-	-	$0.00	$0.00	23	199	$3.93	$0.58
Harness the Sun	16	97	$4.15	$1.37	22	193	$3.71	$1.08	38	289	$3.86	$1.18
Infinite Energy Systems	1	11	$5.38	$1.52	-	-	$0.00	$0.00	1	11	$5.38	$1.52
Intina Energy	3	22	$3.86	$1.13	-	-	$0.00	$0.00	3	22	$3.86	$1.13
JD Solar Solutions, LLC	147	1,174	$3.71	$0.85	-	-	$0.00	$0.00	147	1,174	$3.71	$0.85
Leach Services	2	12	$3.70	$1.53	-	-	$0.00	$0.00	2	12	$3.70	$1.53
Lenz Electric	1	4	$5.71	$1.96	-	-	$0.00	$0.00	1	4	$5.71	$1.96
Litchfield Hills Solar, LLC	71	557	$4.54	$0.96	-	-	$0.00	$0.00	71	557	$4.54	$0.96
Macri Roofing, Inc.	2	13	$5.79	$1.58	-	-	$0.00	$0.00	2	13	$5.79	$1.58
Made in USA Solar LLC	11	79	$4.69	$1.26	-	-	$0.00	$0.00	11	79	$4.69	$1.26
Mercury Solar Systems, Inc.	2	16	$4.93	$1.63	-	-	$0.00	$0.00	2	16	$4.93	$1.63
Mister Sparky	6	20	$6.83	$1.90	-	-	$0.00	$0.00	6	20	$6.83	$1.90
Modern Solar Company	5	41	$5.08	$1.15	-	-	$0.00	$0.00	5	41	$5.08	$1.15
Moore Energy	4	27	$4.98	$1.59	-	-	$0.00	$0.00	4	27	$4.98	$1.59
Mystic Solar (Natural Energy Alternatives, LLC)	4	36	$5.09	$1.61	-	-	$0.00	$0.00	4	36	$5.09	$1.61
New England Clean Energy	1	7	$5.87	$0.50	-	-	$0.00	$0.00	1	7	$5.87	$0.50
Next Step Living	129	795	$6.29	$0.88	-	-	$0.00	$0.00	129	795	$6.29	$0.88
Northeast Energy Design Solutions	1	9	$3.25	$0.49	1	8	$4.37	$0.49	2	17	$3.77	$0.49
Northeast Smart Energy LLC	12	92	$3.24	$1.18	1	13	$3.75	$0.47	13	106	$3.30	$1.09
One Roof Energy / Direct Energy Solar	41	276	$3.77	$0.29	-	-	$0.00	$0.00	41	276	$3.77	$0.29
One Source Solar, LLC	2	15	$4.00	$0.48	-	-	$0.00	$0.00	2	15	$4.00	$0.48
OneRoof Energy, Inc.	97	734	$4.36	$0.30	-	-	$0.00	$0.00	97	734	$4.36	$0.30
Paradise Energy Solutions	1	10	$4.08	$0.60	-	-	$0.00	$0.00	1	10	$4.08	$0.60
PosiGen	383	2,517	$4.49	$0.47	-	-	$0.00	$0.00	383	2,517	$4.49	$0.47
PurePoint Energy, LLC	90	719	$4.73	$0.77	19	162	$4.49	$0.55	109	881	$4.69	$0.73
R. Pelton Builders	60	457	$4.07	$1.00	-	-	$0.00	$0.00	60	457	$4.07	$1.00
Real Goods Solar, Inc	190	1,449	$4.14	$0.99	146	1,058	$3.79	$1.24	336	2,507	$3.99	$1.10
Renewable Resources, Inc.	21	130	$4.16	$1.47	11	66	$3.87	$1.29	32	195	$4.06	$1.40
Roof Diagnostics Solar and Electric of CT	1,027	7,030	$3.40	$0.55	-	-	$0.00	$0.00	1,027	7,030	$3.40	$0.55
Ross Solar Group	392	3,721	$4.15	$0.82	290	2,524	$3.98	$0.87	682	6,245	$4.08	$0.84

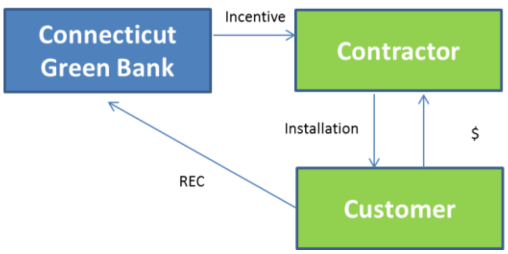
4. MARKET TRANSFORMATION – COST EFFECTIVENESS OF SUBSIDIES CASE OF THE RESIDENTIAL SOLAR INVESTMENT PROGRAM

	Non-Solarize				Solarize				RSIP Total			
Installer	**# Projects**	**Installed Capacity (kW)**	**Installed Cost ($/W)**	**Incentive ($/W)**	**# Projects**	**Installed Capacity (kW)**	**Installed Cost ($/W)**	**Incentive ($/W)**	**# Projects**	**Installed Capacity (kW)**	**Installed Cost ($/W)**	**Incentive ($/W)**
Shippee Solar and Construction LLC	105	815	$3.72	$1.05	14	113	$3.91	$0.60	119	928	$3.75	$0.99
Sicuranza Electric	2	20	$5.45	$0.95	-	-	$0.00	$0.00	2	20	$5.45	$0.95
Sky View Solar	1	5	$6.03	$1.37	-	-	$0.00	$0.00	1	5	$6.03	$1.37
Skyline Solar	38	299	$4.21	$0.82	-	-	$0.00	$0.00	38	299	$4.21	$0.82
SolarCity	6,820	49,515	$5.16	$0.61	4	21	$5.15	$0.59	6,824	49,536	$5.16	$0.61
SON Energy Systems, LLC	2	16	$3.55	$0.87	-	-	$0.00	$0.00	2	16	$3.55	$0.87
Sound Solar Systems, LLC	6	52	$4.80	$1.20	-	-	$0.00	$0.00	6	52	$4.80	$1.20
Summer Hill Solar	24	177	$3.19	$0.89	-	-	$0.00	$0.00	24	177	$3.19	$0.89
Sun Harvest Renewable Resources, LLC	10	76	$6.07	$1.62	-	-	$0.00	$0.00	10	76	$6.07	$1.62
Sundoor Solar	2	14	$4.00	$0.86	-	-	$0.00	$0.00	2	14	$4.00	$0.86
SunEdison	96	603	$2.74	$0.33	-	-	$0.00	$0.00	96	603	$2.74	$0.33
Sungevity, Inc.	811	6,156	$3.96	$0.65	-	-	$0.00	$0.00	811	6,156	$3.96	$0.65
Sunlight Solar Energy, Inc.	197	1,517	$4.15	$0.91	94	700	$3.89	$1.00	291	2,217	$4.07	$0.94
Sunrun Inc	777	6,039	$2.31	$0.30	-	-	$0.00	$0.00	777	6,039	$2.31	$0.30
Sun-Wind Solutions, LLC	17	138	$3.88	$0.96	-	-	$0.00	$0.00	17	138	$3.88	$0.96
Super Green Solutions	8	70	$3.58	$0.63	-	-	$0.00	$0.00	8	70	$3.58	$0.63
The Roofing Store, LLC	1	7	$5.50	$0.47	-	-	$0.00	$0.00	1	7	$5.50	$0.47
Today Electronics USA	1	9	$3.82	$0.71	-	-	$0.00	$0.00	1	9	$3.82	$0.71
Trinity Solar	2,213	17,766	$3.50	$0.47	10	97	$3.83	$0.36	2,223	17,863	$3.50	$0.47
Tuscany Design Build, Inc.	8	82	$5.38	$0.93	1	11	$4.22	$0.31	9	93	$5.24	$0.86
US Energy Concierge	13	72	$4.38	$0.89	-	-	$0.00	$0.00	13	72	$4.38	$0.89
Verengo Solar	35	272	$3.61	$1.00	-	-	$0.00	$0.00	35	272	$3.61	$1.00
Vivint Solar Developer, LLC	13	85	$4.97	$0.29	-	-	$0.00	$0.00	13	85	$4.97	$0.29
Waldo Renewable Electric, LLC	42	302	$4.82	$1.13	1	6	$3.82	$0.49	43	308	$4.81	$1.11
White Oak Development, LLC	10	61	$5.84	$1.46	-	-	$0.00	$0.00	10	61	$5.84	$1.46
Total	15,984	120,917	$4.33	$0.62	2,085	16,294	$3.85	$0.96	18,069	137,211	$4.28	$0.66

Rebates and Incentives

The RSIP is a subsidy program that provides incentives to offset the cost for homeowners to install solar photovoltaic (PV) systems. Incentives are provided either upfront (i.e., through an expected performance based buy-down or EPBB) for homeowners that want to own a system or over time based on system production (i.e., through a performance based incentive or PBI) for homeowners who want to lease a system from a third-party owner. With either incentive type, the Renewable Energy Credits (RECs) are owned by the Connecticut Green Bank (see Figure 4).

Figure 4. Legal Structure and Flows of Capital for the RSIP[41]



The subsidy under the RSIP has decreased over time (see Table 37) with the intention of increasing the number of projects and increasing the amount of clean energy produced (see Table 38) while at the same time supporting the goal of reducing the market reliance on rebates and incentives and moving it towards innovative low-cost financing (see Market Transformation: Financial Warehouse and Credit Enhancement Structures for CT Solar Loan and CT Solar Lease).

Table 37. RSIP Subsidy by Step and Incentive Type

RSIP Subsidy by Step	Start Date	EPBB ($/W)			PBI ($/kWh)		LMI ($/kWh)	
		≤5 kW	5 to 10 kW	>10 kW, ≤ 20 kW	≤10 kW	>10 kW, ≤ 20 kW	≤10 kW	>10 kW, ≤ 20 kW
Step 1	3/2/2012	$2.450	$1.250	$0.000	$0.300	$0.000	N/A	N/A
Step 2	5/8/2012	$2.275	$1.075	$0.000	$0.300	$0.000	N/A	N/A
Step 3	1/4/2013 EPBB 4/1/2013 PBI	$1.750	$0.550	$0.000	$0.225	$0.000	N/A	N/A
Step 4	1/6/2014	$1.250	$0.750	$0.000	$0.180	$0.000	N/A	N/A
Step 5	9/1/2014	$0.800		$0.400	$0.125	$0.060	N/A	N/A
Step 6	1/1/2015	$0.675		$0.400	$0.080	$0.060	N/A	N/A
Step 7	4/11/2015	$0.540		$0.400	$0.064	$0.060	N/A	N/A
Step 8	8/8/2015	$0.513		$0.400	$0.054	$0.054	$0.110	$0.055
Step 9	2/1/2016	$0.487		$0.400	$0.046	$0.046	$0.110	$0.055

[41] The Green Bank incentive is issued to the Contractor on behalf of the Customer. In the case of Third-Party Owned systems, RECs flow from the Contractor to the Connecticut Green Bank.

Table 38. Residential Solar PV Systems Approved, In Progress or Completed through the RSIP Subsidy by Step

RSIP Subsidy by Step	**Approved** (kW)	**Completed** (kW)	**Total** (kW)	**Average Incentive** ($/W-STC)
Step 1	0.0	1,380.7	1,380.7	$1.79
Step 2	0.0	5,991.5	5,991.5	$1.63
Step 3	88.2	13,097.5	13,185.7	$1.23
Step 4	644.2	19,002.9	19,647.1	$1.03
Step 5	930.2	12,748.7	13,678.9	$0.75
Step 6	1,767.6	11,001.1	12,768.6	$0.51
Step 7	2,614.8	17,122.3	19,737.1	$0.40
Step 8	626.2	2,476.7	3,102.9	$0.38
Step 8.1	2,850.0	6,658.8	9,508.8	$0.39
Step 8.2	8,671.1	8,775.8	17,446.9	$0.33
Step 9	18,662.2	2,100.4	20,762.5	$0.32
Total	36,854.5	100,356.3	137,210.8	$0.66

4. MARKET TRANSFORMATION
FINANCIAL WAREHOUSE AND CREDIT ENHANCEMENT STRUCTURES
CASE OF THE CT SOLAR LOAN

As the Connecticut Green Bank's residential solar PV loan program, we are applying the Program Logic Model that focuses on financing and credit enhancements (see Figure 5).

Figure 5. Program Logic Model for the CT Solar Loan

Financing Program

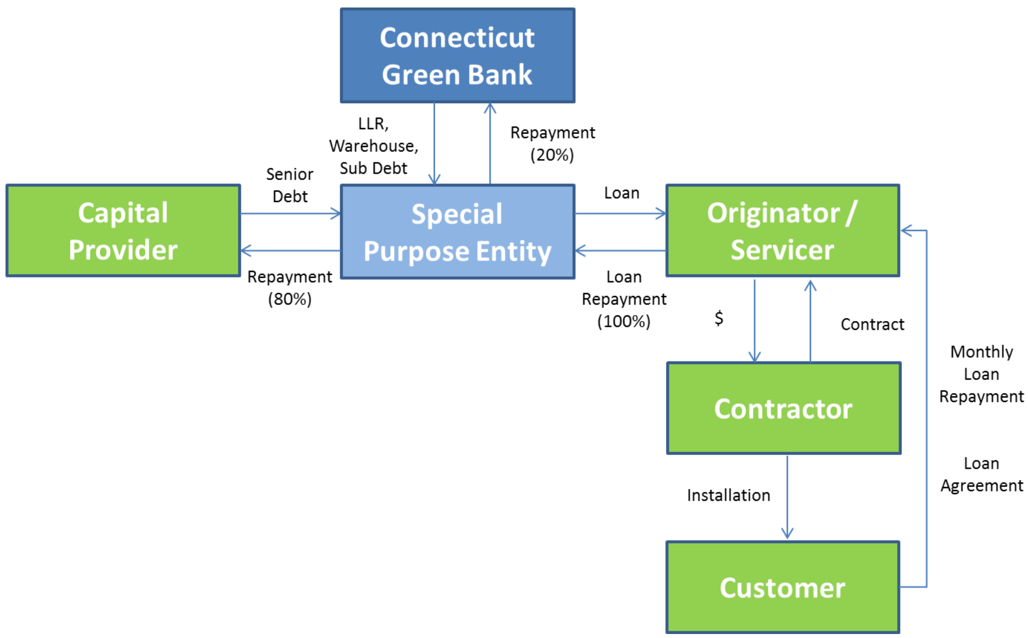
The CT Solar Loan was a financing product developed in partnership with Sungage Financial[42] that uses credit enhancements (i.e., $300,000 loan loss reserve)[43] in combination with a $5 million warehouse of funds and $1 million of subordinated debt from the Connecticut Green Bank. Through this product, the Connecticut Green Bank lowers the barriers to Connecticut homeowners seeking to install solar PV installations thus increasing demand while at the same time reducing the market's reliance on subsidies being offered through the RSIP. The CT Solar Loan was the first dedicated residential solar loan product not secured by a lien on the home or tied to a particular PV equipment OEM supplier. As a loan, capital provided to consumers for the CT Solar Loan is returned to the Connecticut Green Bank – it is not a subsidy. In fact, approximately 80% of the loan value is sold to retail investors through a "crowd funding" platform or to institutional investors without recourse to the Connecticut Green Bank. The financial structure of the CT Solar Loan product includes origination,[44] servicing,[45] and financing features in combination with the support of the Connecticut Green Bank (see Figure 6).

[42] Sungage Financial (http://www.sungagefinancial.com/) won a competitive RFP through the Connecticut Green Bank's Financial Innovation RFP to support a residential solar PV loan program
[43] From repurposed American Recovery and Reinvestment Act funds
[44] Sungage Financial in partnership with local contractors
[45] Concord Servicing Corporation

4. MARKET TRANSFORMATION
FINANCIAL WAREHOUSE AND CREDIT ENHANCEMENT STRUCTURES
CASE OF THE CT SOLAR LOAN

Launched in March of 2013, the CT Solar Loan provided up to $55,000 per loan, with 15-year maturity terms and affordable 6.49% interest rates (including 0.25% ACH payment benefit) to provide homeowners with the upfront capital they needed to finance residential solar PV projects.

Figure 6. Legal Structure and Flows of Capital for the CT Solar Loan



The CT Solar Loan provided financing for 279 projects totaling nearly $6.0 million of investment and 2,193.1 kW of residential solar PV deployment (see Table 39). To date there are no defaults and as of June 30, 2016 there are 5 delinquencies or 1.8% of loans.

Table 39. CT Solar Loan Metrics

Year	# of Projects	Investment	Installed Capacity (kW)
2013	3	$58,974	17.7
2014	140	$2,774,655	1,107.9
2015	136	$3,120,143	1,068.2
Total[46]	279	$5,953,772	2,193.1

[46] Includes approved, closed and completed projects.

4. MARKET TRANSFORMATION
FINANCIAL WAREHOUSE AND CREDIT ENHANCEMENT STRUCTURES
CASE OF THE CT SOLAR LOAN

The CT Solar Loan yields an appropriate rate of return to the capital providers commensurate with the risks they are taking, provided 19 contractors with an important sales tool, and gave nearly 300 customers the ability to own solar PV through low-interest and long-term financing along with access to the federal ITC and state incentives (i.e., the RSIP Expected Performance Based Buydown). Of the $6.0 million invested by the Connecticut Green Bank into the CT Solar Loan, $1.0 million has been sold to the crowd-funding platform Mosaic, $2.6 million to a Community Development Financial Institution in The Reinvestment Fund, and the remaining is on the balance sheet of the Connecticut Green Bank.

In structuring the solar loan product, the Green Bank's objective was to enable homeowners of varying financial means to own their own solar PV systems. Prior to the CT Solar Loan's creation, a homeowner would need to use their own savings or their own home equity (most often though a home equity line of credit) to pay for the system which, at that time, often required an investment exceeding $25,000. The requirement for such a level of personal financial resources dramatically constrained the "ownership" market for solar PV. So the Green Bank with its partner Sungage Financial developed the CT Solar Loan which made 15-year financing available at affordable interest rates without the need to have a lien on the home or limit the purchase to certain manufacturers who offered financing solely for their panels. In developing the CT Solar Loan, the Green Bank had to overcome the risk of being unable to sell the loans to private investors which would have tied up capital resources of the Green Bank and limiting its ability to deploy investment of additional clean energy. Ultimately, the Green Bank became confident that a sufficient rate of return could be offered to enable the investments to "clear" the market without a discount (or loss) to the Green Bank. The combination of crowdsourced funding and a structured private placement enabled the Green Bank to sell the investments with recourse limited to the underlying consumer loans as well as a limited loan loss reserve using American Recovery and Reinvestment Act funds from the US Department of Energy.

The CT Solar Loan was the Connecticut Green Bank's first residential product graduation. It started off being the first crowd-funded residential solar PV transaction with Sungage Financial through Mosaic.[47] And then it graduated to a partnership between Sungage Financial and Digital Federal Credit Union – with no resources from the Connecticut Green Bank.[48] The loan offering from Sungage Financial now includes 5, 10, and 20 year maturity terms at affordable interest rates and is being offered in California, Florida, Massachusetts, New Jersey, New York, and Texas – along with solar PV contractors in Connecticut.

Marketing Programs

To accelerate the deployment of residential solar PV through the RSIP and the uptake of the CT Solar Loan financing product, the Connecticut Green Bank implemented Solarize Connecticut. Solarize programs are designed to use a combination of group purchasing, time-limited offers, and grassroots outreach, while local clean energy advocates volunteer and coordinate with their towns to help speed the process (see Table 40).

[47] http://www.businesswire.com/news/home/20140206005031/en/Sungage-Financial-CEFIA-Mosaic-Announce-5-Million#.VgRTgVIXL4Y

[48] http://www.spark.ctgreenbank.com/ct-solar-loan-partner-graduates-from-connecticut-green-bank/

Table 40. Number of Projects, Investment, and Installed Capacity through Solarize Connecticut for the CT Solar Loan Financing Product

	# of Projects	Investment	Installed Capacity (kW)
Solarize	168	$3,273,609	1,285.7
Non-Solarize	111	$2,680,163	907.4
Total	279	$5,953,772	2,193.1
% Solarize	60	55	59

The Solarize Connecticut program provided a significant marketing channel to catalyze origination for the CT Solar Loan comprising nearly 60 percent of the total projects, investment, and installed capacity.

Data Accessibility
There were 462 applications into the CT Solar Loan – 279 closed, 96 withdrew, and 87 declined in underwriting. The household customers that accessed the CT Solar Loan since its launch in 2013 had varying credit scores – see Table 41.

Table 41. Credit Scores of Household Customers Using the CT Solar Loan

	Credit Score Ranges					
	Below 640	640-679	680-699	700-719	720+	Total
CT Solar Loan			11	15	253	279
			3.9%	5.4%	90.7	

Of the CT Solar Loans approved and closed with household customers, the following table is a breakdown of the contractors offering the financing product – see Table 42.

Table 42. Residential Solar PV Contractors and the CT Solar Loan

Contractor	# of Loans	$ of Loans	% of Loans
31Solar	1	$20,298	0.34%
Aegis Electrical Systems, LLC	24	$539,766	9.07%
AllGreenIT, Inc.	7	$112,604	1.89%
BeFree Green Energy, LLC	2	$46,606	0.78%
Catchin Rays	7	$175,248	2.94%
Centurion Solar	4	$107,025	1.80%
C-TEC Solar LLC	45	$926,307	15.56%
DCS	1	$16,440	0.28%
Direct Energy	28	$572,721	9.62%

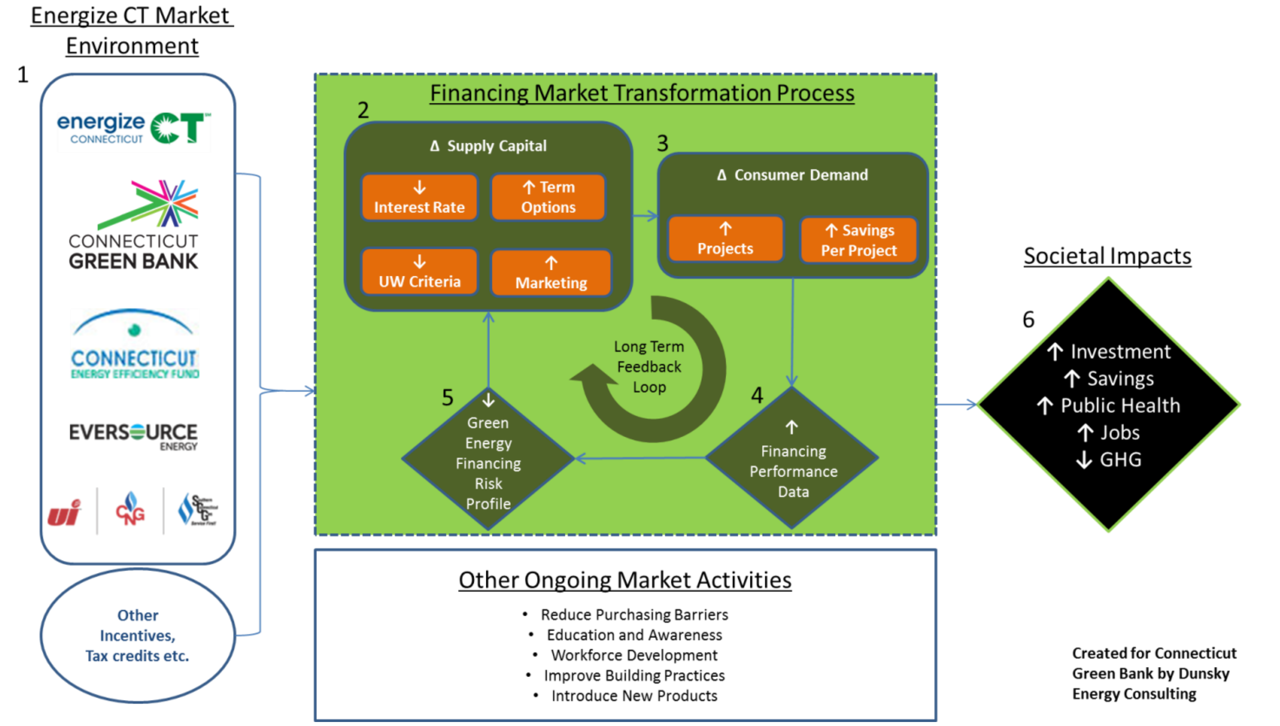
4. MARKET TRANSFORMATION
FINANCIAL WAREHOUSE AND CREDIT ENHANCEMENT STRUCTURES
CASE OF THE CT SOLAR LOAN

Contractor	# of Loans	$ of Loans	% of Loans
Earthlight Technologies	8	$191,189	3.21%
EcoSmart Home Services	2	$55,366	0.93%
Encon, Inc.	13	$217,599	3.65%
Northeast Smart Energy LLC	1	$19,960	0.34%
PurePoint Energy, LLC	6	$174,016	2.92%
RGS Energy	18	$360,238	6.05%
Ross Solar Group	72	$1,571,531	26.40%
Shippee Solar and Construction LLC	3	$61,543	1.03%
Sunlight Solar Energy, Inc.	36	$764,760	12.84%
US Energy Concierge	1	$20,556	0.35%
Total	279	$5,953,772	100.00%

4. MARKET TRANSFORMATION
FINANCIAL WAREHOUSE AND CREDIT ENHANCEMENT STRUCTURES
CASE OF THE CT SOLAR LEASE

As the Connecticut Green Bank's residential and commercial solar PV lease program, we are applying the Program Logic Model that focuses on financing and credit enhancements (see Figure 7).

Figure 7. Program Logic Model for the CT Solar Lease

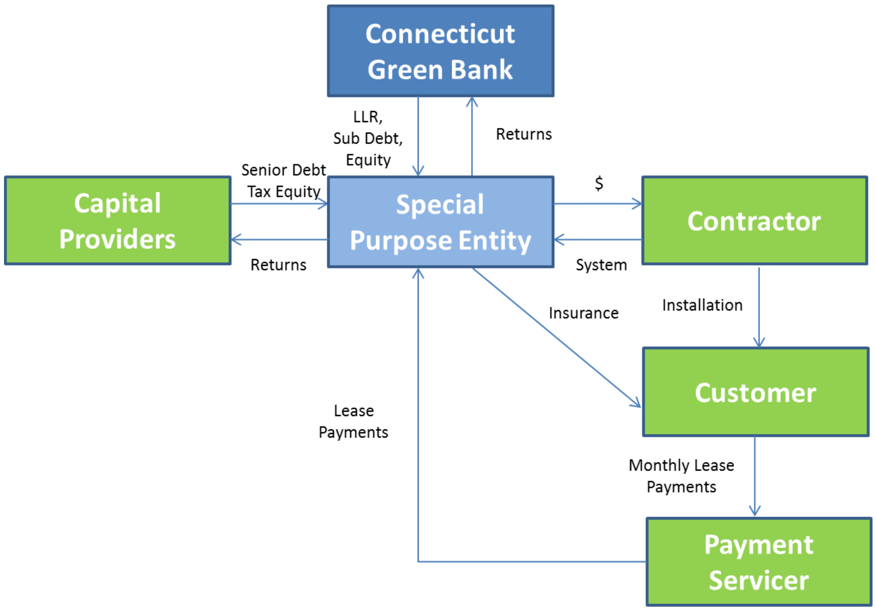


Financing Programs

The CT Solar Lease was a financing product developed in partnership with a tax equity investor (i.e., US Bank) and a syndicate of local lenders (i.e. First Niagara Bank and Webster Bank) that uses a credit enhancement (i.e., $3,500,000 loan loss reserve),[49] in combination with $2.3 million in subordinated debt and sponsor equity from the Connecticut Green Bank as the "member manager" to provide up to $75 million in lease financing for residential and commercial solar PV projects. Through the product, the Connecticut Green Bank lowers the barriers to Connecticut residential and commercial customers seeking to install solar PV with no up-front investment thus increasing demand, while at the same time reducing the market's reliance on subsidies through the RSIP or being more competitive in a reverse auction through the Zero Emission Renewable Energy Credit (ZREC) program. As a lease, capital provided to consumers through the CT Solar Lease is returned to the Connecticut Green Bank, the tax equity investor and the lenders – it is not a subsidy. The financial structure of the CT Solar Lease product includes origination by contractors, servicing of lease payments,[50] insurance and "one call" system performance and insurance resolution,[51] and financing features in combination with the support of the Connecticut Green Bank (see Figure 8).

[49] From repurposed American Recovery and Reinvestment Act funds
[50] AFC First Financial
[51] Assurant

Figure 8. Legal Structure and Flows of Capital for the CT Solar Lease[52]



Through 6/30/2016, the CT Solar Lease provided financing for 1,192 residential solar PV projects and 36 commercial solar PV projects totaling $67.3 million of investment and 17,095 kW of clean energy deployment (see Tables 43 and 44). To date there are no defaults and as of 6/30/2016 there are 2 delinquencies or 0.2% of the portfolio.

Table 43. CT Solar Lease Metrics – Residential

Year	# of Projects	Investment	Installed Capacity (kW)
2014	60	$2,306,025	461.2
2015	486	$18,370,999	3,966.6
2016	646	$23,187,919	5,145.0
Total[53]	1,192	$43,864,942	9,572.7

Table 44. CT Solar Lease Metrics – Commercial

Year	# of Projects	Investment	Installed Capacity (kW)
2015	22	$9,836,739	3,154.3
2016	14	$13,663,830	4,367.8
Total	36	$23,500,568	7,522.2

[52] It should be noted that the Special Purpose Entity structure includes several entities – CT Solar Lease II, LLC and CEFIA Holdings, LLC that provide different functions.
[53] Includes approved, closed and completed projects.

4. MARKET TRANSFORMATION
FINANCIAL WAREHOUSE AND CREDIT ENHANCEMENT STRUCTURES
CASE OF THE CT SOLAR LEASE

The CT Solar Lease yields an appropriate rate of return to the capital providers commensurate with the risks they are taking, provided 27 contractors with an important sales tool, and gave 1,228 customers the ability to lease solar PV and lower their energy costs. The CT Solar Lease is the second "solar PV fund" established using a combination of ratepayer funds and private capital. In developing this fund, the Green Bank sought to innovate both in the types of credits that would be underwritten and broaden the sources of capital in the fund. Before these innovations by the Green Bank, a fund had not been established that would underwrite residential solar PV installations as well as installations on a "commercial scale" such as for municipal and school buildings, community oriented not-for-profit structures (all of which can't take advantage of Federal tax incentives due to their tax exempt status) as well as a vast array of for profit enterprises. These commercial-scale projects were historically the most difficult to finance: too small to attract investment funds and similarly if aggregated to a size worthy of investment, the pool of offtakers that for the most part are non-investment grade or "unrated" credits are difficult to underwrite in a manner that would permit deploying solar PV at scale. By prudently assessing these risks and operational issues – the Green Bank was able to obtain the support of the tax equity investor and lenders from Main Street – not Wall Street – in the fund. The CT Solar Lease is the first fund to secure solar leases and power purchase agreements using a PACE lien – an innovation that has prompted California to introduce legislation to enable the same security arrangement for its businesses and not for profit organizations. The Green Bank's leadership and innovation was recognized by the Clease Energy States Alliance "State Leadership in Clean Energy" award in 2016.

CT Solar Lease and QECBs

The Connecticut Housing Finance Authority (CHFA) is partnering with the Green Bank to identify buildings among the State Sponsored Housing Portfolio (SSHP), as well as other affordable multifamily properties, that are well positioned to "go solar". The Green Bank will own, operate, and maintain these systems while providing owners with discounted electricity for 20 years through Power Purchase Agreements. Originally, the Green Bank intended to secure the power purchase agreements and solar leases for these SSHP systems using C-PACE. When a conflict with CHFA's bond indenture for the financing for these SSHPs with C-PACE as the security mechanism was identified, the Green Bank needed to secure an alternative financing arrangement in order to complete the financing for the SSHP systems. Working with CHFA, the Green Bank structured incremental debt funding using proceeds from Qualified Energy Conservation Bonds (QECBs) that CHFA could make available for this purpose. The Green Bank was able to carve out the SSHP repayment streams from the lenders' collateral package under the Connecticut Solar Lease fund, thereby providing repayment assurance that permitted CHFA to issue the QECBs to Bank of America. With the funding structure in place, the Green Bank was able to move forward with local contractors to provide financing for more than a dozen solar PV systems for the SSHP properties, resulting in more than 750 kW of clean renewable energy for these multifamily dwellings.

With respect to the CT Solar Lease and the commercial market, over $23 million is being used to deploy solar PV systems in the commercial sector (see Table 45).

Table 45. CT Solar Lease Commercial Contractors

Contractor	# of Leases	$ of Leases	% of Leases
64 Solar	3	$949,536	4.04%
American Solar	9	$4,383,607	18.65%
C-TEC Solar LLC	3	$7,690,234	32.72%
Davis Hill	1	$652,860	2.78%
Deutsche Eco USA Corp.	2	$3,300,960	14.05%
Encon, Inc.	10	$2,667,653	11.35%
Entersolar	1	$1,047,153	4.46%
Northeast Energy Design Solutions	1	$802,125	3.41%
Northeast Smart Energy LLC	3	$589,453	2.51%
Renewable Resources, Inc.	1	$239,883	1.02%
Ross Solar Group	2	$1,177,105	5.01%
Total	36	$23,500,568	100.00%

Given the growth in the market from consumers and the level of interest in providing financing from local capital providers, the CT Solar Lease is under consideration for expansion as it applies to commercial customers.

Marketing Programs

To accelerate the deployment of residential solar PV through the RSIP and the uptake of the CT Solar Lease financing product, the Connecticut Green Bank implemented Solarize Connecticut. Solarize programs are designed to use a combination of group purchasing, time-limited offers, and grassroots outreach, while local clean energy advocates volunteer and coordinate with their towns to help speed the process (see Table 46).

Table 46. Number of Projects, Investment, and Installed Capacity through Solarize Connecticut for the CT Solar Lease Financing Product

	# of Projects	Investment	Installed Capacity (kW)
Solarize	326	$11,766,734	2,553.8
Non-Solarize	866	$32,098,208	7,018.9
Total	1,192	$43,864,942	9,572.7
% Solarize	27	27%	27%

The Solarize Connecticut program provided a marketing channel and origination catalyst for the CT Solar Lease comprising 27 percent of the total projects, investment, and installed capacity.

4. MARKET TRANSFORMATION
FINANCIAL WAREHOUSE AND CREDIT ENHANCEMENT STRUCTURES
CASE OF THE CT SOLAR LEASE

Data Accessibility

1,192 household customers accessed the CT Solar Lease since its launch in 2013 – see Table 47.

Table 47. Credit Scores of Household Customers Using the CT Solar Lease

	Credit Score Ranges					
	Below 640	**640-679**	**680-699**	**700-719**	**720+**	**Total**
Solar Lease	1	45	39	78	1,029	1,192
	0.1%	3.8%	3.3%	6.5%	86.3%	

There were 2,833 applications received through the CT Solar Lease – 1,192 were approved, closed, or completed, 1,026 withdrawn, and 615 declined. To date, there have been no defaults and there is presently one delinquency. Of the CT Solar Leases approved and closed with household customers, the following table is a breakdown of the contractors offering the financing product – see Table 48.

Table 48. Residential Solar PV Contractors and the CT Solar Lease

Contractor	# of Leases	$ of Leases	% of Leases
Aegis Electrical Systems, LLC	60	$2,158,610	4.92%
AllGreenIT, Inc.	9	$387,576	0.88%
Astrum Solar	54	$2,137,763	4.87%
BeFree Green Energy, LLC	84	$3,535,688	8.06%
Boston Solar	6	$230,580	0.53%
Connecticut Solar Power, LLC	2	$76,523	0.17%
C-TEC Solar LLC	85	$3,061,148	6.98%
Direct Energy	114	$4,373,528	9.97%
Earthlight Technologies	19	$721,551	1.64%
EcoSmart Home Services	3	$118,035	0.27%
Encon, Inc.	139	$4,641,335	10.58%
Litchfield Hills Solar, LLC	17	$682,940	1.56%
PurePoint Energy, LLC	7	$270,117	0.62%
Real Goods Solar, Inc	7	$229,775	0.52%
Renewable Resources, Inc.	4	$136,773	0.31%
RGS Energy	100	$3,547,073	8.09%
Ross Solar Group	88	$3,516,632	8.02%
Sunlight Solar Energy, Inc.	35	$1,251,128	2.85%
Trinity Solar	356	$12,672,388	28.89%
Tuscany Solar	3	$115,785	0.26%
Total	1,192	$43,864,942	100.00%

4. MARKET TRANSFORMATION
FINANCIAL WAREHOUSE AND CREDIT ENHANCEMENT STRUCTURES
CASE OF THE SMART-E LOAN

For the Energize CT Smart-E residential loan program, underwritten and administered by Connecticut Green Bank, we are applying the Program Logic Model that focuses on financing and credit enhancements (see Figure 9).

Figure 9. Program Logic Model for the Smart-E Loan

Financing Program

The Smart-E residential loan program is a financing program developed in partnership with Energize CT and local lenders that uses a credit enhancement (i.e., $2,800,000 loan loss reserve)[54] and interest rate buy-downs to stimulate the market for residential energy efficiency and solar loans in Connecticut. Through the product, the Connecticut Green Bank lowers the cost of capital for Connecticut residential customers seeking to install solar PV or retrofit their homes and reduces the loan performance risks to lenders. The Loan Loss Reserve uses $2.8mm in repurposed ARRA funds to demonstrate the loan economics to lenders, mitigates their losses, and encourages customers to undertake measures that would prove uneconomical at higher interest rates. The Interest Rate Buy-downs further encourage additional energy savings as they are reserved primarily for customers coupling multiple retrofits or solar.

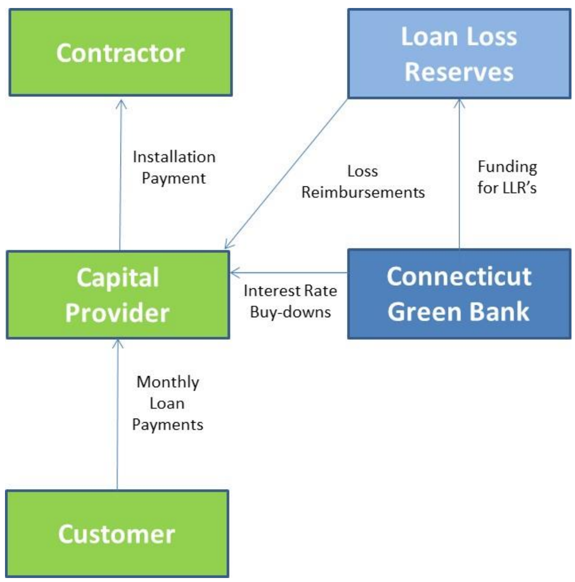
The Smart-E Loan was designed to make it easy and affordable for homeowners to make energy efficiency and renewable energy improvements to their homes with no cash out of pocket and at interest rates low enough and repayment terms long enough to make the improvements “cash flow positive”. At the same time, the Green Bank was intentional in opening conversations with local

[54] From repurposed American Recovery and Reinvestment Act funds

lenders to demonstrate the value of loans that would help their existing customers with burdensome energy costs – and serve as an effective marketing tool to attract new relationships. In return for a "second loss" reserve which would be available beyond an agreed "normal" level of loan losses, lenders agreed to lengthen their terms and lower their rates. The end result is a successful loan product that has enabled hundreds of homeowners throughout the state to lower energy costs and make their homes more comfortable in the summer heat or the depths of winter.

The financial structure of the Smart-E Loan product includes origination,[55] servicing,[56] and financing features in combination with the support of the Connecticut Green Bank (see Figure 10).

Figure 10. Legal Structure and Flows of Capital for the Smart-E Loan



The Smart-E Loan provided financing for 737 projects totaling $13 million of investment and 2,780.9 kW of residential solar PV deployment (see Table 49). To date there have been 2 defaults totaling $51,127 or 0.4% of the portfolio and as of 6/30/2016 there are 0 delinquencies. To date the secondary loan loss reserve has not had to reimburse any of the participating lenders.

Table 49. Smart-E Loan Metrics

Year	# EE	# RE	# RE/EE	Unknown	Total # of Projects	Investment	Installed Capacity (kW)	Annual Saved/Produced (MMBtu)
2013	1	1	-	1	3	$52,400	6.0	38
2014	90	40	6	15	151	$1,910,087	355.9	2,906
2015	123	84	69	44	320	$6,000,452	1,366.9	7,872
2016	113	52	75	23	263	$5,291,436	1,052.0	7,056
Total[57]	327	177	150	83	737	$13,254,375	2,780.9	17,871

[55] Sungage Financial in partnership with local contractors
[56] Concord Servicing Corporation
[57] Includes approved, closed and completed projects.

Marketing Programs

To accelerate the deployment of residential solar PV through the RSIP and the uptake of the Smart-E Loan financing product, the Connecticut Green Bank implemented Solarize Connecticut. Solarize programs are designed to use a combination of group purchasing, time-limited offers, and grassroots outreach, while local clean energy advocates volunteer and coordinate with their towns to help speed the process (see Table 50).

Table 50. Number of Projects, Investment, and Installed Capacity through Solarize Connecticut for the Smart-E Loan Financing Product

	# of Projects	**Investment**	**Installed Capacity** (kW)
Solarize	106	$2,509,259	964.1
Non-Solarize	631	$10,745,116	1,816.8
Total	737	$13,254,375	2,780.9
% Solarize	14%	19%	35%

The Solarize Connecticut program provided a significant marketing channel and origination catalyst for the Smart-E Loan comprising nearly 15 to 20 percent of the total projects and investment and 35% of the installed capacity.[58]

Data Accessibility

There were 1,260 applications into the Smart-E Loan – 737 closed, 168 withdrew, and 355 declined in underwriting. The household customers that accessed the Smart-E Loan since its launch in 2013 had varying credit scores – see Table 51.

Table 51. Credit Scores of Household Customers Using the Smart-E Loan

	Credit Score Ranges						
	Below 640	**640-679**	**680-699**	**700-719**	**720+**	**Unknown**	**Total**
Smart- E Loan	26	75	45	65	501	25	737
	3.4%	10.2%	6.1%	8.8%	68.0	3.4%	

Of the Smart-E Loans approved and closed with household customers, the following tables are a breakdown of the contractors and lenders offering the financing product – see Tables 52 and 53.

[58] It should also be noted that Solarize was adapted to support a transition from propane and heating oil to natural gas through a pilot community-based marketing partnership with Norwich Public Utilities and SmartPower through Energize Norwich. Over 100 Smart-E Loans were originated through this pilot demonstrating that community-based marketing approaches could be adapted to support loan origination strategies.

Table 52. Residential Contractors and the Smart-E Loan

Contractor	# of Loans	$ of Loans	% of Loans
20/20 Save Green Now	3	$22,550	0.17%
31Solar	8	$141,953	1.07%
72 Degrees Air Conditioning & Heating	1	$11,000	0.08%
A&B Cooling & Heating	1	$14,350	0.11%
A.R. Fonda Mechanical Services	1	$8,275	0.06%
Absolute Air Services	3	$48,907	0.37%
Aegis Electrical Systems, LLC	4	$119,487	0.90%
Aiello Home Services LLC	1	$11,800	0.09%
Air Inc	2	$26,795	0.20%
All Phase Heating & Cooling Contractors	3	$46,332	0.35%
All Time Manufacturing Co Inc	2	$9,000	0.07%
AllGreenIT, Inc.	4	$75,536	0.57%
American Heating and Cooling LLC	1	$10,000	0.08%
American Windows & Siding LLC	4	$81,085	0.61%
Apex Solar	2	$13,500	0.10%
Aspen Heating and Cooling	1	$10,000	0.08%
Bartol Heating & A/C	1	$6,359	0.05%
Bay State Fuel Oil	1	$7,792	0.06%
BeFree Green Energy, LLC	40	$1,096,136	8.27%
Benvenuti Oil	3	$34,289	0.26%
Better Building Performance	1	$4,000	0.03%
Better Way Solar	1	$25,000	0.19%
Billy Carlson Heating & AC, LLC	1	$10,500	0.08%
Bonner Electric	6	$152,593	1.15%
Boston Solar	7	$190,900	1.44%
Brayman Heating & Cooling, Inc.	3	$38,690	0.29%
Brooks Oil	1	$14,531	0.11%
Caprio Homes	1	$13,000	0.10%
Caso HVAC	1	$11,045	0.08%
Cawley's Plumbing & Heating	1	$30,000	0.23%
Chabot Electric	1	$6,626	0.05%
Charter Oak Mechanical Service LLC	3	$35,125	0.27%
Chickos Energy Services	5	$77,443	0.58%
Climate Partners, LLC	12	$188,152	1.42%
Conditioned Air Systems Inc	2	$13,550	0.10%
CT Electrical, LLC	1	$22,000	0.17%
CT Exteriors	1	$4,615	0.03%
C-TEC Solar LLC	67	$1,459,883	11.01%
Currie’s Plumbing and Heating	2	$20,656	0.16%
D&D Heating and A/C	2	$65,000	0.49%
Daniels Energy	1	$10,803	0.08%
DeLia Mechanical	7	$61,200	0.46%
Depco Mechanical LLC	1	$6,450	0.05%

4. MARKET TRANSFORMATION
FINANCIAL WAREHOUSE AND CREDIT ENHANCEMENT STRUCTURES
CASE OF THE SMART-E LOAN

Contractor	# of Loans	$ of Loans	% of Loans
Dependable Energy	1	$11,540	0.09%
Diamond Plumbing & Heating	1	$7,000	0.05%
Direct Energy	23	$497,659	3.75%
Douglas Mechanical	1	$6,200	0.05%
Dr. Energy Saver	7	$145,426	1.10%
Duct Works	2	$36,250	0.27%
Dunklee	3	$34,175	0.26%
Dutch	1	$11,700	0.09%
Dziengiel Plumbing Unlimited	3	$35,133	0.27%
Earthlight Technologies	4	$110,000	0.83%
East Coast Mechanical	3	$46,686	0.35%
East Hartford Heating and Cooling	2	$15,876	0.12%
Eastern Mechanical	1	$21,100	0.16%
EcoSmart Home Services	9	$243,484	1.84%
Edward M Sikorski	1	$6,350	0.05%
Elm City Energy Solutions	1	$40,000	0.30%
Encon, Inc.	8	$195,381	1.47%
Evergreen Energy, LLC	3	$64,200	0.48%
F.F. Hitchcock Oil Company	1	$9,819	0.07%
Fahan Brothers	1	$40,000	0.30%
For U Builders	3	$67,795	0.51%
Gelo	1	$13,300	0.10%
Giordano Heating and Cooling	1	$10,500	0.08%
Glasco Heating & Air Conditioning, Inc.	24	$203,630	1.54%
GMI Solar	1	$25,000	0.19%
Good Life Energy Savers	3	$35,785	0.27%
Green Earth Energy	2	$32,032	0.24%
Greystone Home Services LLC	1	$14,096	0.11%
Gulick Building & Development, LLC	1	$7,200	0.05%
Harness the Sun	8	$173,784	1.31%
HARP Mechanical	4	$32,928	0.25%
Home Depot	3	$89,334	0.67%
Home Doctor of America	1	$14,250	0.11%
HomePro Rx	1	$24,000	0.18%
Hurlburt's Plumbing and Heating	1	$7,500	0.06%
Independent Mechanical Inc.	1	$1,800	0.01%
Insulation Solutions of CT	1	$39,227	0.30%
Ireland Oil Co., Inc.	1	$8,095	0.06%
Izbicki Plumbing and Heating	8	$74,100	0.56%
Jack Cipriano Plumbing & Heating	1	$8,400	0.06%
James Carboni Plumbing and Heating, Inc.	6	$61,956	0.47%
James Onze	1	$12,280	0.09%
JD Solar Solutions, LLC	27	$733,546	5.53%
John C. Fiderio & Sons, Inc.	1	$3,325	0.03%
Kevin Caswell & Sons Contracting	1	$5,000	0.04%

Contractor	# of Loans	$ of Loans	% of Loans
King Energy Associates	2	$50,500	0.38%
Lantern Energy	3	$31,417	0.24%
Link Mechanical Services, Inc.	3	$29,157	0.22%
M&G Plumbing and Heating	1	$6,550	0.05%
M. Wallenta	2	$23,200	0.18%
Made in USA Solar LLC	3	$71,000	0.54%
Mainline Heating and Supply	1	$15,648	0.12%
Master Mechanical LLC	1	$7,227	0.05%
MDK	7	$60,706	0.46%
Michael White	1	$13,000	0.10%
Miller Plumbing and Heating	1	$11,000	0.08%
Modern Heating & AC	1	$6,257	0.05%
MTL Heating and Cooling LLC	2	$16,400	0.12%
Nero A/C, Heating & Refrigeration, Inc.	3	$34,199	0.26%
New England Conservation Services, LLC	1	$40,000	0.30%
NP Brulotte & Sons	1	$20,045	0.15%
Nutmeg Mechanical Services, Inc.	5	$110,805	0.84%
One Hour	2	$10,500	0.08%
One Source Solar	1	$40,000	0.30%
Peoples Products	1	$19,267	0.15%
Peter Tavino, PE, PC	1	$30,000	0.23%
Precision Mechanical	2	$12,444	0.09%
PurePoint Energy, LLC	2	$61,821	0.47%
R&W Heating Energy Solutions LLC	65	$732,715	5.53%
Real Goods Solar, Inc	4	$115,940	0.87%
Renewal by Andersen of Southern New England	1	$25,000	0.19%
Riley’s Heating Service Inc.	15	$141,020	1.06%
Ross Solar Group	51	$1,257,530	9.49%
Ryan Oil Company Inc.	1	$12,600	0.10%
Santa Energy	5	$59,575	0.45%
Schede Plumbing & Heating	1	$14,850	0.11%
Scotland Heating & A/C	1	$8,000	0.06%
Secondino Mechanical Services	2	$37,500	0.28%
Shippee Solar and Construction LLC	10	$316,824	2.39%
Silver City Furnace	1	$22,275	0.17%
SLS Heating	1	$8,600	0.06%
Solv It Now	1	$27,710	0.21%
Sonic Development Inc.	1	$30,000	0.23%
Stafford Mechanical Services, Inc.	1	$9,450	0.07%
Stan Pollack Building & Remodeling	1	$25,000	0.19%
Steve Basso Plumbing Heating & A/C LLC	1	$7,345	0.06%
Strohmaier Builders	1	$40,000	0.30%
Summer Hill Solar	7	$83,602	0.63%
Sunlight Solar Energy, Inc.	5	$96,350	0.73%
Super Green Solutions	1	$30,000	0.23%

Contractor	# of Loans	$ of Loans	% of Loans
Superior Fuel	2	$24,208	0.18%
The Heat People	3	$30,989	0.23%
The Roofing Store, LLC	1	$40,000	0.30%
Tom Buehler Plumbing & Heating	2	$14,920	0.11%
Tomax Heating and Cooling	2	$16,615	0.13%
Total Energy Solutions	3	$59,718	0.45%
Total Mechanical Systems LLC	2	$16,129	0.12%
Tri-City	2	$23,753	0.18%
Tyler Air	1	$6,054	0.05%
Uplands Construction Group LLC	1	$25,000	0.19%
Viglione Heating & Cooling Inc.	8	$75,437	0.57%
Waldo Renewable Electric, LLC	3	$76,859	0.58%
Wesson Energy, Inc.	6	$90,559	0.68%
West Hartford Windows LLC	1	$5,500	0.04%
Westville Crest Plumbing and Heating, Inc.	1	$9,100	0.07%
Wilcox Fuel, Inc.	1	$5,005	0.04%
William Perotti & Sons, Inc.	1	$16,007	0.12%
Yankee Gas	1	$8,000	0.06%
Unknown	79	$1,353,742	10.21%
Total	737	$13,254,375	100.00%

Table 53. Lenders and the Smart-E Loan

Lender	# of Loans	$ of Loans	% of Loans
CorePlus Federal Credit Union	183	$ 2,511,003	18.94%
Eastern Savings Bank	182	$ 4,527,516	34.16%
First National Bank of Suffield	38	$ 812,860	6.13%
Ion Bank	40	$ 488,138	3.68%
Liberty Bank	29	$ 380,814	2.87%
Mutual Security Credit Union	10	$ 224,769	1.70%
Nutmeg State Financial Credit Union	157	$ 2,832,971	21.37%
Patriot Bank	41	$ 533,664	4.03%
Quinnipiac Bank & Trust	7	$ 84,056	0.63%
Thomaston Savings Bank	16	$ 238,644	1.80%
Union Savings Bank	23	$ 413,460	3.12%
Workers Federal Credit Union	11	$ 206,481	1.56%
Total	737	$ 13,254,375	100.00%

4. MARKET TRANSFORMATION
FINANCIAL WAREHOUSE AND CREDIT ENHANCEMENT STRUCTURES
CASE OF THE LOW INCOME SOLAR LEASE AND ENERGY EFFICIENCY ENERGY SAVINGS AGREEMENT (ESA)

For the Connecticut Green Bank's residential solar PV low-income lease program, we are applying the Program Logic Model that focuses on financing and credit enhancements (see Figure 11).

Figure 11. Program Logic Model for the Low Income Solar Lease

Financing Program

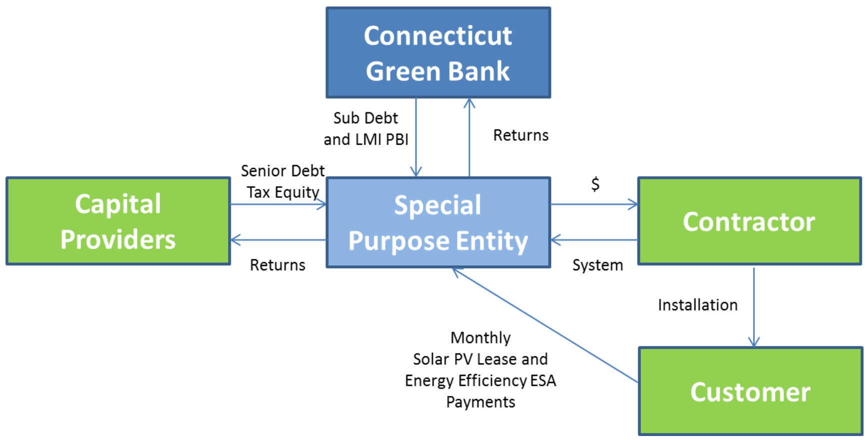
The Connecticut Green Bank offers a solar PV lease product directly targeted to the low-to-moderate income (LMI) population of the state through the solar developer PosiGen. The product was developed in partnership with PosiGen, a senior lender (Enhanced Capital) and a tax equity investor (U.S. Bank). Connecticut Green Bank supplied the initial senior debt of $5,000,000 which has been subordinated to an additional $5,000,000 lent to the lease fund by Enhanced Capital to provide $20 million in lease financing for low income residents' solar projects. This fund is committed to growing in size with Connecticut Green Bank poised to lend an additional $5 million once the fund raises an additional $5 million in private capital. The RSIP program's performance based incentive (PBI) is targeted toward the LMI population and provides a significantly higher incentive to customers demonstrating these income requirements.

Through the product, the Connecticut Green Bank lowers the barriers to Connecticut low-income residential customers seeking to install solar PV with no up-front investment. This increases demand, while at the same time reducing the market's reliance on subsidies through the RSIP. As a lease, capital provided to consumers through the PosiGen solar PV lease and energy efficiency ESA is returned to the Connecticut Green Bank, the tax equity investor and the lenders. This is in contrast to traditional subsidies targeted to LMI homeowners, which are effectively grants.

4. MARKET TRANSFORMATION
FINANCIAL WAREHOUSE AND CREDIT ENHANCEMENT STRUCTURES
CASE OF THE LOW INCOME SOLAR LEASE AND ENERGY EFFICIENCY ENERGY SAVINGS AGREEMENT (ESA)

The financial structure of the Low Income Solar Lease product includes origination,[59] servicing,[60] and financing features in combination with the support of the Connecticut Green Bank (see Figure 12).

Figure 12. Legal Structure and Flows of Capital for the Low Income Solar Lease



Connecticut represented the first expansion for PosiGen outside of its initial market in Louisiana, where starting in 2011, it paired solar leasing and energy efficiency services to maximize savings for low and moderate income customers. Given the strategic emphasis the Green Bank has placed on driving investment for lower income homeowners, the organization developed a flexible funding structure to rapidly bring PosiGen to market. The concept started with the Green Bank being "anchor capital" for PosiGen together with PosiGen's own resources along with tax equity from U.S. Bank (U.S. Bank was already an investor in the Connecticut market through the Green Bank's Connecticut Solar Lease). Documentation was structured to ultimately facilitate funding by a senior lender, providing for the subordination of the Green Bank's loans once this senior lender could be secured. The Green Bank also integrated a working capital module within the financing arrangements to enable PosiGen to focus its capital resources on expanding to Connecticut. With initial capital requirements underwritten by the Green Bank, PosiGen had the financial backing and capital flexibility it needed to confidently secure its base of operation in Bridgeport, hire management and local staff, pursue local partnerships with existing energy efficiency and solar PV contractors, and to resolve supply chain issues. By using its balance sheet as anchor capital, the Green Bank made it possible for a developer that had proven its business model in another market to bring its innovative approach to Connecticut to build investment in solar and energy efficiency for homeowners of more modest means. The investment had the intended impact: PosiGen was able to establish operations, get a market started and its rapid success in Connecticut enabled the Green Bank and PosiGen to secure a senior lender and a new source of tax equity to enable operations to expand to several cities throughout Connecticut.

[59] Sungage Financial in partnership with local contractors
[60] Concord Servicing Corporation

4. MARKET TRANSFORMATION FINANCIAL WAREHOUSE AND CREDIT ENHANCEMENT STRUCTURES CASE OF THE LOW INCOME SOLAR LEASE AND ENERGY EFFICIENCY ENERGY SAVINGS AGREEMENT (ESA)

The Low Income Solar Lease provided financing for 333 projects totaling $9.8 million[61] of investment and 2,199 kW of residential solar PV deployment (see Table 54). To date, there have been no delinquencies and no defaults.

Table 54. Low Income Solar Lease

Year	Total # of Projects	Investment[62]	Installed Capacity (kW)
2016	333	$9,843,865	2,199.1
Total[63]	333	$9,843,865	2,199.1

Of the low income households that installed solar PV, over 65% of them also participated in the energy efficiency ESA, resulting in more comprehensive energy efficiency measures being included in the project.

Marketing Programs

To build the pipeline of projects for the lease, Connecticut Green Bank supports PosiGen's marketing campaigns, leveraging the institution's local experience. This includes assisting with PosiGen's outreach efforts through its Solar for All campaigns which are modeled after Solarize campaigns.

[61] Fair Market Value of systems installed
[62] Fair Market Value of systems installed
[63] Includes approved, closed and completed projects.

4. MARKET TRANSFORMATION
FINANCIAL WAREHOUSE AND CREDIT ENHANCEMENT STRUCTURES
CASE OF THE COMMERCIAL PROPERTY ASSESSED CLEAN ENERGY (C-PACE)

As the Connecticut Green Bank's commercial and industrial financing program, we are applying the Program Logic Model that focuses on financing and credit enhancements (see Figure 13).

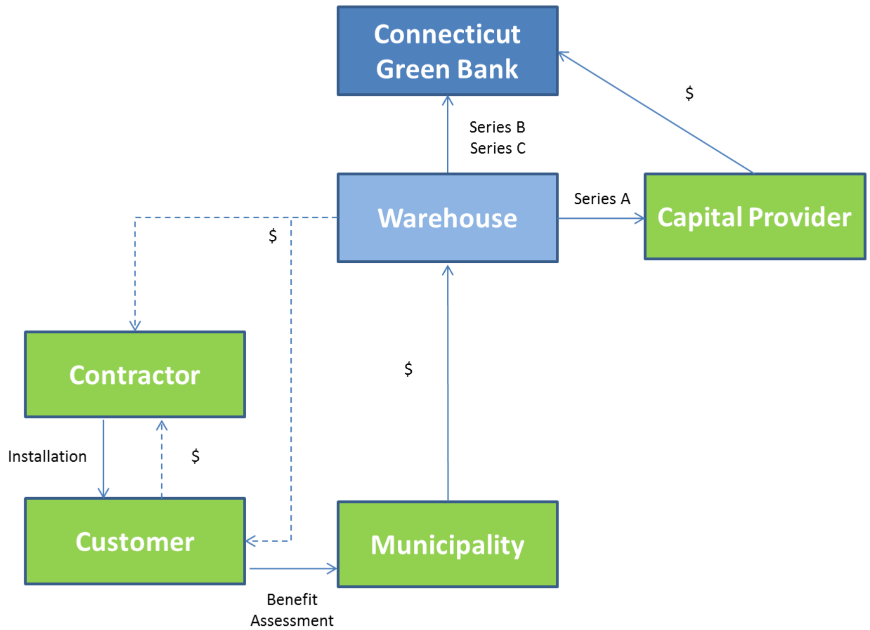
Figure 13. Program Logic Model for the C-PACE Program

Financing Program

Commercial Property Assessed Clean Energy (C-PACE) is a structure through which commercial property owners can finance energy efficiency and renewable energy improvements through financing secured by a voluntary benefit assessment on their property and repaid via the property tax bill. A tax lien, or benefit assessment, is placed on the improved property as security for the loan, and the Connecticut Green Bank requires lender consent from existing mortgage holders prior to approving a C-PACE project. It should be noted, that to date 32 unique banks and 5 specialized lending institutions have provided lender consent to over 70 projects – demonstrating that existing mortgage holders see C-PACE as adding value to the property and net income to the business occupying the building as a result of lower energy prices.

The Connecticut Green Bank maintains a $40 million warehouse of capital from which it finances C-PACE transactions and sells to capital markets upon completion (see Figure 14). Through the warehouse, funds are advanced to either the customer or contractor during construction based on the project meeting certain deliverables. Once the project is completed, the construction advances convert to long term financing whereby the property owner pays a benefit assessment over time to the municipality at the same time other property taxes are paid on the property. The Connecticut Green Bank aggregates the benefit assessment liens which are then sold to interested capital providers. As the benefit assessment payments are made by the property owners, they are then remitted from the various municipalities to the Connecticut Green Bank or its designated servicer to repay the capital providers for the energy improvements financed through C-PACE.

Figure 14. Legal Structure and Flows of Capital for C-PACE



Prior to the establishment of C-PACE in a given municipality, its legislative body must pass a resolution enabling the municipality to enter into agreement with the Connecticut Green Bank to assess, collect, remit, and assign benefit assessments against C-PACE borrowers' liabilities. As of June 30, 2016, there are 123 cities and towns signed up for C-PACE representing more than 90% of commercial and industrial building space in Connecticut. Over 200 contractors have been trained to participate in the C-PACE program. Additionally, as of June 30, 2016, over $72 million in C-PACE assessment advances have been approved of which $68 million has closed.

A portfolio of $17.5 million in benefit assessment liens comprised of 30 energy efficiency and renewable energy projects across 22 municipalities was sold in two tranches to the Public Finance Authority (WI) ("PFA") under a bond conduit structure financed by Clean Fund. Using an auction process, bids for the portfolio were competitively solicited across all of the Connecticut Green Bank's capital providers. Bidders were encouraged to offer various structures and pricing, with or without credit enhancement, and to bid for one or more projects. The selected structure has the PFA use proceeds from Clean Fund (in return for a single class of Senior "A" bonds) to fund 80 percent of the portfolio purchase price. To credit enhance the transaction, the Connecticut Green Bank has taken back, in equal measure, Subordinated "B" and "C" bonds. The structure is, in effect, a "private securitization" of the underlying portfolio.

Building on this experience and the growth of the Connecticut C-PACE market, the Green Bank again solicited proposals from several financial institutions. In the end, the Green Bank established a strategic financing partnership with Hannon Armstrong Sustainable Infrastructure (Hannon), publicly listed on the NYSE. The Green Bank and Hannon structure uses a special purpose entity (SPE) established by Hannon specifically for the Green Bank C-PACE portfolio. The SPE purchases the benefit assessment liens in tranches that are financed from between 80% and 90% by Hannon up to a maximum of $100 million with the residual capital provided by the Green Bank.

Data Accessibility

114 customers accessed the C-PACE since its launch in 2013 – see Tables 55 and 56.

Table 55. CPACE Metrics

Year	# EE	# RE	# RE/EE	Total # of Projects	Investment	Installed Capacity (kW)	Annual Saved/Produced (MMBtu)
2013	1	-	1	2	$943,952	101.0	1,362
2014	7	14	3	24	$20,429,943	3,416.0	36,923
2015	11	30	10	51	$29,452,897	6,925.3	41,363
2016	7	21	9	37	$21,628,858	5,272.7	32,476
Total[64]	26	65	23	114	$72,455,651	15,715.0	112,123

Table 56. Types of End-Use Customers Participating in C-PACE

End-Use	# of Properties (#)	Annual Savings/Production (MMBtu)	Square Footage (ft^2)	C-PACE Investment ($)
Industrial	33	37,667	1,464,131	$22,803,305
Multi-family/apartment (> 5 units)	5	4,680	218,044	$3,184,523
Non-profit	11	4,559	319,269	$3,127,755
Office	20	39,771	1,577,251	$21,067,720
Public assembly	2	748	40,000	$642,194
Retail	36	22,300	975,603	$19,200,221
Warehouse & storage	6	2,275	136,420	$2,393,904
Other	1	123	5,804	$36,029
Total	114	112,123	4,736,522	$72,455,651

To date, there have been 3 delinquencies totaling $4,986,119 or 6.9% of the portfolio and no defaults.

Of the 114 C-PACE projects, the following is a breakdown of projects by municipality – see Table 57.

[64] Includes approved, closed and completed projects.

Table 57. Cities and Towns Supporting C-PACE Projects

Municipality	# of Properties (#)	Annual Savings/Production (MMBtu)	Square Footage (ft^2)	C-PACE Investment ($)
Ansonia	1	411	38,896	$205,652
Avon	2	2,649	89,764	$1,059,417
Bloomfield	1	3,227	0	$3,234,075
Bridgeport	14	13,912	693,713	$6,684,513
Bristol	4	2,311	90,951	$2,579,989
Brookfield	1	-93	36,772	$1,164,790
Canaan	1	406	16,200	$425,527
Canton	1	176	15,000	$154,507
Clinton	1	623	0	$624,260
Cromwell	1	4,084	109,032	$2,114,163
Danbury	1	847	19,640	$87,938
Deep River	1	123	5,804	$36,029
East Haddam	2	694	41,450	$732,597
East Lyme	2	192	16,225	$147,185
East Windsor	3	1,904	94,000	$1,693,944
Ellington	1	764	25,760	$502,504
Enfield	1	1,105	57,000	$881,993
Fairfield	2	658	11,700	$673,360
Glastonbury	2	760	49,000	$676,037
Groton	2	5,133	48,500	$921,682
Hartford	9	5,159	363,604	$2,832,671
Killingly	1	171	0	$153,258
Killingworth	1	257	20,000	$261,649
Manchester	4	5,260	97,104	$5,055,353
Meriden	2	6,800	470,000	$3,306,233
Middletown	2	5,256	146,368	$4,100,595
Naugatuck	1	48	53,158	$541,582
New Britain	1	4,113	150,000	$2,842,049
New Haven	1	1,343	28,000	$836,128
New London	6	2,519	258,369	$2,296,519
Newington	1	562	53,200	$794,873
Newtown	2	4,465	202,814	$2,973,807
North Stonington	1	439	30,000	$344,252
Norwalk	1	661	10,000	$559,952
Norwich	1	545	50,000	$366,586
Plainville	4	3,989	236,000	$2,695,236
Putnam	1	9,218	125,000	$2,350,000
Shelton	1	637	37,600	$271,147
Simsbury	1	824	42,456	$685,316
Somers	1	691	48,360	$997,269
South Windsor	1	135	0	$135,200
Southington	2	534	24,325	$457,792
Stamford	5	4,489	258,900	$1,602,497
Stonington	1	230	16,400	$230,636
Stratford	2	897	48,000	$549,244
Torrington	1	116	19,000	$132,325

Municipality	# of Properties (#)	Annual Savings/Production (MMBtu)	Square Footage (ft^2)	C-PACE Investment ($)
Trumbull	1	1,066	100,000	$1,012,004
Vernon	1	787	30,044	$519,890
Waterbury	3	1,569	45,953	$1,969,966
Watertown	2	1,010	34,756	$604,107
West Haven	1	267	13,000	$243,296
Westport	2	590	22,700	$265,353
Willington	1	50	10,432	$55,421
Windsor	2	3,855	197,572	$2,175,617
Windsor Locks	1	392	34,000	$336,703
Woodbridge	2	3,294	0	$3,300,960
Total	114	112,123	4,736,522	$72,455,651

Of the C-PACE approved and closed projects, the following table is a breakdown of the contractors offering the financing product – see Table 58.

Table 58. C-PACE Contractors

Contractor	# of C-PACE Transactions	$ of C-PACE Transactions	% of C-PACE Transactions
3x Solution Inc	1	$1,164,790	1.61%
64 Solar	3	$949,536	1.31%
Action Air Systems Inc.	1	$179,980	0.25%
American Solar	4	$1,554,554	2.15%
Antonio LLC	1	$20,500	0.03%
BeFree Green Energy, LLC	1	$232,714	0.32%
C&N Mechanical	1	$30,434	0.04%
Chabot Electric	1	$234,202	0.32%
Conserv-Inc	1	$559,952	0.77%
Controlled Air	1	$137,368	0.19%
C-TEC Solar LLC	2	$7,306,975	10.08%
Davis Hill	1	$652,860	0.90%
Deutsche Eco USA Corp.	2	$3,300,960	4.56%
Direct Energy	2	$633,103	0.87%
Earthlight Technologies	6	$1,749,571	2.41%
ECNY	1	$243,296	0.34%
Efficient Lighting and Maintenance, Inc.	1	$30,620	0.04%
Efficient Lighting Consultants	1	$541,582	0.75%
Emcor Services	3	$2,973,427	4.10%
Encon, Inc.	6	$2,091,775	2.89%
Energy Solutions Inc.	1	$52,654	0.07%
Entersolar	1	$1,116,629	1.54%
Environmental Systems Corp	1	$107,556	0.15%
ESI Power Corp	3	$905,109	1.25%
Fortunato Construction Group, Inc.	1	$741,702	1.02%
GM Industries, Inc.	2	$506,321	0.70%
Green Earth Energy	29	$19,016,112	26.25%
H. Hulse, Inc.	1	$166,236	0.23%
Harness the Sun	1	$201,072	0.28%

4. MARKET TRANSFORMATION
FINANCIAL WAREHOUSE AND CREDIT ENHANCEMENT STRUCTURES
CASE OF THE COMMERCIAL PROPERTY ASSESSED CLEAN ENERGY (C-PACE)

Contractor	# of C-PACE Transactions	$ of C-PACE Transactions	% of C-PACE Transactions
High Performance Energy Solutions	1	$87,938	0.12%
Inovateus	1	$2,842,049	3.92%
JD Solar Solutions, LLC	2	$370,396	0.51%
JK Energy Solutions	3	$3,405,337	4.70%
Johnson Control	1	$558,716	0.77%
Kurt Kuegler	1	$120,109	0.17%
Lockheed Martin	1	$2,974,349	4.11%
M.J. Fahy & Sons	1	$36,350	0.05%
MSL Group	4	$2,805,767	3.87%
NORESCO	2	$2,274,881	3.14%
Northeast Smart Energy LLC	3	$589,453	0.81%
Nxegen	1	$331,884	0.46%
Oatley Mechanical Services, Inc.	1	$271,147	0.37%
Reliable Combustion Services LLC	1	$384,000	0.53%
Renewable Resources, Inc.	1	$239,883	0.33%
Ross Solar Group	2	$840,889	1.16%
Sarracco Mechanical	1	$218,814	0.30%
Seldera LLC	1	$836,128	1.15%
Smart Energy Services	1	$418,540	0.58%
Sound Solar Systems, LLC	1	$261,649	0.36%
Trane	4	$5,185,781	7.16%
Total	114	$72,455,651	100.00%

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CONNECTICUT
GREEN BANK

Memo

To: The Board of Directors of the Connecticut Green Bank

From: George Bellas, Vice President Finance and Administration

CC: Bryan Garcia, Brian Farnen, Eric Shrago

Date: October 21, 2016

Re: Updated Banking Resolutions

I am requesting that the Green Bank Board of Directors approve the updated banking resolutions set forth below. This revised set of resolutions will authorize the President and CEO of the Connecticut Green Bank and myself to set up bank accounts when a need to do so arises pursuant to an applicable Board authorization and/or consistent with our governance documents such as the creation of a special purpose entity or a loan program that requires the establishment of a bank account.

RESOLUTION

RESOLVED: that if any FDIC insured bank requires a particular form of resolution of the Connecticut Green Bank ("Green Bank") Board of Directors for opening a bank account or for other bank account matters, the President and CEO of the Green Bank is hereby authorized to approve the form of such resolutions after review and approval by the General Counsel of the Green Bank,

RESOLVED, that upon such approval, each resolution is hereby adopted and the Secretary or Assistant Secretary as applicable is hereby authorized to certify the adoption of all such resolutions.

RESOLVED, that the Board of Directors authorizes the President and CEO to open such bank accounts as are necessary or desirable in the ordinary course of business for the Green Bank and any affiliates it controls that are in existence as of the date of this resolution or to be created by the Board of Directors including but not limited to:

- CEFIA Holdings LLC
- CT Solar Loan I LLC
- CEFIA Services Inc.
- CT Solar Lease 2 LLC
- CGB Meriden Hydro LLC

RESOLVED, that the Board of Directors authorizes the following Green Bank employee positions to draw checks and initiate and release wire or ACH transfers from such accounts in accordance with the established signatory authority as stated in the Green Bank internal control procedures manual:

- President and CEO
- Vice President Finance and Administration
- Executive Vice President and Chief Investment Officer
- Vice President, Commercial and Industrial Programs
- Managing Director, Statutory and Infrastructure Programs
- Director of Operations

RESOLVED, that the Board of Directors affirms that as of the date of this resolution these positions are occupied by the following individuals:

- President and CEO - Bryan Garcia
- Vice President Finance and Administration - George Bellas
- Executive Vice President and Chief Investment Officer – Roberto Hunter
- Vice President, Commercial and Industrial Programs – Michael Dykes
- Managing Director, Statutory and Infrastructure Programs – Dale Hedman
- Director of Operations – Eric Shrago
- Secretary – Matthew Ranelli

1151 Blue Hills: C-PACE Project in Bloomfield, CT

Address	1151 Blue Hills, Bloomfield, CT 06002			
Owner	First Baptist Church of Hartford			
Proposed Assessment	$1,440,300			
Term (*years*)	20			
Term Remaining (*months*)	Pending construction completion			
Annual Interest Rate	6.0%			
Annual C-PACE Assessment	$125,462			
Savings-to-Investment Ratio	1.01			
Average DSCR	[redacted]			
Lien-to-Value	[redacted]			
Loan-to-Value	[redacted]			
Projected Energy Savings (mmBTU)[(2)]		EE	RE	Total
	Per year	1,677	1,800	3,499
	Over term	26,181	36,445	62,627
Estimated Cost Savings[(2)]	Per year	27,403	127,239	154,642
	Over term	603,886	2,452,367	3,056,253
Objective Function[(2)]	43.48 kBTU / ratepayer dollar at risk			
Location	Bloomfield			
Type of Building	Special Purpose - Church			
Year of Build	1999			
Building Size (*sf*)	120,000			
Year Acquired by Owner	1991			
Assessed Value (2015)	[redacted]			
Mortgage Lender Consent	[redacted]			
Proposed Project Description	Proposed 500 kw solar carport, insulation, LED			
Est. Date of Construction Completion	Pending closing			
Current Status	Awaiting Approval			
Energy Contractor	[redacted]			
Notes	[redacted]			

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CT Green Bank Commercial Solar PPA Program

Capitalizing Commercial Solar PV Projects

Due Diligence Package

October 14, 2016

Document Purpose: This document contains background information and due diligence on the CT Solar Commercial PPA Program for commercial solar projects, in partnership with Onyx Renewables, a Blackstone Group portfolio company, and [redacted] as well as other stakeholders through separate fund arrangements as described herein. This information is provided to the Connecticut Green Bank Board of Directors for the purposes of reviewing and approving recommendations made by the staff of the Connecticut Green Bank.

In some cases, this package may contain among other things, trade secrets, and commercial or financial information given to the Connecticut Green Bank in confidence and should be excluded under C.G.S. §1-210(b) and §16-245n(D) from any public discourse under the Connecticut Freedom of Information Act. If such information is included in this package, it will be noted as confidential.

Program Qualification Memo

To: Connecticut Green Bank Board of Directors

From: Laura Fidao, Senior Manager; Chris Magalhaes, Senior Manager; Ben Healey, Director; Bert Hunter, EVP & CIO

Cc: Bryan Garcia, President & CEO; Mackey Dykes, VP, C I &I; Brian Farnen, General Counsel;

Date: October 14, 2016

Re: CT Commercial Solar PV Fund ("SL3")

Purpose

The purpose of this memo is to request programmatic approval from the Connecticut Green Bank ("Green Bank") Board of Directors for authority to deploy up to $15 million, in partnership with private capital, to continue to support the development of commercial solar PV projects across Connecticut. Furthermore, in order to maximize commercial solar deployment given changing market conditions and private capital constraints, staff requests flexibility to utilize funds designated for commercial solar PV projects across varying:

1.) **Development Purposes**: including working capital during construction, term financing, and credit enhancements (i.e. timeliness / PPA defeasance reserves); and

2.) **Fund Structures**: from the established CT Solar Lease 2 ("SL2") fund to new partnership structures with private capital providers.

As Green Bank continues to advance the goal of creating a sustainable private capital market for third-party owned commercial solar projects, the evolution of (a.) fund structures, (b.) capital partners, and (c.) Green Bank participation leads to inherent transactional frictions at certain key points in the market's development timeline. The ability of Green Bank to deploy capital for both working capital and term financing for qualifying commercial solar power purchase agreements ("PPA") projects will mitigate:

i.) Dependence on a single set of capital providers;
ii.) Timing delays due to diligence processes;
iii.) Pricing inconsistencies across fund structures;
iv.) Local developer transitional costs; and
v.) Customer experience and perception risks.

Background

Under Green Bank's current SL2 program, originally approved by the Board of Directors on February 15, 2013, Green Bank offers leases and PPAs to commercial properties, utilizing C-PACE as a credit enhancement to allow unrated credits, including commercial, industrial, and non-profit property owners, to access financing alongside state agencies, housing authorities, municipalities, schools, and rated corporate credits. Connecticut is the only state in the nation providing C-PACE-secured solar PPAs at scale, addressing a gap in the commercial solar market that remains unmet by private industry.

Green Bank set up SL2 as a Special Purpose Vehicle ("SPV"), a de novo organized limited liability company, formed to provide the structural mechanism for the repayment of solar asset capital providers via leases and PPAs entered into by residential and commercial property owners who either preferred a no-money-down model and/or did not have the capacity to monetize federal tax benefits themselves. The SPV, regarded as a third-party ownership structure from the property owner's perspective, has successfully combined tax equity investment, a syndicate of bank debt, and Green Bank subordinated debt and equity in an approximately $75 million fund dedicated to both residential and commercial-scale installations, with roughly $30 million allocated to commercial projects originated via 16 different local and regional development partners. Utilizing a local contractor base and originating projects directly through Green Bank, SL2 also provides working capital to contractors, enabling market competition on price, quality, and services rather than artificial barriers arising from limited capital availability.

As Green Bank continues to develop commercial solar projects in Connecticut, and projecting from its successful track record of deployment in SL2 and current projects in the pipeline, Green Bank expects to originate 15 – 30 MW of third-party-owned, commercial-scale solar projects backed by PPAs between now and December 31, 2017.

Commercial capacity in SL2, however, is anticipated to run out in Q4 2016; hence the need for a follow-on fund solution that can continue to provide PPAs to commercial and industrial, nonprofit, and municipal customers in Connecticut.

Reaching the capacity limit for SL2 is a combination of both the program's success and changing market conditions. Regarding the success of SL2, the number of commercial projects originated into SL2 not only outstripped the initial funding limit but also topped an additional third-party capital extension by SL2 capital providers into the fund, which staff closed in September 2016. Additional capital infusions would have been forthcoming but for market conditions that directly impacted the SL2 capital providers, such as uncertainty surrounding Congress's extension of the federal investment tax credit ("ITC"), and the impact that uncertainty had on private capital participants' ability to accurately forecast tax equity capacity for the 2016 – 2017 calendar years. In response Green Bank went to market in June 2016 with a Request for Proposals (the "RFP") to seek out additional private capital to sustain the deployment of commercial scale solar PV – whether through a new solar PPA fund directly controlled by the Green Bank, through a strategic partnership, or a combination of strategies.

The Green Bank received several formal and informal responses to its RFP, but one proposal – from Onyx Renewable Partners L.P. ("Onyx") – stood out in terms of being able to achieve the goals the Green Bank has established for commercial solar PV deployment.

Program Summary

In response to the Green Bank's RFP, Onyx has proposed a comprehensive solution that not only accounts for the market conditions that closed SL2, but also outsources more of the financing and operational aspects of the commercial solar development cycle to the private sector by combining Onyx investment capital with certain development and asset management capabilities that were previously undertaken by Green Bank staff. Onyx will leverage its existing fund structure, Onyx Holdings, LLC (the "Fund"), and relationship with [redacted] – the global investment banking firm with over $1.2 trillion in assets under management (AUM) to capitalize and own solar PV projects originated by the Green Bank and local contractors within Connecticut. [redacted] will provide the tax equity investment into the fund, while Onyx will act as the sponsor equity (which is the role the Green Bank has in the SL2 fund).

Onyx brings significant experience in solar project development and financing. Backed by its parent company, Blackstone Group – a multinational private equity, investment banking, alternative asset management and financial services corporation with over $300 billion in AUM, and operating under an existing partnership with [redacted], Onyx's proposal presents a strong development and financing solution through its ability to provide:

- A vertically integrated approach with strong supply chain relationships, facilitating procurement of lower cost solar equipment;
- A seasoned team of design, engineering, construction and project management experts; and
- Full-service capabilities for long-term asset management.

Onyx is committed to working with local contractors, alongside Green Bank, to continue to source development opportunities within Connecticut, combining the expertise and strategic relationships that Onyx brings to the table with local economic development and growth. Onyx has also committed to accepting a pipeline of commercial solar projects from Green Bank that are already under various stages of development, facilitating a smooth transition in the market between SL2 and SL3 financing structures. In total, Onyx is committing to help develop and finance up to 30MW of commercial solar projects by the end of 2017, provided the project economics meet Onyx return requirements as outlined in the SL3 Program Term Sheet included in **Exhibit A** to this memo.

To enhance the proposed SL3 structure, and to mitigate pricing inconsistencies and transitional costs to both customers and local contractors during the underlying financing transition between SL2 and SL3, Green Bank staff proposes to provide subordinate debt to the Onyx-proposed SPV on an as-needed basis in order to maintain pricing on projects under development while still meeting Onyx return requirements.

Terms outlining the SL3 programmatic agreement, along with a separate term sheet for Green Bank subordinate debt, are included in Confidential **Exhibit A** and **Exhibit B**, respectively. Collectively, the terms will result in a Master Sourcing and Servicing Agreement ("MSSA") with Onyx enabling the development of third-party owned commercial solar PV projects in the state of Connecticut conforming to eligibility criteria set within. Green Bank intends to source projects for Onyx to acquire with a right of first refusal. This arrangement will enable Green Bank to source alternative funding for projects that are outside of Onyx underwriting criteria. Onyx will co-develop and fund construction as necessary and intends to own each operating project. Green Bank will also provide a limited scope of asset management responsibilities, predominantly to include administration of C-PACE-secured projects falling under this new fund structure.

In aggregate, SL3 will differ from SL2 in the following respects:

	SL2	SL3
Structuring Costs	Paid by Green Bank	N/A
Origination	Green Bank + Local Contractors	Green Bank + Local Contractors
Origination Compensation to	N/A	Green Bank
Development	Green Bank	Onyx + Green Bank
Development Compensation to	Green Bank	Onyx
Senior Debt	Green Bank Sourced Commercial Lenders	Onyx Sourced Lender(s)
Subordinated Debt	Green Bank	Green Bank
Tax Equity	US Bank	[redacted]
Equity	Green Bank	Onyx
Asset Management + Admin.	Green Bank	Onyx + Green Bank

Under the SL3 fund structure, the unlevered, after-tax return for a portfolio of commercial solar PV projects (at the Onyx Holdings, LLC level, as shown below) must meet Onyx return requirements. At the project level, individual projects with returns below Onyx's return requirements may still be accepted into the Fund, on an exception basis, so long as the return criteria is still met at the portfolio level.

The blended aggregate, unlevered portfolio return will be measured on a quarterly basis in arrears beginning December 31, 2016 via a mutually agreed upon cash flow model. Green Bank subordinate debt may be strategically used (at each quarterly look-back date), or Onyx may set a higher go-forward project target yield, in order to help meet the required portfolio return.

Green Bank Benefits

Green Bank expects to benefit from this new partnership in a variety of ways including:

- Remuneration in the form of a sourcing fee for projects originated by Green Bank and accepted by Onyx into the Fund;
- A modest return for any subordinate debt provided by Green Bank;
- Diversifying Green Bank's relationships with private capital partners; and
- Expanding the usage of C-PACE for unrated and non-profit entities by transferring Green Bank's knowledge and experience to new financing partners who can subsequently use C-PACE in other fund structures, where applicable.

Additionally, Onyx's winning solution to this RFP provides Green Bank with access to an established and well-capitalized fund structure, with strong development and asset management capabilities allowing Green Bank to outsource as many financing and operational aspects of commercial solar PV project development as possible to the private market. With this in mind, Green Bank can leverage its limited capital resources and make the most efficient use of staff bandwidth in order to continue expanding the market for clean energy throughout Connecticut.

Additional Programmatic Needs

As with any SPV financing structure, the proposed Onyx/[redacted] partnership has limitations on types of projects accepted, including:

- Systems less than 50kW DC in size
- Houses of worship without mortgages
- Landfills/brownfield sites
- Systems with electrically heated pools behind the meter

From experience, there are many instances of smaller projects (<50kW) and houses of worship without mortgages that have a keen interest in obtaining solar PV systems. Such projects will struggle to obtain a financing solution absent Green Bank support going forward, as Green Bank's SL2 program has been particularly effective in working with these types of projects in the past. Given this need, staff is currently developing a set of alternative financing structures that would make use of other financing options to capitalize these projects (and others) on an as-needed basis. Financing options contemplated include:

- A follow-on pool of tax equity investment from US Bank, Green Bank's current SL2 tax equity provider (discussions already underway); and
- Issuing Clean Renewable Energy Bonds ("CREBs", for use with municipal properties, given Green Bank's success in obtaining an initial CREBs allocation in early October 2016).

These solutions require additional capital for CEFIA Holdings LLC ("CEFIA Holdings" or "Holdings") for working capital and term financing, which are contemplated under the authorizations requested in this memo. Staff anticipates that given Green Bank's existing relationship and fund structure with US Bank for SL2, as well as our initial experience with CREBs, both options should be viable alternatives for projects that don't fit into the Onyx Fund, and both structures will be presented to the Board of Directors once fully developed.

Green Bank Participation and Financial Benefit

While Onyx will provide a capital solution that includes full sponsor and tax equity investment, Green Bank staff is requesting up to **$15 million** of ratepayer funds to be used flexibly as either:

- Long-term subordinate debt to facilitate the Onyx portfolio return requirement as required given a number of underlying projects in the pipeline with challenging economic return profiles; or
- Working capital for use by CEFIA Holdings to continue to sign EPC contracts for projects that can then be placed either into the Onyx Fund if acceptable, or for use under alternative capital options if not meeting the requirements of the Onyx Fund. Green Bank staff will continue to develop these options and will seek authorization from the Board of Directors at a later date for any alternative financing solutions proposed.

From funds deployed, Green Bank expects to capture value via the following mechanisms:

1. Interest from any term subordinate debt provided;
2. Sourcing incentive fees ("Sourcing Incentive") for projects accepted into the Fund; and

3. Fees for asset management functions related to C-PACE administration and servicing ("C-PACE Administration Fee").

The C-PACE Administration Fee will be included in the Sourcing Incentive and paid to Green Bank at the end of the Fund commitment period, anticipated to be December 31, 2017.

Ratepayer Payback

How much clean energy is being produced (i.e. kWh over the projects lifetime) from the program versus the dollars of ratepayer funds at risk?

The $15 million of deployed capital is expected to generate up to 701.9 GWh over 20 years from an anticipated 30MW of solar PV systems, resulting in 46.8 kWh deployed per ratepayer dollar at risk.

Financial Statements

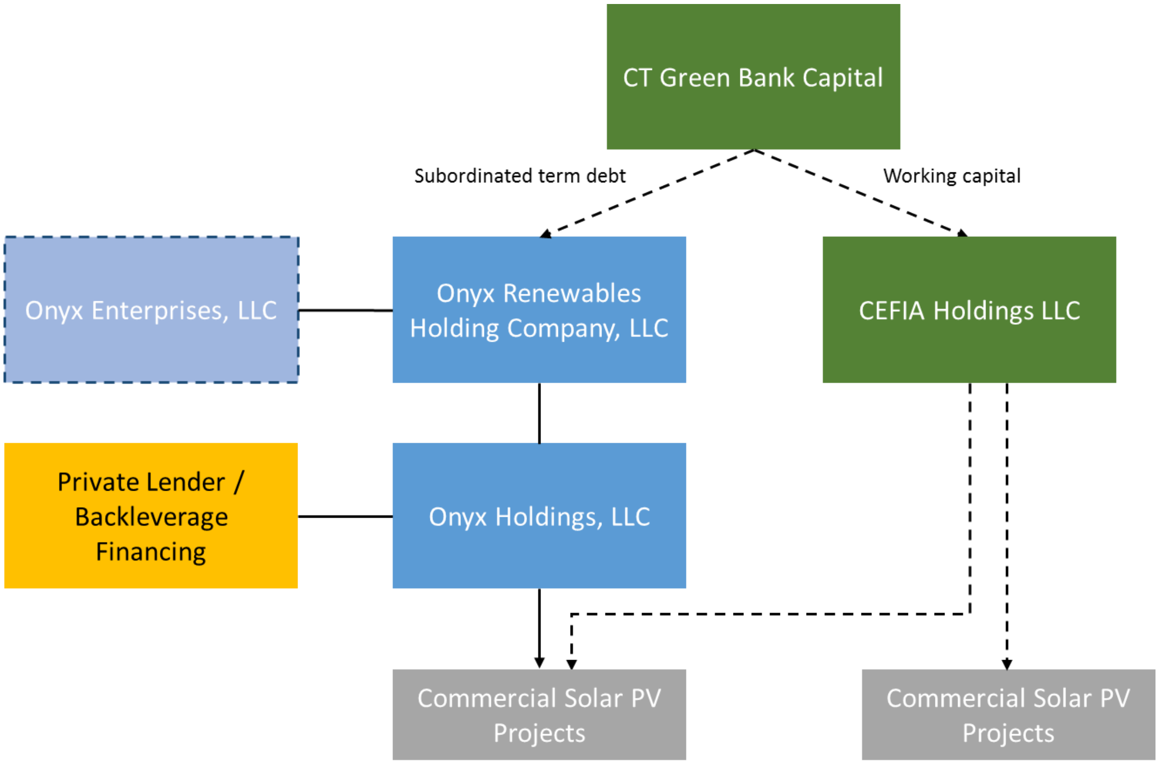
How is the program investment accounted for on the balance sheet and profit and loss statements?

In the case of Green Bank subordinate debt, these advances will be accounted for by a reduction in the Green Bank Cash and Cash Equivalents Account (Current Asset on the Balance Sheet) and a corresponding increase in "[Subordinated] Promissory Notes – [Onyx]" (Non-Current Asset on the Balance Sheet).

Where CEFIA Holdings is advancing working capital, these advances will be accounted for by a reduction in the Cash and Cash Equivalents Account (Current Asset on the Balance Sheet) and a corresponding increase in "Commercial PPA Projects – Costs in Excess of Billings" (Non-Current Asset on the Balance Sheet) at the CEFIA Holdings subsidiary level.

Capital Flow Diagrams

Indicative of Green Bank capital usage.



Risk to Ratepayer Funds

What is the maximum risk exposure of ratepayer funds for the program?

The maximum risk exposure of ratepayer funds for the program is a not-to-exceed amount of $15,000,000, which may be working capital, and/or debt subordinated to private debt capital.

Target Market

Who are the end-users of the engagement?

Commercial, municipal, and institutional PPA off-takers within the state of Connecticut, particularly of benefit to nonprofits and unrated small and medium-sized businesses and corporates that might otherwise struggle to access solar PV in the current market environment.

Selection & Award Process

Assessment and selection process for the RFP was based upon the following criteria and weightings.

Criteria	Weighting
1. Flexibility in the type of projects and underlying credits that can be supported, and the ability to commit tax equity for "placed in service" dates during 2016 Q3 & Q4	30%
2. Strategy for successful deployment and continuing operation of solar projects	20%

3.	Competitive overall cost of capital of the fully-integrated term capital stack	20%
4.	Maximization of private capital placement	15%
5.	Ability for the Green Bank to recover program and administrative costs	15%

Prior to launching the RFP, Green Bank staff actively pursued and spoke to over 20 relevant solar industry financiers, primarily tax equity and sponsor equity investors, in order to gauge interest in, and support for, capitalizing a new commercial solar PPA program in Connecticut. This engagement highlighted the uncertainty of tax equity capacity for the remainder of 2016 as a result of Congress's extension of the ITC.

Following these discussions, two capital providers submitted formal responses to Green Bank's RFP to provide capital solutions that could monetize the ITC in 2016, with 2-3 others indicating they were interested in discussing further though they were not able to submit formal responses. Of the two formal respondents, Onyx provided a more robust and flexible solution for commercial solar PPAs in the Connecticut market.

Strengths of the Onyx proposal include:

- Flexibility in project types and sizes that would be allowed into the fund;
- Desire to incorporate C-PACE as a security mechanism, in the same manner as its use as a credit enhancement in the SL2 fund;
- Full value-chain/servicing capability (investment, development, equipment procurement, asset management);
- Having an existing fund structure up-and-running;
- Familiarity with, and willingness to work alongside, the majority of the local EPC base in CT; and
- Ability of Green Bank to recover costs in-line with fund size and performance.

SL3 Program Partners

Key players in the SL3 program will include Onyx and various affiliated/partner entities including:

- Onyx Enterprises, LLC, a wholly-owned subsidiary of Blackstone Group L.P. as sponsor equity;
- Onyx Holdings, LLC as developer and project holding company for all Onyx solar PPA projects; and
- Onyx Renewables Holding Company, LLC, a special purpose entity set up for the purpose of this SL3 program.
- An existing relationship in the form of a $300 million tax equity facility between Onyx and [redacted] also already exists and will be used for the purposes of providing tax equity investment into this program.
- In addition, it is the intention of Onyx to bring in a yet-to-be-determined senior debt provider. This is intended to take the form of back leveraged term debt at the Onyx Holdings, LLC level.

Onyx Renewables

Background

Onyx is an integrated renewable development company headquartered in New York City. Onyx was established by

The Blackstone Group L.P. ("Blackstone") through its second energy fund, Blackstone Energy Partners II ("BEP II"), as well as its flagship fund, Blackstone Capital Partners VI. Blackstone Capital Partners VI ("BCP VI") is a $16 billion diversified general purpose private equity fund and BEP II is a $4.5 billion energy-focused fund, which, together provide greater than $8 billion of capital available for new energy investments. Blackstone's energy franchise is an active investor in virtually every sector of the energy industry, having invested and/or committed approximately $8.6 billion of equity across 21 investments since 1997, of which $2.7 billion was focused on investments in the power sector. Onyx will not require further capital from outside parties to finance the anticipated SL3 transactions.

Programs/Programmatic Strengths/Service Area

Onyx is currently performing several programmatic roll-outs of solar deployment across highly varied properties and structures. In June 2015, Onyx established a strategic partnership with Corvias Solutions to develop renewable energy assets on Corvias' portfolio of military and student housing across the continental United States. Systems under construction or development include everything from 6 kW residential rooftops, 50 kW commercial rooftops, to large scale 5 MW+ ground mounts. Onyx has a team of dedicated people working with Corvias to ensure efficient and cost-effective project development and construction processes; and will employ the same approach with the Green Bank-sourced projects. In addition, Onyx is currently in late stage development with another Massachusetts municipal utility in a solar program rollout on town-owned land and are working to expand the program to include private commercial rooftops.

Onyx's depth of experience and financial backing makes them an excellent partner in this program. Onyx's full service approach of development, EPC, asset management and financing allows them to accelerate the time to commercial operation. As a fully integrated solar provider, Onyx is well positioned to execute on solar projects in an expedited time frame to achieve Green Bank's goal to offset onsite electricity demand through turnkey agreements.

Onyx's structured finance products and investment capability allow the company to tackle renewable projects all over the United States of any scope and size across the C&I, utility and government sectors.

Onyx's significant breadth of experience across the utility-scale and C&I solar markets provides greater understanding of the opportunities and risks unique to each solar market compared to other potential suppliers, allowing Onyx to offer attractive pricing and faster execution. Finally, because the Onyx business model includes the holding and operating of solar assets, their interests are aligned with the customers' interests ensuring the projects are designed, built, and operated with the optimal performance.

Leadership & Board of Directors

Matthew Rosenblum, Founder and Chief Executive Officer

Matt has over 19 years of investment and trading experience. Matt formed Onyx in partnership with Blackstone around his core operating team at Solops, LLC. Solops was formed by Matt to pursue C&I solar power development. Under Matt's leadership, Solops built a portfolio of solar systems in partnership with local utilities, construction firms and off-takers, and became a significant producer and trader of renewable energy certificates. Prior to Solops, Matt was the Chief Executive Officer of Neuwing Energy, a leading proprietary trader of carbon related credits. Matt also served in management positions at Hambrecht & Quist and KKR. Matt received his Finance degree from the University of South Florida.

Ja Kao, President

Ja has over 14 years of finance and legal experience, as an investment banker and tax lawyer, structuring and placing complex financial instruments and structuring and executing M&A transactions across sectors, including financial services, energy (both traditional and renewable), and industrials. Prior to joining Onyx,

Ja worked at The Blackstone Group, where she was a Managing Director. While at Blackstone, she led the renewable energy investment banking practice, covering wind, solar and other technology companies. Ja structured multiple tax equity financing transactions for solar and wind projects. Prior to The Blackstone Group, Ja was a tax associate at the law firm of Shearman & Sterling, LLP in New York. Ja received a JD, cum laude, from Georgetown University Law Center and a BA with a major in Economics from Brandeis University. Ja serves as Chairman of the Board of Assessment Review for the town of Pound Ridge, NY and on the Board of Directors for the not-for-profit group, Internationals Network for Public Schools.

Ryan A. Marrone, Co-Founder and Chief Legal Officer

Ryan has over 18 years of experience representing private and public companies. In that tenure, Ryan led the development of over 258 MWs of commercial and industrial solar installations and closed on project financings totaling in excess of $1 billion. Ryan was a co-founder of Solops, LLC and a member of the leadership team where he was Chief Operating Officer and General Counsel. Prior to Solops, Ryan practiced law and served as General Counsel for Heller Industrial Parks. Ryan received a BA in English and Political Science from Seton Hall University and a JD from Widener University. Ryan serves on the Board of Directors of the YMCA - Hamilton, the Executive Compliance Board of RWJ University Hospital - Hamilton, and as a member of the Business Development Board of First Choice Bank.

Program Risks and Mitigation Strategies

The risks of structuring a commercial solar PPA financing program are well understood by Green Bank given experience operating in the market.

Market and Origination Risk:

Risks:

- Commodity prices /utility rate changes making PPA rates charged under this fund structure a less viable option for repayment of capital providers
- Green Bank is unable to originate enough qualified projects to meet the expected capacity of the fund
- If the pricing of future PPAs is materially different from SL2-funded projects due to SL3 return requirements, the market may not be able to support pricing

Mitigation Strategy:

- Flexible capital allowing projects that do not meet Onyx's return requirements to be supplemented with either Green Bank subordinated debt or working capital and placement into another financing structure

SL3 Structural risk:

Risks:

- Green Bank subordinated debt that is placed into a comingled portfolio of solar PPA projects across Onyx portfolio faces repayment risk that is not mitigated by SL3's underwriting criteria due to exposure to projects that are outside of Green Bank's control

Green Bank debt that is subordinate to senior debt that is not yet placed in Onyx Holdings, LLC exposes Green Bank to repayment risk that is not mitigated by the SL3 CGB Subordinate Debt Term Sheet due to exposure to unforeseen senior debt terms Mitigation Strategy:

- Green Bank will have either (i) segregated Connecticut Project Cash Flow Waterfall or alternatively (ii) a distinct tracking of the revenues, expenses and cash flows of the Connecticut Projects under the program satisfactory to Green Bank, at the Onyx Holdings, LLC level where back leverage debt facilities are contemplated
- Onyx Hold Co will structure its back leverage to have a minimum debt service coverage of 1.2x of base case projections to mitigate risk of over leveraging and ensuring subordinated debt service requirements can be met at base case and a number of downside scenarios
- Onyx Holdings, LLC will act as guarantor for Green Bank subordinated debt placed into Onyx Renewables Holding Company, LLC

Credit Risk:

Risk:

- Underlying off-takers fail to pay or default under the terms of the PPA

Mitigation Strategy:

- C-PACE as a security mechanism for unrated entities
- Well delineated credit requirements (for rated and unrated) requiring investor oversight
- Proposed timeliness reserve in amount of 2 years of PPA payments to further enhance riskier credits where required

System Performance Risk:

Risk:

- Solar PV systems supporting the solar PPA do not meet production expectations, the value proposition to commercial entities will decline, reducing energy savings

Mitigation Strategy:

- Strict EPC approval requirements (in line with SL2) ensuring EPCs have adequate experience, insurance, and finances to undertake project in a safe and effective manner
- List of approved technologies, actively maintained/updated ensuring that technologies used are the most efficient, cost effective, and that manufacturers with the highest likelihood of being able to stand by their warranties are used

Resolutions

WHEREAS, in response to continued demand for commercial-scale solar PV project financing in Connecticut and capital constraints limiting new projects under the CT Solar Lease 2 (“SL2”) program, Green Bank proposed a new private capital partnership (“SL3”) to provide project financing and the structural mechanism for repayment of capital providers via cash payments from commercial-scale property owners in exchange for the benefits derived from SL3-owned solar PV assets;

WHEREAS, Green Bank issued a competitive Request for Proposals (“RFP”) to source private capital to fund SL3;

WHEREAS, Onyx Renewables Partners, L.P. (“Onyx”) responded to the RFP with a proposal to undertake commercial-scale solar PV projects in Connecticut using a capitalized fund structure that was down-selected through the Green Bank’s RFP selection and award process;

WHEREAS, Onyx’s proposed fund structure for capitalizing SL3 will likely require Green Bank subordinated debt to meet Onyx’s portfolio return criteria; and

WHEREAS, Onyx’s proposed fund structure has constraints on the types of projects it may accept, and such constraints may require Green Bank to find alternative means of developing and financing certain commercial-scale solar PV projects that fall outside of the anticipated SL3 structure.

NOW, therefore be it:

RESOLVED, that the Board of Directors approves funding for the continued development of commercial-scale solar PV projects in an amount not to exceed $15.0 million, to be utilized for the following purposes:

a.) Working capital during project construction;
b.) Term financing, including the ability to subordinate Green Bank’s position; and
c.) Credit enhancements as required on a case-by-case basis.

RESOLVED, that the President of Green Bank; and any other duly authorized officer of Green Bank, is authorized to execute and deliver, any contract or other legal instrument necessary to effect the SL3 program on such terms and conditions as are materially consistent with the memorandum submitted to the Green Bank Board on October 14, 2016; and

RESOLVED, that the proper Green Bank officers are authorized and empowered to do all other acts and execute and deliver all other documents as they shall deem necessary and desirable to effect the above-mentioned legal instrument.

Submitted by: Bryan Garcia, President and CEO; Bert Hunter, EVP and CIO; Ben Healey, Director, Laura Fidao, Senior Manager, Chris Magalhaes, Senior Manager, Clean Energy Finance

EXHIBIT A
SL3 Program Term Sheet

REDACTED

EXHIBIT B
SL3 CGB Subordinate Debt Term Sheet

<u>REDACTED</u>

Memo

To: Connecticut Green Bank Board of Directors

From: Mariana C. Trief, Senior Manager, Clean Energy Finance

CC: Bryan Garcia, President and CEO; Bert Hunter, EVP and CIO; Brian Farnen, General Counsel and CLO; Ben Healey, Director, Clean Energy Finance

Date: October 14, 2016

Re: Project Update for 193kW Hydroelectric Facility in Meriden, CT

Background and Purpose

On February 26, 2016 staff brought forward to the Connecticut Green Bank ("Green Bank") Board of Directors (the "Board") a proposal (see Exhibit A) for the Green Bank to provide both construction and term financing through the issuance of New Clean Renewable Energy Bonds ("CREBs") for a 193kW hydroelectric facility in Meriden, CT (the "Project"). The Board approved the original proposal, as subsequently modified on April 22, 2016 (see Exhibit B), June 22 (see Exhibit C) and July 6, 2016 (see Exhibit D), and authorized:

i) a guaranty to a third party lender for construction financing in an amount not to exceed $3.9 million,

ii) funding from the Green Bank's balance sheet in an amount not to exceed $1,400,000,

iii) a working capital guaranty in an amount not to exceed $600,000 for the benefit of New England Hydropower Company ("NEHC"), the project developer, with a 24-month repayment schedule under the Green Bank's existing working capital facility partnership with Webster Bank;

iv) term financing based on the following prerequisites:
   a. issuing CREBs in an amount not to exceed $3,100,000 within 270 days from the date of authorization by the Board of Directors on February 26, 2016; and,
   b. securing the issuance utilizing the Special Capital Reserve Fund ("SCRF") subject to further Board, Office of the Treasurer, and Office of Policy and Management approval; and

v) the creation of a Special Purpose Entity that will be wholly owned by the Green Bank, to own, operate, and manage the Project, as required by CREBs regulations.

Since the Board's approval, staff has continued to advance towards the issuance of CREBs and, in parallel, the developer has made significant progress towards the Project's construction. The purpose of this memo is to share with the Board details about progress achieved to date on both of these fronts and request a 135-day extension from the original date of authorization by the Board of Directors for the issuance of the CREBs.

Construction Update

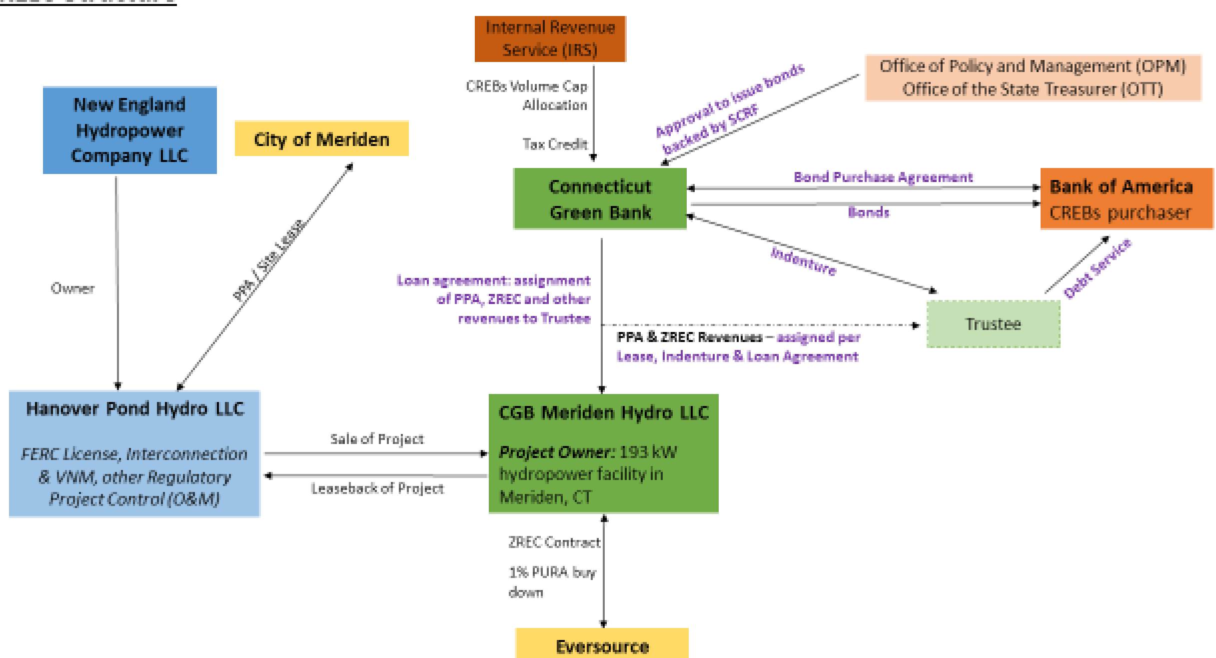
NEHC closed on construction financing, guaranteed by the Green Bank, with a third party lender on July 15, 2016. Construction has since begun and progressed smoothly. The water channel is nearly complete, and the Archimedes Screw Generator is currently being shipped from the Netherlands to the Project site in Meriden, Connecticut. Pictures showing construction progress are presented in Exhibit E. Assuming favorable weather conditions, construction is expected to complete by February 2016.

Throughout construction NEHC has remained in compliance and has maintained close coordination with local and federal oversight agencies, including: i) the Federal Energy Regulatory Commission's ("FERC") Office of Dam Safety has signed off on construction and is continually monitoring the Project's construction; and, ii) the City of Meriden and Connecticut Department of Energy & Environmental Protection ("DEEP") have been involved in the drawdown of the pond and monitoring of water levels.

CREBs Update

Below are the main updates and progress on the CREBs financing along with a structure of the various parties involved.

CREBs Structure



Bond Documentation: with support from bond counsel, staff is currently focused on putting together the package of agreements for bond issuance, which documentation staff will submit for Board approval once finalized. Staff expects to issue the CREBs in February 2017. Documentation for the issuance of bonds includes:

i. Bond indenture: a draft was prepared by Shipman & Goodwin and shared with the Office of the Treasurer ("OTT") and Banc of America Public Capital Corp ("Bank of America") for their comments.

ii. Opinion on Self-sufficiency: a draft was shared with OTT as a requirement for obtaining access to the Special Capital Reserve Fund ("SCRF"). Green Bank staff and OTT are working to finalize the Opinion on Self-sufficiency and seek OTT's approval for the use of SCRF for the bonds.

iii. Bond Purchase Agreement and Loan Agreement: these are in the process of being drafted.

CREBs Allocation: Under the CREBs program, qualified issuers need to apply to the Internal Revenue Service ("IRS") for volume-cap application. The Green Bank submitted its CREBs application to the IRS in early September 2016 and received confirmation of the allocation on October 6, 2016. A copy of the letter from the IRS granting the CREBs allocation to the Green Bank is presented as Exhibit F. As part of the CREBs requirement, the Green Bank must issue the bonds by the expiration date of April 4, 2017, as stated in the IRS's confirmation of allocation.

Staff is therefore now requesting a 135-day extension to the original 270 days authorized by Board of Directors on February 26, 2016 for the issuance of the CREBs, in order to match the CREBs allocation expiration date.

Term Sheet with CREBs Purchaser: Green Bank signed a term sheet with Bank of America. The term sheet locks the interest rate through the beginning of February, by which time the Green Bank expects to have issued the bonds. The signed term sheet is presented in Exhibit G.

Conclusion

The Project is continuing to progress on both the construction and bond issuance front. Staff will continue to update the Board as milestones are completed, and will come back to the Board with final documentation required for the issuance of bonds (i.e., indenture and bond purchase agreement) for Board approval when appropriate.

Resolutions

WHEREAS, pursuant to the development of a small hydroelectric facility at the Hanover Pond Dam on the Quinnipiac River in Meriden ("Project"), at its February 26, April 22, July 6 and July 22, 2016 meetings, the Green Bank Board of Directors (the "Board") previously authorized:

i) a guaranty to a third party lender for construction financing in an amount not to exceed $3.9 million,

ii) funding from the Green Bank's balance sheet in an amount not to exceed $1,400,000,

iii) a working capital guaranty in an amount not to exceed $600,000 for the benefit of New England Hydropower Company ("NEHC"), the project developer, with a 24-month repayment schedule under the Green Bank's existing working capital facility partnership with Webster Bank;

iv) term financing based on the following prerequisites:

   a. issuing New Clean Renewable Energy Bonds ("CREBs") in an amount not to exceed $3,100,000 within 270 days from the date of authorization by the Board of Directors on February 26, 2016; and,
   b. securing the issuance utilizing the Special Capital Reserve Fund ("SCRF") subject to further Board, Office of the Treasurer, and Office of Policy and Management approval; and
   c. the creation of a Special Purpose Entity that will be wholly owned by the Green Bank, to own, operate and manage the Project, as required by CREBs regulations.

WHEREAS, Green Bank staff recommends that the Board authorize a 135-day extension from the original date of authorization by the Board of Directors for the issuance of the CREBs,

NOW, therefore be it:

RESOLVED, that the President of the Green Bank and any other duly authorized officer is authorized to proceed with the prerequisites for the issuance of CREBs no later than 405 days from the authorization by the Board of Directors on February 26, 2016, provided that staff will submit for Board approval all relevant documentation (including but not limited to an indenture of trust) required for the actual issuance of bonds;

RESOLVED, that the proper Green Bank officers are authorized and empowered to do all other acts and execute and deliver all other documents and instruments as they shall deem necessary and desirable to effect the above-mentioned legal instruments.

Submitted by: Bryan Garcia, President and CEO; Bert Hunter, EVP and CIO; Ben Healey and Mariana C. Trief, Clean Energy Finance.

Exhibit E: Construction Pictures

These and additional pictures are available online in the following link, which is updated weekly with the Project's construction progress: https://sway.com/BvCB96cH5pBKHThU.

Figure 1: Water channel, view from the bottom

Figure 2: Water channel, lateral view

Figure 3: Water channel, view from the top

Figure 4: Archimedes Screw Generator ready for shipping