845 Brook Street, Rocky Hill, CT 06067
T 860.563.0015
ctgreenbank.com

CONNECTICUT
GREEN BANK

July 14, 2017

Dear Connecticut Green Bank Board of Directors:

We have a regular meeting of the Board of Directors scheduled on Friday, July 21, 2017 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** – approval of the meeting minutes for the June 23, 2017 regular board meeting. Review and approval of the redline revisions to the FY 2017 and FY 2018 Comprehensive Plan, including recently approved budget and targets for FY 2018. Review and approval of the FY 2017 compliance reporting and the Board of Directors and it's Committees memo. A request for approval for a contract extension for the previously approved Bridgeport Microgrid project. Also included are financial statements through May of 2017 and a year-end report on PSA's over $75,000 requiring approval per the Operating Procedures.

- **Strategy Discussions** – since we approved of the Evaluation Framework in October of 2016, we wanted to review the progress that we are making and get your feedback and guidance as we continue to develop our data collection and analysis systems.

- **Committee Recommendations** – the Audit, Compliance, and Governance Committee will be recommending for the Board of Director approval of the proposed revisions to internal control procedures.

- **Staff Updates and Progress to Targets** – since the FY 2017 year has ended, the program sector directors will review year-end progress to targets.

- **Staff Transaction Recommendations** – we will have one transaction that we are recommending for your review and approval, including:

    a. **Commercial, Industrial, and Institutional Sector** – a prior approved C-PACE transaction that involves a hydroelectric facility at a mixed-use residential and commercial development.

- **Other Business** – we will provide an update on our Nissan Leaf offer and if anyone has any other business, we would be happy to discuss it.

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, July 21, 2017
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 June 23, 2017*
    b. Comprehensive Plan Revisions (FY 2017 and FY 2018)*
    c. Board of Directors and Committees Report for FY 2017*
    d. Bridgeport Microgrid Contract Extension*
    e. Financial Statements for May 2017
    f. Request for Approvals for PSA's Over $75,000 in FY 2017

4. Board of Directors Strategic Discussions – Evaluation Framework and Social Impacts – 30 minutes

5. Committee Updates and Recommendations* – 10 minutes

    a. Audit, Compliance, and Governance Committee* – 10 minutes

        i. Review and consider Revisions to Internal Control Procedures*

6. Sector Updates and Progress to Targets for FY 2017* – 45 minutes

    a. Infrastructure Program Sector* – 15 minutes
    b. Residential Program Sector* – 15 minutes
    c. Commercial, Industrial, and Institutional Program Sector* – 15 minutes

7. Staff Transaction Recommendations and Updates – 15 minutes

    a. Commercial, Industrial, and Institutional Sector Program Recommendations* – 15 minutes

i. C-PACE Transaction (Putnam) – Cargill Falls

8. Other Business – 10 minutes

a. Nissan Leaf Promotion (Update)
b. Other Business

9. Adjourn

*Denotes item requiring Board action

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Dial (408) 650-3123
Access Code: 210-856-909

Next Regular Meeting: Friday, October 20, 2017 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, July 21, 2017
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 June 23, 2017*

   Resolution #1

   Motion to approve the minutes of the Board of Directors Meeting for June 23, 2017.

   b. Comprehensive Plan Revisions (FY 2017 and FY 2018)*

   Resolution #2

   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, the Budget and Operations Committee reviewed the Comprehensive Plan for FY 2017 and FY 2018 at a meeting on June 7, 2016 and recommended the approval to the Board of Directors; and the Board of Directors

subsequently reviewed and approved on July 22, 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;

WHEREAS, the Board of Directors reviewed and approved the FY 2018 targets and budget on June 23, 2017, which together with the Comprehensive Plan, are effectively the Annual Plan;

WHEREAS, the staff of the Connecticut Green Bank have revised in a redline draft version the Comprehensive Plan for FY 2017 and FY 2018 to include recently approved budget and targets for FY 2018 for the review and approval by the Board of Directors;

NOW, therefore be it:

RESOLVED, that the Board approves of the revised Comprehensive Plan for FY 2017 and FY 2018 as presented to the Board on July 21, 2017, and subject to nonmaterial modifications made by the officers as described above.

c. Board of Directors and Committees Report for FY 2017*

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 CONNECTICUT'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, therefore be it:

RESOLVED, that Board has reviewed and approved the Overview of Compliance Reporting and the Board of Directors and Committees for FY 2017 memo dated July 21, 2017 prepared by staff, which provides a summary report of the FY 2017 governance of the Board of Directors and its Committees of the Connecticut Green Bank.

d. Bridgeport Microgrid Contract Extension*

Resolution #4

NOW, therefore be it:

RESOLVED, that the Board of Directors authorizes the President of the Green Bank and any other duly authorized officer of the Green Bank to execute and deliver

a sub-debt loan in the amount of up to $502,860, at any time throughout the extended draw period deadline of January 1, 2018, as stated herein, and to be funded from the CHP Pilot program budget, and with terms and conditions consistent with the memorandum and term sheet submitted to the Deployment Committee dated February 23, 2015 and as revised by the memorandum to the Board of Directors dated June 17, 2016; and

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

e. Financial Statements for May 2017
f. Request for Approvals for PSA's Over $75,000 in FY 2017

4. Board of Directors Strategic Discussions – Evaluation Framework and Social Impacts – 30 minutes

5. Committee Updates and Recommendations* – 10 minutes

a. Audit, Compliance, and Governance Committee* – 10 minutes

i. Review and consider Revisions to Internal Control Procedures*

Resolution #5

WHEREAS, on July 11, 2017, the Audit, Compliance and Governance Committee recommended that the Board of Directors (the "Board") approve the proposed revisions to Internal Accounting Control Procedures as presented.

Now, therefore be it:

RESOLVED, that the Board hereby approves the proposed revisions to Internal Control Procedures outlined in the Memo dated July 21, 2017 (along with attachments) which was submitted to the Board.

6. Sector Updates and Progress to Targets for FY 2017* – 45 minutes

Resolution #6

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 July 22, 2016, the Board of Directors of the Connecticut Green Bank approved a Comprehensive Plan for FY 2017 and FY 2018, including an annual budget and targets for FY 2017.

NOW, therefore be it:

RESOLVED, that Board has reviewed and approved the Program Performance towards Targets for FY 2017 memos dated July 21, 2017, which provide an overview of the performance of the Infrastructure, Residential, Commercial, Industrial, and Institutional sectors with respect to their FY 2017 targets.

a. Infrastructure Program Sector* – 15 minutes
b. Residential Program Sector* – 15 minutes
c. Commercial, Industrial, and Institutional Program Sector* – 15 minutes

7. Staff Transaction Recommendations and Updates – 15 minutes

a. Commercial, Industrial, and Institutional Sector Program Recommendations* – 15 minutes

i. C-PACE Transaction (Putnam) – Cargill Falls

Resolution #7

WHEREAS, the Board previously approved a C-PACE benefit assessment with a not-to-exceed amount of $4,700,000 to Historic Cargill Falls Mill, LLC ("HCFM"), the property owner of 58 Pomfret Street, Putnam, CT to finance the construction of specified clean energy measures (the "Project") in line with the State's Comprehensive Energy Strategy and the Green Bank's Strategic Plan; and

WHEREAS, Enhanced Capital Connecticut Fund V ("Enhanced Capital") acquired $1,200,000 of the original Green Bank's investment (the "Senior Benefit Assessment"), leaving the Green Bank with a total $3,500,000 exposure at the time (the "Subordinated Benefit Assessment"); and

WHEREAS, both the Senior Benefit Assessment and the Subordinated Benefit Assessment have accrued interest to date under the terms of the existing financing agreement with HCFM (the "Financing Agreement"), for a total combined balance of approximately $5,000,000;

WHEREAS, the Green Bank is currently negotiating a loan facility with Bank of America ("BofA") that is expected to close in 2017 and for which C-PACE projects will be an eligible use of funds; and

WHEREAS, the Green Bank now seeks to refinance the Financing Agreement.

NOW, therefore be it:

RESOLVED, that the President of the Green Bank and any other duly authorized officer of the Green Bank, is authorized to execute and deliver an amended Financing Agreement in a total amount not to exceed the sum total of the Senior Benefit

Assessment and the Subordinated Benefit Assessment plus any and all interest accrued, with terms and conditions consistent with the memorandum submitted to the Board dated July 14, 2017, 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 July 21, 2017;

RESOLVED, that the President of the Green Bank and any other duly authorized officer of the Green Bank, is authorized to apply BofA funds to the Project so as to fully replace Enhanced Capital's position in the existing capital stack;

RESOLVED, that before executing an amended Financing Agreement, the President of the Green Bank and any other duly authorized officer of the Green Bank shall receive confirmation that the C-PACE transaction continues to meet 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 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 instrument.

8. Other Business – 10 minutes

   a. Nissan Leaf Promotion (Update)
   b. Other Business

9. Adjourn

*Denotes item requiring Board action

Join the meeting online at https://global.gotomeeting.com/join/210856909

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Dial (408) 650-3123
Access Code: 210-856-909

Next Regular Meeting: Friday, October 20, 2017 from 9:00-11:00 a.m.
Connecticut Green Bank, 845 Brook Street, Rocky Hill, CT

CONNECTICUT GREEN BANK SM

Board of Directors Meeting

July 21, 2017

Board of Directors

Agenda Item #1

Call to Order

Board of Directors

Agenda Item #2

Public Comments

Board of Directors

Agenda Item #3

Consent Agenda

Consent Agenda

Resolutions 1 through 4

1. **Meeting Minutes*** – approval of meeting minutes of June 23, 2017

2. **Comprehensive Plan Revisions*** – proposed redline revisions of FY 2017 and FY 2018 Comprehensive Plan including FY 2018 budget and targets and immaterial edits

3. **Board of Directors and Committee Reports*** – report out on FY 2017 activity of the Board and its Committees for inclusion in the CAFR

4. **Bridgeport Microgrid Extension*** – extension of contract draw down period

- **Report Outs** – provision of Financial Statements through May of 2017 and Request for Approvals Over $75,000 in FY 2017

CONNECTICUT GREEN BANK

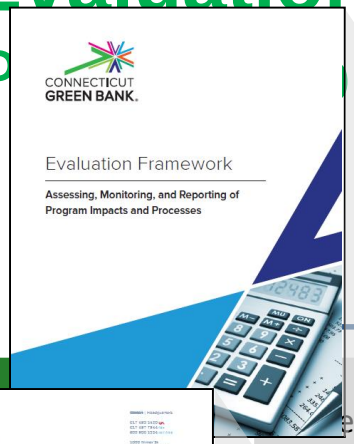
Board of Directors

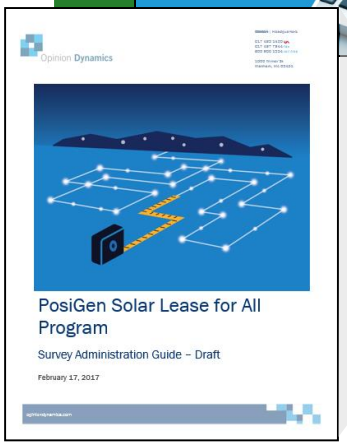
Agenda Item #4

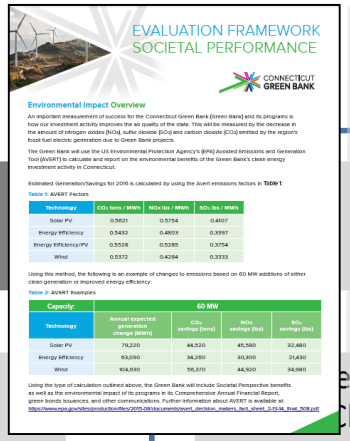
Strategic Discussions

Evaluation Framework

P… Date







Evaluation Framework

Data … ection and Analysis Protocol

PosiGen

C-PACE

Smart-E

Locus)

Energy Efficiency (PSD and SRS)

Others (e.g., RTT, AFV and Infrastructure)

… ions (EPA AVERT)

Equivalencies (EPA AVERT)

Public Health (EPA COBRA)

Economy (DECD)

Investment

Direct, Indirect, and Induced Jobs

Others (e.g., GDP growth, tax revenue, etc.)

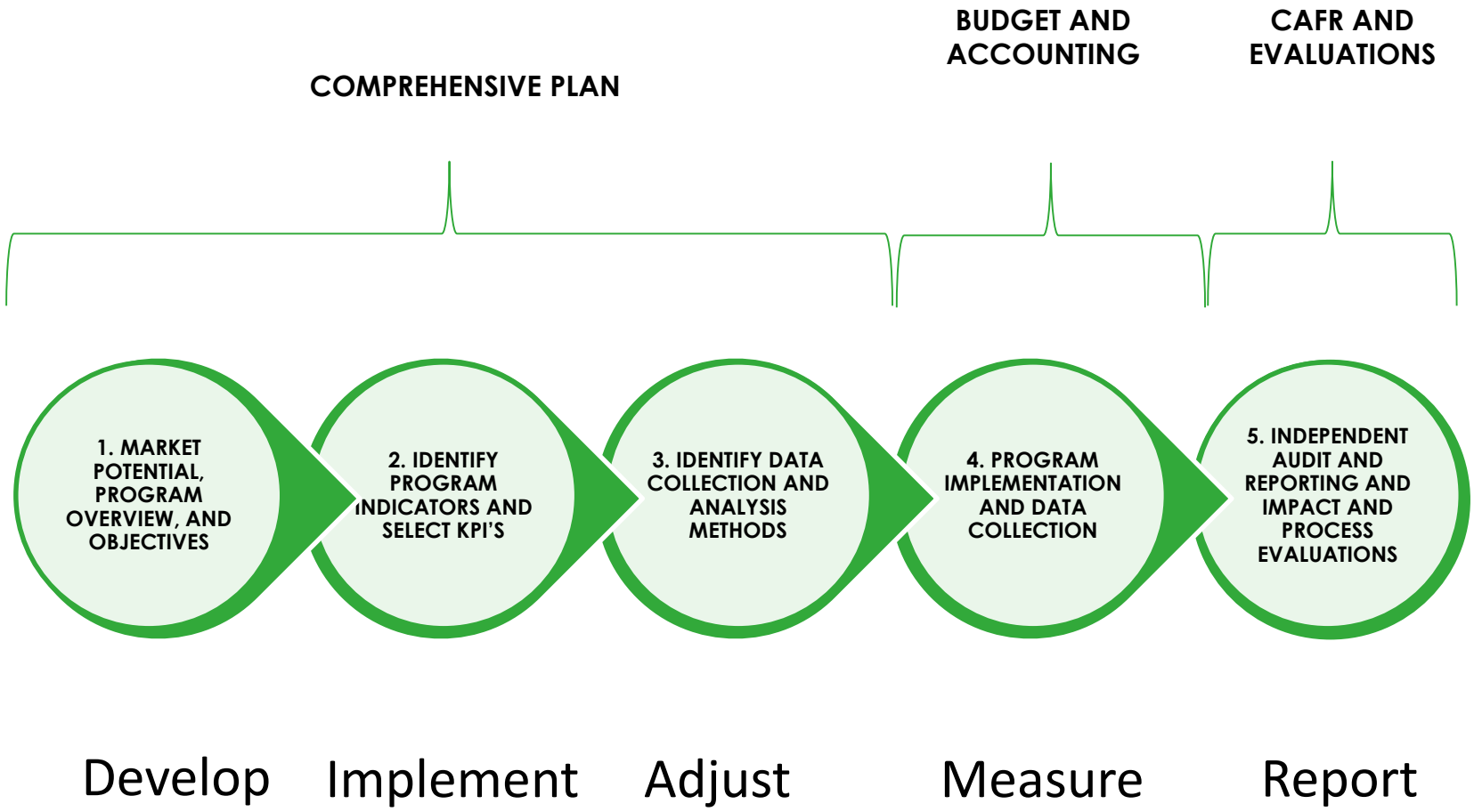
Not completed

Completed

In Process

Evaluation Plan

Development and Implementation



Access and Information
Website Demonstrations

- **Strategy and Impact** – website provides users with access to planning, reporting and transparency, and impact

- **Kevala** – visualization of funded clean energy projects across the state

- **Generation** – Locus Energy's SolarNoc monitors thousands of residential solar PV systems real-time to demonstrate how distributed energy resources serve a power plant-like role supporting the grid

Independent Evaluation

Evaluation Framework

Criteria for Determining Evaluations	Priority (1-5)	RSIP	C-PACE	Smart-E	PosiGen	CT Solar Loan	CT Solar Lease	ARRA-SEP
Public Policy								
Report Required								
Legislature Trust								
Stakeholder Trust								
Asset Management								
Replicability								
Process Improvement								
Performance								
Strategic Priority								
Program Size ($MM)								
Open or Closed								
Prior Evaluation								
Total								

What are key criteria and what program(s) should we independently evaluate?

Board of Directors

Agenda Item #5

Committee Recommendations

Audit, Compliance, and Governance Committee

Connecticut Green Bank

Annual Review of Accounting Internal Control Policies

- Form the basis for safe guarding the Green Bank's assets and ensuring that all disbursements of Green Bank's funds are reviewed and approved at the appropriate management level.
- Are part of the overall system of internal control policies and procedures in place to ensure that all financial transactions are recorded in the financial records of the Green Bank accurately and on a timely basis.
- Reviewed for material weaknesses annually as part of the Green Bank's annual financial audit and issuance of its Comprehensive Annual Financial Report.
- CGB 101 – Purchasing and Accounts Payable
- CGB 102 – Consulting and Advisory Services
- CGB 103 – Credit Cards
- CGB 104 – Mobile Devices
- CGB 105 – Fixed Assets and Depreciation

July 10, 2017
RegularMeeting

Connecticut Green Bank

Annual Review of Accounting Internal Control Policies

Minor revisions proposed to existing procedures as follows:

CGB 103 Credit Cards – Substitute Director of Operations for President and CEO as second approver of credit card invoices after approval by VP Finance.

CGB 104 Mobile Devices – Reflect change in policy to reimburse employees for monthly service charges only and not for equipment.

CGB 105 Fixed Assets and Depreciation – Reflect increase in threshold requiring capitalization of equipment from $500 to $1,000.

July 10, 2017
RegularMeeting

Connecticut Green Bank

Annual Review of Accounting Internal Control Policies

WHEREAS, on July 11, 2017, the Audit, Compliance and Governance Committee recommended that the Board of Directors (the “Board”) approve the proposed revisions to Internal Accounting Control Procedures as presented.

Now, therefore be it:

RESOLVED, that the Board hereby approves the proposed revisions to Internal Control Procedures outlined in the Memo dated July 21, 2017 (along with attachments) which was submitted to the Board.

July 10, 2017
RegularMeeting

Board of Directors

Agenda Item #6

Sector Updates and Progress to Targets for FY 2017

Progress to Targets for FY 2017

Connecticut Green Bank

Program Sector	Projects		Capital Deployed ($MM)		Capacity Installed (MW)	
	Closed	**Target**	**Closed**	**Target**	**Closed**	**Target**
CI&I	60	84	$44.8	$48.9	12.5	14.3
Residential	1,162	771	$44.9	$32.3	6.1	5.4
Infrastructure	5,025	6,001	$141.5	$191.2	39.7	49.0
Strategic	1	-	$4.5	-	-	-
Total	**5,459**	**6,856**	**$212.7**	**$272.4**	**53.0**	**68.7**

Take-Away Message – we are in a dynamic market for clean energy, and although we didn't meet our overall target for FY 2017, we continue to make steady progress for CT.

Board of Directors

Agenda Item #6a

Infrastructure Program Sector

Executive Summary

Infrastructure Program Sector

- **RSIP Milestones** – 170 MW approved of which 145 MW completed of 300 MW target, $100 MM in incentives, and 7:1 leverage ratio
- **SHREC** – MPA approved and executed, SHREC aggregation process approved and implementing for 2017 tranche (Vintage 2015 and 2016)
- **REC Sales** – sale of 40,000 non-SHREC RECs (includes C&I)
- **AD Project** – Southington project achieve commercial operation
- **DOE SunShot** – completed Rooftop Solar Challenge project and SunShot Prize competition (stabilize soft costs at 50%), SolSmart technical advisor, and 3-year project on LMI research and strategy

Progress to Targets for FY 2017

Infrastructure Program Sector

Key Metrics	Program Performance Original Targets	Program Performance Revised Targets	Program Progress	% of Goal Achieved
Capital Deployed	$300,302,000	$191,165,071	$141,469,762	74%
Investment at Risk			$13,370,444	
Private Capital			$128,099,318	
Deployed (MW)	66.2	49.0	39.7	81%
# of Loans/Projects	6,379	6,001	5,025	84%
Leverage Ratio			10.6	

Take-Away Message – broader residential solar PV market forces (e.g., national TPO business model) have impacts on RSIP performance, however local contractor market is resilient.

Lessons Learned

Infrastructure Program Sector

- The residential solar PV market is dynamic and sensitive to a lot of factors including national trends and market forces
- RSIP leveraging ongoing operational improvements and upgrading of technology platforms and resources
- Consumer protection efforts are growing in importance in the residential solar PV market
- Residential solar PV soft costs stabilized by DOE SunShot efforts
- Success of state's first food waste-to-renewable energy facility will demonstrate opportunity to economically generate clean electricity and recycle waste in Connecticut

Lessons Learned (cont'd)

Infrastructure Program Sector

In the context of broader market trends, the state of Connecticut's fiscal status, and climate change mitigation efforts, the strategy for supporting RSIP going forward will not focus primarily on increasing project volume but rather on elements such as the following:

- Sustained orderly development – stable installer base not dependent on incentives and able to adjust to changing policy
- Access to financing (e.g., loans, leases and PPA's)
- Adoption of solar PV by LMI market segment
- Supporting consumer education and protection
- Promoting technology diversity (e.g., energy efficiency) and solar plus strategy (i.e., battery storage, RH&C, EV, etc.)

Board of Directors

Agenda Item #6b

Residential Program Sector

Executive Summary
Residential Program Sector

- **Targets** – exceeded for all programs and broke the $100 million threshold with $125 million of cumulative activity in the sector
- **Smart-E** – brought 6 lenders onto credit-challenged term sheet, also 15-20 year maturities for qualified borrowers – through stellar portfolio performance; launched 0.99% offers with $6 million ARRA IRB program
- **Investments and Program Expansion** – focused on LMI segments
  - $5.3 million of project systems in PosiGen Solar for All
  - Additional $2.5 million to Capital for Change for Low Income Multifamily Energy (LIME) Loan
  - Launch of Multifamily Catalyst Fund with $1.5 million from Green Bank and $1.5 million from DEEP RGGI funds for health & safety
- **LMI Market Analysis** – solar customer segmentation; Experian credit data
- **Launch of Department of Public Health/Green and Health Homes Initiative Partnership** – to research sustainbale funding streams from the CT health sector to support health and safety remediation at scale

Progress to Targets for FY 2017

Residential Program Sector

Key Metrics	Program Performance Original Targets	Program Performance Revised Targets	Program Progress	% of Goal Achieved
Capital Deployed	$36,599,000	$32,263,447	$44,896,880	139%
Investment at Risk			$6,755,866	
Private Capital			$40,090,009	
Deployed (MW)	5.4	5.4	6.1	113%
# of Loans/Projects	1,093	775	1,162	151%
Leverage Ratio			6.8	

Take-Away Message – Smart-E turned a corner, PosiGen ramped up and delivers for LMI, and Multifamily saw a developing but lumpy pipeline start to materialize.

Please note that capital deployed does not include all credit enhancements and uses amount financed rather than cost of the measures. Investment at Risk includes loss reserves and interest rate buydowns as well as capital.

Lessons Learned
Residential Program Sector

Single Family

- Engaging contractors through training and marketing materials drives demand for Smart-E
- Targeted community-based outreach is the best way to engage traditionally difficult to reach communities, but not all groups equipped to succeed
- Our message that income and credit don't correlate is breaking through – increased solar penetration in LMI tracts, new lender interest in Smart-E

Multifamily

- The pipeline continues to be lumpy and long
- Leveraging strategic partnerships is core to our approach, but execution risks and partner capacity are a challenge
- Continued alignment with utility programs is needed to achieve scale
- Distressed properties, especially co-ops, are coming to the Green Bank as lender of last resort for technical assistance and financing
- Split incentive challenges continue to impact investment opportunities

Board of Directors

Agenda Item #6c

Commercial, Industrial, and Institutional Program Sector

Executive Summary
CI&I Program Sector

- **Key Milestone** – broke $100MM threshold for C-PACE-backed financing
- **Attracting More Lenders** – doubled 3rd party capital providers that are active in Connecticut
- **Lease-PPA Performance** – exceeded the goal for Commercial and Institutional Lease-PPA
- **Signs of LBE Potential** – unlocked the state college system for solar and made progress on state facilities
- **New Product Collaboration with Utilities** – CGB has been working with Eversource, Avangrid and the Energy Efficiency Board to attract private capital to the Small Business Energy Advantage financing program.

Progress to Targets for FY 2017

CI&I Program Sector

Key Metrics	Program Performance Original Targets	Program Performance Revised Targets	Program Progress	% of Goal Achieved
Capital Deployed	$56,800,000	$48,930,000	$44,753,461	91%
Investment at Risk			$6,208,094	
Private Capital			$38,545,367	
Deployed (MW)	14.8	14.3	12.5	87%
# of Loans/Projects	94	84	60	71%
Leverage Ratio			7.2	

Take-Away Message – while short of the targets the CI&I sector had a strong year on which to build in FY18.

Changes with regard to the capital deployed figures were made to the CI&I sector memo that have been reflected on this slide. The Sector memo will be restated.

Lessons Learned
CI&I Program Sector

- Need to focus on increasing the % of C-PACE contractors who repeatedly use C-PACE financing for their projects.
- The focused marketing and grant offering to the manufacturing sector through the Energy on the Line campaign was a success.
- Connecticut's open market platform continues to attract capital providers, with two more becoming qualified in FY17.
- While the Green Bank's PPA product continues to see strong demand, with PPA prices declining as installation costs continue to fall, existing utility tariff structures for small commercial customers remain a barrier.
- Demand for small ESA's remains limited.
- The Green Bank continues to work closely with the utilities, the EEB, and JP Morgan to develop a facility to fund customer loans made through the SBEA program in Connecticut.

Board of Directors

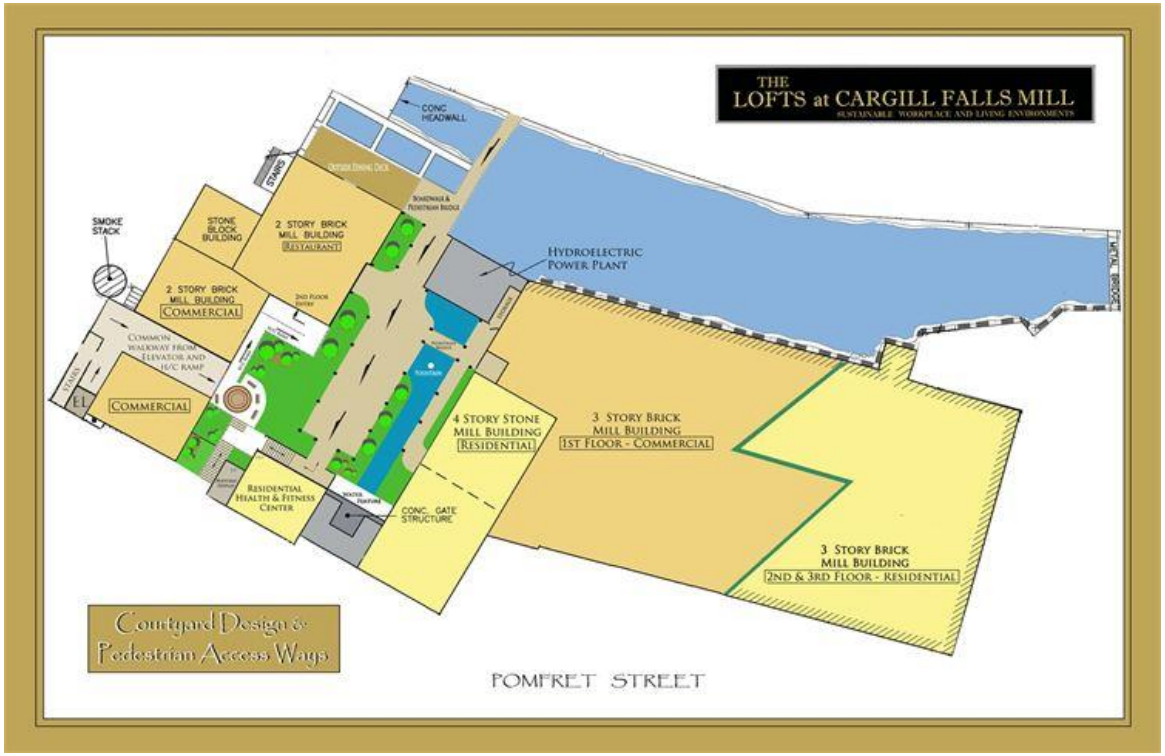
Agenda Item #7

Staff Transaction Recommendation

C-PACE – Cargill Falls (Putnam)

Historic Cargill Falls Mill
Project Context

Historic Cargill Falls Mill
Project Context



- Adaptive reuse of historic mill building in downtown Putnam
- Development to include 82 residential housing units (22 affordable) and 31,570 square feet of mixed commercial workspace

- HCFM developers are working with DOH to close on funding for the overall mill redevelopment (including an existing CHAMP allocation)
- Closing scheduled for this fall following agreement on a guaranteed maximum price for the project from the selected general contractor, **REDACTED**

Historic Cargill Falls Mill Existing Investment

- Green Bank BOD approved $4.7 million C-PACE investment to support 900 kW hydro facility
- Enhanced Capital acquired $1.2 million senior tranche
  - Green Bank outright exposure = $3.5 million

- All Green Bank and Enhanced funds fully deployed
- Utility ZREC contract secured
- Project's remaining installation costs covered by USDA grant (funds already released)

Historic Cargill Falls Mill Project Status

- Hydro portion of the project near completion:
  - Larger turbine (600 kW “T2”) came online this past spring and is currently generating
  - Smaller turbine (300 kW “T1”) expected COD: end of September (progressing on schedule)

- Broader mill redevelopment project expected to begin construction this fall:
  - Investors for the redevelopment have approved or pre-approved almost all required capital
  - General contractor with similar mill redevelopment experience currently finalizing plans

Historic Cargill Falls Mill
Enhanced vs. BofA Loan Conditions

- The Green Bank is currently negotiating a direct loan with Bank of America at favorable rates, which would reduce the cost of capital and give the project greater flexibility

REDACTED

Historic Cargill Falls Mill Staff Proposal

- Repurchase Enhanced's outstanding balance **REDACTED**

- Once closed with BofA, replenish Green Bank repurchase amount

- Amend docs with HCFM in accordance with the BOD memo:
  - Cash sweep approach until the mill redevelopment project completes
    - During this time, cash sweep to the Green Bank **will be targeted at an interest rate in the mid- to high single digits**, to reflect elevated risk profile
    - If target rate not met, accrue and capitalize deficiencies to be repaid during amortization period
  - Once the redevelopment project comes online, principal balance will amortize over a 25-year period, in line with the existing loan documentation

The Green Bank is reassuming some repayment risk in exchange for obtaining lower-cost, longer-term capital and more control over the project's financing

Historic Cargill Falls Mill Project Cash Flows

CONNECTICUT GREEN BANK

Modeling Assumptions

Total Approved Balance	$4,700,000
Balance Expected on 8/01/2017[1]	$5,048,204
Interest Rate (term)	6.25%
Term (yrs)	25
Cash Sweep Period (yrs)	2
Cash Sweep Interest Rate	9%
ZREC Award ($/MWh)	$94.40
Remaining ZREC Period (yrs)	12.25
Class I REC Price (post-ZREC) ($/MWh)	$15
Expected Annual Generation (kWh)	2,953,000
ISO-NE Wholesale Rate (per kWh)	$0.05
Initial PPA Price upon Lease-Up (per kWh)	$0.15
Annual PPA Escalator	$1.00%
Annual O&M Costs	59,058

Simplified Pro Forma

Year	1	2	3-->12	13[3]-->27
Net Revenue	367,500	367,355	6,115,928	6,606,771
Debt Service Due	(454,338)	(454,338)	(4,182,562)	(6,273,843)
Debt Service Paid	(367,500)	(367,355)	(4,182,562)	(6,273,843)
Free Cash Flows	-	-	1,933,366	421,080
DSCR	0.81x	0.81x	1.46x	1.05x

Effective Interest Rate	7.28% (vs. 9% Target Rate)	6.25%	
Cash Deficiency vs. 9% Target Rate	(173,822)	-	-

Discount Rate	NPV
4%	1,880,432
3%	2,652,973
2%	3,576,964

[1] Considers interests accrued as per A&R Agreement entered into on August 3, 2016

[2] Current ZREC Contract expires after year 12

[3] Year 16 PPA price = ~$0.17 / kWh and ISO-NE Wholesale Rate = ~$0.06 / kWh

Historic Cargill Falls Mill
Risks and Mitigants

- **Construction risk** → project is nearing completion (expected COD in Q3 or early Q4), all critical equipment has been manufactured and is either in service or awaiting installation, T2 is now online and generating electricity, and T1 well underway

- **Operational risk** → high-quality, locally fabricated equipment with ready supply of spare parts; experienced O&M partner (same entity as is refurbishing / installing the turbines); appropriate business interruption policies in place

- **ZREC contract risk** → no longer an issue. ZREC contract is in effect, and the contract period exceeds the terms of BofA loan by two years

- **Redevelopment project completion risk** → confirmation of DOH's firm commitment to the project; experience of redevelopment team including GC partner; security of C-PACE Benefit Assessment Lien in downside scenario

- **BofA Loan Closing Risk** → not linked to project; staff expects closing in Q3 or Q4 based on current discussions

Historic Cargill Falls Mill Conclusion

- HCFM hydro project is:
  - Already partially operational and nearing completion on the hydro front
  - Foundational to broader economic development / housing initiative in the state's "quiet corner"
  - Aligned with DOH commitment to the property and the region
  - Financeable, as proposed, with an interest-only period and extended amortization, based on the project's expected cash flows
    - Still viable in a downside scenario based purely on projected generation (net metering + ZREC revenues)

- Staff recommends approval, as this C-PACE refinancing is not only in line with the Green Bank's clean energy mandate, but also reinforces the Green Bank's role as:
  - a driver of economic development (with total project value of ~ $25 million)
  - a partner in the state's affordability agenda; and
  - a problem-solving state agency that gets good projects done

CONNECTICUT GREEN BANK

Board of Directors

Agenda Item #8

Other Business

Zero Emission Transportation
Demand Aggregation

Value Stack	Base Model	Full Trim
Market Price Nissan LEAF (w/ fees)	~ $34,000	~ $40,000
Nissan “fleet” discount	($10,000)	($10,000)
Federal Tax Credit (non-refundable)	up to ($7,500)	up to ($7,500)
State Incentive	($3,000)	($3,000)
Price After Incentives	as low as **$14,500**	as low as **$20,500**

Electric vehicles have already arrived! As an employee of the State of Connecticut, now is your opportunity to enjoy smooth, emissions-free driving with incredibly low maintenance and fuel costs that beat the price of gas.

Select Connecticut audiences now have access to one of the nation's best-selling all electric vehicles with a pre-determined discount. In partnership with the Connecticut Green Bank, Nissan is offering a limited-time $10,000 incentive on retail purchases of the **2017 Model Year LEAF** for State of Connecticut Employees. This offer is valid through September 30, 2017 on retail purchases.

Nissan Purchase Incentive	**$10,000**
CT Hydrogen & Electric Automobile Purchase Rebate	$3,000
Federal Tax Credit	Up to $7,500
Savings	**Up to $20,500**

The LEAF's benefits include:

- EPA estimated range of 107 miles per charge
- Low operating costs – 80 percent less than gas
- Fast charging capability – ability to charge up in under an hour
- Clean, zero-emissions driving

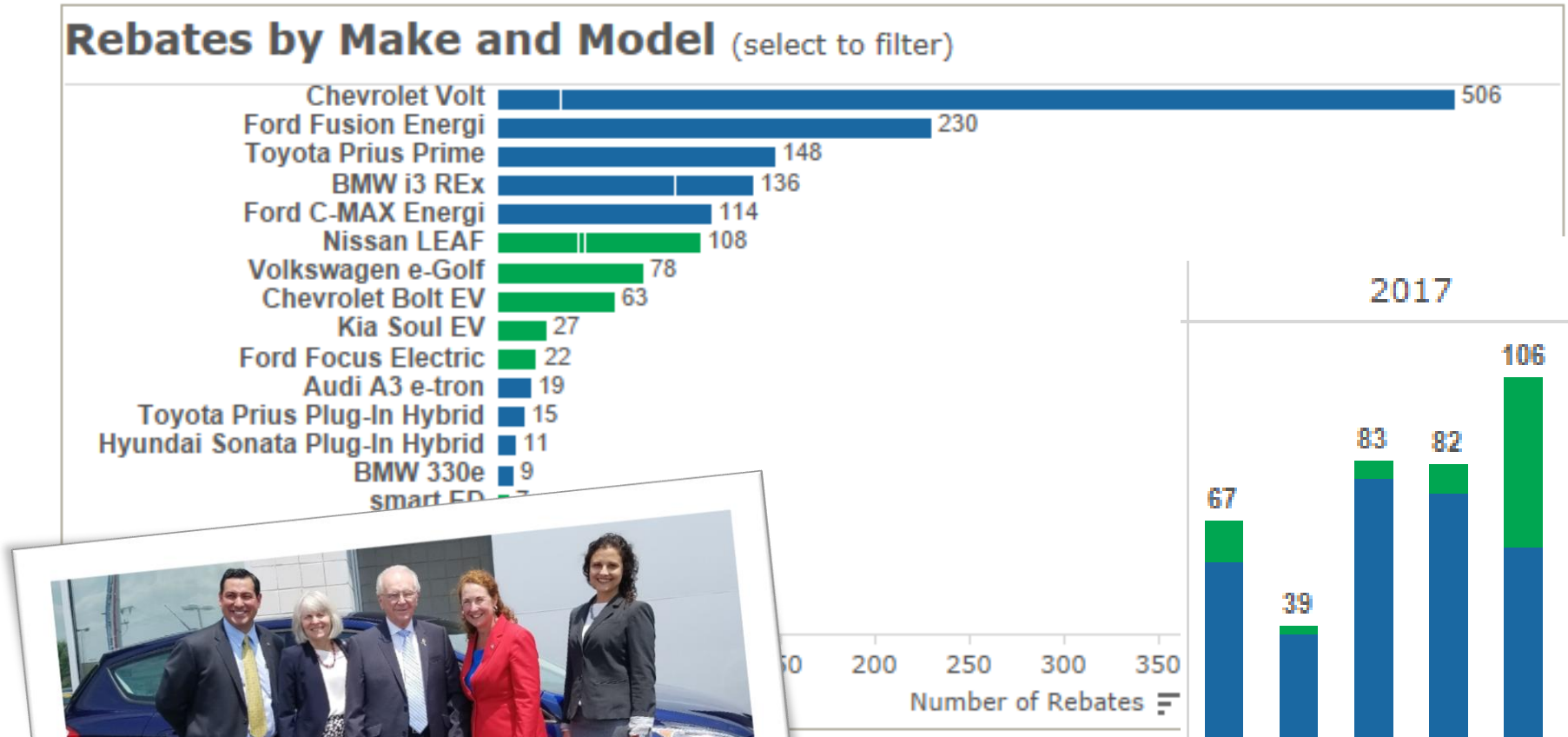
The Connecticut Green Bank was established through Public Act 11-80 as the nation's first state green bank. The Connecticut Green Bank makes clean energy more accessible and affordable to all citizens and businesses in the state by creating a thriving marketplace that accelerates the growth of green energy.

CONNECTICUT GREEN BANK

Zero Emission Transportation

Demand Aggregation

CONNECTICUT GREEN BANK



2017 New Laws

C-PACE – Public Act 17-201 – Clarifications on new construction, 3rd party capital, lien terminology and other PACE-specific features.

ZREC, Fuel Cells – Public Act 17-144 – Extends ZREC/LREC by one year. Requires ratepayer impact statements as of 2019. DEEP procurement authority extends to fuel cells, offshore wind, anaerobic digesters.

Solar Siting, Anaerobic Digesters – Public Act 17-218 – Additional $3M VNM for agricultural anaerobic digesters. Restricts 2 MW+ solar on prime farmland/forest. Initiatives DEEP exploration on various underutilized properties.

Bridgeport Thermal Loop – Public Act 17-227 – Vetoed by Governor. Creates incentive stream to developer of RECs, thermal energy and capacity payments.

Budget – CGB continues to proactively engage stakeholders on various levels to demonstrate our value to the State's economy, job market and the environment.

Norma Glover
Retirement Event

JAVA

WWW.COURANT.COM/JAVA

Norma Glover Honored For Long History In Clean Energy

By DAN HAAR
dhaar@courant.com

Norma Glover had no way of knowing she would play a big role in Connecticut energy and environmental circles when she handed a high school diploma to a Concord, Mass., graduate 40 years ago.

She was head of the local school committee. The student was Dan Esty, future Yale professor and commissioner of the state Department of Energy and Environmental Protection.

Decades later, Esty gave a welcome as Glover, 80, retired as a board member of the Connecticut Green Bank during a June 29 tribute held at Yale University, organized by Green Bank president Bryan Garcia and staff. Glover previously served as chair of the predecessor Connecticut Clean Energy Fund. An energy consultant, she also founded and led the board at the California Natural Gas Vehicle Partnership among other roles.

Glover's admirers present included John W. Olsen, a former board member who ran the Connecticut AFL-CIO and Democratic Party for years, and longtime Democratic National Committee member.

DAN HAAR | DHAAR@COURANT.COM

JOHN OLSEN, former Connecticut state Democratic Party Chairman, with Norma Glover, who is retiring from the Connecticut Green Bank during a tribute at Kroon Hall at Yale University on June 29.

Board of Directors

Agenda Item #9 – Adjourn

CONNECTICUT GREEN BANK

Board of Directors
Draft Minutes
Friday, June 23, 2017

A regular meeting of the Board of Directors of the **Connecticut Green Bank (the "Green Bank")** was held on June 23, 2017 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 9:01 a.m. Board members participating: Rob Klee, John Harrity, Matt Ranelli (by phone), Norma Glover, Reed Hundt (by phone), Gina McCarthy, Betsy Crum, and Bettina Bronisz (by phone).

Members Absent: Tom Flynn and Kevin Walsh

Others Attending: Helle Gronli, Sara Harari, Olivia Headan, Corey Wurster, and Ken Gillingham.

Staff Attending: Bert Hunter, Eric Shrago, Bryan Garcia, Brian Farnen, Kerry O'Neill, Mackey Dykes, Cheryl Samuels, Craig Connolly, Dale Hedman, George Bellas, Jane Murphy, and Kim Stevenson.

2. Public Comments

There were no public comments.

3. Consent Agenda

Upon a motion made by John Harrity, and seconded by Commissioner Klee, the Consent Agenda was unanimously approved.

a. Approval of Meeting Minutes for April 28, 2017 and June 9, 2017*

Resolution #1

Motion to approve the minutes of the Board of Directors Meeting for April 28, 2017 and June 9, 2017.

b. Position Descriptions*

Resolution #2

Motion to approve the position descriptions for Managing Director of Marketing and Director of Residential Programs, Multifamily

c. Financial Statements for April 2017

d. Interest Rate Swap Contract of SL2

e. Acknowledgement and Recognition

Commissioner Smith recognized and thanked Norma Glover for her service. Bryan Garcia also recognized Norma Glover for her service. He also discussed the upcoming event, The Future of Clean Energy in Connecticut. Norma Glover thanked the Board. John Harrity presented Norma Glover with a plaque and also thanked her for her service.

4. Board of Directors Strategic Discussions

Bryan Garcia provided an overview and introduced Ken Gillingham and Helle Gronli to discuss Solarize Your Community and Renewable Thermal Technologies.

a. Solarize Your Community

Ken Gillingham provided an overview of Solarize Your Community. He discussed the partnership that Yale and the Green Bank share with several other partners. He explained the study that they have been doing. He stated that they have determined that it appears to be neighbor affects that is pushing Solarize. He discussed the experiments that they have been doing to test the different hypotheses about what works best.

Ken Gillingham went over a few different hypotheses that they tried. He discussed the options of two or three installers as opposed to one. He also discussed a shorter campaign, along with select towns needing to apply to join and removing group pricing. He stated that in the Solarize towns prices have become lower and adoptions have increased. He stated that prior to the campaign, solar prices were stagnant and during the campaign, there was approximately a 20% price drop.

Ken Gillingham discussed the survey results from those people surveyed, that adopted solar, and those that did not. He stated that group pricing was not essential for the success of the program.

Ken Gillingham stated that they are working on SEEDS II, for additional research on LMI. Gina McCarthy questioned what is considered high value solar. Ken stated that they determine where the grid is most congested or where it is in the most need of an upgrade. Commissioner Klee questioned if it is possible to see if the baseline has been moving relative to the non-Solarize states. He wanted to know if the baseline in CT has moved up because of Solarize. Ken stated that there has been some evidence that yes, it has. He stated that he cannot say for sure, but there is some evidence of spill over to other communities. He stated that the market has grown dramatically, and prices have continued to come down.

Norma Glover questioned how CT compares to other New England states. Ken Gillingham stated that MA has a stronger market than CT with much richer incentives, and he is unsure of RI. He stated that parts of NY are similar to CT. Norma Glover questioned if they are looking at the benefits that the states offer for potential. Ken Gillingham stated that they are referring to potential market.

Bettina Bronisz stated that it appears that radio and television have very low follow through. Ken Gillingham stated that the Solarize is very much community based, and that radio and television might not reach those communities.

Gina McCarthy questioned if they are looking at only homeowner installation or if they are going to look at multifamily, as well. Ken Gillingham stated that that is one of the largest challenges. He stated that they are looking at options to make it easier.

Bryan Garcia questioned the research based strategy in electric vehicles and renewable heating and cooling. Ken Gillingham stated that electric vehicles are visible, and visibility matters. He stated that a key take away, is to leverage pathways in town events and Solar Ambassadors.

John Harrity stated that when it comes to those in apartments, there needs to be clear explanations on how they can do Solar. He stated that they should utilize other community members, such as churches to get the word out.

Commissioner Smith questioned if they are looking at other projects other than Solarize. Ken Gillingham stated that they are looking at other types of messaging that are not Solarize.

Bryan Garcia stated that Solarize has been privatized. He stated that the Green Bank is pulling back. He stated that contractors pay Smart Power for leads and customers.

Matt Ranelli questioned if there is a model to look at people who have social capital in the community. Ken Gillingham stated that social capital is critical in these types of models. Kerry O'Neill stated that they are leveraging the churches that have installed solar, and that they will be laying the groundwork over the next few months.

b. Renewable Thermal Technologies in Connecticut

Helle Gronli provided a high-level overview of the Renewable Thermal Technologies for CT. She stated that heating and cooling of buildings in CT represents 30% of Greenhouse Gases. She stated that they started with how large the market is. She stated that they defined seven different customer categories. She stated that they utilized students to do interviews with consumers, to determine what is driving the market and what the barriers might be. She stated that further studies focused on commercial buildings.

Helle Gronli discussed the economic results. She stated that Solar Water Heating is competitive, but the results are sensitive to fuel costs. Bert Hunter questioned if Propane was considered. Helle stated that yes, you get the same results.

Helle Gronli discussed the Greenhouse Gas emissions from buildings. She discussed the sensitivity of the analysis. She stated that reducing the initial cost by 25% could be done through a Solarize type of campaign. She stated that they also tried combining with Solar PV. She stated that this could represent lower prices than the grid electricity.

Helle Gronli discussed the Cash Flow Analysis. She discussed replacing conventional electricity with GSHP. She explained that they could reduce the initial costs utilizing Solar Thermal, as well as, subsidies and tax credits.

Helle Gronli discussed the barriers, which are, high upfront costs and access to capital financing. Brian Farnen stated that another barrier is the lack of a mature, robust contractor base. Helle stated that the conclusions are to reduce costs, implement market inventions, and improve, operational cash flow, and trust and awareness.

Bryan Garcia stated that the Comprehensive Energy Strategy will come out in July. He stated that renewable heating and cooling will likely be an element of that strategy.

Gina McCarthy stated that this issue must be addressed. John Harrity commented that heating the home is a particular concern in New England.

5. Committee Recommendations and Updates

a. Budget & Operations Committee

Commissioner Klee discussed the Budget and Operations. He stated that they have a similar budget to last year. He stated that they are expecting similar revenues. He stated that they are leveraging their government funds to bring in private capital.

Eric Shrago stated that they are staying pretty much flat in terms of expenses. He stated that they plan to deploy at least 52.5 MW's of clean energy with an investment of $217 million. He stated that 80% of the investment is in loans.

Eric Shrago stated that Targets and Infrastructure will remain flat. He stated that residential they are looking at about a 15% increase on units, not on dollars. He stated that will be an increase in C-PACE on the CI&I side.

Eric Shrago discussed the investment budget. He stated that they expect over $56 million in loans, over double of the budget of FY17. He stated that the largest loan is into a third Solar Lease Fund. He stated that they are looking to increase the credit enhancements. He stated that RSIP is flat. Revenues also aiming to be flat year on year. He stated that they are expecting less income from RGGI. He stated that they should be able to start selling SHREC's. He stated that expenses are likely to be flat. He stated that there will be some large percentage shifts, due to reallocating from different expense lines. Commissioner Klee stated that a flat budget makes a whole lot of sense right now.

Eric Shrago stated that there will be no cost of living adjustment. He stated that staff is proposing a merit pool that is capped at 3% for the highest performers for FY18. Bettina Bronisz reminded the Board that State employees are not getting any merit increases nor are they getting any COLAs and they likely will not for several more years. He stated that the resolution seeks Board approval (as opposed to Chairperson approval) for certain strategic partners. He stated that most of them have been through the RFP process and all have gone through an RFP when required by our operating procedures. He discussed research and development expenditures, stating that they are continuing to innovate.

Reed Hundt had questions on the CGB Program Loans citing large increases for some of the loans and the wide range of expected volume. Commissioner Smith requested that they walk through the numbers. On the large range of expected volume, Mackey Dykes said this resulted from the SBEA program which could, in and of itself, result in approximately $30 million of volume. If this program does not come through – this would result in volume being at the lower end of the expected range. As another example, Bert Hunter stated that in the

FY17 budget for commercial solar transactions, the Green Bank used a financing facility under SL2 to fund a significant portion of these installations. However for FY18, he stated that under SL3 the Green Bank will be providing the leverage instead of going to a 3rd party capital provider – resulting in higher volume on the Green Bank's balance sheet, which staff expects to refinance after the transactions are built, but not necessarily until after FY18 closes. Mr. Hundt suggested that they've chosen a more expensive method. Bryan Garcia referred him to the actual budget breakdown. Commissioner Smith stated that when you look at the Capital Deployed, it's a short-term use of the capital, and it's going to be replaced with outside money. Eric Shrago stated that the loans that they're making they will be keeping a larger portion. Commissioner Klee stated that they've looked at different programs and what it means in terms of projects.

i. Approval of FY 2017 Budget and Targets

Upon a motion made by Commissioner Klee, and seconded by Gina McCarthy, the budget passed.

Resolution #3

WHEREAS, on June 9th, 2017 the Connecticut Green Bank Budget and Operations Committee recommended that the Green Bank Board of Directors approve the Fiscal Year 2017 Budget and Targets; and

WHEREAS, on June 9th, 2017 the Connecticut Green Bank Budget and Operations Committee recommended that the Connecticut Green Bank Board of Directors authorize Connecticut Green Bank staff to extend the professional services agreements (PSAs) currently in place or adopt new PSAs with:

I. Adnet Technologies, LLC
II. Archaeological & Historical Services, Inc.
III. Clean Power Research, LLC
IV. Cortland Capital Market Services LLC
V. EnergySage Inc.
VI. Forsyth Street Advisors, LLC
VII. Locus Energy LLC
VIII. METIS, Financial Network, Inc.
IX. New Ecology, Inc.
X. OpFocus, Inc.
XI. Opinion Dynamics Corporation
XII. Paul Horowitz
XIII. SmartPower Inc.
XIV. Strategic Environmental Associates, Inc.
XV. Sustainable Real Estate Solutions, Inc.
XVI. The Connecticut Housing Coalition, Inc.
XVII. Wegowise, Inc.

For fiscal year 2018 with the amounts of each PSA not to exceed the applicable approved budget line item.

NOW, therefor be it:

RESOLVED, that the Connecticut Green Bank Board of Directors hereby approves: (1) the FY 2018 Budget and Targets and, (2) the seventeen PSAs listed above, as both items were recommended by the Connecticut Green Bank Budget and Operations Committee.

Commissioner Smith excused herself from the meeting and Norma Glover chaired the balance of the meeting.

6. Staff Transaction Recommendations and Updates

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

i. C-PACE Subsidiary

Mackey Dykes provided background on the request for approval to create a C-PACE special purpose entity. He explained that the purpose is to achieve specific goals without exposing the Green Bank's full balance sheet. He explained that it is similar to the others that they have created.

Norma Glover questioned if there was a positive feeling with the direction that the program is heading. Mackey Dykes stated that he feels very good about the fact that other capital providers are coming into CT. He stated that's he's happy that it's growing.

Bettina Bronisz questioned how many special purpose entities that Green Bank currently has. George Bellas stated that they currently have six, and this will make seven. He stated that they will be close to nine when they are finished. He stated that it adds another level of transactions. To a point made that banks should want to provide financing for a pool of loans that the SPE could assemble, Bert Hunter stated that is true, since part of the struggle that commercial banks have is "know your customer" requirements. He stated that since PACE stays on the property no matter who the customer is, this creates a problem for the banks as they are unable to determine with certainty who their borrower will be in the future – as the property could change ownership several times over the life of the financing. He stated that if those customers are pooled into an entity, the bank can then lend to the pool – with the SPE being the borrower, not the underlying property owners.

Reed Hundt questioned if the new SPE would have a different relationship with Hannon Armstrong. Mackey Dykes stated that the creation of the SPE would not alter the relationship or terms with Hannon Armstrong. Brian Farnen clarified that the Green Bank will primarily benefit from the establishment of the SPE. Mr. Hundt noted that staff should express in a hard dollar amount what the benefit of the SPE is expected to be to the Green Bank. Mackey Dykes and Bert Hunter expressed the difficulty of making such an assessment, but would discuss this point further with Mr. Hundt following the meeting.

Upon a motion made by Betsy Crum, and seconded by Gina McCarthy, Resolution #4 passed unanimously.

Resolution #4

WHEREAS, in its various programs and private-public partnerships, Green Bank has successfully utilized special purpose entities ("SPEs") to facilitate private capital investment in certain program; and

WHEREAS, the Green Bank intends to create a new special purpose entity for use in the Commercial Property Assessed Clean Energy Program ("C-PACE") to, among other things, originate, aggregate and warehouse transaction before such transactions are sold/assigned into an existing or future C-PACE private capital fund.

NOW, therefore be it:

RESOLVED, that the Green Bank Board of Directors ("Board") authorizes the President of the Green Bank and any other duly authorized officer of the Green Bank, to create a special purpose entity for the limited purpose outline herein as well as that certain memorandum date June 16, 2017 which has been submitted to the Board; and

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

ii. C-PACE Transaction – Stamford

Mackey Dykes discussed the Stamford C-PACE Transaction. He stated that it is a typical project, eligible for Energy on the Line Program. He stated that it is a 20-year loan at a 6% interest rate.

Upon a motion made by John Harrity, and seconded by, Norma Glover, Resolution #5 passed unanimously.

Resolution #5

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; and

WHEREAS, the Green Bank seeks to provide a $413,981 construction and (potentially) term loan under the C-PACE program to Glenbrook Industrial Park LLC, the building owner of 650 Glenbrook Road, Stamford, 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.

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 June 15, 2017, 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.

iii. C-PACE Transaction – Farmington

Mackey Dykes discussed the Farmington C-PACE Transaction. He stated that it is a slightly elevated loan to value. He explained that it is typical to not exceed 80% LTV. He stated that the finance team is comfortable with this transaction. He explained that this will remain on their balance sheet for the life of the loan.

Upon a motion made by John Harrity, and seconded by Gina McCarthy, Resolution #6 passed unanimously.

Resolution #6

[Forthcoming on Monday, June 19th]

b. **Residential Sector Program Recommendations**

i. Health and Safety Partnership with DEEP

Kim Stevenson provided an overview on the Health and Safety Partnership with DEEP. She stated that they established an agreement to receive the loan funds. She stated that they are asking the Board to approved the use of those funds.

Kim Stevenson discussed Multifamily use of funds, stating that they are amending the guidelines of the Catalyst Fund to incorporate dollars. She stated that they are looking to have up to 25% of the funds able to be used for grants. She stated that any projects using the funds are subject to the contracting requirements of the state.

Kerry O'Neill stated that there has been a bit of friction with wanting to move on the use of the funds for Single Family as soon as possible. She stated that they need to work with DEEP on that. She stated that they do not do the direct lending on the Single Family side, that there is only $1.5 million available, which will quickly be used by multifamily owners, and that the single family market will take extensive study to develop a program for delivering funds through a financing program. Commissioner Klee stated that this is a great opportunity to use the RGGI Funds.

Upon a motion made by Betsy Crum, and seconded by, Gina McCarthy, Resolution #7 passed unanimously.

Resolution #7

WHEREAS, the Connecticut Green Bank ("Green Bank") actively seeks to deploy private capital investment toward clean energy improvements in the state's multifamily housing which in some cases have preexisting health and safety issues that are preventing opportunities for clean energy improvements to be made;

WHEREAS, the definition of "clean energy" per the Green Bank's enabling statute set forth at C.G.S. 16-45n includes renewable energy technologies as well as "financing of energy efficiency projects," but does not include health and safety;

WHEREAS, the Green Bank's enabling statute provides that the Green Bank may make "expenditures that promote investment in clean energy in accordance with a comprehensive plan developed by it to foster the growth, development, and commercialization of clean energy sources," and that "such expenditures may include, but not be limited to…the implementation of the plan developed pursuant to … this section";

WHEREAS, the Green Bank Comprehensive Plan approved by the Board of Directors on July 22, 2016 acknowledges the need to mitigate health and safety issues that act as barriers to realizing clean energy investments opportunities; the Comprehensive Plan also notes that the goals of the Green Bank are to support the implementation of Connecticut's clean energy policies be they statutory (i.e., PA 15-194), planning (i.e., Comprehensive Energy Strategy, Integrated Resources Plan), or regulatory in nature;

WHEREAS, the Connecticut Department of Energy and Environmental Protection (DEEP's) 2013 Comprehensive Energy Strategy and the 2014 report of the Connecticut Department of Public Health highlights a funding gap for health and safety remediation as a significant barrier to energy upgrades in the state.

WHEREAS, Green Bank staff has developed expertise and programmatic capacity in deploying funds to remove health and safety barriers to realize clean energy improvements at multifamily properties consistent with the Green Bank's enabling statute through its current multifamily programs and program partnerships;

WHEREAS, Green Bank Deployment Committee, on May 30, 2017, approved the receipt and administration of $1.5 million in Regional Greenhouse Gas Initiative funds from DEEP for the purpose of funding remediation of energy related health and safety barriers in residential housing through a program titled EnergizeCT Health and Safety Revolving Loan Fund ("H&S Fund");

WHEREAS, Green Bank staff has developed, submitted to and received approval of Health and Safety Fund guidelines, policies and procedures from DEEP, as required by DEEP prior to distribution of funds, per the executed Agreement dated June 1, 2017 between Green Bank and DEEP;

NOW, therefore be it:

RESOLVED, that the Board authorizes administration of the Catalyst Fund Pilot Program as amended to incorporate Health and Safety Fund conditions consistent with the guidelines and memorandum dated June 23, 2017 and associated exhibits submitted to the Board; 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 affect the above-mentioned legal instruments.

7. Other Business

Bryan Garcia provided an update on the benefits of bringing solar to CT.

8. Adjourn

Upon a motion made by John Harrity, and seconded by, Gina McCarthy, the Board of Directors Meeting was adjourned at 11:18 a.m.

Respectfully Submitted,

_____

Catherine Smith, Chairperson

Comprehensive Plan

July 2016

Revised July 2017

Table of Contents

1. Executive Summary

In June of 2011, in a near unanimous bipartisan manner, the Governor and the General Assembly set clean energy policy on a new course in Connecticut.[1] A major piece of that public policy was the creation of the nation's first "green bank" – the Connecticut Green Bank ("the "Green Bank"). Over the past couple of years, the Green Bank has become a model for other states – as well as counties and countries – that are seeking to use public resources in a smarter way to attract more private capital investment in the acceleration and deployment of clean energy in our economies. Approaching $1 billion of capital mobilized in clean energy deployment in Connecticut in its first five years, the Green Bank is delivering on its vision:

> *To lead the green bank movement by accelerating private capital investment in clean energy deployment for Connecticut to achieve economic prosperity, create jobs, promoted energy security, and address climate change.*

Experts suggest that an investment gap of $1 trillion a year – or the so called "clean trillion" – exists until 2030 for green infrastructure growth to address important environmental challenges such as global climate change.[2] The emergence of "Cli-Fi" (or climate finance) in an Intergovernmental Panel on Climate Change (IPCC) report,[3] acknowledges the scale of investment and finance needed to transition electric power generation technologies to a global low carbon economy at $360 billion a year in order to stay within the two-degree Celsius safety zone. The Center for American Progress estimates that the U.S. needs at least $200 billion in renewable energy and energy efficiency investment annually for 20 years to reduce carbon emissions and avert climate disaster.[4] Whatever the level of investment is, we know that it is substantial in order to achieve our national and global priorities, and that repercussions for not addressing them can be felt locally here in Connecticut.

Although this global capital challenge seems daunting, believe it or not, Connecticut has an important role to play in the grand scheme of things. In a recent economic analysis by FiveThirtyEight.com of metropolitan areas in the United States,[5] the cities of New Haven (#1) and Hartford (#3) are the most representative of a "normal America" based on the following demographic indicators – age, education attainment, race and ethnicity. The impact Connecticut can make to help ~~customers~~citizens invest in clean energy will advance our clean energy economy, while serving as an example for the rest of the country. The Natural Resources Defense Council and the Coalition for Green Capital estimate that based on Connecticut's market size, growth rate, and public-private leverage ratio, a green bank in every state

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[1] Public Act 11-80 "An Act Concerning the Establishment of the Connecticut Department of Energy and Environmental Protection and Planning for Connecticut's Energy Future"

[2] Kaminker, C. et al. (2013), "Institutional Investors and Green Infrastructure Investments: Selected Case Studies", *OECD Working Papers on Finance, Insurance and Private Pensions*, No. 35, OECD Publishing. *Note: The authors define "infrastructure" as energy, power, road, rail, water, waste, buildings and agriculture systems.*

[3] *Climate Change 2014: Mitigation of Climate Change* by the IPCC in Chapter 16 "Cross-Cutting Investment and Finance Issues" (April 12, 2014).

[4] "Green Growth: A U.S. Program for Controlling Climate Change and Expanding Job Opportunities" by the Center for American Progress (September 2014)

[5] 'Normal America' Is Not a Small Town of White People by Jed Kolko of FiveThiryEight.com (April 28, 2016)

across the country would yield $200 billion a year in annual investment in clean energy within five years – with 90% of the funds coming from private capital sources and all public contributions being returned over a 10- to 20-year period. Currently, the Green Bank mobilizes clean energy investment of approximately $100 per person per year (with households contributing about $10 to the Green Bank).[6] In order to scale-up investment to achieve the target identified by the Center for American Progress, the Green Bank needs to mobilize 6 to 7 times more investment in Connecticut's clean energy economy – or the equivalent of $2.4 billion a year.

President Obama said it best:

> *"We've got public banks like Connecticut's Green Bank and private banks like Goldman Sachs ready to invest billions of dollars in renewable energy."*[7]

The Green Bank ~~expects to~~ issued its first green bonds in FY 2017. As a tool to raise capital to support the clean energy policies of Connecticut, green bonds bring great promise for attracting more private capital investment in the state. There have been nearly $17 billion of green bonds issued in 2016 YTD – with about three-quarters of those funds being invested in each of the following three areas of projects – energy efficiency, renewable energy, and clean transportation. The Green Bank will be utilizing its bonding capability and capacity to raise funds enabling it to increase its impact by blending its financing with private capital investors.[8]

Beyond its current areas of investment, there are several emerging areas of opportunity for the Green Bank, including:

- Clean alternative fuel vehicles and infrastructure;
- Renewable thermal technologies; and
- Grid modernization

If one simply looks at Connecticut's greenhouse gas emissions inventory and the public policy goal of reducing emissions to 80% below 2001 levels by 2050, one can see that a significant level of investment is going to be needed in the fuels we use for transportation (i.e., about 40% of emissions) and how we heat our buildings (i.e., nearly 40% of emissions).[9] This requires looking at the electrification of vehicles (i.e., electric and hydrogen fueled passenger vehicles and busses) and heating of buildings (i.e., deploying renewable thermal technologies in our homes, businesses, and institutions) – by using emission-free energy sources like solar PV and lower emission generation technologies like fuel cells. In order to secure renewable energy's place in the future, advances in battery storage and other distributed energy resources will be required to modernize the grid and seamlessly integrate cleaner, cheaper, and more reliable source of energy into our infrastructure.

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[6] Through a 1 mill surcharge called the Clean Energy Fund.
[7] President Barack Obama in a speech on American Energy on May 9, 2014.
[8] *Trending: Blending* in The Economist (April 23, 2016)
[9] Connecticut Greenhouse Gas Emissions Inventory 2012 – Executive Summary by the Department of Energy and Environmental Protection.

The future of clean energy is bright in Connecticut! However, we need to ensure that clean energy is accessible and affordable to everyone. Low to moderate income families in Connecticut are struggling to manage their energy costs, as variable energy expenses that reduce household income can strain families that are struggling to make ends meet. The aging of residential buildings in Connecticut is leading to health and safety concerns as a result of asbestos, mold, lead, knob and tube wiring, and other adverse factors. In its efforts to mobilize more investment in clean energy, the Green Bank must ensure that clean energy is accessible and affordable to everyone, while at the same time coordinating with other stakeholders to ameliorate health and safety issues along the way.

Within this Comprehensive Plan (the "Comp Plan") is a detailed overview of the ~~Connecticut Green~~Green Bank, including various clean energy public policies in Connecticut supporting clean energy market development. As we begin to pursue the issuance of green bonds, we have included a new and succinct summary of our Evaluation Framework in the Comp Plan which describes the logic behind the green bank model. We delve into the integral financing and marketing efforts of the Green Bank from capitalization and customer acquisition to collaboration and learning. The structure of our organization and the programs and products that we offer is built around three market segments: infrastructure (i.e., behind the meter and grid tied solutions); residential (i.e., single family and multifamily); and commercial, industrial, and institutional. Within each market segment, the reader can get a better sense of the public policy drivers, market potential, product offerings, and performance indicators and targets. And lastly, we have included a new Research and Development (R&D) section in this Comp Plan to highlight emerging market opportunities.

This Comp Plan is the formal document required by statute to guide the decisions made by the Board of Directors and staff of the ~~Connecticut~~ Green Bank. As you will read, the ~~Connecticut~~ Green Bank will continue its efforts to accelerate the growth of clean energy deployment in Connecticut and lead the green bank movement across the country and around the world.

2. Organizational Overview

The ~~Connecticut Green~~Green Bank ~~("the Green Bank")~~[10] was established 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~~Green Bank leverages public and private funds to drive investment and scale-up clean energy deployment in Connecticut.

The ~~Connecticut Green~~Green Bank's statutory purposes are:

- To develop programs to finance and otherwise support clean energy investment in residential, municipal, small business and larger commercial projects and such other programs as the Green Bank may determine;

- To support financing or other expenditures that promote investment in clean energy sources to foster the growth, development and commercialization of clean energy sources and related enterprises; and

- To stimulate demand for clean energy and the deployment of clean energy sources within the state that serves end-use customers in the state.

The Green Bank's purposes are codified in Section 16-245n(d)(1) of the General Statutes of Connecticut and restated in the Green Bank's Board approved Resolution of Purposes.

2.1 Vision

To lead the green bank movement by accelerating private capital investment in clean energy deployment for Connecticut to achieve economic prosperity, create jobs, promote energy security and address climate change.

2.2 Mission

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.

2.3 Goals

To achieve its vision and mission, the ~~Connecticut Green~~Green Bank has established the following four goals:

1. To attract and deploy private capital investment to finance the clean energy policy goals for Connecticut.
2. To leverage limited public funds to attract multiples of private capital investment while returning ~~and~~ by reinvesting public funds in clean energy deployment over time.

[10] 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.

3. To develop and implement strategies that bring down the cost of clean energy in order to make it more accessible and affordable to customers.

4. To support affordable and healthy buildings in low-to moderate income and distressed communities by reducing the energy burden and addressing health and safety issues in their homes, businesses, and institutions.

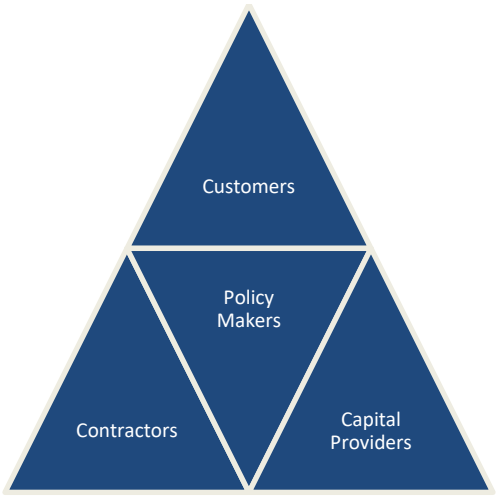
These goals support the implementation of Connecticut's clean energy policies be they statutory (i.e., Public Act 15-194, Public Act 13-298), planning (i.e., Comprehensive Energy Strategy, Integrated Resources Plan), or regulatory in nature.

2.4 Stakeholders

The ~~Connecticut Green~~Green Bank identifies four (4) primary stakeholders (see Figure 1) that are the focus of its programs, products, and services, including:

- Customers
- Capital Providers
- Contractors
- Policy-Makers

Figure 1. Stakeholders - The Three C's (Capital Providers, ~~Consumers~~Customers, and Contractors) and Policy-Makers



Customers

A key Green Bank objective is to eliminate the financial barriers to clean energy investment faced by customers by facilitating the transition to innovative low-cost financing of clean energy deployment using private capital. Customers of all types (i.e., homeowners, renters, businesses, not-for-profits) seek cheaper, cleaner and more reliable sources of energy, yet often face informational gaps and financial challenges in their efforts to acquire these energy resources. Contractors must be able to provide customers with cost-effective and comprehensive (i.e., "deeper") energy solutions while capital providers must offer customers immediate cash flow positive returns by financing their investments. The Green Bank plays an important role in bringing customers and contractors together by providing

them with easy access to affordable capital so that they can implement clean energy solutions for their homes, businesses, or institutions.

Capital Providers
As a key goal is to attract private capital to finance the clean energy goals for Connecticut and to develop and implement strategies that bring down the costs of clean energy to make it more accessible and affordable to consumers, working in partnerships with capital providers is vital to the success of the green bank model. There are local (e.g., community banks and credit unions), state, regional, and national banks, as well as equity, tax equity, and other institutional, foundation, and crowd-sourced investors that seek to invest in clean energy projects in Connecticut. The Green Bank's role is to use the limited public funds it receives and leverage it to attract more private capital investment in clean energy deployment in Connecticut. The Green Bank provides several channels for capital providers to get into clean energy investing in Connecticut while earning a reasonable rate of return.

Contractors
Working in partnership with qualified and certified contractors is also vital to the success of the green bank model, for the same reason as noted above. Qualified contractors (including the full gamut from smaller and more local businesses to the largest of energy services companies, or "ESCOs", that operate on a regional, national and even global scale) must have access to working capital to support the growth and operations of their businesses – including creating new jobs – while providing quality, timely, cost-effective and comprehensive clean energy solutions and financing options for customers.

Policy-Makers
The ~~Connecticut Green~~Green Bank was established by policy-makers to leverage public funds to attract more private capital investment to scale-up clean energy deployment in Connecticut. Through its Board of Directors, the Green Bank has established this Comprehensive Plan that will guide the implementation of the objectives of policy-makers, including the Department of Energy and Environmental Protection (DEEP), Department of Economic and Community Development (DECD), and other state agencies, to deploy more clean energy at a faster pace while more efficiently managing public funds and attracting significantly more private investment. As the implementer of the Conservation & Load Management Plan (C&LM Plan), the Electric Distribution Companies (EDCs) and Natural Gas Companies (LDCs), the Energy Efficiency Board (EEB) and Electric Distribution Companies (EDCs) are important stakeholders for the Green Bank as well, including through the Joint EEB-~~Connecticut Green~~Green Bank Committee.

2.5 Governance
Pursuant to Section 16-245n of the General Statutes of Connecticut, the powers of the ~~Connecticut Green~~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 (see Table 1).

Table 1. Board of Directors of the Connecticut Green Bank

Position	Status	Voting	Name	Organization
State Treasurer (or designee)	Ex Officio	Yes	Bettina ~~Ferguson~~Bronisz	Treasurer's Office
Commissioner of DEEP[11] (or designee)	Ex Officio	Yes	Robert Klee[12]	DEEP
Commissioner of DECD[13] (or designee)	Ex Officio	Yes	Catherine Smith[14]	DECD
Residential or Low Income Group	Appointed	Yes	Pat Wrice (Ret~~s~~) Betsy Crum	Operation Fuel Women's Institute for Housing & Economic Development
Investment Fund Management	Appointed	Yes	Norma Glover (Ret)	NJG Associates
Environmental Organization	Appointed	Yes	Matthew Ranelli[15]	Shipman & Goodwin
Finance or Deployment of Renewable Energy	Appointed	Yes	Thomas Flynn	Environmental Data Resources
Finance of Renewable Energy	Appointed	Yes	Reed Hundt[16]	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 (Ret) Gina McCarthy	University of Connecticut Former EPA Administrator
President of the Green Bank	Ex Officio (non-voting)	No	Bryan Garcia	Connecticut Green Bank
Board of Connecticut Innovations[17]	Ex Officio (non-voting)	No	(unfilled)	(unfilled)

There are four (4) committees of the Board of Directors of the ~~Connecticut Green~~Green Bank, including:

- Audit, Compliance and Governance
- Budget and Operations
- Deployment
- Joint Committee of the Energy Efficiency Board and the ~~Connecticut Green~~Green Bank[18]

To support the Joint Committee of the Energy Efficiency Board and the Connecticut Green Bank, the following is a principal statement to guide its activities:

The Energy Efficiency Board and the Connecticut Green Bank have a shared goal to implement state energy policy throughout all sectors and populations of Connecticut with continuous innovation towards greater leveraging of ratepayer funds and a uniformly positive customer experience.

[11] Department of Energy and Environmental Protection
[12] Vice Chairperson of the Board of Directors and Chairperson of the Budget and Operations Committee
[13] Department of Economic and Community Development
[14] Chairperson of the Board of Directors
[15] Secretary of the Board of Directors and Chairperson of the Audit, Compliance and Governance Committee
[16] Chairperson of the Deployment Committee
[17] 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.
[18] Pursuant to Section 16-245m(d)(2) of the Connecticut General Statutes

~~In order to~~To expand the impact of Connecticut's energy efficiency programs, the ~~Connecticut Green~~Green Bank will continue to leverage public funds, including through the Connecticut Energy Efficiency Fund programs, to attract more private investment in the state through its financing programs.

The Board of Directors of the ~~Connecticut Green~~Green Bank is governed through enabling legislation, as well as by an Ethics Statement and Ethical Conduct Policy, Resolutions of Purposes, Bylaws, Joint Committee Bylaws, and Comprehensive Plan. All meetings, agendas, and materials of the Green Bank's Board of Directors and its Committees are publicly available on the organizations website.[19,20]

2.6 Organizational Structure

The organizational structure of the ~~Connecticut Green~~Green Bank is comprised of three parts (see Figure 2):

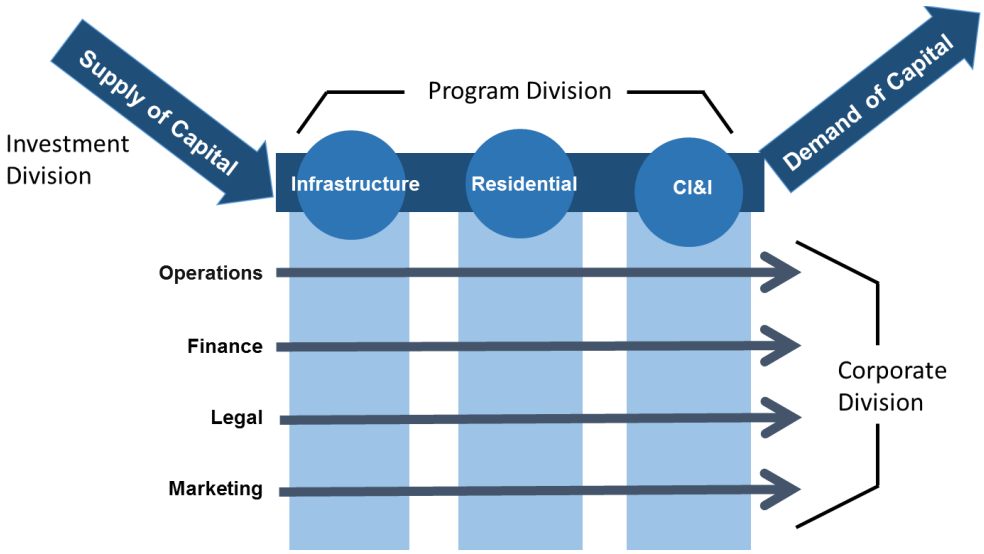
- **Investment Division** – this division is responsible for investing limited ratepayer and other public funds into the clean energy market while *attracting capital* to finance the clean energy policy goals for Connecticut, including the issuance of green bonds.

- **Program Division** – in collaboration with marketing, this division is responsible for *deploying capital* to meet the clean energy policy goals for Connecticut. There are three (3) program divisions –Residential (including single family and multifamily), Commercial, Industrial, and Institutional (i.e., including Municipal, Universities, Schools & Hospitals ("MUSH")), and Infrastructure.

- **Corporate Division** – this division is responsible for providing administrative, accounting, legal, marketing and operational support services to the investment and program divisions, ~~including~~ as well as ~~accounting, legal, marketing, and operational support~~the President and C.E.O. to help ~~them~~ the organization meet ~~their~~ its goals.

[19] http://www.ctgreenbank.com/about-us/board-member-resources/connecticut-grboard-meetings/
[20] http://www.ctgreenbank.com/about-us/board-member-resources/connecticut-grittee-meetings/

Figure 2. Organizational Structure of the Connecticut Green Bank



The Green Bank staff is attentive to the needs of its stakeholders, committed to the vision and mission of the organization, and conducts itself in a collaborative and professional manner that demonstrates its knowledge and leadership of clean energy policy, finance, marketing and technology.

An Employee Handbook and Operating Procedures have 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.

2.7 Comprehensive Annual Financial Report (CAFR)

A Comprehensive Annual Financial Report (CAFR) is a set of government financing statements that includes the financial report of a state, municipal or other government entity that complies with the accounting requirements promulgated by the Governmental Accounting Standards Board (GASB). GASB provides standards for the content of a CAFR in its annually updated publication *Codification of Governmental Accounting and Financial Reporting Standards*. A CAFR is compiled by a public agency's accounting staff and audited by an external American Institute of Certified Public Accountants (AICPA) certified accounting firm utilizing GASB requirements. It is composed of three sections – Introductory, Financial, and Statistical. The independent audit of the CAFR is not intended to include an assessment of the financial health of participating governments, but rather to ensure that users of their financial statements have the information they need to make those assessments themselves.[21] To date, the ~~Connecticut Green~~Green Bank has issued ~~two~~three CAFR's, including:

- Fiscal Year Ended June 30, 2014 (Certificate of Achievement)
- Fiscal Year Ended June 30, 2015 (Certificate of Achievement)

[21] The Government Finance Officers Association (GFOA), founded in 1906, represents public finance officials throughout the United States and Canada. GFOA's mission is to enhance and promote the professional management of governmental financial resources by identifying, developing, and advancing fiscal strategies, policies, and practices for the public benefit. GFOA established the Certificate of Achievement for Excellent in Financial Reporting Program (CAFR Program) in 1945 to encourage and assist state and local governments to go beyond the minimum requirements of generally accepted accounting principles to prepare comprehensive annual financial reports that evidence the spirit of transparency and full disclosure and then to recognize individual governments that succeed in achieving that goal.

- Fiscal Year Ended June 30, 2016 (Certificate of Achievement)

As the "gold standard" in government reporting, the CAFR is the mechanism the ~~Connecticut Green~~Green Bank uses to report its fiscal year financial and investment performance – including societal benefits – to its stakeholders.

Beyond the CAFR, the annual reports of the ~~Connecticut Green~~Green Bank are compiled by the marketing staff and include consolidated financial statement information and narratives of various program achievements in a condensed format that can be widely distributed. To date, the Connecticut Green Bank has issued five~~four~~ annual reports, including:

- Fiscal Year 2012 Annual Report
- Fiscal Year 2013 Annual Report
- Fiscal Year 2014 Annual Report
- Fiscal Year 2015 Annual Report
- Fiscal Year 2016 Annual Report

3. Public Policy Overview

The ~~Connecticut Green~~Green Bank's role is to support the implementation of public policy on clean energy in Connecticut by attracting and deploying capital to finance the achievement of those goals. Over the course of the legislative history on clean energy in Connecticut and specifically the last decade, there have been significant public policies passed that guide the programs of the Green Bank, including, but not limited to:

- **Public Act 78-262** – "An Act Establishing a State Energy Policy" is Connecticut's original energy policy from 1978. The original energy policy declared the following matters as important and are the focus of the policy – engaging in energy conservation, energy efficiency, renewable energy deployment, energy diversification, reducing reliance on interruptible sources of energy, reducing energy costs, assuring that low-income households have essential energy services, public education and consumer awareness, and including financial and technical assistance.

- **Public Act 98-28** – "An Act Concerning Electric Restructuring," deregulated the generation component of the electric utility industry and opened it up to competition, established the Class I and Class II Renewable Portfolio Standards, and created the Conservation and Load Management (C&LM) Fund to be administered by the electric distribution companies (EDCs) and the Renewable Energy Investment Fund (later called Clean Energy Fund) to be administered by Connecticut Innovations (CI) (and later on by the ~~Connecticut Green~~Green Bank).

- **Public Act 05-01** – "An Act Concerning Energy Independence," established the Class III Renewable Portfolio Standard for CHP and energy efficiency, Project 100 requiring the electric distribution companies to sign long-term power purchase agreements for no less than 100 megawatts of Class I renewable energy sources developed in Connecticut, and the joint committee of the Energy Conservation Management Board (ECMB) and Connecticut Clean Energy Fund (CCEF) to coordinate on programs and activities.

- **Public Act 07-242** – "An Act Concerning Electricity and Energy Efficiency," expanded Project 100 to Project 150, requires the municipal utilities to submit a comprehensive report to the CCEF on the actions to promote renewable energy sources, and modifies the definition of clean energy for the CCEF. The act also addresses energy improvement districts, interconnection standards, property, sales, and use tax exemptions for clean energy, a definition for weatherization, and modifies the Class I and III RPS.

Definition of Clean Energy

Clean energy means solar photovoltaic energy, solar thermal, geothermal energy, wind, ocean thermal energy, wave or tidal energy, fuel cells, landfill gas, hydropower that meets the low-impact standards of the Low-Impact Hydropower Institute, hydrogen production and hydrogen conversion technologies, low emission advanced biomass conversion technologies, alternative fuels, used for electricity generation including ethanol, biodiesel or other fuel produced in Connecticut and derived from agricultural produce, food waste or waste vegetable oil, provided the Commissioner of Energy and Environmental Protection determines that such fuels provide net reductions in greenhouse gas emissions and fossil fuel consumption, usable electricity from combined heat and power systems with waste heat recovery systems, thermal storage systems, other energy resources and emerging technologies which have significant potential for commercialization and which do not involve the combustion of coal, petroleum or petroleum products, municipal solid waste or nuclear fission, financing of energy efficiency projects, projects that seek to deploy electric, electric hybrid, natural gas or alternative fuel vehicles and associated infrastructure, any related storage, distribution, manufacturing technologies or facilities and any Class I renewable energy source, as defined in section 16-1.

- **Public Act 11-80** – "An Act Concerning the Establishment of the Department of Energy and Environmental Protection and Planning for Connecticut's Energy Future," created the Department of Energy and Environmental Protection (DEEP) and charged it with energy and policy planning and regulation, including increasing the use of clean energy and technologies that support clean energy. The act also creates the ~~Connecticut Green~~Green Bank, sets energy reduction targets for state facilities of 20% by 2018, initiates a 3-year pilot anaerobic digester and combined heat and power program administered by the Green Bank, establishes a residential solar investment program administered by the Green Bank, and creates a zero-emission renewable energy credit (ZREC) and low-emission renewable energy credit (LREC) reverse auction program for long-term contracts administered by the EDCs.

- **Public Act 12-2** – "An Act Implementing Certain Provisions Concerning Government Administration," established the Commercial Property Assessed Clean Energy (C-PACE) Program to be administered by the ~~Connecticut Green~~Green Bank, modifies the definition of clean energy for the Green Bank, permits the Green Bank to issue up to $50 million in bonds backed by a special capital reserve fund (SCRF) to support bond financing for the Green Bank,[22] and clarifies the quasi-public status of the Green Bank.

- **Public Act 13-298** – "An Act Concerning Implementation of Connecticut's Comprehensive Energy Strategy," reinforces key findings from DEEP with regards to the implementation of the Comprehensive Energy Strategy (CES) and includes the Green Bank in numerous instances, including coordination with ECMB, implementation of community-based marketing campaign

[22] Sec. 161 of PA 12-2 of the June Special Session contains the SCRF bonding provisions.

pilots for natural gas conversions and energy efficiency, and the development and implementation of an on bill repayment program for residential customers using private capital. The act also makes important adjustments to the C-PACE program to support lender consent, further defines critical facilities for micro grid purposes, and clarifies language with respect to virtual net metering, sub-metering, and energy improvement district policy.

- **Public Act 14-94** – "An Act Concerning Connecticut's Recycling and Materials Management Strategy, the Underground Damage Prevention Program, and Revisions to Energy and Environmental Statutes," renames the Clean Energy Finance and Investment Authority to the ~~Connecticut Green~~Green Bank, allows micro grid projects as eligible for C-PACE financing, and provides cost recovery mechanism for the residential on bill repayment program. The bill also requires the Green Bank to conduct a study on residential property assessed clean energy (R-PACE), updated high performance building standards for state facilities and state funded construction, and authorized a limited liability company to be a thermal energy transportation company, regulated by PURA, for a district heating loop in Bridgeport which the Green Bank is involved in.

- **Public Act 15-1** – "An Act Authorizing and Adjusting Bonds of the State for Capital Improvements, Transportation and Other Purposes" increases, from $50 million to $100 million, the amount of bonds the Green Bank may issue that are backed by a special capital reserve fund (SCRF). It also allows electric companies to build, own, or operate demonstration projects under DEEP approval to investigate how distributed energy resources can be optimally integrated into the electric grid. The proposal must be complimentary to the existing ecosystem of programs.

- **Public Act 15-194** – "An Act Concerning the Encouragement of Local Economic Development and Access to Residential Renewable Energy" expands the state's residential solar PV deployment target from no less than 30 MW to no more than 300 MW under RSIP. Under the law, 15-year Solar Home Renewable Energy Credits (SHRECs) are generated from qualifying residential PV systems and owned by the Green Bank, which sells SHRECs to electric distribution companies under a master purchase agreement negotiated by the parties. The Green Bank may fund its incentive program using the proceeds of the sale, and the electric companies may seek cost recovery from the Public Utilities Regulatory Authority (PURA). Also, municipalities must prepare for more residential solar PV applications by incorporating these systems into their building permit application process.

- **Public Act 16-212** – "An Act Concerning Administration of the Connecticut Green Bank, the Priority of the Benefit Assessments Lien Under the Green Bank's Commercial Sustainable Energy Program and the Green Bank's Solar Home Renewable Energy Credit Program" makes changes to a variety of Green Bank statutes. It creates new, direct statutory authority for the Green Bank so that it no longer needs to derive powers through a statutory link to Connecticut Innovations, Inc.; in the process it removes a potential complication to financial transactions. It also clarifies electric distribution companies' purchase obligations for SHRECs, makes power purchase agreements eligible for RSIP incentives, and adjusts RSIP to only apply to the first 20 kW of installed solar PV. Lastly, it clarifies the C-PACE lienholder consent provisions.

These statutes comprise a majority of the public policies that seek to advance clean energy in Connecticut and fall within the sphere of the ~~Connecticut Green~~Green Bank.

Beyond these statutes, there are various planning documents as well as regulatory decisions that also serve to inform the clean energy policies of the state. The public policies outlined in the 2013 CES and the 2014 IRP developed by DEEP's approval of the 2016-2018 Electric and Natural Gas C&LM Plan, and

The Future of Residential Solar PV – Grid Modernization

There have been several recent developments in state and federal incentives for residential solar PV. With the passage of the SHREC policy in 2015, and subsequent revisions in 2016, incentives offered through the RSIP will continue to decline. With the extension of the federal ITC at the end of 2015, tax incentives will also continue to decline:

- **State**: The PA 15-194 SHREC policy phases out the RSIP through a declining block incentive structure, which must cease either by the end of 2022 or after 300 MW of deployment.
- **Federal**: The 30% Investment Tax Credit for residential and commercial projects runs through the end of 2019 before dropping to 26% in 2020 and 22% in 2021. It then drops permanently to 10% for commercial projects and 0% for residential projects.

The future of residential solar PV not only depends upon lowering installed costs – particularly "soft costs" from customer acquisition and permitting – and continuing to improve easier access to affordable private capital investment and financing, but it will also require sharing the benefits of behind-the-meter policy with the rest of those tied to the grid. Through various policy and technology approaches, including but not limited to rate structure and design (i.e., Time of Use Rates and demand charges) along with battery storage and smart inverters, residential solar PV systems can continue to deliver cost-effective benefits to households and the electric grid.

As the state continues its efforts to reduce GHG emissions to 80% below 2001 levels by 2050, the deployment of renewables both utility scale, and residential solar PV will help to further enable emission free transportation (e.g., EV) and deployment of renewable thermal technologies (e.g., air source heat pumps and ground source heat pumps).

their impact on the programs of the Green Bank, are highlighted within each of the three programmatic sectors below. The Green Bank also interplays with the administrators of the Conservation and Load Management Fund (i.e. Eversource Energy and Avangrid) and the Energy Efficiency Board through coordination of our staff as well as a Joint Committee to continue to work to harmonize programs and initiatives to support the implementation of public policy goals.

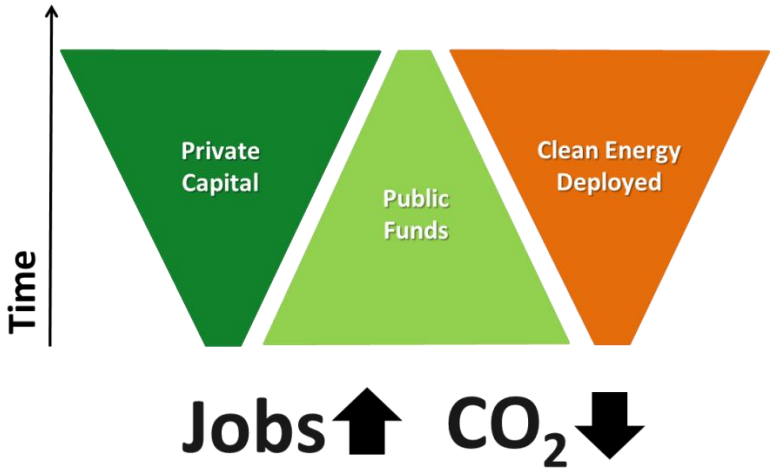
4. Evaluation Framework

The Evaluation Framework[23] of the ~~Connecticut Green~~Green Bank is intended as an internal Green Bank document to provide staff with the guidance on how to approach the evaluation and assessment of its programs' impacts. As the Framework document notes, "These impacts can broadly be viewed within two categories: 1) energy savings and clean energy production supported by the Green Bank programs and the resulting societal impacts or benefits arising from clean energy investments; and 2) market transformation impacts from Green Bank programs that lead to new opportunities to support clean energy projects, ultimately through the increase in private capital investment in clean energy."[24] It also recognizes the importance of continuously evaluating program impacts along the way (e.g., RSIP) that may be required by statute or requested by the Board.[25]

4.1 Green Bank Model

The high level, long term Green Bank financial market transformation objective – to rely increasingly on private capital to deploy increasing amounts of clean energy resources, increase jobs, and reduce greenhouse gas emissions – can be graphically represented in the following figure. This graphic also presents the green bank model of public-private partnerships which envisions public funds being leveraged more and more over time – for example, achieving a high leverage ratio for every $1 of public funds invested by the Green Bank attracting $10 of private capital investment. The Green Bank will also seek to recover the $1 of investment it makes over time through its financing offerings, including its cost of capital.

Figure 3. Green Bank Model - Public and Private Partnerships for Clean Energy Deployment

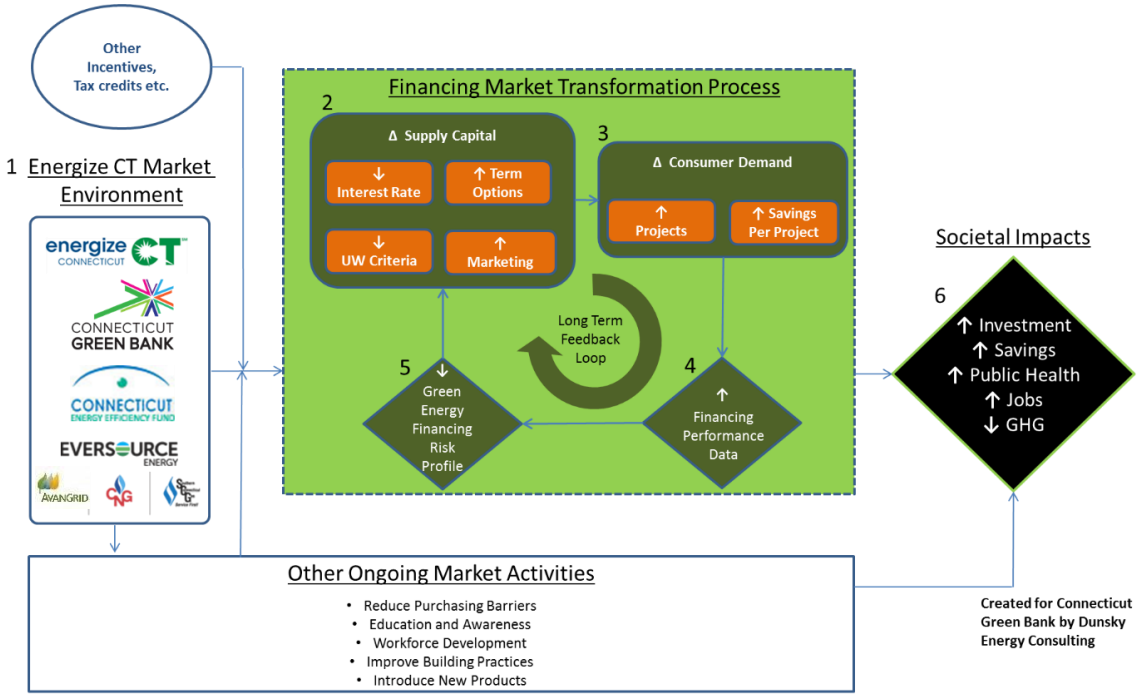


[23] Evaluation Framework – Assessing, Monitoring, and Reporting of Program Impacts and Processes (July 2016)
[24] Ibid. p. 5
[25] Cost-Effectiveness Assessment of the Residential Solar Investment Program (March 26, 2016) by Cadmus

4.2 Program Logic Model

A Program Logic Model (PLM) is a "graphical representation of the causal links between program activities, short-term responses to those activities among market actors and longer-term market effects. Logic models flow from decision-makers' hypotheses of how a program intervention strategy addresses barriers or market failures. A logic model can provide the basis for establishing metrics that indicate progress toward program goals and help program administrators, policymakers, and stakeholders assess the likely timeframe within which the theorized transformation might be realized."[26] Figure 5 below presents a generalized market transformation and impact logic model of the Green Bank's program activities that can be adapted to apply to any of the Green Bank's specific programs, in alignment with the market transformation and associated evaluation strategies are developed. The ~~Connecticut Green~~Green Bank recognizes that a more formalized and detailed structure is typical of industry logic models, and that this is simply a ~~high level~~high-level presentation. The PLM includes three parts: Energize CT Market Environment (including Other Ongoing Market Activities); Financing Market Transformation Process; and Societal Impacts.

Figure ~~4~~5. Connecticut Green Bank Program Logic Model



[26] State and Local Energy Efficiency Action Network (2015). *Making it Count: Understanding the Value of Regulated Energy Efficiency Financing Programs*. Prepared by: Chris Kramer, Emily Martin Fadrhonc, Charles Goldman, Steve Schiller, and Lisa Schwartz of Lawrence Berkeley National Laboratory (pp 53). click here

EnergizeCT Market Environment

Energize CT is an initiative of the ~~Connecticut Green~~Green Bank, the Connecticut Energy Efficiency Fund, the State (i.e., DEEP), 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.

Financing Market Transformation Process

The efforts of the ~~Connecticut Green~~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, such as supplying capital through financing offers, marketing clean energy financing, offsetting clean energy financing risk by backstopping loans, or sharing loan performance data.

- **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.

- **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.

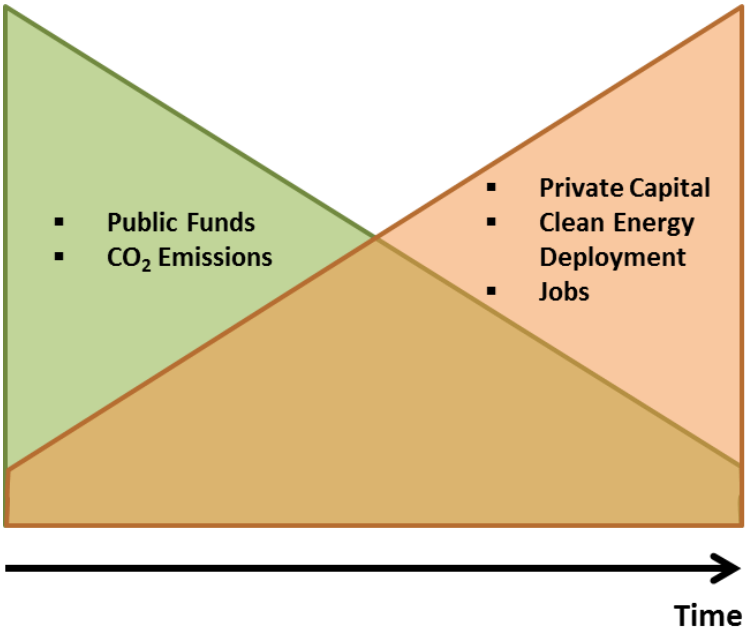
- **Financing Performance Data** – the ~~Connecticut Green~~Green Bank gathers and communicates the performance of clean energy financing either through its own programs or for other financing options in the market place.

- **Financing Risk Profile** – the ~~Connecticut Green~~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~~all 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/or (2) select projects for financing to reduce risks.

Societal Impacts

The efforts to accelerate and scale-up investment in clean energy deployment by the ~~Connecticut Green~~Green Bank lead to a myriad of societal impacts and benefits – among them economic development (e.g., job creation) and environmental protection (e.g., reduction of greenhouse gas emissions, improvement in public health, etc.). The transition to a cleaner energy Connecticut with the resulting societal benefits can be represented by the following figure:

Figure 6. Societal Benefits, Environmental Protection, and Economic Development ~~From~~ from a Cleaner Connecticut



For more information on Societal Impacts, visit the ~~Road Map~~Stategy and Impact page of the Connecticut Green Bank website.[27]

[27] http://www.ctgreenbank.com/strategy-impact/impact/ ~~http://www.ctgreenbank.com/road-map/~~

5. Financing

A major focus of the Green Bank is ~~the~~ to attract~~ion of~~ private capital to finance the clean energy policy goals ~~for~~ of Connecticut and ensure that customers and contractors are able to access and deploy cleaner, cheaper and more reliable sources of energy. Meeting these policy goals for the residential and commercial sectors alone, which do not begin to consider industrial, municipal or institutional potential, could require more than *$10 billion* in investment over the next 5-10 years. Thus, reaching these goals will require a combination of private and ratepayer capital sources. Through a combination of ratepayer incentives alongside increasing low cost and long-term private capital investment, the market for clean energy will expand and customers will pursue deeper measures. Recognizing that ratepayer resources are limited, achieving greater uptake of measures by providing customers with easy access to affordable capital will result in a larger impact. Attracting low cost and long-term private capital will make clean energy more accessible and affordable to customers, resulting in greater and accelerated deployment.

The green bank model, which works by designing and implementing innovative financing, security and collection structures, has already enabled Connecticut to use its limited ratepayer and taxpayer resources to attract hundreds of millions of dollars in private investment from local, regional and national sources. This model offers Connecticut and other states the most promising~~e~~ route to source the capital required to achieve ambitious public policy objectives and to transition the state to a sustainable clean energy marketplace driven by private sector investment. Acknowledging the importance of attracting more and more private capital to help Connecticut meet its clean energy policy goals, DEEP established a policy to ensure that subsidized financing products aren't unfairly preventing private capital from entering the market.

"The ratepayer-supported C&LM financing products should be positioned in the market in such a way that they do not undermine financing products offered by the private market."

Final Decision on the 2013-2015 C&LM Plan
Department of Energy and Environmental Protection
October 31, 2013

5.1 Ratepayer and State Funds

The ~~Connecticut Green~~Green Bank is capitalized through a number of public – state and ratepayer – sources.

Systems Benefit Charge

As its main source of capitalization, the Green Bank through C.G.S. § 16-245n(b) receives a 1 mill surcharge called the Clean Energy Fund from customers of Eversource Energy and Avangrid. The fund has been in existence since Connecticut deregulated its electric industry in the late 1990's. On average, the Clean Energy Fund cost households about $10 a year and generates about $27 million a year to support the programs and initiatives of the Green Bank.

Regional Greenhouse Gas Emission Allowance Proceeds
The Green Bank receives a portion of Connecticut's funds from the Regional Greenhouse Gas Initiative (RGGI). As a result of Regulation of Connecticut State Agencies § 22a-174-31(f)(6)(B), the Green Bank receives all of the state RGGI funds for renewable energy (i.e., Class I RPS renewable energy sources). The Green Bank uses these carbon allowance proceeds from the nation's first cap and trade program to provide financing for energy improvement projects through its Commercial Property Assessed Clean Energy (C-PACE) program for commercial, industrial, non-profit, and multifamily buildings. Connecticut is the first state to use carbon emission allowance revenue as financing for C-PACE in order to (1) attract private capital investment, and (2) return funds back to the Green Bank for future reinvestment to lower energy costs and improve the competitiveness of its businesses and institutions.

Special Capital Reserve Fund
As part of C.G.S. § 16-245n(d)(1)(C), the Green Bank has access to the Special Capital Reserve Fund (SCRF), which allows quasi-public agencies to issue bonds for self-supporting projects or programs that are backed by the State of Connecticut, lowering the cost of capital for the program – in essence, having a no-cost insurance policy. The Green Bank has received $100 million in SCRF authorization that can be placed on bonds issued for clean energy programs.

~~**Green Connecticut Loan Guaranty Fund**~~
~~As part of C.G.S. § 16a-40d, the Green Connecticut Loan Guaranty Fund provides the Green Bank with access to funds to attract lending institutions to participate in clean energy financing programs for individuals, non-profit organizations, and small businesses through a first loss credit enhancement. The program is to be designed in consultation with the ECMB and Connecticut Health and Education Finance Authority (CHEFA).~~

Connecticut State Treasurer's Office
The ~~Connecticut Green~~Green Bank will work cooperatively with the State Treasurer's Office to explore opportunities to co-invest in Connecticut projects that can deliver appropriate risk-adjusted returns for Connecticut pension assets, reduce the emissions of greenhouse gases, and contribute to job creation.

5.2 Federal Funds
Alongside public funds made available through state channels, the Green Bank has access to and/or expects to pursue federal funds including stimulus monies, revolving loan funds, and competitive grant solicitations as well as loan guarantees, in order to bring private capital to these sources.

American Recovery and Reinvestment Act
The American Recovery and Reinvestment Act (ARRA) of 2009 awarded the Green Bank, and its predecessor the CCEF, $20 million for its programs and initiatives. About $8.25 million of those funds are currently being used as credit enhancements (i.e., loan loss reserves and interest rate buy-downs) for the Green Bank's residential financing programs including the Energize CT Smart-E Loan and~~,~~ CT Solar Loan~~, and CT Solar Lease~~. These funds have already been received and are being used to attract private capital investment in products that support the policy goals of Connecticut.

Clean Water State Revolving Fund
The Clean Water State Revolving Fund (CWSRF) serves as the nation's largest water quality financing source, helping communities across the country meet the goals of the Clean Water Act. The CWSRF

programs provide low interest and long-term loans for many things including water quality protection projects for wastewater treatment. Recently, a nexus has been drawn in New York (e.g., Green Jobs and Green New York) between energy and water that permits programmatic guarantees for financing energy efficiency projects that results in a reduction of air emissions from stationary power plants, and thus deposition of airborne pollutants into our waterways. The Green Bank will explore with DEEP and the Treasurer's Office how the CWSRF can be leveraged to bring in more private capital for investments in key areas (e.g., food waste and sludge from waste water treatment plants to energy through anaerobic digester projects).

Loan Guarantees

Through the U.S Department of Energy and U.S. Department of Agriculture, potential sources of loan guarantee or low interest and long-term loans from the U.S. Treasury are accessible. The Green Bank will pursue – as necessary and appropriate – access ~~of~~ to federal resources to attract more private capital investment in clean energy deployment in Connecticut.

5.3 Green Bonds

Green Banks have an essential role in leveraging limited public funds with private capital to drive investment and scale-up clean energy deployment in order to achieve climate goals, create green jobs and promote economic development. While co-investment with banks has been a key element of its ability to leverage its core capital resources, ~~of~~ C.G.S. § 16-245n(d)(1)(C) is the enabling statute that allows~~has enabled~~ the Green Bank to issue revenue bonds to support its investments in clean energy. Bonds offer several advantages over co-investment with banks and other investors offering loan facilities. While interest on long-term loans are often structured with interest rates priced as a spread over a variable index, such as LIBOR[28], bonds generally allow the issuer to lock in a long-term interest rate for the entire duration of the bond .[29] In addition, an issuer of bonds can repay the principal borrowed over 15, 20, 30 years or more, far beyond the reach of typical bank facilities, which are in most cases limited to 7, 10 or 15 years at the maximum.[30] The ability to raise funds for fixed interest rates for longer maturities make bonds a useful and attractive financing tool for the Green Bank's clean energy projects and programs.

Green Bonds are bonds whose proceeds are used for projects or activities with environmental or climate benefits, most usually climate change mitigation and adaptation. [31] Labeling a bond "green" makes it easier for institutional investors to identify green investments.[32] The size of investment required and revenue streams from clean energy infrastructure required under various government clean energy policies lend themselves well to bond structures. The Green Bank is a natural issuer of green bonds given its mandate to provide financing solutions to increase uptake of clean energy measures within Connecticut. Issuing green bonds can provide the Green Bank a lower-cost, longer-term source of capital, enabling the Green Bank to further leverage the ratepayer funds at its disposition. Given that the yields on investment-grade project bonds are generally lower than project finance rates available from commercial banking institutions with more generous maturities, the use of green bonds can not

[28] London Interbank Offered Rate

[29] Variable interest rate bank loan interest can be converted to fixed interest rates using interest rate swaps but add a degree of complexity and execution cost to the overall financing arrangement.

[30] In 2014, the District of Columbia Water and Sewer Authority sold $350 million of bonds with a 100-year maturity.

[31] Climate Bonds Initiative, "Scaling Up Green Bond Markets for Sustainable Development," (September 2015) www.climatebonds.net

[32] Climate Bonds Initiative, ibid.

only contribute to a lower cost of capital, but also can ease annual debt service requirements, improving clean energy economics.

Growth in green bond issuance~~s has accelerated nationally~~has continue~~ds~~ to accelerate ~~in recent years~~ with $~~16.5~~58 billion of green bonds issued in the first ~~quarter~~ half of ~~2016~~2017.[33] As of ~~May~~ July ~~2016~~2017, in total over $~~117~~ 233 billion of green bonds ha~~sve~~ been issued by approximately ~~180~~ 320 separate entities.[34] Total green bond issuance for ~~2016~~ 2017 could reach as high as $123~~70~~ billion,[35] which would bring global outstanding issuance to around $~~160~~ 340 billion by the end of ~~2016~~the year[36].

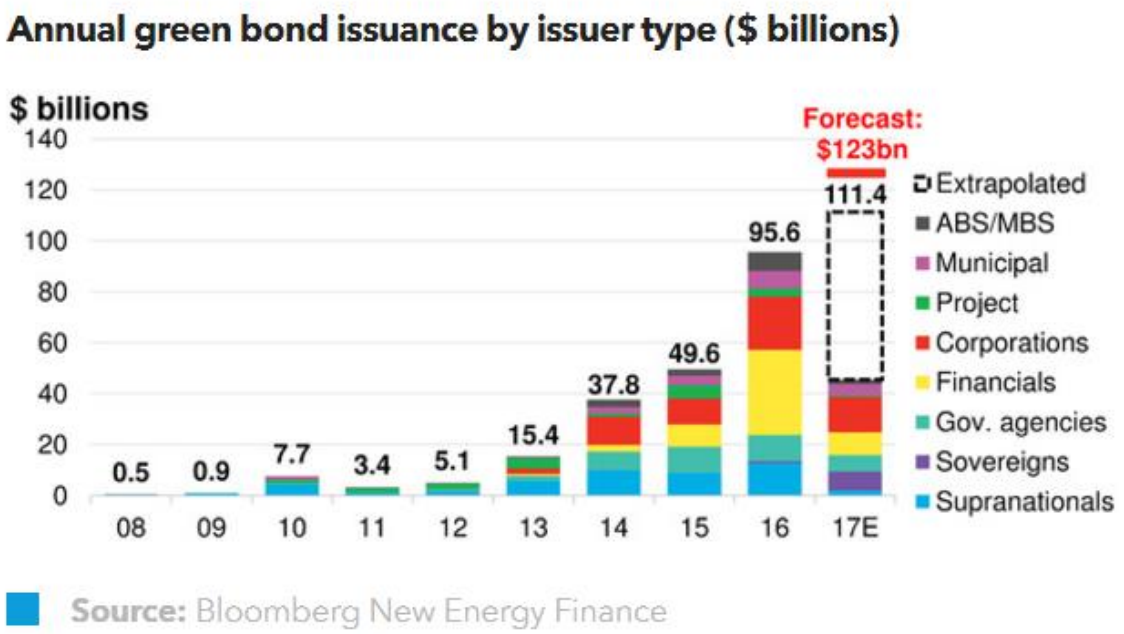


Table 3. Types of Green Bonds[37]

Type	Debt Recourse
Green "Use of Proceeds" Bond	Standard recourse-to-the-issuer debt obligation linked to issuer's lending and investment operations for eligible projects.
Green "Use of Proceeds" Revenue Bond	Non-recourse-to-the-issuer debt obligation in which credit exposure of the bond is to the pledged cash flows of the revenue streams. Use of proceeds of bond can be related or unrelated to the project cash flows.
Green Project Bond	Project bond for single or multiple green project(s) for which investor has direct exposure to the risk of the project with or without potential recourse to the issuer.
Green Securitized Bond	Bond collateralized by one or more specific projects, including covered bonds, ABS, and other structures. First source or repayment is generally cash flows of the assets. This type of bond covers asset-backed securitizations of rooftop solar PV and/or energy efficiency assets, for example.

[33] https://www.climatebonds.net/ ~~https://www.climatebonds.net/2016/04/q1-largest-ever-green-bonds-165bn-issuance-baml-leads-top-5-qtrly-underwriters-league-table~~

[34] Climate Bonds Initiative, Labelled Green Bonds Database, Accessed June 3, 2016. Available at: https://www.climatebonds.net/cbi/pub/data/bonds?items_per_page=All

~~[35] Moody's Investor Services, *Summary of Green Bond Methodology for Public Finances*, April 26, 2016.~~

[36] Bloomberg New Energy Finance, Green Bonds Monthly – May 2017. June 2, 2017.

[37] Climate Bonds Initiative, *Explaining Green Bonds*, https://www.climatebonds.net/market/explaining-green-bonds

Environmentally responsible investments are becoming more widely pursued every year. Green bonds attract a diverse investor base as investors seek the environmental attributes of the bonds. However, as with any emerging financial product there are also inherent risks. One of the most recognized risks associated with green bonds is that of 'greenwashing,' when environmental claims are made irresponsibly or without supporting evidence. The Green Bond Principles (GBP) and Climate Bond Standards (CBS) have been set up largely as a means to mitigate against greenwashing by providing guidelines for what constitutes a 'green bond' and a standardized means to evaluate the bonds against these guidelines.

The Green Bond Principles specifically focus on four components:[38]

1. Use of proceeds – types of projects and their environmental benefits should be clear;
2. Process for evaluation and selection of projects funded with proceeds;
3. Management of proceeds – proceeds and disbursements for 'green' projects should be housed in separate, easily trackable accounts leaving a clear audit trail; and
4. Reporting – use of proceeds should be reported and updated at least annually stating the disbursements and expected environmental impact.

The Climate Bond Standards were created as a certification scheme to verify the green credentials of a bond. The certification standards align with the Green Bond Principles and are guided by a panel of climate and energy experts. Other services providing ~~second-party~~independent reviews and/or third-party assurances have sprung up off the back of the Green Bond Principles and Climate Bond Standards as well.

Methodologies for evaluating the 'greenness' of green bonds ~~also~~ have also emerged, such as CICERO's 'Shades of Green' assessment and the Alliance to Save Energy's CarbonCount™ quantification of emissions and energy reduction impact of bonds. ~~Some a~~Detail of~~dditional insight into~~ these evaluation techniques is included in the below table ~~on the next page~~ (see Table 4). In addition, the Green Bank has been providing input into the design of the Climate Action Reserve's Climate Impact Score framework (currently in development) which can be used to score the climate impact of green financing.

Table 4. Green Bond Evaluation Techniques

Name	Summary	Focus
Qualitative Evaluation of Managerial Aspects of Bonds (use of proceeds, management process, reporting/disclosure, etc.)		
Green Bond Principles (GBP)	Voluntary guidelines to promote transparency and disclosure	•Use of proceeds •Process of project evaluation and selection •Management of proceeds •Reporting
Moody's Green Bond Assessment (GBA)[39]	Qualitative assessment 'rating' using similar parameters to GBP	•Use of proceeds •Organization structure & decision •Disclosure on use of proceeds •Management of proceeds •Ongoing reporting & disclosure

[38] http://www.icmagroup.org/Regulatory-Policy-and-Market-Practice/green-bonds/green-bond-principles/
[39] https://www.moodys.com/research/Moodys-launches-new-Green-Bond-Assessment-service--PR_346590

Climate Bond Initiative's Climate Bond Standard (CBS)[40]	Certification scheme to verify green credentials of a bond, aligns with GBP; Guided by panel of climate and energy experts; focus on corporate issuers	•Monitoring, reporting, and assurance of conformance with Climate Bonds Standards •Decision making process of underlying projects' eligibility •Internal process & controls (use and tracking of proceeds) •Reporting (disclosure prior to issuance) •Post-issuance reporting and disclosure
Evaluation of Environmental Impact of Bond		
CarbonCount™[41]	Quantitative metric to evaluate green impact of bonds	•Quantitative analysis of forecast power generation and/or energy savings •Uses investment grade audit or independent engineer's analysis of underlying projects •Estimates emissions impact using EPA's AVERT model and/or other EPA emissions factors •Derives annual carbon savings per $1,000 (face value) of bond to normalize emission savings
CICERO[42]	Provides 'Shades of Green' qualitative assessment (dark, medium, light) on climate and environmental 'ambition' of bonds	•Grading is based on a broad qualitative assessment of each project, according to what extent it contributes to building a low-carbon society.

The Green Bank, in effect, ~~issued its~~enabled the issuance of ~~first~~ "green bonds" when it securitized $20 million of commercial PACE benefit assessment liens with Clean Fund. During FY201~~6~~7, the Green Bank ~~expects to~~ issued or participated in additional green bond issuances as follows:

- Approximately $3 million in New Clean Renewable Energy Bonds (New CREBs) backed by the state's Special Capital Reserve Fund and purchased by Bank of America to fund the first Archimedean screw generator to produce hydroelectric power for the City of Meriden;
- Approximately $2 million in Qualified Energy Conservation Bonds (QECBs) issued by the Connecticut Housing Finance Authority and purchased by Bank of America to provide debt capital to the Green Bank for solar PV energy to more than a dozen housing authorities under power purchase agreements.

During FY2018, the Green Bank expects to issue~~; and S~~several millions of dollars of green bonds ~~to be issued~~ to support the Residential Solar Investment Program (RSIP) using revenues from contracted sales of Solar Home Renewable Energy Credits (SHRECs) to Eversource and Avangrid.

5.4 Public-Private Partnerships

The foundation of the green bank model rests on Connecticut's achievement of a legislative and regulatory policy framework that makes it possible for financing, security and collection structures and mechanisms to be put in place in order to facilitate significant pools of private capital into the

[40] http://www.climatebonds.net/standards/standards-V2.0
[41] http://www.ase.org/resources/carboncounttm-quantitative-carbon-scoring-system-green-bonds
[42] http://www.cicero.uio.no/en/posts/news/cicero-grades-climate-friendly-bonds-with-shades-of-green

marketplace to finance a diverse array of clean energy investment across all sectors. Since its formation, the Green Bank has attracted hundreds of millions of dollars in private investment from local, regional and national sources. These investments are the quintessential public private partnerships for clean energy finance~~,~~ and include ~~i~~investments such as:

- **Dominion Bridgeport Fuel Cell Park** – Green Bank financing in support of the largest fuel cell in North America – a 15 MW project on an old brownfield site in a distressed community using a technology manufactured in Connecticut – attracted $65M in initial investment from Dominion Resources.

- **CT Solar Lease** – a unique combination of a tax equity investor, a syndicate of debt providers and the Green Bank to create a $~~6~~70 million fund for rooftop solar PV (i.e., residential lease financing for solar PV and commercial leases and PPAs for solar PV).

- **CT Solar Loan** – a $5 million pilot public-private partnership between the Green Bank and Sungage Financial resulting in the first crowd-funded solar loan program in the country and graduating to a $100 million pool of capital from the Digital Federal Credit Union to enable citizens to own solar PV systems installed on their homes.

- **Energize CT Smart-E Loan** – a second ~~loan~~ loss reserve provided by the Green Bank to attract private capital investment for Energize CT Smart-E Loans offered by local community banks and credit unions offering state-wide coverage and supporting the implementation of the CES.

- **PosiGen** – 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 a solar PV lease and energy efficiency energy savings agreement (ESA) product for 1,000 homes in the low-to-moderate income market segment.

- **C-PACE** – an offering by the Green Bank of C-PACE funded transactions that resulted in attracting $24 million in private capital using $6 million of Green Bank investment to fund a $30 million securitization of commercial, industrial, non-profit, and multifamily projects. A follow-on $100 million public-private partnership with Hannon Armstrong increased access to capital for C-PACE.

- **Private ~~MacArthur~~ Foundations** – as a result of C.G.S. § 16-245n(d)(2)(C)(iii), the Green Bank can receive grants and investment (e.g., Program Related Investments, or PRIs) from philanthropic foundations.

    - **MacArthur Foundation –** In partnership with the MacArthur Foundation, the Green Bank is supporting a $5 million PRI to support clean energy deployment in the affordable multifamily market segment.

Kresge Foundation –

    - ~~Kresge Foundation –~~ The Green Bank is supporting the deployment of solar PV and battery energy storage systems for affordable housing and community institutions in Connecticut with funding from the Kresge Foundation in the form of a PRI for up to $3

million and associated grant funding of 5% of the loan amount.~~[Laura or Anthony – please provide details]~~

These partnerships with private capital are positive signs that the ~~funds are~~capital is ready, willing and able to be supplied to the clean energy marketplace in Connecticut.

Cost of Capital

It is not sufficient for private capital to be supplied into the market for clean energy and energy efficiency investment. Capital "at any cost" will not permit the market to scale-up to levels required to enable Connecticut to achieve its public policy goals. This is particularly true in Connecticut where the marketplace has become conditioned to subsidized interest rate loans, particularly for energy efficiency. To date, much success has been observed in the Green Bank's ability to attract capital at rates that are viewed by consumers as both reasonable and affordable. The Green Bank's Energize CT Smart-E loan for homeowners is available at 5-year rates not-to-exceed 4.49% (4.24% from at least one lender). For homeowners without access to home equity financing, these rates compare quite favorably to unsecured lending rates, which frequently range from 9-12% or more. The C-PACE program is attracting funding at a level of approximately 300 basis points (100 basis points = 1%) over long term swap rates. An even lower rate was achieved for the debt funding associated with the leveraged solar lease fund. Crowd-funding could provide funding at even lower yields, but the potential for crowd funding is too uncertain at the present time to be relied upon as a meaningful supply of capital for clean energy projects.

Maturity

To date, the Green Bank has been successful in attracting capital for terms that enable consumers of all types to make the desired investments in clean energy with no cash investment up~~-~~front in most cases. In fact, Green Bank programs have demonstrated that lengthening the maturity of the loan can be an effective way to raise more capital for these projects. For instance, it would require a reduction in interest rate from 5% to nearly 0% to have the same impact as a one-year extension in repayment terms (i.e., from 6 years to 7 years) to finance a home oil-to-gas conversion with a new boiler/furnace for about the same $100 per month outlay. The benefits of extended terms become even more significant for financing comprehensive energy efficiency retrofits called for by the CES that cost more to implement and deliver benefits to the homeowner over somewhat longer payback periods. In these cases, the 10, ~~and~~ 12 and even up to 20 year maturities for the Smart-E loan and the 15 and 20-year maturity for the Sungage solar loan permit homeowners to become cash flow positive either throughout the life of the loan or after a modest fraction of the total loan payments have been made. With C-PACE, commercial and industrial property owners are able to finance their investments at periods extending to 25 years with a statutory requirement that expected energy savings exceed financing obligations levied on their property tax bill.

Private Investment and Leverage Ratio

In the end, these public-private partnerships are efforts by the Green Bank to attract private investment to finance Connecticut's clean energy policy goals. In doing so, the Green Bank uses a diverse array of financial structures and instruments to facilitate co-investment with a host of capital providers, participating in every level of the capital stack, from equity, to subordinated debt and senior debt (i.e., earning returns that range from "concessionary~~l~~ rates" to "market" rates of return). The Green Bank will also provide other credit enhancements, such as loss reserves, guarantees, funding warehouses, and other forms of support where such support for the sector or achieving Connecticut's policy goals is

warranted. The Green Bank has no formula for the manner or level of support or credit enhancement it ultimately provides, but seeks to provide the least amount of support necessary to result in the highest possible levels of private financing for the projects concerned or to meet programmatic goals.

That said, the Green Bank has been successful in leveraging ratepayer and other forms of public capital from 4:1 to 12:1. For example, the Green Bank leverages ratepayer capital in various ways through its products, including a 5:1 leverage ratio through the CT Solar Lease whereby $10 million of ratepayer capital ~~is~~was used to initially attract $50 million in tax equity and debt investment.

Another example is yielding an 11:1 leverage ratio to support the growth and sustainability of a local residential solar PV contractor market, through the Energize CT Smart-E Loan whereby a $2.5 million second loss reserve is attracting $28 million of long-term and low-interest loans from local community banks and credit unions to help finance energy improvements in homes that are consistent with the CES.

5.5 Green Bank Network

The Green Bank Network is a new global organization and platform that will enable Green Banks and network participants to share experience, best practices and data around innovative green infrastructure financing activities. At the Conference of the Parties (COP) 21 conference in Paris, France in December 2015, the ~~Connecticut Green~~Green Bank joined with the UK Green Investment Bank, the Australian Clean Energy Finance Corporation, the Japan Green Fund, Malaysia Green Technology Financing Scheme, and the New York Green Bank to announce the formation of the Green Bank Network. The Green Bank Network is coordinated by two non-profit organizations, the National Resource Defense Council (NRDC) and the Coalition for Green Capital (CGC) with start-up funding from ClimateWorks for 2016.

The Green Bank Network will collect, organize and share know-how through virtual and in-person platforms. This will allow green banks, development finance institutions and other intermediaries to collaborate and learn from one another and will equip the global clean energy finance community with advanced tools and practices based on an “open source banking” model. Over time, the network aims to help private sector investors and developers partner with Green Banks, and to drive standardization in clean energy markets to increase the flow of capital to the sector and increase the scale, scope and efficiency of financing activities.

6. Marketing

As the ~~Connecticut Green~~Green Bank continues to grow and evolve from a grant distribution model to one whose success is increasingly measured by private market participation, the role of marketing and communications necessarily must too. Consequently, a great deal of effort has been focused on marketing innovation in order to raise stakeholders' awareness of, and engagement with, the ~~Connecticut Green~~Green Bank brand and its programs.

The Green Bank's marketing efforts support the organization's drive to attract private capital to finance the clean energy goals for Connecticut, as well as facilitate the deployment of more green energy throughout the state. Through various marketing channels including our utility partners, local lenders and contractors, on the ground community efforts, as well as our online assets, the Green Bank is helping more and more consumers receive access to cleaner, cheaper, and more reliable sources of green ~~energy.~~energy.

6.1 Brand

The ~~Connecticut Green~~Green Bank brand was officially launched to the public on April 15, 2015. While a noticeable departure from CEFIA's previous visual identity, the new brand is much more than a distinctive logo and creative copy. It serves as a valuable asset designed to drive market activity, increase stakeholder engagement, and project the Green Bank's team-centered approach to achieving Connecticut's clean energy policy goals.

Many participated in the brand development process which included quantitative and qualitative research designed to capture stakeholder attitudes about the ~~Connecticut Green~~Green Bank and its predecessor CEFIA. Accordingly, it was only through the collective input of stakeholders that we were able to discover, and in turn, amplify ~~Connecticut Green~~Green Bank's authentic brand voice. As an organization, the Green Bank also strove to ensure the new brand properly expressed staff's commitment to being skilled listeners, connectors, and facilitators. To that end, the process not only revealed considerable insight into external stakeholders' perceptions of the Green Bank but also served as a touchstone for its corporate culture and identity.

When asked to describe the ~~Connecticut Green~~Green Bank, research efforts often observed respondents employing metaphors such as "catalyst" and "spark". As self-identified agents of change, this particular insight resonated strongly with internal stakeholders, and for good reason. ~~Certainly~~Certainly, one of the most important roles of the Green Bank is to catalyze Connecticut's green energy market. However, many internal and external stakeholders viewed the Green Bank's mission and impact through a much broader lens. Several survey participants expressed that the ~~Connecticut Green~~Green Bank was responsible for "sparking a movement." ~~As a result~~Thus, the catalyst metaphor was heavily leveraged to underscore the new Green Bank brand identity.

Pillars

Supporting the Green Bank's new brand platform are three mission-driven pillars. They are: Innovate, Educate, and Activate. As the foundation of the brand, the pillars' collective role is to facilitate the acceleration of clean energy deployment in Connecticut; individually however, they serve to articulate

the organization's commitment to engage all stakeholders on multiple levels. Through innovation, the Green Bank is making clean energy investment safer, more affordable and accessible. By educating Connecticut residents and businesses, we are helping to illuminate the benefits of green energy in order to drive interest. And finally, by inspiring people to make green energy a part of their lives, we are activating consumer behavior change and accelerating clean energy market growth throughout the state.

Table 5. Pillars of the Connecticut Green Bank

Innovate We are making clean energy investment safer, more affordable and accessible with our innovative model. ▪ Innovations in finance: Creative financial solutions that make green energy affordable and rewarding ▪ Innovations in green technology: Invest in cleaner, greener and more reliable sources of energy for a healthier economy and healthier planet ▪ Innovations in public-private collaborations: Work with local contractors and lenders to help businesses and homeowners access affordable financing	**Educate** We are helping to make the benefits of green energy clear to drive interest. ▪ Empower residents and businesses to discover how to access green energy financing by providing education and answers ▪ Train and certify Connecticut Green Bank partners about green energy financing ▪ Raise community awareness of the benefits of green energy for a thriving Connecticut	**Activate** We are inspiring people to take action and make green energy a part of their lives. ▪ Give residents and businesses the confidence to take action by helping them navigate the process ▪ Help them realize their goals by finding a solution that's right.

Brand Promise

Energy is essential to grow and thrive. Energy powers your life, your business, your community. And green energy, leveraging energy efficiency and renewable energy sources, guarantees an enduring future. You want to make a change, but are uncertain how to navigate the process of making green energy a part of your life. The ~~Connecticut Green~~Green Bank lowers barriers to make green energy financing more accessible and affordable. We introduce an innovative model that leverages public and private dollars to accelerate the growth of green energy. With this model, we create a robust marketplace that brings down the cost of energy so that Connecticut citizens thrive and businesses grow. We innovate to educate and activate people to accelerate the growth of green energy. We create jobs. We grow businesses. We promote healthier communities…We help people thrive. By creating a flourishing marketplace, we contribute to a better quality of life, a better environment and a better future for all.

Customer Classifications

In order to achieve the ambitious energy policy objectives of Connecticut, it is important to ensure that consumers are not only becoming increasingly educated and aware of what they can do to improve their personal energy habits, but, more importantly, to use public incentives and financing from private capital sources to take action and do more with less. Increasing consumer education and awareness by making strong impressions and generating leads will drive more consumers to install clean energy technologies and use more private capital to finance those projects.

- **Impressions** – an impression is the earliest stage of consumer education and awareness. It includes things such as earned media, website hits, event attendance and customer relationship management. Impressions are a leading indicator of consumer action.
- **Leads** –an expressed interest by a consumer in wanting to understand the opportunity further. It includes less tangible things such as signing an interest list or having a site visit or audit, to more action oriented things such as submitting an application for approval on incentives and/or financing.
- **Installations** –a clean energy project that has received approval for an incentive (e.g., RSIP), in construction, or commissioned. Installations are expressed in terms of the number of consumers reached, renewable energy produced (e.g., kW installed, kWh generated), and energy saved (e.g., MMBTUs), along with the associated societal benefits that come with those installations (e.g., GHG emission reductions, jobs).
- **Financings** –a closed loan, lease, PPA, ESA or other financing transaction where the Green Bank is repaid (versus a subsidy), including the number of transactions, size of transaction1s, credit scores of borrowers and the trends towards increased financing over time.

6.2 Energize Connecticut

Energize Connecticut℠ is an initiative dedicated to empowering Connecticut citizens to make smart energy choices, now and in the future. It provides Connecticut consumers, businesses and communities the resources and information to make it easier to save energy and build a clean energy future for everyone in the state. It is an initiative of the Connecticut Energy Efficiency Fund, the ~~Connecticut Green~~Green Bank, the state, and the local electric and gas utilities. The Green Bank's Smart-E loan is marketed under the Energize Connecticut brand. The Green Bank, in conjunction with its Energize Connecticut partners, has developed a statewide marketing plan for the brand to raise awareness as well as realizing the goal stated in the CES:

> "To create a culture that understands the value of and therefore demands energy efficiency, establishes standards that enable consumers to easily ascertain the efficiency profile of their own homes or buildings, and makes financing for energy efficiency measures both easily accessible and affordable."

For more information, go to www.energizect.com

6.3 Channel Marketing

The Green Bank works on the ground in communities throughout the state with its channel marketing partners including the utilities, local lenders and contractors, and volunteer citizens and community-based organizations. It also engages consumers online through www.ctgreenbank.com, www.energizect.com and other campaign-based or programmatic platforms like www.gosolarct.com, www.solarizect.com, and www.c-pace.com.

Utility Partners

The electric (i.e., Avangrid, Eversource Energy, and Connecticut Municipal Electric Energy Cooperative) and natural gas (i.e., Connecticut Natural Gas, Southern Connecticut Gas, Yankee Gas, etc.) distribution companies are an important channel marketing partner. As administrators of the Connecticut Energy Efficiency Fund, our utility partners are helping consumers reduce their energy consumption, lower peak electric demand, and provide consumers with opportunities to access natural gas. Through the Conservation and Load Management Fund, the administrators of the CEEF are developing a customer engagement platform that can be used to target key market segments with various incentives and financing. ~~Connecticut Green~~Green Bank works with CEEF and DEEP to share data to better inform marketing tactics to acquire customers for clean energy improvements.

Local Lending Partners

The Green Bank partners with local lenders including credit unions, community development finance institutions, community, state, regional, and national banks. Through credit enhancements – including subordinated debt, loan loss reserves, and interest rate buy downs – the Green Bank supports local lenders in providing customers with easy access to affordable capital. With low interest loans that have long maturities, customers can receive immediate positive cash flow returns from their energy improvements as their energy savings exceed debt service payments.

Local Contractors

The Green Bank supports local contractors installing clean energy systems in the residential, commercial, industrial, and institutional sectors. Contractors serving renewable energy, energy efficiency, and natural gas conversion projects – all components of the CES – are supported with access to private capital sources to support the growth of their businesses through working capital, as well as easy access to affordable capital for their consumers.

Community-Based Campaigns

Community-based campaigns provide an opportunity to engage local residents, businesses and institutions in advancing the clean energy policy goals of the state. Over the years, the Green Bank, and its predecessor the CCEF, have been involved in the creation of several community-based campaigns that are attracting foundation contributions and winning federal grants by accelerating the deployment of clean energy in communities across the state, including the Clean Energy Communities program,[43] Neighbor to Neighbor Energy Challenge, Solarize Connecticut, and Energize Norwich.

[43] The U.S. Environmental Protection Agency and U.S. Department of Energy awarded the CCEF and SmartPower with the Green Power Pilot Award for the Connecticut Clean Energy Communities Program in 2006. Such programs were supported by

Automated Marketing Platform

The Green Bank recently implemented an automated marketing platform that enables our private sector marketing partners to easily and cost effectively create, distribute and measure the impact of their green energy related marketing efforts. As a means to promote the Green Bank's products, this new marketing technology infrastructure houses professionally developed marketing assets designed to help channel partners improve their sales efforts through the distribution of high quality, ~~Connecticut Green~~Green Bank co-branded marketing collateral. The platform's library currently stocks a variety of customizable collateral for our channel partners to leverage in their own campaigns, with many more pieces expected to be added throughout the course of the year. The automated platform also offers several step-by-step guides designed to help our channel partners develop, execute and ultimately measure the effectiveness of their marketing efforts.

Digital and Online Media

As part of the ~~Connecticut Green~~Green Bank branding effort, the marketing unit conducted a thorough audit of all existing digital marketing assets and tools. As a result, the former CEFIA website was replaced with the much more user-friendly and "on-brand" CTGreenBank.com. Design of the new website experience was heavily influenced by a desire to create an environment that was easily navigable for all users across our diverse stakeholder base. Informed by the success of community-centric campaigns such as Solarize and Neighbor-to-Neighbor, another priority of the site was to present compelling stories and video testimonials that illustrate the benefits and relative ease of financing renewable energy upgrades with the Green Bank.

Still another digital communication and marketing channel that continues to command ever more attention is social and online media. Over the past decade, much has changed with regards to providing consumers with easier, quicker, and more substantive access to information through the internet and things such as Google, Facebook, LinkedIn and Twitter. Often in real time, the Green Bank employs these tools to increase the level of awareness and education of consumers to help them take action to receive cleaner, cheaper, and more reliable sources of energy.

6.4 Green Bank University

The well-documented success of the Green Bank and green energy finance in general has generated significant demand for more information about the creation, administration and ultimate evaluation of the quasi-public green bank model. As such, the Green Bank, Coalition for Green Capital, and Yale Center for Business and the Environment have seized the opportunity to leverage their collective experience and create resources that will support a Green Bank University to advance the green energy finance movement. Taking the form of an in-person and online experience, careful consideration has been given to both the nature and scope of its content and message. Equally important still, has been the determination by the partners of what purpose(s) the university does not intend to serve. Both are cited below:

contributions from the Emily Hall Tremaine Foundation, John Merck Fund, Pew Charitable Trusts, Rockefeller Brothers Fund, Surdna Foundation, and others.

Key roles of the Green Bank University:

- Establish standardization of green bank processes and procedures
- Memorialize institutional wisdom / knowledge
- Provide insight into green bank operations
- Present an overview of successful financial innovations and marketing strategies
- Establish parameters around the scope of a green bank
- Illustrate the lifecycle of a green bank
    - documentation of key success factors pertaining to policy, implementation & adaptation
- Facilitate the proliferation of the green bank model
- Underscore the urgency of implementing the green bank model

The University does not intend to:

- Be a guide for state banking
- Position green banks as a vehicle driven by profit maximization
- Confine or limit green banks' roles to that of market animators or solely as mechanisms for capital deployment
- In broad terms neither endorse, favor, nor condemn the value of public-private partnerships (PPP) over privatization or government-only run programs but demonstrate when and where a PPP like a green bank may be most effective at advancing/achieving policy goals.

In June of 2017, the Ash Center of the Harvard Kennedy School of Government named the Connecticut Green Bank winner of its 2017 Innovations in American Government Award. Along with the honor of being included among the 7 finalists selected from over 500 submissions, as winner, the Green Bank also receives a $100,000 grant from The Ash Center. The monetary award, in addition to a matching sum approved by the Green Bank's board of directors, are being allocated to both development and subsequent operations of the Green Bank University.

~~The well-documented success of the Connecticut Green~~Green Bank ~~and green energy finance in general has generated significant demand for more information about the creation, administration and ultimate evaluation of the quasi-public green bank model. As such, the Connecticut Green~~Green Bank~~,~~ ~~and the Coalition for Green Capital, and Yale Center for Business and the Environment have seized the opportunity to leverage their collective experience to create Green Bank Academy~~ University ~~to advance the green energy finance movement. Taking the form of both an in-person and online experience and printed reference companion, careful consideration has been given to both the nature and scope of its content and message. Equally important still, has been the determination by the Coalition for Green Capital and Green Bank team~~partners ~~of what purpose(s) the university does not intend to serve. Both are cited below:~~

~~Key roles of the Academy~~Green Bank University~~:~~

- ~~Establish standardization of green bank processes and procedures~~
- ~~Memorialize institutional wisdom / knowledge~~
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- ~~Establish parameters around the scope of a green bank~~
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- ~~Be a guide for state banking~~
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7. Infrastructure Sector – Behind the Meter and On the Grid

The Infrastructure Sector is focused on implementing statutorily mandated programs[44] as well as infrastructure projects[45] that provide cheaper, cleaner and more reliable sources of energy while creating jobs and supporting local economic development.

Comprehensive Energy Strategy and Integrated Resource Plan

The Infrastructure Sector programs support the implementation of the 2012 CES and 2014 IRP. Specifically, the deployment of clean energy supports many of the strategy recommendations in Chapter 2 (i.e., Industry Sector Strategy) and Chapter 3 (i.e., Electricity Sector Strategy) of the CES that better enable Connecticut residents and businesses to take advantage of the opportunities. Programs such as the U.S. Department of Energy SunShot Initiative Rooftop Solar Challenge are but a few examples where the Green Bank's Infrastructure Sector is supporting the implementation of the CES. The pending release of and finding within the 2016 CES will be incorporated into the future Comprehensive Plan of the Green Bank.

Reducing the costs of the Class I RPS by deploying more cost-effective in-state and regional resources is a focus of the 2014 IRP. An additional challenge noted in the IRP is the need to reduce peak demand in the summer and winter months to release some of the cost pressures as a result of increasing peak demand.

The programs of the Infrastructure Sector are intended to support the implementation of the strategies and recommendations outlined in the CES and IRP.

Conservation and Load Management Plan

The Infrastructure Sector programs support the implementation of programs in the 2016-2018 C&LM Plan and vice versa. Specifically, the deployment of solar PV systems through the Residential Solar Investment Program (RSIP) assists with the implementation of several programs in Chapter 3 (i.e., Residential Programs) of the C&LM Plan, including, but not limited to:

- **Home Energy Solutions (HES)** – every residential solar PV project is required to undertake a HES assessment or an equivalent energy audit (e.g., BPI audit). Currently, approximately 55% of all RSIP projects undergo a HES assessment and 45% a BPI audit.

- **Water Heating** – as a result of the HES assessment or the BPI audit requirement for residential solar PV projects, opportunities for more efficient water heating systems are being identified.

- **Space Heating** – the increase in deployment of residential solar PV is providing an opportunity for homeowners to convert from heating oil furnaces to electricity powered air source and ground source heat pumps.

[44] Examples of statutorily mandated programs would be, but are not limited to, Section 103 of PA 11-80 (i.e., anaerobic digester and combined heat and power pilot programs) and Public Act 15-194 (i.e., solar home renewable energy credit).

[45] Examples of infrastructure projects include Section 26 of Public Act 05-01 (i.e., Project 100) which resulted in the Dominion Bridgeport Fuel Cell Park or Section 127 of Public Act 11-80 (i.e., 30 MW of grid tied renewable energy projects sited in Connecticut) which resulted in Colebrook Wind.

The combination of solar PV with renewable thermal technologies for water and space heating such as solar thermal hot water, air source heat pumps, and ground source heat pumps present a significant opportunity to support Connecticut's long-term greenhouse gas emission reductions policy. Solar PV can provide the electricity production needed to offset the additional electricity usage associated with deployment of renewable thermal technologies such as air source heat pumps, reducing overall energy usage and in particular, fossil fuel based energy usage. A recent evaluation of the RSIP program further illustrates the opportunity to deploy solar PV in combination with energy efficiency measures including HVAC upgrades, as well as other emerging energy solutions.

The Cadmus Group has conducted two evaluations of RSIP[46], the second of which focused specifically on the cost-effectiveness of RSIP through program step 7. The key findings from this study were:

- RSIP is cost-effective from the perspective of program participants, the ~~Connecticut Green~~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 and the latest generation of renewable thermal technologies, while maintaining cost-effectiveness.

The following table illustrates increasing benefit/cost ratios as incentives decrease over program steps 1 through 7, with respect to the PACT or program administrator cost test, while the PCT or participant cost test remains level, reflecting similar economics for the participant through all steps – see Table 6. Similarly, the ~~Connecticut Green~~Green Bank Objective Function (OF) reflects increasing benefits (kWh's generated) per program dollar invested.

[46] Residential Solar Investment Program Evaluation (January 30, 2015) – click here
Cost-Effectiveness Assessment of the Residential Solar Investment Program (March 26, 2016) by Cadmus – click here

Table 6. Cost-Effectiveness of RSIP by Step

RSIP 2012-2015	Installed Capacity (MW)	PACT Benefits	PACT Costs	Net PACT Benefits	Net Benefits/ MW	PACT Benefit/ Cost Ratio	PCT Benefit/ Cost Ratio	OF (kWh/$ invested)
Steps 1 & 2	7.4	$18,646,724	$12,435,693	$6,211,031	**$839,329**	**1.50**	**1.72**	**18.1**
Step 3	13.3	$32,714,259	$15,784,621	$16,929,638	**$1,272,905**	**2.07**	**1.80**	**25.7**
Step 4	20.5	$47,901,194	$18,200,235	$29,700,959	**$1,448,827**	**2.63**	**1.83**	**33.4**
Step 5	14.8	$33,822,171	$9,467,372	$24,354,799	**$1,645,594**	**3.57**	**1.80**	**45.3**
Step 6	14	$31,078,515	$6,021,396	$25,057,119	**$1,789,794**	**5.16**	**1.80**	**67.0**
Step 7	21.4	$46,247,561	$7,148,375	$39,099,186	**$1,827,065**	**6.47**	**1.80**	**83.9**
Total	**91.3**	**$210,410,423**	**$69,057,692**	**$141,352,731**	**$1,546,529**	**3.05**	**1.80**	**38.7**

With the PACT benefit/cost ratio for RSIP Step 7 in the above table approaching 7, solar PV has sufficient extra benefits relative to costs by itself or in combination with utility-supported energy efficiency measures (which are also cost-effective) to support deployment of other technologies which may or may not be as cost-effective. For example, solar PV bundles well with renewable thermal technologies or with emerging technologies such as energy storage or smart meters to provide more comprehensive energy solutions and savings to participants while maintaining program and participant cost-effectiveness. Programs in Vermont already encourage participant adoption of energy storage in combination with solar PV, or solar PV along with energy efficiency measures and renewable thermal and other heating and cooling improvements. The Green Bank has been seeing the beginning of activity in the Connecticut market looking to incorporate energy storage solutions. The Green Bank currently supports bundling of solar PV with energy efficiency measures for residential customers through the Smart-E loan offer, and has recently included energy storage as an eligible measure for the Smart-E bundle in recognition of strong interest and developments in this market.

TAM and SAM

For the Infrastructure Sector, the Total Addressable Market (TAM), Serviceable Addressable Market (SAM) and Share of Market (SOM) scenarios with respect to residential solar PV and anaerobic digesters are presented below.

Residential Solar PV

Per Public Act 15-194, the Green Bank is to structure and implement a residential solar investment program which shall result in no more than 300 megawatts of new residential solar photovoltaic installations located in Connecticut on or before December 31, 2022. In order to assess the market potential for residential solar PV to determine if the goal established by the legislature is achievable, the Green Bank worked with Geostellar[47] to use big-data geomatics to determine the technical and economic viability (i.e., TAM and SAM, respectively) and market penetration (i.e., SOM) in Connecticut (see Table 7).

[47] www.geostellar.com, or click here for the report "The Addressable Solar Market in Connecticut" (December 6, 2013)

Table 7. Residential Solar PV Market in Connecticut and Market Penetration – By Capacity, Generation and Customers

Market Definition	Market Size (GW, 2015)	Market Size (MWh/~~yr~~yr.)	Market Size[48] (# of customers)	Penetration (MW, 2015)	Penetration (MWh/~~yr~~yr.)	Penetration[49] (# of customers)	% Market Penetration (based on MW)
Residential Sector Total	12.7	14,462,760	1,454,651	129.6	147,588	17,128	1.0%
Residential - Technically Viable Rooftops	6.51	7,413,588	659,312	129.6	147,588	17,128	2.0%
Residential - Economically Viable Rooftops	3.89	4,429,932	506,714	129.6	147,588	17,128	3.3%

Given the existing federal and state subsidies, according to Geostellar, more than 500,000 residential rooftops can carry solar panels that produce a net present value gain for the residences taking solar electricity off their own roofs. The potential market represents more than 40% of households in the state. - and more than 12 times the legislative target of 300 MW. At saturation, the total investment would be about $12 billion and create about 70,000 to 100,000 job years within the state. Geostellar has also estimated that the size of the market will grow to 650,000 rooftops, as solar costs decline. These rooftops would generate 6,599 GWh per year, equivalent to approximately 22% of total electricity consumption in the state, able to satisfy the state's Class I RPS.

It should be noted that the Green Bank support of the residential solar PV market through the RSIP is to deliver no more than 300 MW – or reach approximately 40,000 residential rooftops before the end of 2022. In its efforts to meet the public policy objective, the Green Bank will also work to help the residential solar PV market transition itself by making it efficient and effective to connect the homeowner or third party owner to the Class I RPS.

Anaerobic Digesters

The three common types of AD projects that can readily be deployed in the state are: Source-Separated Organic Matter (primarily Food Waste); Waste Water Treatment Facility (WWTF) sludge; and Animal Waste (Farm). Because of the availability and economics of processing feedstock (i.e., food waste, sludge and animal waste), these projects take more time than other energy projects to develop.

The available food waste market assessment was based on information taken from the DEEP State-Wide Solid Waste Composition and Characterization Study and the DEEP Food Residual Generation Mapping Study (September 2001, updated for DEEP by US EPA in Spring 2012)[50] identifying all Connecticut large

[48] The TAM and SAM calculated by Geostellar are both based on 659,312 customers whereas the market sizes in terms of installed capacity (GW) differ because the SAM is based on average, economically viable system sizes while the TAM maximizes system sizes based on technical viability.

[49] As of the RSIP Market Watch report, May 6, 2016, 129.6 MW or 17,128 projects were completed, in progress or approved, not including an additional 2,019 projects that were installed through the Green Bank's predecessor organization, the Connecticut Clean Energy Fund (CCEF), bringing total market penetration up to 19,147 residential solar PV projects.

[50] *Updated Mapping of Food Residual Generation in Connecticut* by the Department of Energy and Environmental Protection (Spring 2012)

food waste generators. Per the source-separated organics recycling legislation (Public Act 11-217, as updated by Public Act 13-285, and codified at CGS 22a-26e) large commercial food waste generators are required to bring their source-separated organic materials to a recycling facility, unless there is not a suitable facility within a 20-mile radius of the generator. Large food waste generators subject to this requirement are identified as commercial food wholesalers or distributors, industrial food manufacturers or processors, supermarkets, resorts or conference centers that each generate an average projected volume of not less than one hundred four tons per year of source-separated organic materials (SSOM). The purpose of the law is to signal to investors and prospective facilities that a large volume of feedstock is quantified and available for composting and anaerobic digestion facilities. DEEP estimates the total food generation within Connecticut to be in excess of 320,000 tons/year, with additional tonnages of other SSOM available as well. If all the available food waste from the large generators was made available for waste to energy plants, it could support up to 9.6 MW of generation capacity.

For WWTF, the TAM and SAM are limited to the number of facilities in the State. A WWTF study assessment done by Fuss & O'Neill (F&O) for the Green Bank[51] identified a total of 84 WWTF throughout Connecticut. The total available market capacity of all the facilities is 551-million gallons of sludge per day (MGD). However, the serviceable market, based on F&O's assessment of what criteria WWTF use as their guide for acceptable paybacks for capital investments (between 5 and 10 years), identifies facilities with greater than 5 MGD as required to achieve these paybacks. This leaves the serviceable market size at 102 MGD which accounts for less than 20 of the 84 total WWTF. The market size in the table reflects the serviceable market size based on installed generation capacity of up to 2.7 MW.

Data used to determine the potential market size for animal waste, primarily cow manure, was estimated using information provided by the agriculture department at the University of Connecticut as well as the Department of Agriculture. The dairy cow population has not changed significantly in Connecticut since 2007. This TAM is directly correlated to the dairy cow population, which currently is estimated to be around 19,000. The market estimates below were based on information gathered in 2012 from several agricultural studies as well as recent information gathered from several site visits to operating farm AD systems both in Ohio and Massachusetts. Data gathered from these studies estimates that the manure from approximately 1,000 cows can provide enough methane to support a generator capacity of 250 kW. Determining the serviceable available market in Connecticut is a bit challenging because 60% of the dairy farms are either 100 cows or less. So in order for any of these farms to make an AD installation feasible, it would require partnering and aggregating feedstock with other neighboring farmers and/or co-digest using food waste or other organic feedstock.

Based on Connecticut's farm size numbers established in the studies there are only a handful of farms that are even large enough, 800 plus cows, to economically consider a ~~small scale~~small-scale AD project without supplementing (co-digesting) the feedstock with food waste or other organics. For the purpose of better estimating the total available market we will assume that the medium size CT dairy farms, with 400 to 800 cows, will co-digest with some percentage of food waste. There are also significant financial

[51] *Report to CEFIA of Results of Anaerobic Digester Project* by Fuss & O'Neill for the Connecticut Green Bank (January 21, 2014)

as well as performance benefits to co-digesting manure with food waste. Digester biogas quality and yields can be significantly improved by just adding small percentages of food waste to the farm digester feedstock recipes. ~~Also~~Also, the economics of a farm based AD project can be significantly enhanced with the addition of tipping fees from bringing in the food waste. The more accounted-for revenue, the fewer incentives farmers require to make these AD projects feasible. Medium sized dairy farms in this size range account for approximately 20% of the 159 operating dairy farms in CT.

Currently the USDA, DOE and EPA agencies are working to promote biogas utilization through their existing programs by aligning incentive programs, research plans and standards to support these efforts.

Connecticut Farm Energy has recently sent out surveys to all registered dairy farms in the state to gauge the level of interest for farm digesters. They are currently compiling the data as the surveys come in and are expecting to have the results by the end of June 2016. This information will also provide them with a better sense of the size of the farms that are interested in digesters.

Both food waste and waste sludge are dependent on the number of feedstock generators (see Table 8). The table below shows a preliminary estimate of the market by annual electricity generation for projects using the feedstock.

Table 8. Anaerobic Digester Market in Connecticut for Food Waste, Waste Water Treatment Sludge, and Animal Waste

Market Definition	Market Capacity (MW)	Market Size (MWh)	Current Penetration
Food Waste (SSOM)	9.6	75,923	67%
WWTF Sludge	2.7	21,318	30%
Animal Waste (Farm)	5.9	46,516	0%
Total	**18.2**	**143,757**	

Product or Program Overview and Objectives

The Infrastructure Sector has established the following program objectives for FY 2017 (see Table 9):

Table 9. Infrastructure Sector Fiscal Year 2017 Objectives

Program	Projects	Capital Deployed	Clean Energy Deployed (MW)
RSIP	8,500	$282,302,000	64.6
AD	1	$18,000,000	1.6
Total	8,501	$300,302,000	66.2

Meeting these targets would generate 85,480 MWh of clean energy (or 291,445 MMBtu's) in the projects first year of generation and 2,137,002 MWh of clean energy (or 7,286,131 MMBtu's) over the life of the projects.

After gauging market performance, the Green Bank revised its Fiscal Year 2017 target in January 2017 to the following (see Table 10):

Table ~~9~~10. Revised Infrastructure Sector Fiscal Year 2017 Objectives

Program	Projects	Capital Deployed	Clean Energy Deployed (MW)
RSIP	6,000	$173,165,071	47.4
AD	1	$18,000,000	1.6
Total	6,001	$191,165,071	49.0

The following are Fiscal Year 2018 targets for the Infrastructure Sector (see Table 11).

Table 11. Infrastructure Sector Fiscal Year 2018 Objectives

Program	Projects	Capital Deployed	Clean Energy Deployed (MW)
RSIP	4,431	$ 136,300,000	37
Anaerobic Digester	1	$ 20,000,000	1.6
Strategic Investments	1	$ 15,000,000	3.7
Total	4,433	$ 171,300,000	42.3

Residential Solar Investment Program

The RSIP requires that no more than 300 MW of new residential solar PV be installed in Connecticut on or before December 31, 2022, at a reasonable payback to the customer all the while developing a sustainable market for contractors. The RSIP provides to residential customers, via solar PV contractors, direct financial incentives in the form of expected performance-based buy-down incentives (EPBB) and performance-based incentives (PBI) for the purchase and/or lease of qualifying residential PV systems.

In an assessment conducted in December of 2014, it was identified that solar PV deployment in the low-to-moderate (LMI) household market segments ~~was~~were not performing as well as the non-LMI market segment.[52] Back then, the LMI market needed to deploy between 2 to 10 times more solar PV to be on par with the non-LMI market segment. ~~As a result~~Thus, the RSIP now includes an LMI PBI to provide additional incentive to support the growth of solar PV deployment in this underserved market segment.

[52] Market Analysis of Residential Solar Deployment and Housing Characteristics of CT's Low Income Sector (December 12, 2014) – click here

Since December of 2014, progress has been made deploying solar PV in the LMI market segment (see Table 120).

Table 1012. Residential Rooftop Solar PV Distribution by Income-Banded Census Tract as of ~~May~~ June 3013, 20176

Income Level (AMI)	# of Census Tracts	Tract Pop.	Tract House-holds (HHs)	# of Projects	Installed Capacity (kW)	Projects per 1,000 People	Projects per 1,000 HHs	Watts/ Tract HHs
Less than 60%	17166	725,66266 2,619	224,39340, 062	8681,78 1	5,20611,0 04	1.22.7	3.97.4	23.245. 8
60-80%	10918	507,03149 3,438	216,43719 3,791	1,7572,6 35	11,8427,9 53	3.55.3	8.113.6	54.792. 6
80-100%	15337	596,40865 9,934	231,01469, 711	3,0874,5 37	22,07133, 123	5.26.9	13.416.8	95.5122 .8
100-120%	1460	723,31462 5,478	278,17437, 488	5,26661 7	39,43642, 914	7.39.0	18.923.7	141.818 0.7
More than 120%	25146	1,007,2091 ,143,854	406,18511, 504	7,92310, 046	62,38680, 801	7.98.8	19.524.4	153.619 6.4
Total	**827**	**3,559,6248 5,323**	**1,356,2032 ,556**	**18,9012 4,642**	**140,9418 6,016**	**5.36.9**	**13.918.2**	**103.913 7.5**

Benchmarks

Below are some of the Benchmarks to be used to compare the Residential Solar Investment Program with other states in the region (see Table 131). The below table reflects installed costs for homeowner-owned projects. Pricing for third party owned projects is structured differently and described in the next paragraph.

Table ~~11~~13. State Benchmarks of Residential Solar PV Program Incentives for Homeowner Owned Projects, Q1 2017[53]

Benchmarks	CT	MA	NJ	NY
~~Electric Retail Rate ($/kWh)~~	~~$0.199~~	~~$0.193~~	~~$0.155~~	~~$0.165~~
~~Installed Cost of Homeowner Owned System ($/W)~~	~~$3.88~~	~~$4.54~~	~~$3.69~~	~~$3.79~~
~~State Incentives ($/W)~~	~~$0.46~~	~~$2.39~~	~~$2.43~~	~~$1.09~~
~~Federal Incentives ($/W)[54]~~	~~$1.03~~	~~$0.64~~	~~$0.38~~	~~$0.81~~
~~Net Cost to Customer~~	~~$2.39~~	~~$1.50~~	~~$0.88~~	~~$1.89~~
~~Net Cost as % of Installed Cost~~	~~62%~~	~~33%~~	~~24%~~	~~50%~~
~~Installed Watts (2015)~~	~~55,100,000~~	~~140,800,000~~	~~91,500,000~~	~~163,000,000~~
~~Installed Watts per Capita (2015)~~	~~15~~	~~21~~	~~10~~	~~8~~
~~Installed Watts per State Incentive $ Invested (2015)~~	~~2.7~~	~~0.4~~	~~0.4~~	~~0.9~~
~~Installed Watts Cumulative (MW)~~	~~104~~	~~264~~	~~317~~	~~326~~
~~Energy Efficiency Requirement~~	~~energy audit required for all projects~~	~~energy audit required for Mass Solar Loan~~	~~none~~	~~energy audit required for on-bill financing~~

[53] Calculated by Statutory and Infrastructure Sector program staff ~~on March 3027~~in March~~,~~ 2017~~6~~. ~~CT, MA, and NY i~~Installed costs ($/W) are for Q~~1~~4 2017~~5, while NJ cost numbers are for Q1 2016~~. CT ~~cost numbers are~~cost data are from the RSIP dataset~~,~~, MA data are~~costs are~~ from the Massachusetts Clean Energy Center (http://www.masscec.com/get-clean-energy/production-tracking-system), the MA Solar Carve-Out ~~II~~ Program ~~dataset~~ (~~http://www.mass.gov/eea/energy-utilities-clean-tech/renewable-energy/solar/rps-solar-carve-out-2/current-statis-solar-carve-out-ii.html~~http://www.mass.gov/eea/energy-utilities-clean-tech/renewable-energy/solar/rps-solar-carve-out/current-status-of-the-rps-solar-carve-out-program.html), and the Mass Solar Loan Program (http://www.masssolarloan.com/program-performance). ~~and consultation with Massachusetts Clean Energy Center,~~ NJ data are from the New Jersey Clean Energy Program (http://www.njcleanenergy.com/renewable-energy/project-activity-reports/project-activity-reports). ~~costs were estimated from conversations with installers, and~~ NY ~~cost~~data~~s were taken~~ are from the NYSERDA NY Sun Program ~~dataset~~ (https://www.nyserda.ny.gov/All-Programs/Programs/NY-Sun/Solar-Data ~~http://www.nyserda.ny.gov/All-Programs/Programs/NY-Sun/Solar-Data~~). ~~New Jersey Clean Energy Program data was also referenced (http://www.njcleanenergy.com/renewable-energy/project-activity-reports/installation-summary-by-technology/solar-installation-projects).~~ CT and NY have direct incentives for which averages are provided in program installation data, and are also reflected on program web sites (http://www.nyserda.ny.gov/All-Programs/Programs/NY-Sun/Megawatt-Block-Dashboards/Residential-Small-Commercial-MW-Block, ~~and~~ http://www.energizect.com/your-home/solutions-list/residential-solar-investment-program, and http://www.gosolarct.com/). SREC prices for MA and NJ are as reported by SRECTrade, Flett Exchange, and the NJ Clean Energy Program for Q1 2017 ~~on March 30, 2016~~ (http://www.srectrade.com/, http://markets.flettexchange.com, and http://www.njcleanenergy.com/renewable-energy/project-activity-reports/srec-pricing/srec-pricing) taken on a net present value basis over 15 years for NJ and 10 years for MA, assuming a 5% aggregator fee and PV degradation rate of 0.5%. MA has a state tax credit of the lesser of $1000 or 15% of system costs ~~(http://www.mass.gov/dor/businesses/help-and-resources/legal-library/regulations/62-00-income-tax/830-cmr-6261-residential-energy-credit.html)~~ and NY has a state tax credit of 25% of system costs capped at $5000 (http://www.mass.gov/dor/businesses/help-and-resources/legal-library/regulations/62-00-income-tax/830-cmr-6261-residential-energy-credit.html, https://www.tax.ny.gov/pit/credits/solar_energy_system_equipment_credit.htm). All state incentives including SRECs were assumed to reduce the tax basis for the federal ITC for consistency and simplicity, though the tax treatment varies across states and is based on individual tax decisions. Installed Watts for 2016~~5~~ are ~~as reported by~~from SEIA/GTM, ~~in the~~ U.S. Solar Market Insight Full Report, 2015~~6~~ Year in Review (http://www.seia.org/research-resources/solar-market-insight-report-2016-year-review~~http://www.seia.org/research-resources/us-solar-market-insight~~). The electric retail rate is ~~as reported by~~from EIA's Electric Power Monthly, Table 5.6.A. Average Price of Electricity to Ultimate Customers by End-Use Sector, by State, for January 2017~~6~~, cents per kilowatthour (http://www.eia.gov/electricity/monthly/epm_table_grapher.cfm?t=epmt_5_6_a). Population data is from Census Bureau, CY16 population estimate (-https://www.census.gov/quickfacts/).

[54] ~~Includes 30% Federal Investment Tax Credit for homeowner-owned system, not MACRS (accelerated depreciation) only available to third party system owners.~~

Benchmarks	CT	MA	NJ	NY
Electric Retail Rate ($/kWh)	$0.193	$0.196	$0.158	$0.173
Installed Cost of Homeowner Owned System ($/W)	$3.70	$4.00	$3.67	$3.98
State Incentives ($/W)	$0.40	$2.59	$2.10	$1.06
Federal Incentives ($/W) [55]	$0.99	$0.42	$0.47	$0.88
Net Cost to Customer	$2.31	$0.99	$1.10	$2.05
Net Cost as % of Installed Cost	62%	25%	30%	51%
Installed Capacity in CY 2016 (MW)	59	165	165	206
Installed Capacity in CY 2016 per Capita (W)	16	24	18	10
Installed Capacity per State Incentives Invested (W/$)	3	0.4	0.5	0.9
Energy Efficiency Requirement	energy audit required for all projects	energy audit required if using Mass Solar Loan	none	none

A third-party owner of a residential solar PV system retains state and federal incentives for these projects, including the 30% federal investment tax credit as well as the MACRS[56] depreciation benefit. The homeowner pays for electricity on a per kWh basis through a power purchase agreement (PPA) or will make a monthly lease payment for an estimated amount of electricity produced from their leased system. These per kWh rates and monthly payments vary among lease and PPA providers, and depend on many factors including location, utility service territories (and associated electric retail rates), site characteristics, and the terms of the lease/PPA contracts. The below table provides a few benchmarks for comparison of homeowner owned and third party owned system costs and market penetration (see Table 1~~2~~4).

Table ~~12~~14. State Benchmarks of Residential Solar PV Program Incentives for Third Party Owned Projects, Q1 2017[57]

~~Benchmarks~~	~~CT~~	~~MA~~	~~NJ~~	~~NY~~
~~Electric Retail Rate ($/kWh)~~	~~$0.199~~	~~$0.193~~	~~$0.155~~	~~$0.165~~
~~Installed Cost of Homeowner Owned System ($/W)~~	~~$3.88~~	~~$4.25~~	~~$3.69~~	~~$3.79~~
~~Installed Cost of Third Party Owned System ($/W)~~	~~$3.27~~	~~$3.99~~	~~$3.35~~	~~$4.66~~
~~Installed Cost Overall - Weighted Average ($/W)~~	~~$3.39~~	~~$4.05~~	~~$3.38~~	~~$4.38~~
~~State Incentives for Third Party Owned System ($/W)~~	~~$0.35~~	~~$2.41~~	~~$2.43~~	~~$1.05~~
~~Percentage of Third Party Owned Projects (CY 2015)~~	~~84%~~	~~70%~~	~~91%~~	~~68%~~

Benchmarks	CT	MA	NJ	NY
Electric Retail Rate ($/kWh)	$0.193	$0.196	$0.158	$0.173
Installed Cost of Homeowner Owned System ($/W)	$3.70	$4.00	$3.67	$3.98
Installed Cost of Third Party Owned System ($/W)	$3.49	$3.46	$3.65	$4.34
Installed Cost Overall - Weighted Average ($/W)	$3.53	$3.61	$3.65	$4.19
State Incentives for Third Party Owned System ($/W)	$0.32	$2.46	$2.10	$1.09
Percentage of Third Party Owned Projects (CY 2016)	81%	72%	85%	59%

[55] Includes 30% Federal Investment Tax Credit for homeowner-owned system, not MACRS (accelerated depreciation) which is only available to third party system owners.

[56] 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.

[57] Percentage of homeowner owned versus third party owned projects was estimated based on the program datasets referenced ~~for Table 9~~in the prior table. ~~for calendar year 2015. For MA, the percentage was provided by Massachusetts Clean Energy Center.~~

Performance Indicators
Below are several Performance Indicators that will be used to measure the success of the RSIP.

- Number of projects submitted, approved, and completed
- Total MW (name plate)
- First year and lifetime generation (MWh)
- Installed cost ($/W)
- Incentive ($/W) and percent of incentive as installed cost
- Investment Tax Credit (ITC) ($/W) and percent of ITC as installed cost
- Ratio of ITC to incentive
- Net cost to the customer ($/W)
- Aggregate levelized cost of energy to customer ($/kWh)
- Aggregate payback to customer
- Aggregate internal rate of return to customer
- Percentage of third party owned versus homeowner-owned systems

Anaerobic Digester Program
Per Public Act 11-80 Section 103, the Green Bank is to develop a three-year pilot program for AD by setting aside $2 million a year for three years – for a total of $6 million. Funds to support the pilot programs can be used as grants, power purchase agreements or loans. There are to be no more than five (5) AD projects, each no more than 3 MW in size at a support for projects of no more than $450 per kW on a grant basis.

To date, five AD projects have been approved or are seeking approval by the staff from the Green Bank Board of Directors for a total of 8.4 MW (five projects) and $14 million (four projects) in sub-debt.

Benchmarks
AD using food waste and other organics is relatively new to the New England region. The Massachusetts Clean Energy Center (MassCEC) has recently awarded $2.3 million in FY 2013 for Organic-to-Energy projects, studies, and services relating to the development of new AD facilities in an effort to divert food waste from its landfills and incinerator facilities. Of the total amount awarded, $1.75 million was awarded in grants to develop 5 new AD facilities throughout Massachusetts and remaining funds were awarded to 12 public entities and 1 non-profit for studies and other services leading up to the development of new AD facilities.

Performance Indicators
Below are the Performance Indicators that will be used to measure the success of the AD pilot.

- Number of projects submitted, approved and completed
- Total MW (name plate)
- First year and lifetime clean energy generation
- Amount of food waste diverted from landfills and incinerators
- Installed cost ($/kW)
- Loan to private capital ratio
- MWh's generated and/or saved per $1 of ratepayer funds at risk

Other Areas of Strategic Importance

U.S. Department of Energy SunShot Initiative Rooftop Solar Challenge and SunShot Prize

The DOE's SunShot Initiative[58] goal is to achieve cost reductions for solar PV systems in the United States of 75% by 2020 to enable solar electricity to be cost-competitive with other forms of energy without subsidies. Two rounds of the SunShot Initiative's Rooftop Solar Challenge have supported progress in reducing the non-hardware or soft costs associated with rooftop solar energy systems through improved permitting, financing, zoning, net metering, and interconnection processes for residential and small commercial photovoltaic (PV) installations.[59] As overall solar PV costs continue to decline, and as subsidies are reduced and eliminated, reduction of soft costs will continue to be critical to improvement of solar PV economics and scaling of the market.

The Green Bank has applied for and won two Rooftop Solar Challenge funding awards totaling almost $850,000. In FY 2013, the Green Bank led a collaborative Connecticut Rooftop Solar Challenge Round I team to analyze and document soft cost reduction opportunities in Connecticut, resulting in a Final Project Report and development of recommendations to improve permitting, planning and zoning, and interconnection processes for solar PV. [60] In FY 2014, the Green Bank partnered with four other New England states, under the leadership of the Clean Energy States Alliance (CESA), to continue soft cost reduction efforts under the Rooftop Solar Challenge II. In this second round of the program, the Green Bank has finished development and production of a Connecticut Rooftop Solar PV Permitting Guide[61] which completes and packages permitting recommendations and tools developed or begun in Round I.

FY 2015 and 2016 activities have focused on outreach to municipalities, solar PV installers and other stakeholders to implement the Permitting Guide and achieve soft cost reductions. Through these initiatives the Green Bank has trained over 400 Connecticut code officials and 700 fire officials on solar PV technologies, developed and released a solar PV permit application endorsed by the Office of the State Building Inspector, and supported the passage of legislation that requires municipal building departments to incorporate residential solar PV into their municipal permit processes.[62] In FY16 the Green Bank contracted with Yale University's Environmental Performance Index to develop a municipal solar-friendly score card system for Connecticut. The score cards rate municipalities on their efforts to encourage residential solar PV adoption in their communities across five indicator categories, including the municipal solar permit process. The score cards, released in Q4 of FY 2016, encourage streamlined and efficient permitting practices for solar PV, and drive standardization in municipal permitting throughout the state.

In FY 2016 a team led by the Green Bank was accepted into the DOE's SunShot Prize *Race to 7-day Solar* competition[63]. This national competition challenges local governments, solar installers and utilities to collaborate towards improving the "going solar" experience, and reducing the total time it takes to complete solar PV installations. The Connecticut team includes the state's investor-owned utilities, seven solar contractors and 10 municipalities. The team will use a data-drive approach to further identify and implement soft-cost reduction strategies and reduce the total time taken to permit, install and interconnect solar PV projects in Connecticut. To date, the team has been awarded $50,000 from

[58] http://energy.gov/eere/sunshot/sunshot-initiative
[59] http://energy.gov/eere/sunshot/rooftop-solar-challenge
[60] Final Project Report is available for download at www.energizect.com/sunrisene.
[61] See the Permitting Guide tab at www.energizect.com/sunrisene.
[62] https://www.cga.ct.gov/2015/sum/2015SUM00194-R02HB-06838-SUM.htm
[63] http://energy.gov/eere/sunshot/sunshot-prize-race-7-day-solar

the DOE through the competition. The team will continue to compete in the SunShot Prize until the competition concludes in March 2017.

The Green Bank's Solarize program has already contributed to soft cost reductions of about 20% through customer acquisition. Efforts to streamline permitting could result in an additional 5-10% or more in soft cost reductions in the near term, and significantly more in the long term, in addition to removing or reducing market barriers associated with permitting and planning and zoning processes and rules. Interconnection improvements implemented by Connecticut's utilities will further add to soft cost reductions. While DOE funding under the Rooftop Solar Challenge II program concludes in Quarter 1 of FY 2017, the Green Bank will continue to support municipalities and utilities in further improving processes to achieve soft cost reductions in FY 2017 and 2018.

Emerging Technologies and Opportunities

As of 2016, the Green Bank anticipates emerging technology areas and approaches that offer growth opportunities with respect to market transformation for distributed generation and further aligning Green Bank efforts with state climate change reduction strategies as well as efforts to modernize the grid. Some of these opportunities are described here, though these developments in these technology areas are expected to continue to quickly evolve.

Based on the results of Cadmus' cost-effectiveness evaluation of RSIP and signs of an emerging market for energy storage, the Green Bank is looking at opportunities to support deployment of energy storage and other technologies that will provide comprehensive energy solutions for customers as well as contribute to utility and stakeholder efforts to improve and modernize the grid. These opportunities may include pilot projects with utilities to deploy solar PV, energy storage and other technologies at strategically beneficial locations. Developments in the area of smart meters and advanced metering infrastructure would also be beneficial in supporting clean energy deployment and better integrating distributed generation into the grid.

As previously noted, programs in Vermont are encouraging adoption of solar PV with energy efficiency, energy storage, and renewable thermal technologies. Deployment of solar PV along with renewable thermal technologies such as heat pump hot water heaters and air source heat pumps presents a particularly beneficial opportunity to reduce overall customer energy use and in particular fossil fuel use and move Connecticut further towards its climate change reduction goals.

The Green Bank is looking at opportunities to support deployment of alternative fuel vehicles and infrastructure as an emerging technology solution for reducing greenhouse gas emissions from fossil fuel combustion in the transportation sector. Electric vehicles are becoming more affordable and attractive to consumers and are on the cusp of wider-scale adoption. Solar PV will continue to be important to provide clean electricity to enable this shift towards zero emissions in the transportation sector.

The Green Bank participates in the ISO New England (NE) Distributed Generation (DG) Working Group that provides yearly forecasts of the penetration of distributed generation in the New England region, in particular solar PV which is anticipated to have the greatest impact on transmission and distribution planning. One of the findings is the need for smart inverter technologies as market penetration of solar PV increases. Smart inverters can provide grid stability by allowing solar PV to better "ride-through" events that would otherwise cause large-scale shut downs of solar PV. Another area of consideration is the "duck curve" phenomena whereby increasing penetration of solar PV shifts utility peaks to later in the day, also creating a steeper ramp-up to those peaks. Utilities in California are developing multiple

approaches to ameliorate this effect, one possible solution being the installation of solar PV on west facing roofs to help meet loads occurring later in the day. A pilot project in Rhode Island is incentivizing west-facing deployment of solar PV. While these effects have not yet been closely examined in Connecticut, the Green Bank is staying abreast of these regional and national developments.

Membership and participation in activities led by the Clean Energy States Alliance (CESA) is important to the Green Bank's programs including in the area of residential solar PV. For example, CESA is taking leadership in areas such as consumer protection at a time when customers are still relatively new to financing as well as third party ownership models of solar adoption, and when incentives are decreasing and program oversight is lessening relative to increasingly higher volumes of solar PV deployment. CESA is also providing leadership on soft cost reduction strategies, such as through SunShot Rooftop Solar Challenge projects, has a strong research arm focused on advancing energy storage, and is active in many other areas of importance to the advancement of clean energy.

8. Residential Sector – At Home

The Residential Sector is focused on deployment of residential financial products for renewable energy, energy efficiency projects, and natural gas conversions serving residential 1-4 unit and multifamily (5 or more unit) dwellings, as well as programs and platforms that support the scaled growth of those instruments in order to provide cheaper, cleaner and more reliable sources of energy while creating jobs and supporting local economic development.

Comprehensive Energy Strategy and Integrated Resource Plan

The Residential Sector programs support the implementation of the 2013 CES and 2015 IRP. Specifically, they support the implementation of the energy efficiency, electricity, and natural gas strategy recommendations in Chapters 1, 3 and 4 of the CES.

As identified in the CES, buildings constitute 58% of the state's energy use and 87% of its electricity, with residential buildings as a whole consuming 70% more than their commercial counterparts. Due to the lack of significant residential home construction in the state, the existing opportunity for energy improvements in the residential sector is in existing housing stock, 50% of which are heated by oil, and only one-third by natural gas. Further, while 322,000 state residents have participated in the HES and HES-IE program through April 2016 (23% of eligible customers statewide), approximately 28% of those who complete the HES audit in 2014-2015 time-period go on to install recommended deeper energy savings measures. A significant additional opportunity exists to maximize the program's gross impact through a strong call to action supported by low-cost financing.

DEEP's 2014 Integrated Resources Plan calls for the state's electricity sector to mitigate the impact of expected increases in Class I RPS costs beginning in 2017 and the potential for increases in peak demand for both summer and winter peaks, with winter peaks being a particular area of focus.

Conservation and Load Management Plan

The 2016-2018 Conservation and Loan Management Plan highlights the following priorities that relate to the residential sector:

- Driving comprehensive and deeper savings;
- Scaling and broadening the reach of its programs to underserved markets;
- Expanding the impact of its funding including leveraging Green Bank financing;
- Continuing the transformation of the HES program to a market-based program that can drive more comprehensive upgrades;
- Reinforcing the connection between energy efficiency and renewables;
- Mainstreaming efficiency through supply channels and the broader marketplace, including working with the Green Bank; and
- Researching demand response and other new technologies.

With respect to financing, the C&LM plan notes the "key objective of the Companies' and ~~Connecticut Green~~Green Bank's financing programs is to provide attractive financing options to customers, while maximizing cost-effective energy efficiency and achieving more and deeper energy

savings." It further notes the "Companies expect that the ~~Connecticut Green~~Green Bank can identify and will secure the least cost sources of capital in order to provide sustainable and attractive customer financing options."

The Residential Sector team has established ongoing collaboration with the EEB, DEEP and utility staff, including the following:

- Monthly residential financing working group coordination meetings with DEEP, EEB consultants and members, electric and gas utility staff – the primary forum for aligning products, marketing, and outreach across the various residential financing options;
- Quarterly reports on the Green Bank Residential Sector progress to the Residential Committee of the EEB; and
- Joint Committee of the Energy Efficiency Board and ~~Connecticut Green~~Green Bank and the Single-Family and Multifamily Working Groups of the committee.

The residential sector goals adopted by the Joint Committee are below.

Residential Sector: Single Family

1. Per Public Act 11-80 Section Identify coordinated strategies for expanding comprehensive loans for the 2016-2018 period. Calibrate incentive and buy-down levels to achieve more comprehensive projects while reducing program costs.
2. Pursue all cost-effective energy efficiency in the residential sector, using financing and increasing the amount of private sector capital where effective (and a simplified approval process where possible and appropriate), to leverage up ratepayer funds and achieve more and deeper savings.
3. Increase financing in the HES/HPwES channel to meet needs and drive deeper energy savings and more projects.
    a. Increase HES projects with completed follow-ons per the C&LM plan, using financing as one of the tools to increase completed follow-ons.
    b. Increase the adoption of the Smart E-bundle and CHIF comprehensive loans

In addition to the above formally adopted goals, the single-family sector-level coordination document developed by the Single-Family Working Group of the Joint Committee contains additional areas of coordination that the Companies and the ~~Connecticut Green~~Green Bank are expected to work on over the 2016-2018 time period. These include, but are not limited to, the following:

- Exploring options to expand alternative underwriting and simplified approvals where possible and appropriate to reach more customers while reducing hassle and delays, including customers below 80% area median income and credit-challenged customers;
- Developing solutions that incorporate financing where effective and appropriate to address health and safety or other remediation issues; and
- Exploring and developing strategies for driving energy efficiency through the solar channel, and vice versa.

Residential Sector: Multifamily

1. Reduce energy consumption and costs in multifamily properties consistent with goals in the ~~Connecticut Green~~Green Bank's plan and the Conservation and Load Management plan. (MMBTU's per unit).
2. Establish, align and fund financing programs to fill current unmet needs and gaps including projects driven by energy efficiency improvements where capital improvements are a subcomponent. Complete the tasks from the work plan from the May 2015 Lean event.
3. Fund and complete a market analysis of certain sectors to quantify and qualify this segment and identify gaps, opportunities and best ways to serve by the end of 2016. Hard to reach sectors include certain rural areas and non-subsidized, non-rent restricted multifamily housing that is privately owned and serving low-income tenants (also referred to as naturally occurring affordable properties).

TAM and SAM

Residential Housing Market

For the Residential Sector, a discussion of the TAM and SAM must first be grounded in a description of the housing and income characteristics of the state's residents. The diverse characteristics of housing and income across the state inform the types of upgrades that are needed and the range of financing solutions and strategies that are required to adequately address this market.

The Green Bank, working with the state's housing agencies and a variety of other stakeholders, has defined low income for its programs to be 80% of Area Median Income (AMI) or lower and low to moderate (LMI) income to be 100% of AMI or lower. These AMI cutoffs may either be at:

a) the census tract level, for high level Green Bank reporting purposes;
b) actual household income for Green Bank program reporting purposes where household income is collected (limited number of programs);
c) the household level for program eligibility purposes, in which case household size and area of state is used (referencing Connecticut Department of Housing (DOH) income tables); or
d) the multifamily property level, where a percent of residents and a certain AMI limit are used to determine program eligibility.

There are 3,592,000 residents in the state living in 1,356,000 housing units (see Table 1~~3~~5). Of these units, about 1,125,000 are single family, also known as residential 1-4 (i.e., approximately 83%), and 230,000 are multifamily, 5 or more units (i.e., approximately 17%).

Table ~~13~~15. Estimate of the Distribution of Housing Units by Income and Ownership

Housing Units 1,360,000	
Non- LMI	**LMI**

685,000 (≥100% AMI)		695,000 (<100% AMI)			
		Moderate Income (80-100% AMI) 230,000 34%		**Low Income** (<80% AMI) 445,000 66%	
Own 559,000 82%	**Rent** 126,000 18%	**Own** 148,000 64%	**Rent** 82,000 36%	**Own** 162,000 36%	**Rent** 283,000 64%

Figure 5 shows a breakdown of the 1,1250,000 single family housing units for each of the income groupings, categorized by owner occupied homes, owner-occupied 2-4 unit buildings, or 1-4 unit rental properties. These categories of single family housing are relevant for the types of financing that are typically available, particularly whether the property is owner occupied or not. Figure 6 shows a breakdown of the 240,000 multifamily housing units for each of the income groupings, categorized by the size of the rental properties, whether 5-9 units, 10-19 units, or 20 or more units. These categories of multifamily properties are relevant for the types of financing that work best for each.

Figure 5. Single Family Housing Type and Income Breakdowns

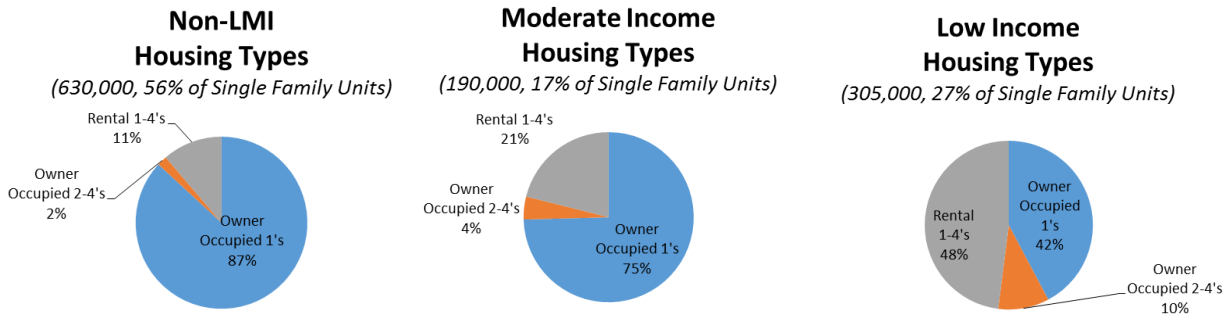
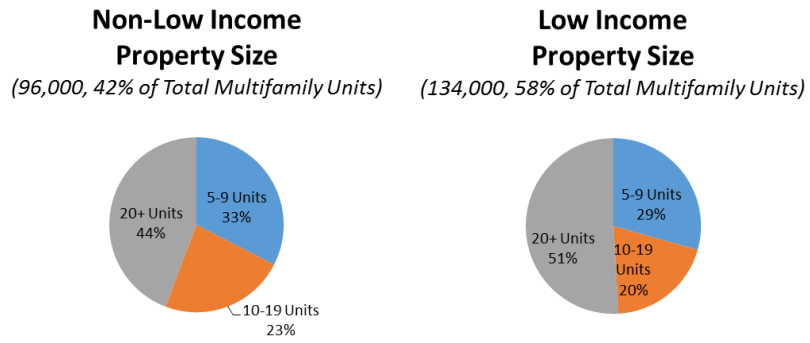
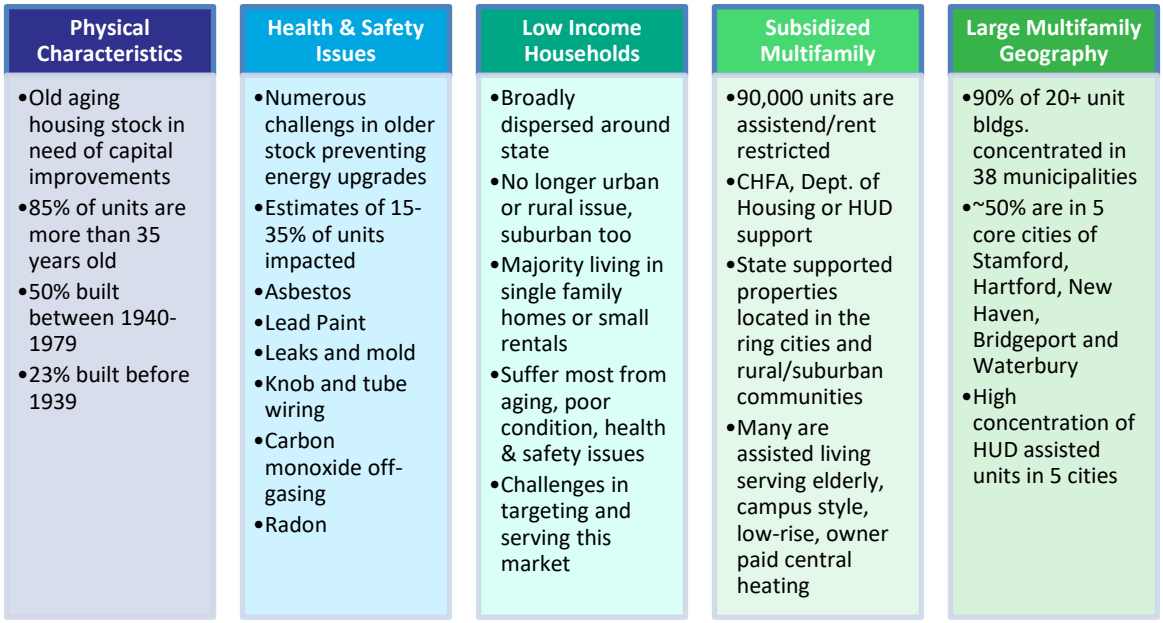


Figure 6. Multifamily Property Type and Income Breakdowns



Beyond the distribution of housing units in Connecticut, the Green Bank's December 2014 Housing Market Analysis provided several key insights into the overall challenges for our low income and multifamily market segments, shown in Figure 7.

Figure 7. Housing Market Insights and Characteristics



For the ~~single family~~single-family owner occupied market segment, homeowners have many options for financing clean energy improvements (e.g., solar PV, natural gas conversions, energy efficiency, etc.) including cash, savings, credit cards, vendor/equipment financing, mortgages, and home equity loans or lines of credit. While estimates for a reasonable market share for energy financing programs vary, one suggested rule of thumb from one of the largest state energy programs to date for energy efficiency and natural gas conversions is Pennsylvania's Keystone HELP program, where about a third of customers doing energy upgrades in the state use cash or credit cards, another third use some other loan product (e.g., vendor, equipment, mortgage or home equity), and a third used the state's energy program. For solar PV financing in Connecticut, currently no less than 4 in 5 projects finance projects through a third-party owner through a lease or power purchase agreement.

Solar PV – Single Family Owner Occupied Properties (1-4 Units)

For Solar, the TAM is calculated to be the total number of residences with rooftops that are economically viable (i.e., 506,714 households) for siting a solar array (see Table 4). Of the economically viable households for rooftop solar PV, over 17,000 have already installed clean energy systems leaving approximately 490,000 households – or the SAM. Assuming that the market potential follows the current make-up of third-party owned systems versus homeowner owned systems, then the potential for financing solar PV projects is substantial at greater than $10 billion (see Table 1~~4~~6).

Table ~~14~~16. SAM for Residential Solar PV Financing in Connecticut

	Homeowner Owned	Third-Party Owned	Total
% of the Current Market	20%	80%	100%
# of Households Left	98,000	392,000	490,000

Investment Needed[64]	$2.7 billion	$9.0 billion	$11.7 billion

Approximately 75% of Connecticut's residents meet the minimum credit requirements in order to qualify for Green Bank financing that was available through the middle of 2015. However, 2015 was a year of transition for solar financing options. Having graduated two products off the Green Bank balance sheet, CT Solar Lease and CT Solar Loan, the Green Bank was only focused on offering solar financing for purchases (currently through the Smart-E Loan program and potentially in the future through residential PACE), and for leasing through an LMI targeted offering with alternative underwriting (non-traditional credit requirements) that was launched in mid-2015 in partnership with PosiGen. With the addition of PosiGen's offering in the market we can now serve nearly 100% of Connecticut residents with a solar financing option.

From 2013 through March 30, 2016 the Green Bank financed 1,905 solar projects through one of its offerings, representing 0.38% of the TAM and 11.1% of the approximately 17,000 systems installed to date. From 2015 through April of 2016 there were 1,645 solar-owned/purchased systems and 164 were financed by the Green Bank representing 10.0% of the purchase market in that period.

Natural Gas Conversions – Single Family Owner Occupied Properties (1-4 Units)

The CES characterizes the state's market for natural gas conversions, dividing prospective residential end-users into three classifications, Segment A, B, and C. Prospective consumers in Segment A are comprised of residential – low use and residential – on main, while Segment B prospective consumers are comprised of residential – off main (see Table 1~~5~~7).

Table ~~15~~17. Estimate of the Residential Natural Gas Conversion Market in Connecticut

Segment	Type	Prospective Consumers
A	Residential, Low Use	39,000
A	Residential, On Main	161,000
B	Residential, Off Main	51,500
Total		**251,500**

Given the present payback economics, the TAM is limited to Segment A, 200,000 residences in total and with an average installed cost of $7,500 for a conversion, the TAM requires $1.5 billion of investment. Using the rule of thumb that one third of customers will use a state financing program and that 85% of customers can meet our credit criteria, the SAM represents 56,000 projects and $420 million of investment. Providing households that seek to convert to natural gas with access to low-cost and long-term private capital will support the implementation of the CES and Natural Gas Expansion Plan. Based on Smart-E project data through February 29th, 2016, Green Bank financing has resulted in 72 natural gas conversions, or 0.13% of the SAM. The Green Bank's Smart-E financing for natural gas conversions currently competes against the gas companies' Energize CT Heating Loan product. DEEP's stated policy is that ratepayer-subsidized products should be positioned such that they do not undermine products

[64] Based on homeowner owned installed cost of $3.88/W, third-party owners installed cost of $3.27/W and assuming an average system size of 7 kW.

backed by private capital. This is an ongoing area of focus for DEEP, the Green Bank, the utilities and EEB.

Deeper Energy Efficiency – Single Family Owner Occupied Properties (1-4 Units)
The CES and the C&LM Plan both call out the need for deeper energy efficiency measures to be undertaken in Connecticut homes. The Green Bank sees an opportunity to support high efficiency heating, cooling and hot water equipment upgrades. Additionally, there is a growing focus on whole home performance as an industry in the state. The TAM is 870,000 consumers (the approximate number of owner occupied 1-4 unit homes in the state) and $7 billion of investment, assuming an average installed cost of $8,000 per project. Industry estimates indicate that 1 in 7 homeowners pursue an upgrade or replacement that impacts energy consumption each year[65], or approximately 124,000 homes per year in Connecticut. The SAM represents 35,000 homeowners and $280 million of investment each year, assuming about one third of consumers will use state financing and 85% can credit qualify for Green Bank financing.

Based on Smart-E project data through February 2016, the Green Bank has financed 421 projects incorporating high efficiency heating, cooling, hot water equipment, insulation, windows and other efficiency measures. The Green Bank's share of the TAM is 0.05%, and 0.40% of the annual SAM on average over the last three years. The Green Bank's Smart-E financing for deeper residential energy efficiency projects currently competes against the EnergizeCT Heating Loan, and through June 2016 also competed against the Connecticut Housing Investment Fund's (CHIF) Residential Energy Efficiency and Energy Conservation Loan financing programs. Both are ratepayer-subsidized financing products, with the Heating Loan legislatively mandated through 2019; however, CHIF will be joining the Smart-E program in July 2016. DEEP's stated policy is that ratepayer-subsidized products should be positioned such that they do not undermine products backed by private capital. This is an ongoing area of focus for DEEP, the Green Bank, the utilities and EEB.

All Energy Upgrades – Multifamily Properties (5+ Units)
There are approximately 240,000 multifamily units in the state representing the TAM, about 150,000 of which are low income units. To date, the focus of the Residential Sector multifamily programs has been on the affordable assisted/rent restricted multifamily market, about 90,000 units (40,000 of these are financed by CHFA, with the remaining supported by DOH or HUD). The other area of focus has been on larger properties of 20 or more units, representing about 110,000 units.

The Green Bank has provided pre-development or technical assistance support on for 5 properties and 310 units through April 30, 2016, representing 0.13% of the total units. Additionally, the Green Bank has provided financing for 21 properties comprising 1,122 units, representing 0.47% of the total units.

Product or Program Overview and Objectives

[65] From Renovate America May 2016 presentation at ACEEE Finance Forum

Table 1~~8~~6 presents a breakdown of the single family and multifamily product and program objectives for FY 2017 of the ~~Connecticut Green~~Green Bank.

~~After gauging market performance, the Green Bank revised its Fiscal Year 2017 target in January 2017 to the following:~~

Table 18. Residential Sector Fiscal Year 2017 Targets

Program	Projects	Capital Deployed	Clean Energy Deployed (MW)
Energize CT Smart-E Loan[66]	538	$9,039,000	1.1
LMI Solar PV Leases and EE ESA's	500	$15,250,000	3.4
Multifamily Term Loans	55	$12,310,000	0.9
Multifamily Pre-Development Loans	36	$570,000	N/A
Total *(not including Pre-Development Loans)*	**1,093**	**$36,599,000**	**5.4**

After gauging market performance, the Green Bank revised its Fiscal Year 2017 target in January 2017 to the following (see Table 19):

Table ~~16~~19.Revised Residential Sector Fiscal Year 2017 Targets

Program	Projects	Capital Deployed	Clean Energy Deployed (MW)
Energize CT Smart-E Loan[67]	~~538~~254	$5,873,447~~$9,039,000~~	1.1
LMI Solar PV Leases and EE ESA's	500	$15,250,000	3.4
Multifamily Term Loans	~~55~~17	$11,140,000~~$12,310,000~~	0.9
Multifamily Pre-Development Loans	~~36~~4	$~~570,000~~299,167	N/A
Total *(not including Pre-Development Loans)*	**~~1,093~~771**	**$32,263,447~~$36,599,000~~**	**5.4**

The following are Fiscal Year 2018 targets for the Residential Sector (see Table 20).

Table 20. Residential Sector Fiscal Year 2018 Targets

Program	Projects	Capital Deployed	Clean Energy Deployed (MW)

[66] Includes the new CHIF/HES channel (250 loans) and existing channels for solar PV (143 loans), and HVAC/energy efficiency upgrades (145 loans).

[67] Includes the new CHIF/HES channel (250 loans) and existing channels for solar PV (143 loans), and HVAC/energy efficiency upgrades (145 loans).

Energize CT Smart-E Loan[68]	440	$8,153,050	1.3
LMI Solar PV Leases and EE ESA's	720	$20,087,746	4.5
Multifamily Term Loans	16	$7,550,000	0.6
Multifamily Pre-Development Loans	9	$188,400	N/A
Total	**1,185**	**$35,979,196**	~~5.6~~6.4

The following is a breakdown of the single family and multifamily product and program overviews. These include options for both LMI and non-LMI housing.

Energize CT Smart-E Loan

In partnership with Connecticut's community banks, credit unions, and a local CDFI ~~for credit-challenged customers~~, homeowners, include those that are credit-challenged, are offered low-interest (between 4.49% to 6.99%) and long-term (5 to 12 year terms, and up to 15-20 years for qualified borrowers) unsecured financing for a range of credit quality consumers (580 FICO or above) through unsecured loans backed by a second loan loss reserve from the Green Bank. Financing is available for all measures that the CES supports (e.g., energy efficiency, renewable energy, natural gas conversions, alternative fuel vehicle infrastructure) as well as up to 25% of a loan can be used for healthy home measures (e.g., asbestos remediation, lead abatement) and other related improvements. A special "Smart-E Bundle" is being offered to support multi-measure and comprehensive renewable energy and energy efficiency projects by lowering the interest rate to 0.99-2.99% for eligible measures for the 5, 7 or 10 year terms. Another special offer is available for natural gas conversions for high efficiency heating or hot water equipment by lowering the interest rate to 0.99-2.99% for the 5, 7, or 10 year terms. The Smart-E Loan program uses $74.8 million of repurposed ARRA-SEP funds and Green Bank funds for a second loan loss reserve and interest rate buy-downs to attract nearly $31 million of private capital.

LMI Solar PV Lease and Energy Efficiency ESA – PosiGen

This program was launched in partnership with PosiGen Solar Solutions in mid-2015, supporting low-to-moderate income residents to go solar and install energy efficiency measures using an innovative solar lease and energy savings agreement financing model. The offer is open to households regardless of income or credit, utilizing alternative underwriting approaches that examine factors such as bill payment history and bad debt and bank databases. Green Bank support for PosiGen includes an initial $5 million of subordinate debt (with an option for an additional $5 million investment) and a higher level of solar incentive for income verified low-to-moderate income households. PosiGen is targeting an initial 1,000 installs in a $27 million fund. Through a combination of a solar PV lease and energy efficiency energy savings agreement (ESA) financial product structure in the low-to-moderate income market segment, HES/HES-IE is also being conducted on 100% of projects[69] – and, in addition, 65% of projects are "going deeper" on energy efficiency by paying $10 more per month to purchase an ESA that installs additional

[68] Includes the new CHIF/HES channel (250 loans) and existing channels for solar PV (143 loans), and HVAC/energy efficiency upgrades (145 loans).

[69] Except for those homes that can't be served due to health and safety issues.

measures like insulation and thermostats. Customers who take the ESA option also get a savings guaranty.

Low Income Multifamily Energy (LIME) Loan
Through a partnership with Capital for Change (formerly known as Connecticut Housing Investment Fund), the LIME loan provides up to 20 year terms for an unsecured low interest loan product geared towards mid-~~stream~~ cycle energy improvements and serving properties where at least 60% of units serve renters at 80% or lower of Area Median Income. Projected energy savings are used to cover the debt service of the loan. The Green Bank supports LIME with a $~~300~~325,000 loan loss reserve and provided $3.5~~1~~ million to capitalize the initial $~~3.~~5 million loan fund.

C-PACE for Multifamily
C-PACE is available for multifamily properties where lender consent is available, typically market rate or naturally occurring affordable properties. The Green Bank ~~expects~~ was ~~please~~pleased to see HUD ~~to~~ issue guidance in ~~2016~~ 2017 that would allow C-PACE on HUD financed affordable multifamily properties. See the "At Work" section below for more information.

Solar-Only Financing for Multifamily
Solar financing is available for multifamily properties through the CT Solar Lease facility (both leases and power purchase agreements are supported). See the "At Work" section below for more information. Of particular note is a partnership with CHFA and their State Sponsored Housing Portfolio, a Solarize-style group purchasing model to drive down aggregate solar PV costs on housing authorities.

Affordable Multifamily ~~Gap Financing~~Catalyst Loan Fund
Through a partnership with Housing Development Fund and MacArthur Foundation, who has provided a $5 million program related investment, and with additional support of $1.5 million of Green Bank funds and $1.5 million of DEEP Regional Greenhouse Gas Initiative Funds, a gap financing fund is available at concessionary rates to support energy projects that otherwise would not pencil out or that require remediation of health and safety upgrades. This fund is intended to be blended with other project financing to lower the overall rate for the project.

Benchmark CT – Performance Measurement

This initiative is offered through a partnership with CHFA, where WegoWise will benchmark 1,600 multifamily properties and guide building owners through an analysis to identify opportunities. The first year of benchmarking is offered for free. An initial 500 properties were benchmarked in partnership with New Ecology, Inc. between 2014 and 2015. The Green Bank and CHFA will leverage the benchmarking results to identify the highest priority targets across the portfolio for either pre-development or term financing.

Residential Property Assessed Clean Energy (R-PACE)

In 2016 the Green Bank – working with the Department of Banking – proposed a Residential Property Assessed Clean Energy program (R-PACE) that was not successful due to concerns regarding FHFA's stance on sales of mortgages to FNMA and FHLMC that have PACE liens. In light of pending guidance from HUD on treatment of R-PACE benefit assessment liens that are subordinated to first mortgages - and following from the success of the Green Bank's nation-leading Commercial PACE program – a proposal to update Connecticut's existing R-PACE statute will be a top state legislative priority in the 2017 legislative session. With a program expected to draw national players to Connecticut, and with longer terms (up to 20 years) and interest rates that are expected to affordably finance cash flow-positive energy improvements, R-PACE enablement could be a key strategy in achieving deeper energy upgrades in the residential 1-4 market. Furthermore, it can contribute to achieving more market uptake in the LMI sector, since underwriting is to the property (e.g. collateral based), as opposed to the consumer, based on credit.

An R-PACE policy in Connecticut would not only attract more private capital investment to support clean energy deployment, but it would also result in considerable jobs and local economic development.

Multifamily Pre-Development Energy Loan Program

In a traditionally difficult sector to address, multifamily projects have a significant need for pre-development financing, trusted technical support, and streamlined access to funding programs. In 2015, the Green Bank developed pre-development energy loan programs to support property owners in identifying high-quality technical assistance providers, and to fund the work needed to scope and secure financing for deeper, cost effective energy upgrades. There are two versions available – a high-touch version through partner New Ecology called the Sherpa Loan and an owner managed version called the Navigator Loan. The Green Bank is working to change the model of pre-development and technical assistance from one that is primarily grant-funded in the affordable housing space to one that is loan driven. Owners can petition for loan forgiveness, if for some reason a project is unable to proceed to implementation. This program is supported by a $650,000 revolving loan fund for loans of 0.0% to 2.99% and up to two year terms. The affordable multifamily version of this program is housed at the Housing Development Fund, a local CDFI, and part of a $5 million program related investment from MacArthur Foundation is being used to support the program.

Performance Indicators

Below are the Performance Indicators that will be used to measure the success of the residential financing programs for FY 2017.

Single Family

- Number of applications received
- Application approval rate
- Average FICO and DTI (where applicable)
- Average loan size, term and rate
- Performance stats (delinquency and default rate, scheduled to actual collected)
- Average energy savings/production per project
- Average system size (solar)
- Percent of projects with multiple measures (Smart-E)
- Number of eligible contractors
- Contractor engagement – percent of eligible contractors bringing in applications/repeat applications
- Market penetration by income band/census tract and distressed community
- RSIP market penetration;
- Ratio of public to private capital deployed
- Successful innovation in marketing and outreach (ex: performance-based customer acquisition)

Multifamily

- Number of applications received
- Application approval rate
- Average loan size, term and rate
- Performance stats (delinquency and default rate, scheduled to actual collected)
- Average energy savings/production per project
- Average dollar savings by unit
- Average system size (solar)
- Affordable vs. market rate breakdown
- Market penetration by income band/census tract and distressed community
- Ratio of public to private capital deployed

Other Areas of Strategic Importance

Energy Burden Reduction for Low to Moderate Income Communities

Our goals for our low to moderate income work are to:

1. Reduce the clean energy affordability gap for low to moderate income residents, bringing their energy burden as a percent of household income in line with national targets for household energy spend and on par with what more affluent households spend in the state.
2. Ensure low to moderate income communities aren't left behind and have access to the same clean energy future that higher communities do.

The state's high energy prices have the greatest impact on our most vulnerable citizens. The energy affordability gap is the difference between how much a household actually spends on energy each year versus what is considered to be an affordable amount. National housing targets for an affordable rate of energy spend is 6% of household income. Lower-income households in Connecticut have a significantly higher energy burden than higher-income households do, ranging from an affordability gap of $1,500 to $2,500 per year over the past few years, based on the price of heating oil and natural gas in a given year[70]. This is money that could be spent on much needed medicine, or education, or paying other bills or building savings – residents are being forced to make tough decision around basic needs.

In developing strategies for the LMI market, the Green Bank seeks solutions that will improve the financial sustainability of low-to-moderate income families who are most susceptible to rising energy costs by reducing their energy consumption and assure that implemented measures deliver on the projected performance. We have taken a partnership based approach to the development of solutions with partners including local CDFIs (HDF and CHIF), MacArthur Foundation (providing a program related investment), state and federal housing agencies (CHFA, DOH, HUD), the utilities, DEEP, Connecticut Housing Coalition, municipalities, and community-based organizations. These partners are organized around a common goal to achieve comprehensive, deeper energy improvements that help owners and tenants save energy, reduce costs, increase property values, and provider healthier and more comfortable housing.

Other Areas for Development

[70] Operation Fuel conducts a study of the state's affordability gap periodically. The 2015 report can be found here.

While a solid foundation has been laid for making demonstrable progress in low-to-moderate income communities, we have already identified additional area that will need to be developed to reach all the segments that make up our LMI market. The following areas of product development will require further work and/or investigation:

- **Credit-builder and "energy savings accounts" products** for LMI consumers who finance energy upgrades and use their repayment experience to improve their credit and build wealth.
- **Additional multifamily products** including financing support for smaller properties (2-9 units) and project sizes, energy savings agreements, and a savings guaranty product.

The following areas of policy development will require further work:

- **Clean energy upgrades as a "way in" to community development and neighborhood revitalization and/or stabilization**, including exploration of integration of Green Bank programs with federal HOME and CDBG funds to weave housing and energy funding together. The excitement around solar is proving to be a powerful catalyst for driving interest in broader community investment that targets not just housing, but nonprofits, institutions and small businesses.
- **Energy + Housing + Health nexus**, covered in the next section.
- **Community Solar** – moving beyond the pilots being run by DEEP through 2017 and towards a statewide policy. This will be a critical piece in the longer term to making the benefits of solar available to all LMI residents, especially renters and those who can't go solar given roof conditions or siting. It is an open question whether community solar is a better solution for the small rental market rather than direct installs.
- **Sub-metering policy** – regulators have clarified rules around the sub-metering of tenants, establishing maximum allowable rates sub-metered tenants can be charged for access to renewable distributed generation.
- **Modifications to utility allowances in subsidized multifamily properties** at both the state and federal level to remove disincentives for owners to pursue energy upgrades when they are also seeking funding from state and federal housing programs.

Energy + Health + Housing Nexus

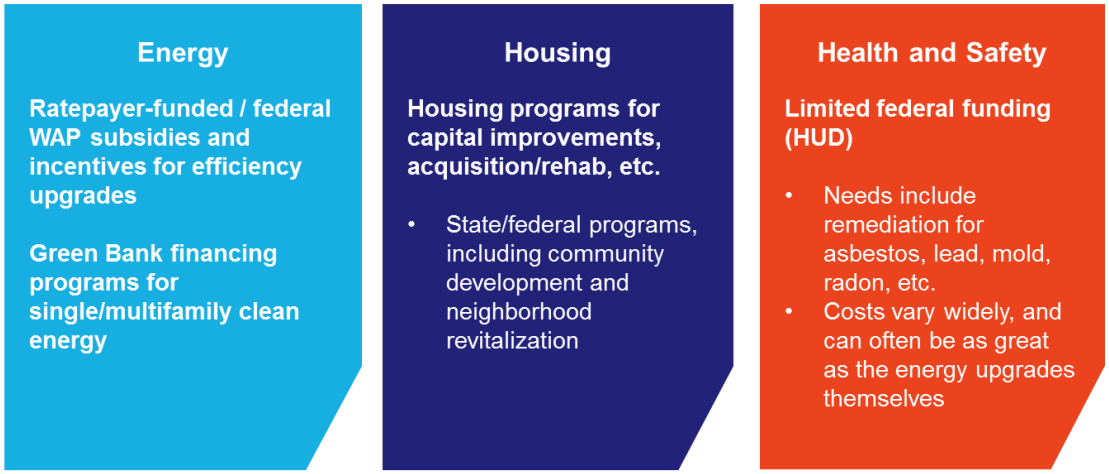
Connecticut's housing stock is aging, with 83% of housing units built before 1980. Older housing stock is most prevalent within lower income communities, and suffers from decades of deferred maintenance. Numerous health and safety challenges in that older building stock prevent energy upgrades from moving forward. These include health-related items such as the presence of asbestos, lead paint, mold from leaks, radon, carbon monoxide off-gassing, safety issues such as knob and tube wiring, and lack of safety rails and ramps for an aging population. Estimates from the state's Home Energy Solutions program range from 15-35% of housing units can't even pursue a blower door test due to a health or safety issue.

The Challenge

There is no sustainable, scalable funding source to address these health and safety issues – HUD's lead abatement and Healthy Homes programs, while still available, have had their funding cut by Congress in the last 20 years, and the Connecticut Department of Public Health (DPH) is not funded to provide remediation services. Furthermore, even when there are limited funds available for health and safety, they are not coordinated with energy and housing funding streams. *This is a preservation of affordable housing units issue*, for if nonprofit multifamily developers or homeowners can't afford holistic

upgrades, then private developers or investors come in and make improvements but in the process convert the units to market rate. The silos of funding available are illustrated below (see Figure 7).

Figure 7. Funding Silos - Energy, Housing, and Health and Safety



The Opportunity

By linking improved, greener and healthier housing to improved health outcomes in our ~~low-income~~low-income communities, it may be possible to tap into a whole new funding source in the public health sector to address these issues. Considerable research has been done on the link between energy upgrades and improved indoor air quality, for example, improved asthma outcomes are linked to improved air quality in the home. Improved health outcomes are also tied to higher income levels, as are energy upgrades and reduced household energy burdens.

The state's DPH Healthy Homes Initiative published the Connecticut Healthy Homes Data Book in July 2012[71], shedding light on the most pressing health concerns tied to our homes:

- Asthma is costly to the state and concentrated:
  - $112 million is spent for acute asthma care each year, 41% of this in the state's five largest cities, where the majority of low income residents live (Bridgeport, Hartford, New Haven, Stamford, Waterbury)
  - An additional $80 million is spent on hospitalizations and $32 million on emergency room visits associated with asthma events;
    - 75% of each of those occurs in the five largest cities and is paid for by Medicaid or Medicare
- Falls, largely among the elderly, led to 8,800 hospitalizations and 96,000 ER visits.

Our public health sector is going through a massive transformation with the passage of the Affordable Care Act (ACA). There is a huge focus on driving down the costs in our health care system, but figuring out who, exactly, is willing to pay for cost reductions is very complex. We need to figure out how to

[71] The Connecticut Healthy Homes Data Book, July 2012 can be found here and the Healthy Connecticut 2020 State Health Improvement Plan (March 2014) can be found here (relevant sections include Lead, Healthy Homes, Asthma & Chronic Respiratory Disease, and Falls). The state's health performance dashboard can be found here.

engage the health sector as a funder – there is a case to be made for an integrated funding and service delivery model for green and healthy housing upgrades for low income communities, if we can figure out who to work with.

Required Research
The following research is needed around the opportunities that exist within the ACA:

- **Nonprofit hospitals –** Community Health Needs Assessment required every 3 years. There is an IRS requirement to invest "profits" and as ACA covers more uninsured, more dollars become available for community benefits/community investment. Comprehensive housing upgrade programs in low income communities are a great community investment that also link to health outcomes.
- **Medicaid** – Ability for doctors to prescribe things like energy/environmental assessments for respiratory illnesses through a waiver the state applies for from the federal government. Medicaid Healthy Home allows for coordinated care professionals (not just physical health) and gets additional Medicaid payments. Accountable Care Organizations are new in the Medicaid world and have a per capita payment based on health outcomes. The requirement that all children be tested for lead could be covered by Medicaid.
- **Pay for Success Models** – Focused on population health management, reducing "frequent flyers", which insurers (and/or hospitals?) now get penalized for. There could be an opportunity to tie payments to reductions in emergency room visits/hospitalization for asthma/other respiratory illnesses, trips and falls for elderly, etc.

The Green Bank will pursue foundation funding to assist in this initiative. New York and Rhode Island are also working to address these challenges, providing an opportunity to explore regional approaches with funders.

Real Estate Ecosystem Support
An outreach initiative to realtors was begun in early 2015 in conjunction with DEEP and the utilities. The focus is on educating realtors about trends in energy improvements and available programs, rebates and financing, recent studies on how energy improvements contribute to home values, strategies for marketing energy improvements to potential buyers, and what to expect during a home sale or mortgage refinancing if there is leased or owned solar on the property. This outreach will be expanded to include appraisers, inspectors, and mortgage lenders. Mortgage lender outreach may also include exploring ways in which the Green Bank can support new energy mortgage products such as the FNMA HomeStyle Energy Mortgage.

9. Commercial, Industrial and Institutional Sector – At Work

The Commercial, Industrial and Institutional Sector is focused on the development and deployment of programs that support investments in energy efficiency and renewable energy projects in all commercial and industrial properties as well as institutional facilities, including schools, hospitals, houses of worship, and other non-profits in order to provide cheaper, cleaner and more reliable sources of energy while creating jobs and supporting local economic development.

Comprehensive Energy Strategy and Integrated Resource Plan

The CES relies heavily on C-PACE financing to accomplish its goals for the CI&I sector in Connecticut. The Executive Summary of the CES notes the goal to: "Leverage private capital through innovative financing mechanisms including Connecticut's first-in-the-nation Green Bank (the Clean Energy Finance and Investment Authority), standardized energy efficiency performance contracts, and the state's new Commercial Property-Assessed Clean Energy (C-PACE) program."

- In addition to referencing C-PACE financing as a way to meet the state's goals in the C&I sector around energy efficiency, the CES also notes several policy goals that would ramp up demand for C-PACE financing such as decoupling, benchmarking and energy efficiency standards.
- Throughout the CES, there is an expanded commitment to cost effective energy efficiency and a goal of deeper efficiency gains in heating, air conditioning, ventilation, insulation, windows, furnaces, boilers, etc. C-PACE enables these deeper projects, with the average C-PACE project becoming 45-55% more efficient.
- The CES notes that the development of financing programs is critical to moderate ratepayer costs of energy efficiency programs over time. To that end, the Green Bank is working closely with the EEB to optimize incentives and ensure that the rebates and incentives are leading customers to do larger projects, possibly financed by C-PACE.

The CES has been of great benefit to the Green Bank in its research on the building composition in Connecticut. According to the CES, residential and commercial buildings are the largest users of energy in Connecticut, collectively accounting for 58% of the State's energy usage and 87% of its electricity usage annually. In a business-as-usual scenario (which assumes modest energy efficiency savings per year), consumption is projected to grow to 550 trillion BTUs per year in 2050, nearly 20% higher than today's energy use of approximately 468 trillion BTUs. While buildings in Connecticut vary in their ownership and size, commercial and residential buildings consume energy in very similar ways. Over 60% of the energy used in buildings is for heating and cooling. The next highest uses are water heating in residential buildings and lighting in commercial buildings, representing about 15% of energy usage in each respective building type. Of the primary energy (that is, energy produced from raw fuels or otherwise found in nature) used by buildings today, 59% comes from electricity, 21% from oil, and 20% from natural gas. Electricity and natural gas use has increased while oil and biomass consumption has declined. Another common feature across building types is the prevalence of existing building stock (as opposed to new construction).

C-PACE, Lead-By-Example and other CI&I financing products are an important tool to help the state pursue several of the resource strategies outlined in the 2014 Integrated Resource Plan. The IRP recognizes the important benefits the Green Bank provides to Connecticut in pursuing its goal of a reliable, clean, and cost-effective energy supply. Among the several resource strategies outlined, the Green Bank will play a direct role in improving cost-effectiveness and increasing energy savings from C&LM program and state buildings, supporting increased deployment of CHP and Class I renewables, and procuring resources to address winter peak demand.

Conservation and Load Management Plan

The 2016-2018 Conservation and Load Management Plan outlines several priorities that overlap with the Green Bank's Commercial, Industrial and Institutional (CI&I) goals and opportunities for collaboration. The plan shares the following top priorities with the CI&I sector:

- **Delivering comprehensive and deeper savings for Commercial and Industrial customers.** Through its financing products, the Green Bank provides an important tool to help customers pay for more comprehensive projects.
- **Stretching and expanding the impact of funds from Commercial and Industrial customers.** The Green Bank will work with the C&LM programs to maximize the use of Green Bank financing products, which leverage ratepayer dollars to bring private capital into the Connecticut clean energy market. By accessing this funding, the C&LM programs expand the impact of their ratepayer dollars.
- **Scaling and broadening the reach of programs to provide services to new or underserved markets.**
  The Green Bank's financing products can help overcome the cost barrier to efficiency for those in new or underserved markets. The Green Bank will work with the C&LM programs to refine its new and existing products to help penetrate these markets.
- **Mainstreaming efficiency and continued shift toward changing the energy efficiency marketplace.**
  The Green Bank works to transform the clean energy marketplace toward greater use of private capital to finance improvements. By demonstrating the performance and benefits of energy efficiency as investments, and improving access to data for lenders, the Green Bank aims to shift the market and allow incentives and programs to continue to scale meet the shared goal of implementing state energy policy throughout all market segments and populations.

Working through the Joint Committee of the Connecticut Energy Efficiency Fund Board and the ~~Connecticut Green~~Green Bank board, the following joint goals for the CI&I sector were adopted to realize these priorities and ensure that the principles of leveraging ratepayer funds and continuously improving the customer experience are recognized in each organization:

Government

1) **Improve the Customer Experience.** Ensure seamless service delivery that is responsive to State and local governmental and institutional needs, including:

    i. Integration of appropriate ~~Connecticut Green~~Green Bank and other related services, especially for those who aren't currently served by Lead By Example ("LBE")- Energy Savings Performance Contracts ("ESPC"); and
    ii. Providing technical support and incentives from the Connecticut Energy Efficiency Fund and the ~~Connecticut Green~~Green Bank's capability to finance ESPC projects at scale. Establish and communicate a process for customers undertaking ESPCs to receive technical support through internal utility resources and contracted "owner's representative" services.

2) **Establish Sustainable and Cost-Effective Financing Mechanisms.** Develop sustainable and cost-effective funding mechanisms for both the preparatory and permanent project financing needs of government sector energy-saving projects.

3) **Develop New Products to Fill Market Gaps.** For example, develop a financing vehicle for the aggregation of small-scale, comprehensive energy-saving projects at municipal or other institutional facilities that are individually too big for the Small Business Energy Advantage ("SBEA") financing program, but too small to be standalone ESPC projects.

Small Business

1) **Improve the Customer Experience.** Ensure seamless service delivery between services of the Connecticut Energy Efficiency Fund and the ~~Connecticut Green~~Green Bank that is responsive to customers' needs, including integration of appropriate ~~Connecticut Green~~Green Bank and other allied small business services, especially for those that aren't currently served by the SBEA financing program.

2) **Identify and Engage Alternative Capital Sources to Lower the Cost of and Increase Opportunities for Project Financing.**

3) **Examine Ways to Couple SBEA and C-PACE (or Other Financing Offerings).** Promote more comprehensive projects (especially among higher energy usage customers) and longer term payback measures.

Medium and Large Business

1) **Improve Understanding of Opportunities Within this Market for Deep Energy-Efficiency Improvements.** Build on available knowledge and analysis to develop effective and sustainable incentive and financing strategies for stimulating deeper energy investments and that meet all cost-effective energy-efficiency goals.

2) **Increase Customer Savings and Benefits from the C&I Programs.** Drive more projects with deeper energy savings, supported with increased financing options (including C-PACE) to help ensure comprehensive investment and closure of financing gaps.

3) **Cross-Leverage Connecticut Energy Efficiency Fund and ~~Connecticut Green~~Green Bank Programs.** Develop and implement communication and marketing strategies to ensure maximum cross-leveraging of these opportunities to help achieve the state goals of acquiring all cost-effective energy efficiency and expanded renewable deployment through highly effective leveraging of customer funds

TAM and SAM

Commercial and Industrial

In 2013, the Green Bank contracted HR&A Advisors to do an analysis of the Commercial and Industrial (C&I) market in Connecticut. Table 17 outlines the TAM for the C&I sector as a whole.

For the Commercial Property Assessed Clean Energy (C-PACE) program, the TAM is defined as the square feet of C&I buildings in towns that have opted into the C-PACE program, outlined in table 21~~17~~. 93% of the total C&I market is within the TAM of C-PACE and the Green Bank continues to expand the program into new towns with the goal of bringing 100% of Connecticut buildings into the C-PACE market.

Table ~~1~~21~~17~~. C&I and C-PACE TAM

	Hospitality	Industrial	Retail	Commercial Office	Total
C-PACE (Square Foot)	18,113,030	263,807,383	180,545,900	162,649,498	**625,115,811**
C-PACE (Percent of Square Foot)	97%	92%	91%	96%	**93%**
Total	**18,724,855**	**287,180,874**	**197,739,420**	**169,989,282**	**673,634,431**

Institutional

Estimates of the Total Addressable Market (TAM) are based on known and estimated data on the number of facilities, square footage, and estimated energy expenditures. Estimates of the Serviceable Available Market (SAM) are primarily based on market penetration studies for the energy savings performance contracting industry, as a proxy for comprehensive retrofits that would be undertaken under any financing mechanism that uses energy savings to finance investments in upgraded equipment. Market potential in terms of energy and dollars are based on percentage energy savings from comprehensive retrofits applied to estimates of energy use intensity per square foot.

To calculate the Institutional sector TAM (see Table 22~~15~~), data that exist on various unit measures of the municipal, university, school and hospital (MUSH) market segments are used, including number of state buildings, population, and lists of facilities from trade associations for private colleges and schools and hospitals. However, robust square footage data varies and is not widely available.

Square footage of state buildings was quantified by OPM in the most recent State Building Inventory (March 2014). Square footage estimates for municipalities are based on average per capita square footage for some known Connecticut towns and cities, extrapolated to the entire Connecticut population. While preliminary, these estimates appear to be in line with available estimates of Level of Service Standards for municipalities in other parts of the country. Estimates for square footage of

hospital facilities are based on national estimates of square footage per available hospital beds. Estimates for private colleges and schools are based on average building square footage per student for some known schools in Connecticut, extrapolated to the total number of schools.

Overall, the institutional sector encompasses about 300 million square feet. At an average estimated energy cost of between $2 and $3 per square foot, the MUSH sector in Connecticut spends approximately $550 million per year on energy.

Table ~~18~~22. Institutional TAM

Market Segment	#	Units	Million ft^2	Estimated Annual Energy Use (million MMBtu)	Estimated Annual Energy Expenditures (million $)
State Facilities	3,200	Buildings	60.5	9	$200
UCONN and State Colleges	23	Campuses	29.5	4.4	$89
Municipal Facilities	169	Towns	104.5	15.5	$314
Private K-12 Schools	97	Schools	30	4.5	$90
Private Colleges and Universities	47	Schools	82	12.3	$247
Hospitals	37	Hospitals	22	5	$67
Total	**3,550**		**300**	**46.6**	**$917**

Lawrence Berkeley National Laboratory (September 2013) issued a report on the current size and remaining market potential of the U.S. energy service company (ESCO) industry. Data on market penetration was obtained from surveys of ESCO companies (see Table 19). Median values of market penetration (as a percentage of total floor area) that were reported for the Northeast are presented below. This data supports the Green Bank's assessment that traditional performance contracting, with associated debt commitments for bond or lease financing commonly used, has been most successful to the segments of the MUSH sector with good credit (i.e. state and local facilities including K-12 schools).

Table ~~19~~23. Market Penetration

Market Segment	Median Estimate of ESCO Market Penetration Since 2003 (% of total market floor area)
K-12 Schools	45%
State and Local	39%
Universities and Colleges	25%
Health and Hospitals	10%

For purposes of estimating SAM, we assume that K-12 schools represent mostly public schools which were included in the TAM under the municipal facilities market segment. Further, we know that the standardized ESPC program in Connecticut was only recently developed, and that state facilities in Connecticut, including public colleges and universities, have not used performance contracting since 2003. Therefore, we have adapted LBNL's estimates of the market opportunity to estimate the SAM, based on square footage. To estimate the market potential in terms of lifetime MMBtu saved, we have assumed a 25% reduction in energy consumption over 15 years (see Table 2~~0~~).

Table ~~20~~24. Institutional SAM

Market Segment	Estimated TAM (million ft²)	Estimated Market Penetration	Estimated SAM (million ft²)	Estimated Lifetime Savings (million MMBtu)
State Facilities	60.5	0%	60.5	34
Municipal Facilities	104.5	43%	59.5	59
Private K-12 Schools	30	25%	22.5	17
Private Higher Education	82	25%	61.5	46
Hospitals	22	10%	19.8	19
Total	**300**		**224**	**175**

Product or Program Overview and Objectives

The Commercial, Industrial and Institutional Sector has established the goals outlined in table 2~~5~~1 for fiscal year 2017.

Table 25. Commercial, Industrial, and Institutional Fiscal Year 2017 Targets

Program	Projects	Capital Deployed	Clean Energy Deployed (MW)
C-PACE	79	$45,550,000	11.1
CT Solar Lease	30	$22,500,000	7.5
Total[72]	**94**	**$56,800,000**	**14.8**

After gauging market activity, ~~-~~the Green Bank revised targets in January 2017 as follows (see Table 26):

Table ~~21~~26. Revised Commercial, Industrial, and Institutional Fiscal Year 2017 Targets

Program	Projects	Capital Deployed	Clean Energy Deployed (MW)
C-PACE	~~79~~66	$~~45,550,000~~35,430,000	~~11.1~~9.8
CT Solar Lease	~~15~~28	$~~11,250,000~~21,000,000	~~3.7~~7.0
Total[73]	**~~98~~4**	**$~~56,800~~48,930,000**	**~~14.8~~14.3**

The following are Fiscal Year 2018 targets for the Commercial, Industrial, and Institutional Sector (see Table 27).

Table 27. Commercial, Industrial, and Institutional Fiscal Year 2018 Targets

Program	Projects	Capital Deployed	Clean Energy Deployed (MW)
C-PACE	51	$24,000,000	6.4
CT Solar Lease	25	$15,000,000	6.3

[72] The C-PACE goals includes CT Solar Lease projects that are secured using C-PACE. They have been removed from the total to avoid double-counting.

[73] The C-PACE goals includes CT Solar Lease projects that are secured using C-PACE. They have been removed from the total to avoid double-counting.

Total of existing programs[74]	**67**	**$34,000,000**	**10.4**
SBEA	1,600	$28,000,000	n/a
Total with SBEA[75]	**1,667**	**$62,000,000**	**10.4**

As in the previous comprehensive plan, the program's focus will be the deployment of clean energy through its primary financing products, C-PACE and the CT Solar Lease. However, C-PACE is not a fit for all sectors or buildings. For instance, many public purpose buildings such as hospitals or universities have bond financing which makes consent for a C-PACE lien difficult. The CI&I program will continue to work on developing alternative products or options to expand the financing options available to the sector.

Commercial and Industrial Property Assessed Clean Energy (C-PACE)

C-PACE provides 100% upfront financing for up to 25 years for clean energy upgrades to commercial, industrial and non-profit buildings. The financing is then repaid as a benefit assessment to the building owner's property tax bill. Energy savings offset the financing payments over the life of the upgrades, unlocking positive cash flow for the building's owner and increasing the building's value. 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, appraisal fees, construction costs and ancillary non-energy-saving improvements, such as roof replacements, that are integral to deploying energy efficiency projects can also be financed through C-PACE.

Since the Green Bank introduced the program in January 2013, C-PACE has been a notable success in deploying clean energy throughout the state. 120 Connecticut municipalities, together accounting for over 90% of the state's commercial and industrial building stock, have signed onto the program. The Green Bank has closed financing agreements on 111 projects totaling $73.6 million, partly financed by a warehouse facility using the Green Bank's balance sheet and working in concert with third-party capital providers. This has resulted in the deployment of 15.4 MW of clean energy and countless energy efficiency projects that will lead to an estimated 2.8 million MMBTU over the lifetime of the projects. Total avoided electric and fuel cost savings from these projects will exceed $172 million in aggregate for the benefited property owners.

The program has garnered attention nationwide, with state and local governments taking the Green Bank's C-PACE model and emulating it in their communities. In its three years, the program has enjoyed several notable successes:

- Completed the first securitization of commercial energy efficiency loans in the country, issuing $30 million in C-PACE backed bonds in 2014 which were purchased by Clean Fund, leveraging RGGI funding at a 4:1 ratio;

- Opened the C-PACE platform to allow capital providers to fund C-PACE projects directly in Connecticut. To date, two C-PACE private capital providers are active in the state;[76] and

[74] The C-PACE goals includes CT Solar Lease projects that are secured using C-PACE. They have been removed from the total to avoid double-counting.

[75] There remains some uncertainty with the Green Bank arranging financing for the SBEA program.

[76] Clean Fund and Greenworks Lending

- Negotiated a partnership with Hannon Armstrong to bring up to $100 million in C-PACE financing to Connecticut, leveraging RGGI funding at a 9:1 ratio.

The Green Bank offers a pre-development loan for up to $30,500 to building owners. This loan can be used to cover project development work, such as audits or feasibility studies, in advance of a C-PACE loan.

CT Solar Lease

The Green Bank launched the CT Solar Lease 2 program ("SL2") as a combined residential and commercial solar tax equity fund designed to provide low-cost, long-term PPAs and leases to Connecticut homeowners, municipalities, and commercial and nonprofit customers. SL2 has expanded opportunities for greater solar access by allowing local developers to serve an increasingly broad spectrum of customer credits. Specifically, for non-investment grade nonprofit and commercial customers, who traditionally have been excluded from the solar financing market, SL2 has opened the door to solar via by utilizing C-PACE as a security and collections mechanism. By the time that SL2 is fully subscribed (anticipated in Q1 of FY17), C-PACE-secured credits will make up nearly 25% of the fund, with over two dozen projects financed.

Due to continuing demand for this kind of commercial-scale financing, the Green Bank expects to raise a new fund modeled on SL2. This "CT Solar Lease 3" ("SL3") program will aim to foster partnerships that will help achieve continued growth of the commercial solar market in Connecticut. In creating SL3, the Green Bank will build upon the success of SL2 with a facility that will originate, develop through construction, and own commercial solar installations with (or without) Green Bank participation as an investor. In crafting SL3, the Green Bank will prioritize the following goals (1.) minimizing the overall cost of capital of the SL3 fund, (2.) maximizing the flexibility of SL3 to support various underlying commercial projects and credits, including the use of C-PACE for credit enhancement, (3.) maximizing the amount of private capital leveraged per dollar of Green Bank capital expended, and (4.) recapturing Green Bank programmatic and administrative costs.

Performance Indicators

Below are the Performance Indicators that will be used to measure the success of the commercial, industrial and institutional financing programs for FY 2017.

- Number of applications received
- Number of C-PACE towns opting in
- Application approval rate
- Size of the project and level of energy savings
- Ratio of public to private capital deployed
- Growth into new markets (e.g., multifamily)
- Successful innovation in marketing and outreach (e.g., relationship managers)
- Number of trained contractors
- Number of new contractors bringing in applications

- Number of jobs created and environmental emissions reduced
- Amount of dollars saved by building owners

Other Areas of Strategic Importance

Small Business Energy Advantage (SBEA)

The Small Business Energy Advantage program (SBEA) in Connecticut is a proven model for financing small-scale energy efficiency projects. While the program is well-matched, due to its four-year, zero interest financing that can be paid back on bill, to small commercial, industrial, non-profit, and municipal customers, there are opportunities to lower the cost of the program for ratepayers and capture increased energy efficiency for customers. The Green Bank is working with the EEB and our utility partners to develop solutions that decrease the cost of the program by sourcing lower-cost capital and provide new ways to encourage customers to implement more comprehensive clean energy projects thereby increasing the impact of this already successful program.

Alternative Commercial & Industrial Financing Product

The Green Bank continues to explore development of an additional financing solution for commercial, industrial and institutional customers for whom C-PACE is not an accessible solution. For example, despite great interest in implementing clean energy upgrades, the terms connected with existing debt at "public-purpose facilities" such as education, healthcare, senior living, and recreation frequently present obstacles to successful completion of a C-PACE project.

The Green Bank is pursuing an alternative solution that retains key characteristics of C-PACE such as 100% upfront financing, off-balance-sheet treatment, and ability to finance capital-intensive deep energy retrofits. The Energy Services Agreement (ESA) is a model that offers promise for financing deep retrofits at facilities that are capital constrained, credit challenged, or both. While the 100% financing and off-balance sheet characteristics are achievable with standard ESAs today, there are challenges to packaging an ESA that is performance-based (i.e. the investment is paid for through energy savings) and can be used to invest in deep energy retrofits.

At the end of 2016, the Green Bank participated in a pilot Energy Services Agreement to finance clean the energy upgrades sought by a school in Bridgeport that previously was unable to finance such measures through C-PACE. The Green Bank is following closely the progress and performance of this pilot project and an earlier ESA investment through Campus Efficiency Now. Through these projects and ongoing engagement with building owners, ESA providers, contractors, regional lenders, and insurance providers, the Green Bank will determine the viability of a programmatic and scalable approach to ESAs for meeting the unmet financing need in the "public purpose" sector.

Clean Energy Storage

The market for energy storage in the United States grew 222% from $134 million in 2014 to $432 million in 2015. A leading analysis projects annual storage deployment to grow from 221MW in 2015 to more than 400MW in 2018 and nearly 1.7GW by 2020.[77] Rapidly decreasing prices for lithium ion batteries, policies and incentives to encourage deployment, and the extension of extension of the federal Investment Tax Credit (ITC) for solar and Production Tax Credit (PTC) for wind are all significant factors

[77] GTM Research/Energy Storage Association, U.S. Energy Storage Monitor: 2015 Year in Review, www.greentechmedia.com/research/subscription/u.s.-energy-storage-monitor.

driving projections for growth. When energy storage systems are paired with renewable generation like solar and wind, the ITC and PTC can be applied to the cost of the storage system at varying levels depending on the proportion of system charging that comes from renewable (with a minimum requirement of 75%).

In the face of changing tariff structures for small-mid-sized C&I customers that reduce net metering benefits and declining ZREC prices, deployment of storage alongside solar could help improve the long-term economics by enabling more strategic consumption of clean energy through peak demand shaving and time-of-use arbitrage. In 2015, the Green Bank worked with building owners with solar systems financed through C-PACE and leading storage providers to analyze interval load and solar production data and assess the economic potential for retrofitting energy storage to existing solar system to reduce energy costs and provide energy resiliency. The Green Bank will continue to monitor and work with current and prospective Green Bank customers, energy storage companies, and lenders to identify cost-effective approaches for incorporating storage at commercial, industrial, institutional and multifamily residential facilities.

10. Research and Development

As the Green Bank implements its Comprehensive Plan, there will be a number of opportunities that arise that deserve further research and development (R&D) – think of these initiatives as catalytic investments. With the lessons being learned and best practices being discovered in financing, marketing, and other areas, the Green Bank's ability to deliver more societal benefits requires understanding potential opportunities and the development of pilot programs and initiatives to increase impact, for example:

- Could the creation of a CDFI or other affiliated entity serve the interests of scaling up clean energy investment in underserved market segments?
- Could the legislative broadening of its "clean energy" definition open up new market segments for confronting climate change and environmental protection through alternative fuel vehicles and infrastructure, renewable thermal technologies, and other areas of sustainability (e.g., food, resilience, waste, water, etc.)?

The Green Bank's R&D efforts are intended to open up new market channels for private investment in Connecticut's clean energy economy through studies, pilot projects, royalty arrangements, and other initiatives that have the potential for expanding the impact of the Green Bank. Below are just a few examples of the catalytic areas we are exploring.

10.1 Community Development Financial Institution (CDFI) or Other Affiliated Entity

A Community Development Financial Institution (CDFI) is a specialized financial company that invests and lends in target markets with community development as their primary mission. They can be banks, loan funds and even non-profits, but they must be certified as a CDFI by the CDFI Fund, a branch of the U.S. Treasury Department. In order to be certified as a CDFI a company must have a primary mission of promoting community development and must have 60% of its activities and 50% of its assets directed to low-income target markets. All CDFI's are private-sector organizations with no government affiliation. CDFI's attract capital from private (e.g., corporations, individuals, religious institutions, and private foundations) and public sources. CDFI's have helped banks reassess their initial perceptions of risk in underserved markets and help them enter niche markets, cultivate future customers, and deliver mainstream and alternative financial products and services to underserved communities.

Per C.G.S. Section 16-245n(d)(2)(A) the Green Bank may seek to qualify as a CDFI under Section 4702 of the United States Code. If approved as a CDFI, the Green Bank would be treated as a qualified community development entity for purposes of Section 45D and Section 1440N(m) of the Internal Revenue Code.

In an effort to expand its impact in underserved market segments (i.e., households and buildings in low income and distressed communities, credit-challenged consumers or owners with unrated credits), the Green Bank will undertake research as to whether it should create a CDFI or some other form of an affiliated entity for the purposes of providing greater access to clean energy upgrades, reducing energy burden, ~~and~~ improving health (i.e., remediation of asbestos, mold, lead, radon, etc.) and safety (i.e.,

knob and tube wiring, resiliency, safety rails and ramps for the elderly, etc.) of buildings in Connecticut, and if replicable and scalable, across the region.

10.2 Emerging Markets for Clean Energy

The following areas – Grid 2.0, alternative fuel vehicles and infrastructure, and renewable thermal technology – are "clean energy" resources that the Green Bank can support.

Grid 2.0 – Infrastructure Modernization

The ~~Connecticut Green~~Green Bank continues to empower Connecticut homeowners and business owners in adopting distributed energy resources (DERs) to reduce and shift their energy consumption through improved efficiency and demand response and energy generation technologies like solar PV, wind, small hydro, and combined heat and power. Deploying resources that also make energy more reliable requires innovation that gives consumers options not only for reducing energy consumption and choosing cleaner sources, but also controlling when they use that energy and improving the likelihood of that energy being available when most needed. These goals are one element of a broader transition of our energy grid — often referred to as Utility 2.0 — in which our homes and businesses are active participants on the grid. Buildings connected in a Grid 2.0 world can manage two-way flows of energy from the grid and out to it, and can communicate in real time with other participants and grid operators to optimize and balance use of available energy resources.

The Green Bank is successfully contributing to transformation of the grid in Connecticut into one characterized by increased deployment of DERs. We are poised to make important contributions in several areas that usher in a more interactive, efficient, and reliable grid.

Locational Value and the Value of Information

Collection, management, and sharing of real-time data is a key underpinning of realizing the Grid 2.0 vision of an internet for energy that appropriately values energy resources on the grid at a given time and location. The Green Bank's requirement to deploy revenue-grade meters with all Green Bank supported rooftop solar PV in Connecticut allows us access to real-time solar production data that in many instances exceeds what is available to the utility companies working to efficiently integrate those resources. To better understand the geographic and local implications of DER deployment, we are partnering with the innovative spatial and energy analytics firm Kevala to develop a publicly available platform that enables both Green Bank staff and the public to visualize on a map and analyze the impact of Green Bank supported projects across the state. The platform will also enable closer collaboration with the utilities in Connecticut in analyzing the Green Bank's activities relative to location-specific needs and opportunities on the grid as well as the locational value of DERs.

In the fall of 2015, the Connecticut DEEP announced a proceeding to solicit pilot concepts from the utilities for grid-side system enhancements to integrate DERs. In 2016, the Green Bank and SmartPower are partnering with AVANGRID to identify circuits in AVANGRID's territory to target for high level of penetrations of DERs such as solar PV, smart inverters, and energy efficiency and storage. Goals for the

pilot include optimizing the value of DERs by incorporating them into grid planning and operations and assessing the use of DERs to defer more traditional infrastructure investments.

Competing for Federal and Philanthropic Resources

The Green Bank's demonstrated ability to incubate new markets and scale clean energy investments in Connecticut makes us a sought-after partner and highly competitive contender for federal and philanthropic funding in the area of Grid 2.0 and resilient clean energy.

In the summer of 2016, the Green Bank was invited to join a funding proposal with researchers at major universities to develop a distribution network platform to enable integration of high levels of solar PV penetration. The proposal is in response to the U.S. Department of Energy's (DOE) Enabling Extreme Real-Time Grid Integration of Solar Energy (ENERGISE) funding opportunity. The Green Bank's role would be as a conceptual partner and a data provider, leveraging multiple years of robust rooftop solar PV energy production data available through our solar PV monitoring platform. With or without funding from DOE, the Green Bank is collaborating with Connecticut's universities and utilities to better understand the impacts and value of DER integration on the grid.

The Green Bank is applying to the Kresge Foundation for low-interest loan capital and a direct investment to accelerate deployment of resilient solar PV plus battery storage in affordable housing in Connecticut's urban and coastal communities. The proposed project will leverage the Green Bank's Solar Lease offering and programmatic strength in the multifamily sector to benefit Connecticut communities and achieve the Kresge Foundation's goal of strengthening energy resilience and delivering low-carbon energy to low-income populations.

Grid 2.0 Technology: Focus on Energy Storage

Approximately 226 MW of energy storage were deployed in the U.S. in 2015. Industry projections point to reaching 281 MW of deployment in 2016 and a market size of almost nine times that — 2,081 MW and approximately $2.9 billion — in the year 2021. Since 2013, more than 90% of all energy storage deployments have occurred in California or the PJM service territory (not including New Jersey).[78] Rapid growth of the energy storage market is attributable to several factors, including generous state-level incentives; opportunities to reduce electrical bills through peak-shaving, demand reduction and load shifting; and monetizing ancillary services such as providing frequency regulation to the grid.

During the last year, we have taken a close look at the technology and market landscape for behind-the-meter battery energy storage in Connecticut, where deployment has been limited, to understand what is restraining storage deployment and what challenges the Green Bank might address to accelerate deployment of storage in Connecticut. We have worked with commercial and industrial building owners and storage providers to assess the potential for deploying storage at facilities with existing solar PV systems. Fortunately, precipitous reductions in the cost of battery cells and energy storage systems hold

[78] GTM Research/Energy Storage Association, U.S. Energy Storage Monitor: Q2 2016, www.energystoragemonitor.com.

the potential to improve the economics of energy storage in Connecticut and support greater deployment in the near term, possibly within the horizon of this Comprehensive Plan.

On the residential side, we recently completed a study in partnership with the Cadmus Group that suggests a technology bundling approach would allow for cost-effective deployment of small-scale, behind-the-meter energy storage in the residential sector in combination with solar PV and or energy efficiency measures. Such a bundled technology package could provide a more comprehensive energy solution for customers and offer added value to the grid.[79]

We remain continually engaged with Connecticut building owners, contractors, energy storage providers and the utilities to assess the demand for and value of energy storage in our state and explore the potential of the Green Bank to provide financing, create new approaches and work with stakeholders to accelerate energy storage deployment.

Our Future, Smarter Grid

The Green Bank is accelerating the arrival of Grid 2.0 through continued deployment of DERs across Connecticut. In the next two years, we will continue to explore new technologies and innovative approaches with a range of partners to ensure that the energy grid is transitioning to become smarter, more interactive, and more efficient. These efforts, combined with pursuit of first-class pilot and demonstration projects that lead to replicable and scalable solutions, will help deliver energy that is cleaner, cheaper and more reliable and sustainable.

Alternative Fuel Vehicles and Infrastructure

Connecticut's transportation sector is over-reliant on oil-based fuels, and accounted for 40% of the state's greenhouse gas emissions in 2014. The Global Warming Solutions Act of 2008 set a goal for the state to achieve an 80% reduction in greenhouse gas emissions below 2001 levels by 2050, and meeting these targets requires steep, economy-wide emissions reductions - particularly in the transportation sector. These reductions can be achieved by catalyzing greater deployment of alternative fuel vehicles and the associated infrastructure to support them.[80]

The Green Bank, having identified the need to cost-effectively support a cleaner and more efficient transportation system, is working with Atlas Public Policy, Cadmus Group, and DEEP to study the Alternative Fuel Vehicle space and provide guidance on potential high-impact areas of opportunity. Research commenced in the winter of 2015 and is expected to conclude in the summer-fall of 2016 on a six-to-nine-month contract. Phase I of the study has been completed, assessing the market potential for the use of alternative fuels[81] in on-road vehicles in Connecticut using four criteria (i.e., "cleaner, cheaper and more reliable, while creating jobs and supporting local economic development):

[79] Cost-Effectiveness Assessment of the Residential Solar Investment Program, The Cadmus Group, Inc., www.ctgreenbank.com/wp-content/uploads/2016/03/RSIP_Evaluation_I_Final_Report_and_cvr_ltr.pdf.

[80] It should be noted that the definition of "clean energy" for the Green Bank includes "alternative fuel vehicles and infrastructure".

[81] "Alternative fuels" are battery-electric; biodiesel from waste oils; renewable diesel; E85; landfill or wastewater gas; dairy biogas; propane; compressed natural gas; liquefied natural gas; and hydrogen.

- Near-term market feasibility;
- Environmental performance;
- Cost-effectiveness; and
- Local economic benefits

Passenger plug-in electric vehicles are seen through these criteria to be the most promising vehicle and fuel technology focus to help the state realistically and cost-effectively meet its statutory emissions targets. The lowest cost option for Connecticut drivers - when considering current federal and state incentives – would be an electric vehicle powered by solar PV. Hydrogen fuel cell vehicles are an attractive longer-term option if infrastructure is deployed and the costs of the fuel and vehicles decrease significantly.

Phase II of the study will generate policy recommendations for the Green Bank to consider and act upon to create dynamic, in-state markets supporting alternative fuel vehicles and infrastructure. This research will provide a regional assessment of deployment, policy developments, and regulatory standards and proposals, with emphasis on the New England States. Phase II will also review federal and state incentive mechanisms, and opportunities to leverage public funds to attract private capital investment – helping to "crowd-in" the market. Finally, it will assess industry preparedness and barriers to market entry, including barriers in the capital markets and access to financing. Based on all these analyses Atlas Public Policy will recommend next steps to advance the Green Bank's alternative fuel vehicles strategy.

Once complete, the study will allow for the Green Bank to understand where in the transportation sector it can meaningfully leverage its core strengths in developing public-private partnerships and experience in scaling nascent clean energy markets.

Renewable Thermal Technology

Over 60% of the energy used in residential and commercial buildings is for space heating and cooling.[82]. Changing from fossil fuels to renewable thermal technologies (RTTs) in heating and cooling buildings, as well as heating industrial processes, has the potential of providing a valuable contribution to Connecticut's target of reducing greenhouse gas emissions to 80% below 2001 levels by 2050.

Renewable thermal technologies (RTTs) are technologies that provide heating and cooling services based on renewable energy resources – as opposed to fossil fuel sources coming from natural gas, heating oil, and through electricity. RTTs can deliver energy for thermal purposes; domestic hot water, process heating, heat and power, cooking, space heating and cooling. RTTs utilize a broad range of renewable energy sources which often have low alternative value. For the purpose of this project, RTTs include:

- Heat pumps such as Air Source Heat Pump and Ground Source Heat Pumps
- Solid biomass, such as wood chips, wood pellets and cord wood
- Liquid biomass such as biogas and biodiesel
- Solar thermal

[82] 2013 Connecticut comprehensive energy strategy: http://www.ct.gov/deep/lib/deep/energy/cep/2013_ces_final.pdf

- Waste heat technologies

RTTs can range from small domestic applications to large scale applications used in industrial processes and district heating and cooling networks. As RTTs often utilize locally available energy resources to meet the on-site heating and cooling demand of one or several buildings, customized solutions often are required.

The Green Bank's RTT efforts focus on Connecticut and the Northeast Region.

Connecticut
Working with Yale University's Center for Business and the Environment (CBEY), as well as DEEP, Eversource Energy, and Avangrid, we are assessing the potential deployment of RTT, to provide a realistic estimate of the contribution of RTTs to reduce Connecticut's greenhouse gas emissions by 2050, and to establish the necessary knowledge for qualified policy choices and strategies to advance RTT in Connecticut. This research project will focus on whether or not RTTs are "cleaner" than alternative heating and cooling technologies, whether or not RTTs are competitive or "cheaper" in various situations, and hence the potential for private capital investments, and to what extent they might improve energy security and "reliability" in the Connecticut energy system.

Northeast Region
States across the Northeast are currently at different stages in investigating the feasibility of RTTs and its potential role in achieving states' climate change efforts. A common theme in each investigation is the idea that RTTs can play an essential role in the mix of climate actions. Working with CBEY and New York State Energy Research and Development Authority (NYSERDA), the Green Bank is leading and cooperating in the development of a regional renewable thermal market through joint efforts and sharing of information between different public and private (e.g., utilities and developers) stakeholders in the Northeast, including those in New England and New York. In order to ensure that each state can learn from the experience of others in real time, an extended framework of a regional cooperation is being established as each state explores how RTTs fit into their energy system with a focus on standardization (i.e., contracts, definitions, etc.), EM&V and data, and innovation.

10.3 Sustainability

The ~~Connecticut Green~~Green Bank is demonstrating how the green bank model can be applied to increase private capital investment in and accelerate the deployment of clean energy in Connecticut. Can the green bank model go beyond clean energy on the customer side of the meter and be applied to utility scale clean energy deployment and infrastructure – or what about sustainability broadly (e.g., local food systems, efficient transportation, waste water treatment, waste reduction, etc.)?
There are examples where the green bank model is broader than just behind the meter clean energy deployment, including:

- **Australian Clean Energy Finance Center** – has programs that provide affordable loans to corporate, government and non-profit fleet buyers to choose low emission and electric passenger and light commercial vehicles.

- **California Infrastructure and Economic Development Bank** – has programs that provide financing to public agencies and non-profit corporations for streets and highways, water supply

and flood control, parks and recreational facilities, ports and public transit, and a number of other important infrastructure facilities.

- **Rhode Island Infrastructure Bank** – has programs that use funds to make loans, issue bonds, and receive interest earnings or other capital from public and private sources to finance projects that clean water.

- **UK Green Investment Bank** – has programs that leverage public funds to attract more private investment not only in utility scale renewable energy resources, but also waste reduction facilities from anaerobic digesters processing food waste to large scale waste to energy plants diverting large amounts of household waste from landfills to generate renewable energy.

Green Banks across the country and throughout the world are demonstrating how the smarter use of public resources can attract more private capital investment in the modernization of infrastructure that is providing the essential services we need every day in a manner that is environmentally and economically sustainable.

11. Budgets for FY 2017 and FY 2018

FY 2017

The fiscal year budget can be found at – click here. The financial statements for FY 2017 will be available at the end of 2017.

FY 2018

The fiscal year budget ~~for FY 2018 is not yet developed.~~can be found at – click here.

12. Key Definitions

Alternative Fuel Vehicles and Associated Infrastructure
Per Public Act14-136, an amendment to C.G.S. §4a-59 defines "clean alternative fuel" as natural gas, propane, electricity, or hydrogen when used as a motor vehicle fuel. C.G.S. §14-212(5) defines "motor vehicle" as all vehicles used on the public highways. "Associated infrastructure" is defined by the ~~Connecticut Green~~Green Bank as structures, machinery, and equipment necessary and integral to refuel an alternative fuel vehicle.

Class I Renewable Energy
Conn. Gen. Stat. §16-1(a)(26) defines "Class I renewable energy source" as: "(A) electricity derived from (i) solar power, (ii) wind power, (iii) a fuel cell, (iv) geothermal, (v) landfill methane gas, anaerobic digestion or other biogas derived from biological sources, (vi) thermal electric direct energy conversion from a certified Class I renewable energy source, (vii) ocean thermal power, (viii) wave or tidal power, (ix) low emission advanced renewable energy conversion technologies, (x) a run-of-the-river hydropower facility that began operation after July 1, 2003, and has a generating capacity of not more than thirty megawatts, provided a facility that applies for certification under this clause after January 1, 2013, shall not be based on a new dam or a dam identified by the commissioner as a candidate for removal, and shall meet applicable state and federal requirements, including applicable site-specific standards for water quality and fish passage, or (xi) a biomass facility that uses sustainable biomass fuel and has an average emission rate of equal to or less than .075 pounds of nitrogen oxides per million BTU of heat input for the previous calendar quarter, except that energy derived from a biomass facility with a capacity of less than five hundred kilowatts that began construction before July 1, 2003, may be considered a Class I renewable energy source, or (B) any electrical generation, including distributed generation, generated from a Class I renewable energy source, provided, on and after January 1, 2014, any megawatt hours of electricity from a renewable energy source described under this subparagraph that are claimed or counted by a load-serving entity, province or state toward compliance with renewable portfolio standards or renewable energy policy goals in another province or state, other than the state of Connecticut, shall not be eligible for compliance with the renewable portfolio standards established pursuant to section 16-245a."

Class II Renewable Energy
Conn. Gen. Stat. §16-1(a)(27) defines "Class II renewable energy source" as: "energy derived from a trash-to-energy facility, a biomass facility that began operation before July 1, 1998, provided the average emission rate for such facility is equal to or less than .2 pounds of nitrogen oxides per million BTU of heat input for the previous calendar quarter, or a run-of-the-river hydropower facility provided such facility has a generating capacity of not more than five megawatts, does not cause an appreciable change in the ~~riverflow~~river flow, and began operation prior to July 1, 2003."

Class III Renewable Energy
Conn. Gen. Stat. §16-1(a)(44) defines "Class III source" as: "the electricity output from combined heat and power systems with an operating efficiency level of no less than fifty per cent that are part of customer-side distributed resources developed at commercial and industrial facilities in this state on or after January 1, 2006, a waste heat recovery system installed on or after April 1, 2007, that produces electrical or thermal energy by capturing preexisting waste heat or pressure from industrial or commercial processes, or the electricity savings created in this state from conservation and load management programs begun on or after January 1, 2006, provided on and after January 1, 2014, no

such programs supported by ratepayers, including programs overseen by the Energy Conservation Management Board or third-party programs pursuant to section 16-245m, shall be considered a Class III source, except that any demand-side management project awarded a contract pursuant to section 16-243m shall remain eligible as a Class III source for the term of such contract."

Clean Energy Fund (CEF)
A fund formed pursuant to Conn. Gen. Stat. 16-245n which is supported by a one mill per kilowatt hour charge to each end use customer of electric services in the state plus any federal funds as may become available to the state for clean energy investments. The fund is used by ~~Connecticut Green~~Green Bank to promote investment in clean energy in accordance with a comprehensive plan developed by ~~Connecticut Green~~Green Bank to foster the growth, development and commercialization of clean energy sources, related enterprises and stimulate demand for clean energy and deployment of clean energy sources that serve end use customers in this state and for the further purpose of supporting operational demonstration projects for advanced technologies that reduce energy use from traditional sources.

Comprehensive Energy Strategy (CES)
Pursuant to Conn. Gen. Stat. § 16a-3d, the comprehensive energy strategy is developed by DEEP every three years which assesses and plans for all energy needs in the state, including, but not limited to electricity, heating, cooling, and transportation, includes the findings of the IRP, C&LM Plan, CP, and Energy Assurance Plan.

Comprehensive Plan (CP)
Pursuant to Conn. Gen. Stat. § 16-245n, the comprehensive plan is developed by the Green Bank to foster the growth, development and commercialization of clean energy sources, related enterprises and stimulate demand for clean energy and deployment of clean energy sources that serve end use customers in the state as well as support operational demonstration projects for advanced technologies that reduce energy use from traditional sources.

Connecticut Energy Efficiency Fund (CEEF)
A fund formed pursuant to Conn. Gen. Stat. § 16-245m, supported by a charge of up to three mills per kWh on electric bills which is used to implement cost-effective energy conservation programs and market transformation initiatives in accordance with the Conservation and Load Management Plan approved by the Energy Efficiency Board and DEEP.

Connecticut Renewable Portfolio Standards (RPS)
Pursuant to Conn. Gen. Stat. § 16-245a, each electric supplier and electric distribution company is required to demonstrate by January 1, 2020 that not less than twenty per cent of the total output or services of any such supplier or distribution company shall be generated from Class I renewable energy sources and an additional three per cent of the total output or services shall be from Class I or Class II renewable energy sources.

Critical Facilities
Conn. Gen. Stat. § 16-243y(a)(2) defines "critical facility" as: "any hospital, police station, fire station, water treatment plant, sewage treatment plant, public shelter, correctional facility or production and transmission facility of a television or radio station, whether broadcast, cable or satellite, licensed by the Federal Communications Commission, any commercial area of a municipality, a municipal center, as identified by the chief elected official of any municipality, or any other facility or area identified by the

DEEP as critical." It should be noted that DEEP considers grocery stores and gas stations as "other critical facilities" as well as part of the micro grid initiative.

Distributed Energy Resources (DER)
Conn. Gen. Stat. § 16-1(a)(() (49) defines DERs as any (A) Class I renewable energy sources or Class III sources that can either be grid-tied or on the customer side of the meter, and (B) customer-side distributed resources that reduce demand for electricity through conservation and load management, customer-side energy storage systems, or resources connected to the distribution system or a microgrid.

Economically Viable
Economically viable means the costs are cheaper than the grid. For example, what makes solar viable?

- A large system with economies of scale resulting in a lower installed cost
- Panels must receive enough sun
- Installed cost must be low enough or the subsidy high enough
- Price of the alternative, grid-power, must be high enough.

Energize Connecticut
Energize Connecticut is an initiative of the Energy Efficiency Fund, the Clean Energy Finance and Investment Authority, the State and your local electric and gas utilities dedicated to empowering Connecticut citizens to make smart energy choices, now and in the future.

Green Connecticut Loan Guaranty Fund
A fund formed by the ~~Connecticut Green~~Green Bank pursuant to Conn. Gen. Stat. § 16a-40e and Conn. Gen. Stat. § 16a-40f. The Green Connecticut Loan Guaranty Fund provides the Green Bank with access to $18 million to attract lending institutions to participate in clean energy financing programs for individuals, non-profit organizations, and small businesses through a first loss credit enhancement. The program is to be designed in consultation with the ECMB and CHEFA.

Integrated Resources Plan (IRP)
Pursuant to Conn. Gen. Stat. § 16a-3a, the integrated resource plan is developed by the DEEP, in consultation with the electric distribution companies, for the procurement of energy resources, including, but not limited to, conventional and renewable generating facilities, energy efficiency, load management, demand response, combined heat and power facilities, distributed generation and other emerging energy technologies to meet the projected requirements of customers in a manner that minimizes the cost of all energy resources to customers over time and maximizes consumer benefits consistent with the state's environmental goals and standards.

Interest Rate Buydowns (IRB)
An IRB is a payment made to a lender on behalf of a borrower that lowers the borrower's interest rate. This can be structured to pay out at the same intervals as a borrower's payments to the lender.

Levelized Cost of Energy (LCOE)
Levelized cost of electricity (LCOE) is a summary measure of the overall competitiveness of different generating technologies. It represents the per-kilowatt hour cost (in real dollars) of building and operating a generating plant over an assumed financial life and duty cycle. Key inputs to calculating

LCOE include capital costs, fuel costs, fixed and variable operations and maintenance (O&M) costs, financing costs, and an assumed utilization rate for each plant type.

Loan Loss Reserves (LLR)
An LLR is a portion of cash or cash equivalents set aside to cover estimated potential losses in a loan portfolio.

Low Emission Renewable Energy Credit (LREC)
An LREC is a Class I Renewable Energy Credit from a low-emissions project as defined in Conn. Gen. Stat. § 16-244t. LREC-qualified projects are Connecticut generation projects that are located behind company customer meters, achieve commercial operation on or after July 1, 2011, and have emissions of no more than 0.07 pounds per megawatt-hour (MWh) of nitrogen oxides, 0.10 pounds per MWh of carbon monoxide, 0.02 pounds per MWh of volatile organic compounds, and one grain per 100 standard cubic feet. To qualify for the LREC/ZREC Program, LREC projects may not be larger than 2,000 kilowatts (kW).

Low to Moderate Income (LMI)
The Green Bank, working with the state's housing agencies and a variety of other stakeholders has defined low income for its programs to be 80% of Area Median Income (AMI) or lower and low to moderate (LMI) income to be 100% of AMI or lower. These AMI cutoffs may either be at the census tract level; actual household income where data is collected; household level for program eligibility purposes, in which case household size and area of state is used (referencing Connecticut Department of Housing (DOH) income tables); or the multifamily property level, where a percentage of residents and a certain AMI limit are used to determine program eligibility.

Micro Grid
Conn. Gen. Stat. § 16-243y(a)(5) defines "microgrid" as: "a group of interconnected loads and distributed energy resources within clearly defined electrical boundaries that acts as a single controllable entity with respect to the grid and that connects and disconnects from such grid to enable it to operate in both grid-connected or island mode."

Multifamily
Greater than or equal to 5 residential housing units.

Net Metering
Pursuant to Conn. Gen. Stat. § 16-243h net metering is the process by which electric suppliers and electric distribution companies are required to interconnect and give a credit for any electricity generated by customers from Class I renewable energy sources or hydropower facility of less than two megawatts. The amount of electricity the customer produces shall be deducted from the amount the customer uses in each monthly billing period and any excess generation shall be credited toward the next monthly billing period. At the end of each year, the electric distribution company or electric supplier shall compensate the customer-generator for any excess kilowatt-hours generated, at the avoided cost of wholesale power.

Renewable Energy and Efficient Energy Finance Account
The Renewable Energy and Efficient Energy Finance Account of $8 million may support grants, investments, loans or other forms of financing assistance to clean energy projects. The program is to be

designed in consultation with the DEEP, DECD, and the Office of the Treasurer and priority shall be given to projects that use major system components manufactured or assembled in Connecticut.

Renewable Energy Credit (REC)
A REC represents the property rights to the environmental, social, and other nonpower qualities of renewable electricity generation. A REC, and its associated attributes and benefits, can be sold separately from the underlying physical electricity associated with a renewable-based generation source. Connecticut Statutory Framework - Pursuant to Conn. Gen. Stat. § 16-245a, RECs are used to satisfy the Class I, II, and III RPS obligations mandated by Conn. Gen. Stat. §§ 16-245; 16-243q. Electric suppliers may procure RECs by long-term contracting mechanisms, purchasing eligible certificates issued by the New England Power Pool Generation Information System or by purchasing eligible renewable electricity and associated attributes from residential customers who are net producers. Additionally, there are two subcategories of RECs.

Serviceable Addressable Market (SAM)
SAM is a market for which the technology makes economic sense. A SAM is a segment of the TAM that should be targeted and must meet select criteria of what makes the market serviceable. TAM and SAM are not static. In other words, what is technically possible or economically viable today will change in the future. TAM and SAM represent measurements at a point in time.

Single Family
Between 1 to 4 residential housing units.

Solar Home Renewable Energy Credit (SHREC)
SHREC means a Class I renewable energy credit created by the production of one megawatt hour of electricity generated by one or more qualifying residential solar photovoltaic systems with an approved incentive from the ~~Connecticut Green~~Green Bank on or after January 1, 2015.

Special Capital Reserve Fund (SCRF)
SCRF allows quasi-public agencies to issue bonds for self-supporting projects or programs that are backed by the State of Connecticut, lowering the cost of capital for the program. SCRF has historically been used to help launch new financing programs in Connecticut, including CDA, CHESLA, CHFA, CHEFA, CRRA, and UCONN student fees. Pursuant to Conn. Gen. Stat. § 16-245mm, the Green Bank received $100 million in SCRF authorization, for self-sufficient financing for energy efficiency/clean energy programs.

Total Addressable Market (TAM)
TAM is maximum technical potential of a market. A TAM describes a goal in relation to a market. Focusing on a market permits identification of customers. Market definition permits comparison of financing goals. TAM helps the Green Bank understand how market size changes in relation to subsidy level, technology cost, and financing costs. The Green Bank uses the TAM data to make tailored financial offerings to each customer, listing terms and savings that demonstrate economic gains of clean energy.

Zero Emission Renewable Energy Credit (ZREC)
A ZREC is Class I Renewable Energy Credit from a zero emissions project as defined in Conn. Gen. Stat. § 16-244r. ZREC-qualified projects are Connecticut generation projects that are located behind company customer meters, achieve commercial operation on or after July 1, 2011, and emit no pollutants. To qualify for the LREC/ZREC Program, ZREC projects may not be larger than 1,000 kW.

845 Brook Street, Rocky Hill, CT 06067
T 860.563.0015
ctgreenbank.com

CONNECTICUT GREEN BANK

Memo

To: Board of Directors of the Connecticut Green Bank

From: Brian Farnen, CLO and General Counsel, Matt Ranelli, Chair of the Audit, Compliance and Governance Committee

Date: July 21, 2017

Re: Overview of Compliance Reporting and the Board of Directors and Committees for FY 2017

Overview

This memo provides a summary report of the FY 2017 governance as it pertains to the Board of Directors and its Committees. For an overview of the governance process, please see the Bylaws of the Connecticut Green Bank.

This summary report also includes Statement of Financial Interest (SFI) filing requirements, report filings that are statutorily required by the Connecticut General Assembly for the Connecticut Green Bank, and review of governance documents (i.e., bylaws, operating procedures, etc.).

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 two non-voting members each with knowledge and expertise in matters related to the purpose of the organization (see Table 1).

Table 1. Composition of the Board of Directors of the Connecticut Green Bank

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 Bronisz	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 Gina McCarthy[1]	Resigned Appointed	Yes
Investment Fund Management	Norma Glover[2]	Appointed	Yes
Environmental Organization	Matthew Ranelli	Appointed	Yes
Finance or Deployment	Tom Flynn	Appointed	Yes
Residential or Low Income	Pat Wrice Betsy Crum[3]	Resigned Appointed	Yes
President of the Green Bank	Bryan Garcia	Ex Officio	No

[1] The first official board meeting of Gina McCarthy was April 28, 2017
[2] The last official board meeting of Norma Glover was June 23, 2017
[3] The first official board meeting of Betsy Crum was April 28, 2017

Board of Connecticut Innovations	(unfilled)[4]	Ex Officio	No

Board of Directors
The Board of Directors of the Connecticut Green Bank is comprised of eleven (11) ex officio and appointed voting members, and two (2) ex officio non-voting members. A quorum for a meeting of the Board of Directors is six (6) voting members at each meeting. 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)
- **Staff Lead** – Bryan Garcia, President and CEO

For FY 2017, the Board of Directors of the Connecticut Green Bank met ten (10) times, including six (6) regularly scheduled meetings and four (4) special meetings (see Table 2).

Table 2. Summary of Board of Directors Meetings for FY 2017

Date	Regular or Special Meeting	Attendees / % Attendance	# of Resolutions Approved[5]
July 6, 2016	Special	7 / 64%	1
July 22, 2016	Regular	8 / 73%	7
October 21, 2016	Regular	10 / 91%	8
December 16, 2016	Regular	9 / 82%	6
January 5, 2017	Special	7 / 64%	0
January 20, 2017	Regular	6 / 55%	8
March 10, 2017	Special	8 / 89%	3
April 28, 2017	Regular	11 / 100%	7
June 9, 2017	Special	9 / 82%	3
June 23, 2017	Regular	9 / 82%	6
Total	4 Special Meetings 6 Regular Meetings **10 Total Meetings**	8 / 70% 9 / 80% **8 / 70%**	7 42 **49**

Overall, the attendance for each meeting established a quorum – 6 of the 11 voting members present – in order to enable business decisions, and on average there were 8 of 11 members present at each meeting, of which 2 attended on average by phone.

For a link to the materials from the Board of Directors meetings that is publicly accessible – click here.

Statement of Financial Interest

[4] It should be noted that Catherine Smith serves on the Connecticut Innovations Board of Directors.
[5] Excludes approval of meeting minutes.

It is required by state ethics laws 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). With respect to the 2017 SFI filing – required by May 1, 2017 – 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 2017

	Number of SFIs Submitted	% Submitted on Time
Senior Staff	9	100%
Board of Directors	7	100%

Of the 16 SFI filings by Senior Staff and the Board of Directors, 15 were filed online and 1 was submitted in writing. On June 26, 2017, the Connecticut Green Bank received a letter from Carol Carson, Executive Director of the Office of State Ethics congratulating us "for the timely submission of 100% of the Statements of Financial Interests," where of 75% of state agencies, offices, commissions, and quasi-publics achieved 100% compliance.

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. A quorum for a meeting of the ACG Committee is two (2) voting members at each meeting. Note, that if there aren't enough voting members of the ACG Committee present at a meeting, then the Chair and/or Vice Chair of the Connecticut Green Bank can participate in the meeting to establish a quorum. The leadership of the ACG Committee, includes:

- **Chair** – Matthew Ranelli, Partner and Shipman and Goodwin (designated as the Chair by Catherine Smith)
- **Members**[6] – John Harrity[7] and Pat Wrice[8] (designated as a member of the Committee by Catherine Smith)
- **Staff Lead** – Brian Farnen, CLO and General Counsel

For FY 2017, the ACG Committee of the Connecticut Green Bank met two (2) times, both special meetings (see Table 4).

Table 4. Summary of Audit, Compliance and Governance Committee Meetings for FY 2017

Date	Regular or Special Meeting	Attendees / % Attendance	# of Resolutions Approved
October 21, 2016	Special	3 / 100%	4
April 24, 2017	Special	2 / 66%	2
Total	2 Special Meetings		

[6] 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

[7] It should be noted that as a result of the resignation of Norma Glover, John Harrity's appointment to the ACG Committee was transitioned to the B&O Committee beginning July 1, 2017

[8] It should be noted that as a result of the resignation of Pat Wrice and given his professional experiences, Tom Flynn was appointed to the ACG Committee.

	2 Total Meetings	**3 / 100%**	**6**

Overall, the attendance for each meeting established a quorum – 2 of the 3 voting members present – in order to enable business decisions, of which 0% attended on average by phone.

For a link to the materials from the ACG Committee meetings that is publicly accessible – click here.

Review of Governance Documents and Statutory Reporting
With respect to annual review of governance documents and statutory reporting, the following applies:

- Annual review by the ACG Committee of the Governance Documents (i.e., Bylaws, Operating Procedures, and Statement of Purpose) completed on October 21, 2016 4, 2015.

- As a result of state auditor findings in FY 2014 and draft findings in FY 2017, we are tracking statutory responsibilities and reporting with a checklist attached hereto as Exhibit A for continuous reporting process improvement.

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. A quorum for a meeting of the B&O Committee is two (2) voting members at each meeting. Note, that if there aren't enough voting members of the B&O Committee present at a meeting, then the Chair and/or Vice Chair of the Connecticut Green Bank can participate in the meeting to establish a quorum. The leadership of the B&O Committee, includes:

- **Chair** – Rob Klee, Commissioner of DEEP (designated as the Chair by Catherine Smith)

- **Members**[9] – Mun Choi and Norma Glover[10] (designated as a member of the Committee by Catherine Smith)

- **Staff Lead** – Eric Shrago, Director of Operations

For FY 2017, the B&O Committee of the Connecticut Green Bank met three (3) times, two (2) were regularly scheduled and one (1) was special (see Table 5).

Table 5. Summary of Budget and Operations Committee Meetings for FY 2017

Date	Regular or Special Meeting	Attendees / % Attendance	# of Resolutions Approved
January 11, 2017	Regular	3 / 100%	1
May 26, 2017	Special	2 / 100%	0
June 9, 2017	Regular	2 / 100%	1
Total	1 Special Meeting 2 Regular Meetings **3 Total Meetings**	2 / 100% 2 / 100% **2 / 100%**	0 1 **1**

[9] 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

[10] It should be noted that as a result of the resignation of Norma Glover, John Harrity's appointment to the ACG Committee was transitioned to the B&O Committee beginning July 1, 2017.

Overall, the attendance for each meeting established a quorum – 2 of the 3 voting members present – in order to enable business decisions, and on average there were 2 members present at each meeting, of which 1 attended on average by phone.

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. A quorum for a meeting of the Deployment Committee is three (3) voting members at each meeting. Note, that if there aren't enough voting members of the Deployment Committee present at a meeting, then the Chair and/or Vice Chair of the Connecticut Green Bank can participate in the meeting to establish a quorum. The leadership of the Deployment Committee, includes:

- **Chair** – Reed Hundt, CEO of the Coalition for Green Capital (designated as the Chair by Catherine Smith)
- **Members**[11] – Bettina Bronisz (ex officio per bylaws), Matthew Ranelli, and Pat Wrice (designated as a member of the Committee by Catherine Smith)
- **Staff Lead** – Bryan Garcia, President and CEO, and Bert Hunter, EVP and CIO

For FY 2017, the Deployment Committee of the Connecticut Green Bank met four (4) times, including four (4) regularly scheduled meetings (see Table 6).

Table 6. Summary of Deployment Committee Meetings for FY 2017

Date	Regular or Special Meeting	Attendees / % Attendance	# of Resolutions Approved
September 29, 2016	Regular	3 / 75%	1
February 27, 2017	Regular	2 / 66%	2
March 28, 2017	Regular	2 / 66%	2
May 30, 2017[12]	Regular	3 / 75%	2
Total	4 Regular Meetings **4 Total Meetings**	**3 / 75%**	**7**

Overall, the attendance for each meeting established a quorum – 3 of the 4 voting members present – in order to enable business decisions, and on average there were 3 members present at each meeting, of which 2 attended on average by phone.

For a link to the materials from the Deployment Committee meetings that is publicly accessible – click here.

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[11] Note – the Chair and/or Vice Chair of the Board of Directors of the Connecticut Green Bank can attend the Deployment Committee meeting to establish a quorum

[12] It should be noted that Betsy Crum was appointed by Catherine Smith to serve on the Deployment Committee to fill the position vacated by Pat Wrice.

Joint Committee of the EEB and the CGB

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. A quorum for a meeting of the Joint Committee is three (3) voting members at each meeting. 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**[13] – Bryan Garcia (non-voting), Norma Glover, Bert Hunter (non-voting), and John Harrity (designated as members of the Committee by Catherine Smith)
- **Staff Lead** – Bryan Garcia, President and CEO of the Connecticut Green Bank

For FY 2017, the Joint Committee of the EEB and the Connecticut Green Bank met four (4) times, including four (4) regularly scheduled meetings (see Table 7).

Table 7. Summary of Joint Committee Meetings for FY 2017

Date	Regular or Special Meeting	Attendees / % Attendance		# of Resolutions Approved
		Voting	Non-voting (CGB)	
July 20, 2016	Regular	4 / 80%	4 / 100%	0
October 17, 2016	Regular	5 / 100%	2 / 50%	0
January 18, 2017	Regular	5 / 100%	2 / 50%	0
April 19, 2017	Regular	3 / 60%	4 / 100%	0
Total	4 Regular Meetings **4 Total Meetings**	**4 / 80%**	**3 / 75%**	**0**

Overall, the attendance for each meeting established a quorum – 3 of the 5 voting members present – in order to enable business decisions, and on average there were 4 members present at each meeting, of which 1 attended on average by phone.

For a link to the materials from the Joint Committee meetings that is publicly accessible – click here.

[13] Note – these members are representatives from the Connecticut Green Bank.

Exhibit A

	Individual Responsible for Filing	Due date	9/30/2016	12/31/2016	3/31/2017	6/30/2017			
Accounting Section 1-123 subsection(b): Quarterly Financial Cash Flow Report to OFA. Such Report shall include, but not	G. Bellas	Submitted Date	11/8/2016	2/23/2017	5/10/2017	Coming Soon			
HR - Section 1-123 subsection (c): Quarterly Personnel Status Report to OFA. Such report shall include, but not be limited to: (1) The total number of employees by the end of the quarter.	C. Baisden		10/05/16	2/21/2017	4/10/2017				
			Governor	Auditors of Public Accounts	Legislative Program Review and Investigations Committee (2 copies)				
"Annual Report"/CAFR year, including, for each such issue, the financial advisor and underwriters, whether the issue was	FY14-16: M. Dykes FY16: E. Shrago, M. Macunas		12/29/2016	12/29/2016	12/29/2016	12/29/2016			
REEEFA bonding - Section 16-245aa subsection (d): CGB shall report on the effectiveness of the Renewable Energy and Efficient Energy Finance program to the joint standing committee of the General Assembly having cognizance of matters relating to energy	B. Garcia		January 1, 2017						
	Date Filed:		12/15/2016						
RSIP - Section 16-245ff report by January 1, 2017 and every two years thereafter to the Legislative Energy and Technology Committee on its progress toward deploying 300 MW of residential solar PV	FY15: D. Goldberg, A. Brydges FY17: M. Macunas		January 1, 2019						
	Date filed:		1/30/2017						
			DEEP		Energy & Technology Committee	Commerce Committee			
Annual Report - Section 245n(f)(1) The board shall issue annually a report to the Department of Energy and Environmental Protection reviewing the activities of the Connecticut Green Bank in detail and shall provide a copy of such report, in accordance with the provisions of section 11-4a, to the joint standing committees of the General Assembly having cognizance of matters relating to energy and commerce. The report shall include a description of the programs and activities undertaken during the reporting period jointly or in collaboration with the Energy Conservation and Load Management Funds established pursuant to section 16-245m.	M. Macunas		Coming Soon		Coming Soon	Coming Soon			
Board Meetings - At least 6 per fiscal year, per CGB Bylaws			FY17						
			12/16/2016 regular	1/5/2017 special	1/20/2017 regular	3/10/2017 special	4/28/2017 regular	6/9/2017 special	6/23/2017 regular

845 Brook Street
Rocky Hill, Connecticut 06067

300 Main Street, 4th Floor
Stamford, Connecticut 06901

T: 860.563.0015
F: 860.563.4877
www.ctcleanenergy.com

CONNECTICUT GREEN BANK

Bridgeport Microgrid Project

Loan Draw Period Deadline Extension Request

Project Update Memo

July 21, 2017

Document Purpose: This document contains background information and due diligence on the Bridgeport Microgrid Loan facility and the stakeholders involved. This information is provided to the Board of Directors. for the purposes of reviewing a Project Update Memo.

In some cases, this package may contain among other things, trade secrets, and commercial or financial information given to the 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.

Project Memo

To: Connecticut Green Bank Board of Directors

From: Dale Hedman, Managing Director, Statutory & Infrastructure Programs; Rick Ross, Associate Director, Statutory & Infrastructure Programs; Chris Magalhaes, Assistant Director, Clean Energy Finance

CC: Bryan Garcia, President and CEO, Bert Hunter, EVP & CIO, Mackey Dykes, VP, Commercial and Industrial Programs, Brian Farnen, General Counsel & CLO, and Eric Shrago, Director of Operations

Date: July 21, 2017

Re: Bridgeport Microgrid Project Loan Draw Period Deadline Extension

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Project Summary

The City of Bridgeport is working with Bridgeport MicroGrid LLC to develop a microgrid that will provide islanding capability, electricity and thermal energy services to Bridgeport Town Hall and two adjacent buildings: a police station at 300 Congress Street and a Community/Senior Center located at 263 Golden Hill Street in Bridgeport (the "Project").

The Project consists of three 265 kW natural gas fueled Combined Heat & Power (CHP) units, for a total of 795kW of new installed capacity. The average load of the proposed microgrid is estimated to be around 300kW during normal operation with a peak load of around 700kW. Existing diesel generators located at the Police Headquarters will be used as redundant generation capacity for the microgrid. The microgrid distribution infrastructure is sized, designed and installed to handle 1.8MW of generation for future expansion, to enable additional capacity for other facilities to take advantage of the microgrid.

The City of Bridgeport has entered into a 20-year Energy Services Agreement (the "ESA") with Bridgeport MicroGrid LLC for the electricity and thermal energy produced by the system. The ESA will provide the cash flow necessary to finance the Project, supporting a senior loan of up to $3,838,000 from Key Bank (previously First Niagara Bank), net of a $2,975,635 project grant from DEEP, and a Connecticut Green Bank ("Green Bank") subordinated loan of up to $502,860.

Green Bank Loan Approval History

The Project was selected by Green Bank staff pursuant to a request for proposals under the statutorily mandated Combined Heat and Power (CHP) Pilot program set forth under Public Act 11-80 and approved by the Green Bank Deployment Committee on March 3, 2016 (the "Original Approval"). As part of the CHP Pilot program, Green Bank is using the $450/kW incentive to buy down the interest rate on the Green Bank's subordinate loan to 2%. The outstanding principal and interest amount will be payable monthly.

After the Original Approval, on June 17, 2016 the Green Bank Board of Directors approved the following modifications as summarized below:

- Pursuant to the Original Approval, Green Bank was to make an advance to Bridgeport MicroGrid, LLC in the form of a single payment in the full principal amount of the Subordinated Loan at Commercial Operation Date (COD) and no earlier than Senior Debt advances. The loan agreement as approved by the Board and executed by the parties now provides that the Green Bank is able to make multiple advances during the construction period, i.e., prior to COD, provided that Bridgeport MicroGrid, LLC received advances from the Senior Lender under the Senior Loan Agreement such that the ratio of the aggregate amount of such advances to the maximum principal amount permitted to be drawn under the Senior Loan Agreement equals or exceeds the ratio of the aggregate amount of Green Bank advances (including any advance then being requested) to the maximum principal amount of the Subordinated Loan. This modification was necessary to encourage the senior lender to advance funds during construction.

- Pursuant to the Original Approval, the maturity date was to be coterminous with the Senior Loan facility, not to exceed twenty (20) years from the date of the advance of the loan and repayment was to have been in the form of fully amortizing level payments of principal and interest (mortgage-style basis). The loan agreement as approved by the Board and executed by the parties now provides a maturity that will be 20 years from the earlier of: (a) the date that is twenty (20) years from the date on which the final advance of the Subordinated Loan is made (which in no event shall any advance be made later than July 1, 2017); (b) acceleration of maturity upon an event of default or other mandatory prepayments as set forth in the Subordinated Loan agreement; or (c) the date of the consummation and closing of any sale of the Project to a non-affiliated third party. Repayment commences the first month following the final advance with each of the 240 monthly payments being in the form of fully amortizing level payments of principal and interest (mortgage-style basis). This modification was also a conforming change that resulted from the initial modification noted above in order to maintain the Green Bank's exposure on a proportionately equivalent basis to that of the senior lender.

- The Green Bank Subordinated Loan would be used for paying off the last construction payables, paying down a portion of First Niagara Bank construction debt (provided the ratios noted above hold) and also for funding a $300,000 escrow account to be used as additional collateral to secure both the senior loan and subordinated loan. The pay down of the construction debt by the DEEP grant ($2,975,000) and the Green Bank funds, will result in the senior loan from First Niagara Bank of $3,800,000.

Purpose

The Project has experienced some delays with construction and the DEEP grant funding process, and as a result has not been able to meet construction milestones necessary to draw down on the entire Green Bank loan facility before the draw period deadline of July 1, 2017, as dictated by Section 2.3(c) of the Green Bank Loan Agreement. The delays mostly result from interconnection and Virtual Net Metering progress with United Illuminating ("UI"), along with the delays to the DEEP grant funding. Based on discussions with the Borrower and with DEEP staff, Green Bank staff expect these delays to be resolved by the fourth calendar quarter of 2017. Staff believes that the nature and scope of such

delays represent typical project development contingencies and do not change staff's opinion of the Project's viability or prospects for completion.

Bridgeport MicroGrid LLC is currently in the process of requesting extensions from Key Bank and DEEP to allow advances out to January 1, 2018 as well, which will align the financing on the same schedule. In the event that either Key Bank or DEEP does not agree to extend out to January 1, 2018, Green Bank capital is protected from being advanced out ahead of the senior debt because Green Bank debt can only be drawn according to same ratio as the drawn senior debt, and the senior debt in turn is predicated on advances of the DEEP grant to meet certain threshold limits.

DEEP has already released $300,000 of the total grant amount, and is currently reviewing and approving a second progress payment request for about $600,000. DEEP has indicated that the next big project milestone payment release will occur after the UI interconnection testing and approval has been completed, which is scheduled for some time in August 2017. The final DEEP grant installment payment will occur after successful system commissioning and testing, which is anticipated to occur by October 2017. Assuming the Project follows the updated schedule, completion will occur by the end of October 2017, and the financing extensions out to January 1, 2018 will leave some margin for any unforeseen delays.

Accordingly, Staff recommends the Board give its approval to the requested extension of the draw period deadline found in the Green Bank Loan Agreement from July 1, 2017 to January 1, 2018.

Resolution

NOW, therefore be it:

RESOLVED, that the Board of Directors authorizes the President of the Green Bank and any other duly authorized officer of the Green Bank to execute and deliver a sub-debt loan in the amount of up to $502,860, at any time throughout the extended draw period deadline of January 1, 2018, as stated herein, and to be funded from the CHP Pilot program budget, and with terms and conditions consistent with the memorandum and term sheet submitted to the Deployment Committee dated February 23, 2015 and as revised by the memorandum to the Board of Directors dated June 17, 2016; and

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

845 Brook Street, Rocky Hill, CT 06067
T 860.563.0015
ctgreenbank.com

CONNECTICUT GREEN BANK

Memo

To: Board of Directors of the Connecticut Green Bank

From: Brian Farnen, Loyola French, and Bryan T. Garcia

Date: July 21, 2017

Re: Overview of Requests for Approvals for Professional Services Agreements over $75,000 for FY 2017 per Operating Procedures

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Overview

This memo provides a summary report of the requested approvals for those Professional Services Agreement ("PSA") with a not-to-exceed amount of over $75,000 in the 2017 fiscal year ("FY2017"). This approval process is outlined in Section IX (ii) of the Connecticut Green Bank Operating Procedures, as follows:

> "(ii) for such contracts requiring an expenditure by the Green Bank over seventy-five thousand dollars ($75,000) and up to and including one hundred fifty thousand dollars ($150,000) over a period of one (1) fiscal year, the President and the Chairperson must both approve the expenditure, and (iii) for such contracts requiring an expenditure by the Green Bank of over one hundred fifty thousand dollars ($150,000), such contract shall, whenever possible, be awarded on the basis of a process of competitive negotiation where proposals are solicited from at least three (3) qualified parties. To the extent permitted by any contract for administrative support and services between the Green Bank and Connecticut Innovations, Incorporated, professional services may also be provided by consultants and professionals selected by and under contract to Connecticut Innovations, Incorporated, subject to appropriate cost sharing. The provisions of Section 1-127 of the General Statutes shall apply to the engagement of auditors by the Green Bank".

Green Bank staff requested a total of 15 PSAs, or amendments to existing PSAs, with not-to-exceed amounts over the $75,000 threshold for FY2017, for a total amount of $3,342,173. Approval for 6 of the 15 were requested, and subsequently granted, by Commissioner Smith (see Table 1), with the other gaining approval of the full Board of Directors, as either a one-time approval or as strategic selections for FY 2017 at the 6/17/16 BOD meeting (see Table 2). This number is up from that of FY 2016 by just over $457,000, when approval was sought for fourteen PSAs and/or amendments over $75,000, for a total amount of $2,884,980, with seven being approved by direct request of Commissioner Smith and approval for the remaining seven being granted by the full Board. A breakdown of the agreements for FY2017 follows.

Table 1. FY 2017 PSAs over $75,000 approved by Commissioner Smith

Date	Agreement	Division / Program	Amount
7/1/2016	Pemberton PSA 5240	Solar Lease II Program	$47,000*
7/1/2016	Adnet PSA 5261	General Operations	$45,600**
7/1/2016	Adnet PSA 5271	General Operations	$139,000**
8/3/2016	FREEDOM. Inc. PSA 5259	Residential/Multifamily – LMI	$95,000
2/1/2017	Sustainable Energy Resource Partners PSA 5297	CI&I Program	$100,000
4/18/2017	AHS – Amendment to PSA 5162	Residential/Multifamily – LMI	$15,000***
		Total:	**$441,600**

*Combined with Pemberton PSA 5219 ($70K) for S&I Program exceeds the $75K threshold.
** Combined Adnet PSA amounts exceed $75K threshold.
*** Increases total PSA 5162 to $85,000

Table 2. FY 2017 PSAs over $75,000 approved by Green Bank BOD

Date	Agreement	Division / Program	Amount
7/1/2016	Metis PSA 5238 - FY17	Residential Program	$220,000
7/1/2016	Sustainable Real Estate Solutions PSA 5242	CI&I Program	$974,750
7/1/2016	Clean Power Research 3rd Amendment to PSA 5071	S&I Program - Resi	$66,362*
7/22/2016	Clean Power Research PSA 5253	S&I Program - Resi	$311,698
7/22/2016	Locus Energy PSA 5254	S&I Program - Resi	$522,979
11/1/2016	Yale RTT Study 3rd Amendment to PSA 5154	General Operations	$100,934
1/27/2017	Eversource/UI Mktg Agr 2nd Amendment to PSA 5039	General Operations - Marketing	$381,500
1/27/2017	Eversource/UI Mktg Agr PSA 5289	General Operations - Marketing	$297,351
3/15/2017	Yale Research Agreement 2nd Amendment to PSA 5295	General Operations – Research & Training	$25,000**
		Total:	**$2,900,573**

* Amended Total $846,762, up from $780,400 in 2nd amendment 7/1/2015. Term through 8/31/2016
** Combined Yale PSA amounts exceed $75K threshold.

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Evaluation Framework

Assessing, Monitoring, and Reporting of Program Impacts and Processes

Evaluation Framework

July 2016

Table of Contents

1. Contributors and Acknowledgements

In a Request for Qualifications (RFQ) issued on August 28, 2013, the Connecticut Green Bank ("the Green Bank") sought to identify qualified firms and individuals with expertise in program evaluation, measurement, and verification (EM&V) that could be engaged on an as needed basis to complete certain EM&V projects ranging from researching and developing strategies for EM&V and data collection and analysis to conducting in-depth market, process, or impact evaluations.

For its evaluation framework development and data collection efforts, the Green Bank selected the Opinion Dynamics and Dunsky Energy Consulting team, including:

- Philippe Dunsky, President of Dunsky Energy Consulting
- Antje Flanders, Vice President of Opinion Dynamics
- Alex Hill, Senior Consultant of Dunsky Energy Consulting
- Jake Millette, Project Manager of Opinion Dynamics

The consulting team was selected to assist the Green Bank in developing a strategy for an evaluation framework to assess, monitor and report program impacts and processes. Given their industry leading expertise in the area of financing programs, they were engaged in an effort to assist us in first defining and testing key indicators and associated metrics for impact evaluation with a focus on market transformation, and developing a data collection protocol. This document is the output of the first engagement.

The Green Bank would like to acknowledge the Opinion Dynamics and Dunsky Energy Consulting for contributing to this important work for our organization.

The Green Bank, Opinion Dynamics, and Dunsky Energy Consulting are also grateful for the guidance and feedback from the Board of Directors of the Green Bank and the Joint Committee of the Energy Efficiency Board and the Green Bank.

We also appreciate the feedback and guidance from several individuals and specifically would like to acknowledge:

- Matt Gibbs, former Director of Energy Efficiency at Eversource Energy
- Paul Horowitz, President at PAH Associates
- Chris Kramer, Senior Consultant at Energy Futures Group (and Financing Consultant to the Connecticut Energy Efficiency Board)
- Pat McDonnell, Director of Conservation and Load Management at the United Illuminating Company

As a founding member of the Green Bank Network,[1] we would also like to acknowledge our colleagues who have been advancing best practices for assessing, monitoring, and reporting the impact of public-private partnership models – Australian Clean Energy Finance Corporation,[2] New York Green Bank,[3]

[1] http://greenbanknetwork.org/
[2] http://www.cleanenergyfinancecorp.com.au/reports.aspx
[3] New York Public Service Commission Case 13-M-0412

and the UK Green Investment Bank.[4] We look forward to continuing to collaborate with them – through the Coalition for Green Capital and the Natural Resources Defense Council – to advance public-private partnerships and clean energy investing in our communities and worldwide.

This "Evaluation Framework: Assessing, Monitoring and Reporting on Program Impacts and Processes" document represents an effort by the Green Bank to formalize how we evaluate the societal impacts and benefits we are helping create as a result of our investments. We thank and acknowledge all of the contributors who have helped us produce this evaluation framework.

[4] http://www.greeninvestmentbank.com/green-impact/

2. Introduction

The Green Bank, a quasi-public agency created by state legislation and governed by a Board of Directors, is the first state-level green bank in the United States. The Green Bank uses limited public dollars to attract and deploy private capital to accelerate the deployment of clean energy[5] in Connecticut. Note, the definition of "clean energy" includes "financing energy efficiency projects" and "alternative fuel vehicles and associated infrastructure" – and thus the term "clean energy," when used throughout this document, also includes renewable energy, energy efficiency, and clean fuels for transportation.

The Green Bank's goals are:

1. To attract and deploy private capital investment to finance the clean energy policy goals for Connecticut.

2. To leverage limited public funds to attract multiples of private capital investment while returning and reinvesting public funds in clean energy deployment over time.

3. To develop and implement strategies that bring down the cost of clean energy in order to make it more accessible and affordable to customers.

4. To support affordable and healthy buildings in low-to moderate income and distressed communities by reducing the energy burden and addressing health and safety issues in their homes, businesses, and institutions

By attracting and deploying private capital at leverage ratios of 5, 10, or 20 to 1 of public funds, through public-private partnerships the Green Bank can support the successful implementation of Connecticut's ambitious clean energy policy goals. For example, through statute (i.e. Public Act 15-194), regulation (i.e. Conservation and Load Management Plan), and planning (i.e. Comprehensive Energy Strategy and Integrated Resources Plan), the Comprehensive Plan of the Green Bank seeks to support the clean energy policies of the state.[6]

Beyond the contributions that Green Bank projects and programs can deliver within its near term Comprehensive Plan, to a large extent through the use of private sector capital, we are mindful that significant deployment of clean energy resources and strategies will be required over the coming

[5] Clean energy means solar photovoltaic energy, solar thermal, geothermal energy, wind, ocean thermal energy, wave or tidal energy, fuel cells, landfill gas, hydropower that meets the low-impact standards of the Low-Impact Hydropower Institute, hydrogen production and hydrogen conversion technologies, low emission advanced biomass conversion technologies, alternative fuels, used for electricity generation including ethanol, biodiesel or other fuel produced in Connecticut and derived from agricultural produce, food waste or waste vegetable oil, provided the Commissioner of Energy and Environmental Protection determines that such fuels provide net reductions in greenhouse gas emissions and fossil fuel consumption, usable electricity from combined heat and power systems with waste heat recovery systems, thermal storage systems, other energy resources and emerging technologies which have significant potential for commercialization and which do not involve the combustion of coal, petroleum or petroleum products, municipal solid waste or nuclear fission, financing of energy efficiency projects, projects that seek to deploy electric, electric hybrid, natural gas or alternative fuel vehicles and associated infrastructure, any related storage, distribution, manufacturing technologies or facilities and any Class I renewable energy source, as defined in section 16-1.

[6] FY 2017 and 2018 Comprehensive Plan of the Connecticut Green Bank

decades as the state continues to encourage the successful attainment of its long term greenhouse gas emissions reduction target, of 80 percent below 2001 levels by 2050. The Green Bank's ability to continue to attract and deploy increasing amounts of low-cost and long-term private capital will be an essential element toward attaining this target while helping to mitigate the associated costs that would potentially be recovered from residents, businesses, and industry through electric or gas rates.

In this document, the Green Bank presents a framework through which to evaluate the impacts of its programs. These impacts can broadly be viewed within two categories:

1) Energy savings and clean energy production supported by Green Bank programs and the resulting societal impacts or benefits arising from clean energy investments; and

2) Market transformation impacts from Green Bank programs that lead to new opportunities to support clean energy projects, ultimately through the increase in private capital investment in clean energy.

This evaluation framework focuses primarily on assessing the market transformation impacts of the green bank model. However, it also recognizes the importance of regularly evaluating the program impacts along the way (e.g., of the Residential Solar Investment Program).[7]

The Green Bank currently derives a majority of its capital sources from electric ratepayers,[8] although increasingly it is accessing more and more private capital through various for-profit,[9] non-profit,[10] and public finance[11] sources and transactions. Unlike the State's energy utilities, the Green Bank is not required by statute to evaluate its programs' impacts and thus Green Bank programs are not subject to the evaluation requirements to which the electric and gas utilities who are incentivized to deliver energy efficiency programs to customers are subject. However, many of the Green Bank's programs co-exist in the market alongside ratepayer supported clean energy incentive and other programs; in many cases, they are in a mutually supporting relationship with the utility sponsored programs.

While the Green Bank is not obliged to evaluate its programs in the same manner as are the utilities' energy efficiency programs, the Green Bank is committed to evaluating its programs in order to ensure that the Clean Energy Fund, cap-and-trade allowance proceeds, and other investments are yielding value to the Green Bank's objectives and that the Green Bank's programs effectively and efficiently operate and deliver their services to customers. The Green Bank sees assessing, monitoring and reporting of program impacts and processes as a normal function of operating an organization focused on delivering societal impact. In addition, there are varying degrees of statutorily required auditing and reporting requirements for the Connecticut Green Bank and its programs, including:

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[7] Cost-Effectiveness Assessment of the Residential Solar Investment Program (March 26, 2016) by Cadmus click here

[8] Through the Clean Energy Fund, a 1 mil surcharge (i.e., $0.001/kWh) is charged to electric ratepayers in Eversource Energy and United Illuminating service territories. This surcharge aggregates to approximately $27 million a year in capital for the Connecticut Green Bank. The Connecticut Green Bank also receives cap-and-trade allowance proceeds of about $5 million a year through the Regional Greenhouse Gas Initiative to support clean energy projects.

[9] Through a public-private partnership with Hannon Armstrong, the Connecticut Green Bank through contract has access to $100 million of private capital to support its C-PACE program.

[10] Through a public-private partnership with the MacArthur Foundation, the Connecticut Green Bank and its partner the Housing Development Fund have access through contract to $5 million of program related investment capital to support their low income and multifamily programs.

[11] Through Sections 159-166 of SB 501 (i.e., 2012 Special Session of the Connecticut General Assembly), the Connecticut Green Bank will begin to issue revenue bonds – or green bonds – to raise private capital to support its programs in 2016.

- **Independent Audit** – Public Act 11-80 requires that the Clean Energy Fund,[12] which is administered by the Connecticut Green Bank be audited annually by independent certified public accountants; and

- **Reporting** – Public Act 15-194 requires the Green Bank to report to the Energy and Technology Committee of the General Assembly on progress toward the goals of the Residential Solar Investment Program (RSIP).

For more details on the statutory reporting requirements of the Green Bank – see Appendix I.

This evaluation framework was developed to assist the Green Bank to present appropriate evaluation approaches to estimate the impacts and benefits of its programs and to help it communicate them to key stakeholders.

2.1 Program Evaluation Objectives

Several objectives guided the development of this evaluation framework, including:

- Identify and estimate quantitative and market impacts resulting from Green Bank financing and Green Bank supported clean energy programs;
- Provide insights into program efficiency and effectiveness that can support program design and process improvements, including coordination with other Energize CT programs;
- Track progress toward Green Bank's market transformation objectives;
- Where appropriate to the program being evaluated, estimate the extent to which the program produced savings or clean energy generation that would not have happened in its absence;
- Provide an assessment, monitoring and reporting mechanism to support the issuance of green bonds that provide increased capitalization to the Green Bank for clean energy investment; and
- Report progress toward objectives and impacts to internal and external stakeholders through the Comprehensive Annual Financial Report (CAFR) of the Green Bank.

2.2 Framework Elements

The evaluation framework presented in this document was developed based on a review of the Green Bank's overall program goals as outlined in the Comprehensive Plan, through discussion with program administrators and Green Bank leadership, and through a review of Green Bank reporting and program documentation, including its audited and unaudited statements.[13] This evaluation framework can be incorporated into the operations of the organization and used as a template for Green Bank programs.

The remainder of this document presents the following framework elements:

- Program Logic Model (PLM)
- Program Impact Indicators
- Evaluation Plan Development
- Net Impact Analysis and Cost-Benefit Analyses

[12] On and after July 1, 2004, the Public Utility Regulatory Authority requires the electric IOU utilities to assess a charge of not less than one mill per kilowatt hour to each end use customer of electric services in Connecticut and that those funds be deposited into the Clean Energy Fund. The Clean Energy Fund is within the Connecticut Green Bank.

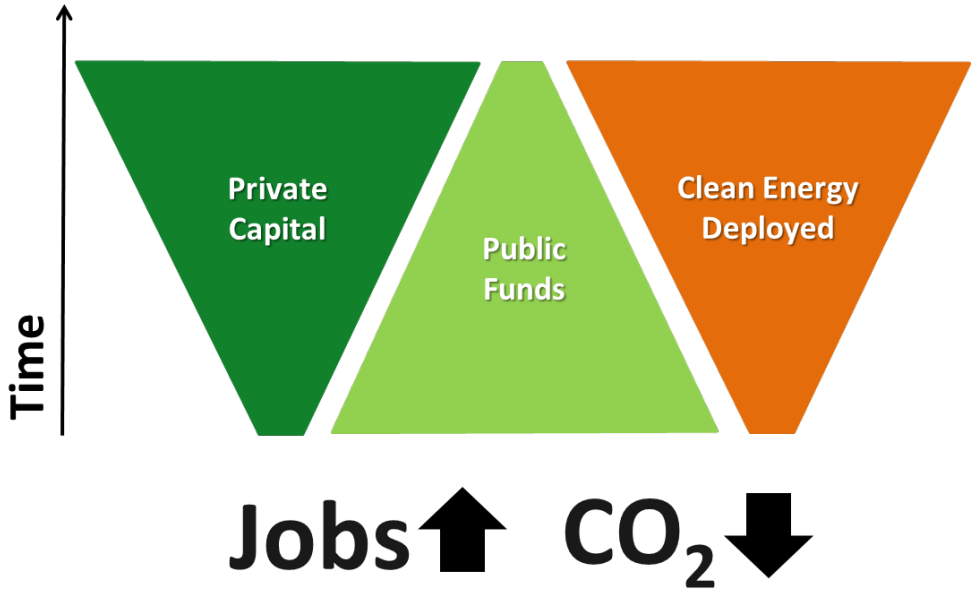
[13] Comprehensive Annual Financial Report for FY 2015 for the Connecticut Green Bank

3. Program Logic Model

A Program Logic Model (PLM) is a "graphical representation of the causal links between program activities, short-term responses to those activities among market actors and longer-term market effects. Logic models flow from decision-makers' hypotheses of how a program intervention strategy addresses barriers or market failures. A logic model can provide the basis for establishing metrics that indicate progress toward program goals and help program administrators, policymakers, and stakeholders assess the likely timeframe within which the theorized transformation might be realized."[14]

The high level, long term Green Bank financial market transformation objective – to rely increasingly on private capital to deploy increasing amounts of clean energy resources, increase jobs and reduce greenhouse gas emissions – can be graphically represented by the following (see Figure 1). The green bank model of public-private partnerships depicts public funds being leveraged more and more over time by private capital – for example, achieving a high leverage ratio for every $1 of public funds invested by the Green Bank by attracting $10 of private capital investment. The Green Bank also expects to recover its investments over time through its financing offerings achieving even greater leverage on the $1 of public funds invested.

Figure 1. Green Bank Model of Public-Private Partnerships for Clean Energy Deployment



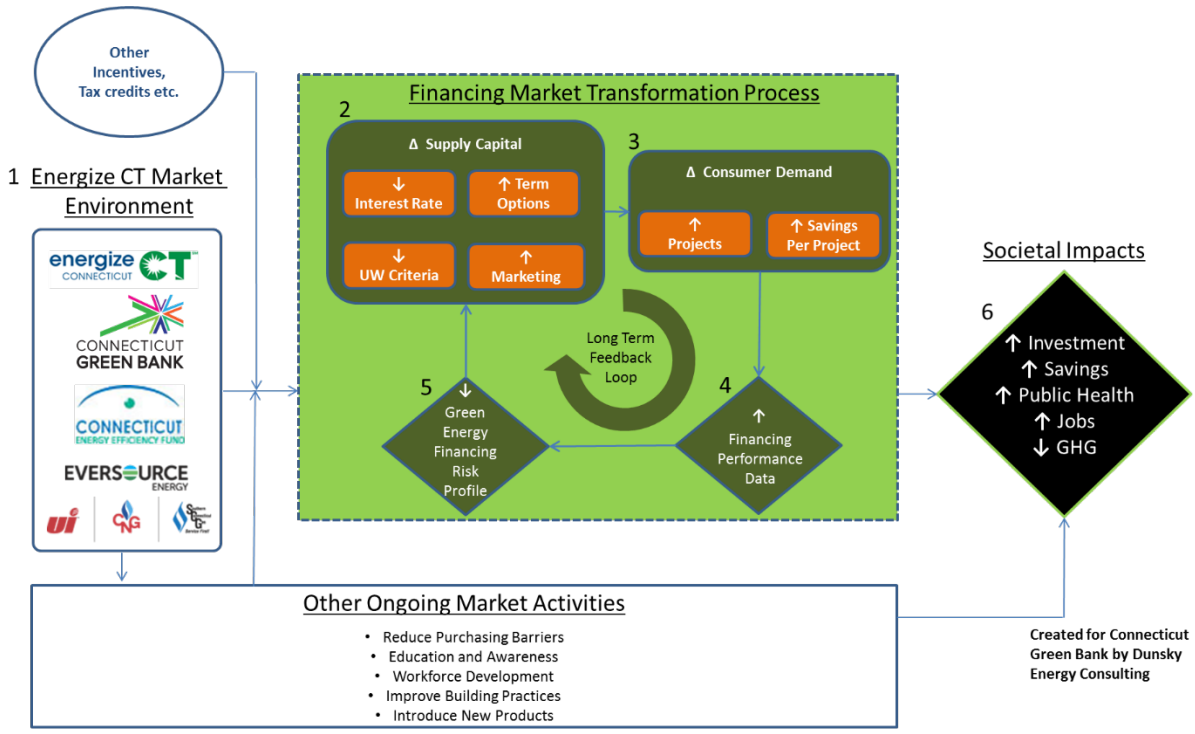
This organizational objective can serve as the general framework within which the PLM for the Green Bank's overall strategy to increase the use of private capital financing to accelerate the deployment of clean energy can be developed and presented. The focus of the Connecticut Green Bank's PLM is on its role in effecting this transformation (see Figure 2).[15] However, as noted above, the Green Bank's programs and associated financing elements are for the most part marketed and deployed in the same

[14] State and Local Energy Efficiency Action Network (2015). *Making it Count: Understanding the Value of Regulated Energy Efficiency Financing Programs*. Prepared by: Chris Kramer, Emily Martin Fadrhonc, Charles Goldman, Steve Schiller, and Lisa Schwartz of Lawrence Berkeley National Laboratory (pp 53). click here

[15] The Green Bank recognizes that a more formalized and detailed structure is typical of industry logic models, and that this is a high level display.

environment as the utilities' energy efficiency and renewable energy (i.e., zero emission renewable energy credit and low emission renewable energy credit) programs, and they often intersect and interact at the Green Bank's individual project level.

Figure 2. Green Bank Program Logic Model



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.[16]

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.

The PLM includes three (3) components – Energize CT Market Environment (including Other Ongoing Market Activities), Green Bank Financing Market Transformation Process, and Societal Impacts.

[16] Comprehensive Annual Financial Report for FY 2015 – Market Transformation: Financial Warehouse and Credit Enhancement Structures Case of the CT Solar Loan (pp. 133-136)

3.1 Energize CT Market Environment

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. [17]

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.[18] It is important to note that there are a number 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.

[17] 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.

[18] 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 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.

3.2 Financing 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.

- **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)[19] 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

[19] Section 52 of Public Act 13-298

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 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.[20]

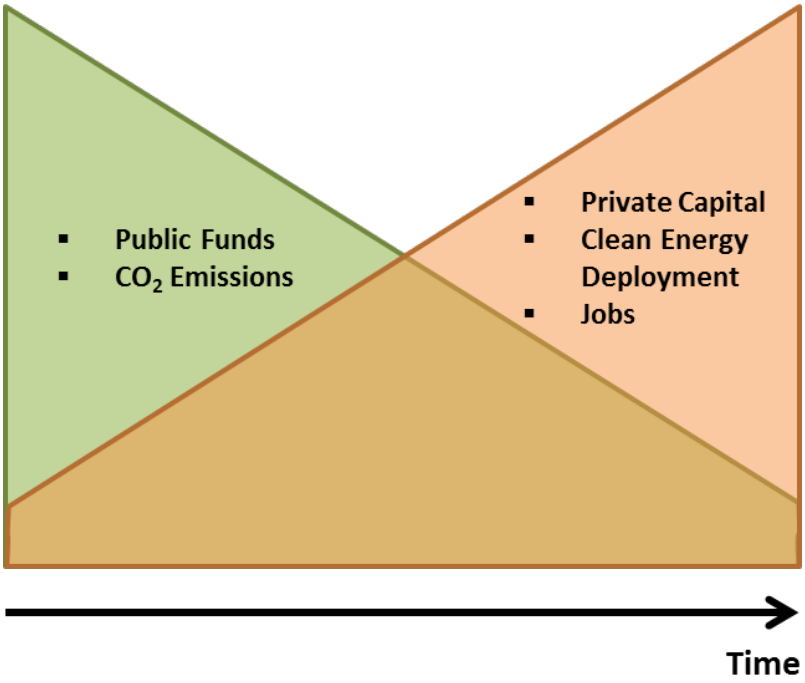
3.3 Societal Impacts

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.

[20] 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

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,[21] increase in the creation of local in-state jobs,[22] and the reduction of greenhouse gas emissions[23] 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 3 below represents the transition over time of the Green Bank's clean energy impacts and associated creation of societal benefits.

Figure 3. 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.

[21] 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

[22] 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.

[23] 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

4. Program Impact Indicators

For an extensive list of potential program performance indicators that will be used to assess the pace and extent of the movement toward the market transformation objectives, see Appendix II. Each indicator is a numerical value that, in relation both to a stated value for that indicator that would represent success and to previous values that would indicate the extent of progress over time, provides the Green Bank with quantitative feedback on its progress toward transforming the clean energy markets with respect to more customers and deeper energy savings with the use of greater proportions of private financing.

These program impact indicators are organized to correspond to four key impact areas of the PLM (see Figure 3):

1. Capital Supply
2. Consumer Demand
3. Loan Performance / Risk
4. Impacts / Benefits

Figure 4. Key Program Impact Indicators

1. Capital Supply	2. Consumer Demand
o Available private loan pool o Green Bank funds available for credit enhancements o Ratio of public to private capital deployed o Weighted average interest rate o Weighted average loan term	o Awareness of financing options o Total capital deployed (total amount of the loan) o Number of customer applications o Application approval rate o Green Bank customer acquisition costs o Number of active enrolled contractors
3. Loan Performance / Risk	**4. Impacts / Benefits**
o Annual default rate o Average delinquency rate o Early repayment rates o Average and minimum FICO o Average and maximum DTI ratio	o Clean energy capacity installed o Energy savings from clean energy o Jobs created o Improvement in public health o Greenhouse gas emission reductions o Savings-to-investment ratio (SIR) o Total net benefits

The first three categories in blue, present the key market transformation performance impacts of Green Bank programs, following the market transformation process described in Section 3.2. This process involves 1) the provision of capital supply, which facilitates 2) consumer demand, allowing collection of data to improve the 3) risk profile of clean energy investments, improving the capital supply and unlocking greater demand for clean energy, ultimately 4) increasing energy savings, clean energy production, and positive societal impacts. The financing market transformation process can be entered at any point. The category in green, captures the program's ultimate clean energy benefits for economic development and environmental protection. An important step in developing an evaluation plan for any Green Bank program will be to review the lists of indicators and select those that are most relevant to that program and measurable in order to formulate the program's key performance indicators (KPIs) and key risk indicators (KPIs). An associated timeline would also need to be developed

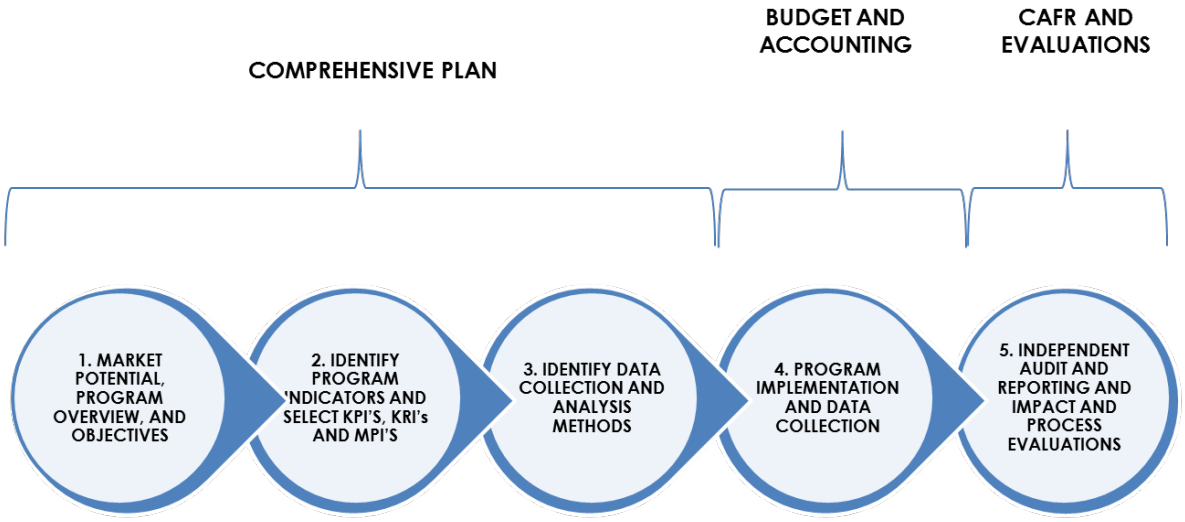
to indicate expected levels of progress toward near-term and long-term metrics at specific points in time.

While this framework focuses on the evaluation of Green Bank program impacts, assessing market transformation effects may best be accomplished by also including some process evaluation. The direct program impacts represent the specific energy savings or economic benefits stemming from the program financing or supported financing (i.e. third-party financing that benefits from program credit enhancements). Aside from measuring the impacts that are supported by the program, it will be important to make some assessment of the portion of the supported clean energy projects and measures that would likely not have happened in the absence of the Green Bank program. Methods for assessing this are addressed in more detail below in the Net Impact Analysis section to follow.

5. Evaluation Plan Development

An important element of applying the evaluation framework is incorporating it within the operations of the organization. This section outlines five steps in the plan development and implementation process. The first three steps can be incorporated into the Green Bank's multi-year Comprehensive Plan, the fourth step is within the annual Budget and ongoing Accounting processes for the organization, and the fifth and final step is through either the independently audited Comprehensive Annual Financial Report (CAFR) or program evaluation, initiated through a statutory requirement, Board of Director requests, or at the discretion of the Green Bank management– see Figure 5.

Figure 5. Evaluation Plan Development and Implementation Process



5.1 Step 1 – Market Potential, Program Overview, and Objectives

Within the Comprehensive Plan of the Green Bank, for each sector programs and products, it is important to clearly state the market in which the program operates – that is, its market potential or Total Available Market (TAM) and the Serviceable Addressable Market (SAM) – how much of the universe is the market for my programs and products?[24] From there, providing an overview of the programs and products as well as the specific targets or objectives will provide a foundation for evaluation. Understanding how the programs and products address market barriers should be part of this first step, in order to then select program KPIs and KRIs and subsequent evaluation methods. A program logic model for each program, typically an implementation tool used by program managers to observe and track performance, should also be prepared. It can also serve as an input into the development of individual program evaluation plans.

[24] The National Action Plan for Energy Efficiency (2007) describes technical potential (i.e., theoretical maximum), economic potential (i.e., cost effective), and achievable potential (i.e., aggressive and effective implementation).

5.1.1 Market and Program Baseline Assessments

As part of its evaluation activities, the Green Bank may conduct baseline assessments to understand current energy savings and clean energy production levels being supported by Green Bank programs and products and to establish baseline values for the key performance and market indicators. These assessments may help establish benchmark values against which to measure the impacts of future activity, while simultaneously serving as near-term assessments of goals achieved through Green Bank programs. Baseline assessments may also characterize current private market practices in providing capital for clean energy, to provide a benchmark for measuring future impacts on the broader market. Some of these baseline characterizations may be conducted collaboratively with the Department of Energy and Environmental Protection, the state's utilities, or other parties.

5.2 Step 2 – Identify Program Indicators, Select KPI's, KRI's and MPI's

The evaluation framework draws from a table of indicators (see Appendix I) which captures various program impacts and market transformation metrics. For each program outlined within the Comprehensive Plan, these indicators are of varying relevance and may be more or less measurable depending on the nature of the financing program's features and available data. The program logic models can serve as a guide on which indicators, key performance indicators (KPIs), key risk indicators (KRI's), and market transformation or market performance indicators (MPIs) to select for each program.

- **Indicator** – A metric of program performance (e.g., the number of loans issued, total estimated energy savings).

- **Key Performance Indicator** – A measure of the program's progress toward its core objectives. KPIs may simply be a single indicator (e.g., annual loan volume) or they may combine multiple indicators to develop a metric that captures a relationship among indicators. For example, the leverage ratio of private to public capital is comprised of the ratio of the total private capital employed to the total public capital invested through the program. In this case, an increasing leverage ratio indicates that the program is making progress toward its core objective of leveraging private capital.

- **Key Risk Indicator** – A measure of risk that could prevent a program or organization from achieving its core objectives. KRIs are meant to be a leading indicator, predictive metric, or warning that targets might not be met (e.g. projects remaining in approved status but not closing, or the number of distributed energy systems not online reporting real-time performance data). Key risk indicators are to be monitored on a regular basis prompting an operational response from the organization to ensure that targets are met.

- **Market Performance Indicator** – a measure of the program's contribution towards the financing market transformation process and program logic model of the Green Bank.

For a given program, the framework can be applied to develop a list of indicators, KPIs, KRIs, and MPIs as follows:

1) Identify the relevant indicators from the provided list and remove indicators that do not apply to the program;
2) Assess the relevance and measurability of each indicator to the program;

3) Select the indicators to be measured in the evaluation; and
4) Identify the indicators that best represent progress toward the program's objectives and green bank model and formulate measurable KPIs, KRIs, and MPIs.

5.3 Step 3 – Identify Data Collection and Analysis Methods

Once the program indicators, KPIs, KRIs, and MPIs have been established, the Comprehensive Plan should outline the data collection and analytical methods that will be used. Selected methods will depend on a number of factors, including the selected KPIs, KRIs, and MPIs, the type of program, the status of projects within the program (i.e., approved, in construction, closed, or completed transactions), the installed measures, the expected magnitude of savings, the level of program participation, and the evaluation timeline. Within the Comprehensive Annual Financial Report process an independent auditor will assess the data collection systems, project status, and project reporting to provide a formal opinion as to whether these data are fair and accurate.

In addition to program materials, evaluations will typically require additional data. Data collection can be broadly grouped into primary and secondary data collection methods. Primary data collection might include in-depth interviews, surveys, real-time metered data, access to utility bill data, and/or on-site measurement and verification. Every effort will be taken to collect customer, contractor, and capital provider data (e.g., through surveys and other means) during the project implementation phase so as to ensure that the information is captured on time as opposed to a future point in time. Examples of secondary data include evaluation plans or reports from other programs/jurisdictions, market reports, or publicly available data (e.g., Census data, EIA data).

5.4 Step 4 – Program Implementation and Data Collection

As programs are being implemented, continuous data collection, analysis, and reporting are being done. With the approval of the Comprehensive Plan and Budget, the accounting department and data collection efforts are constantly tracking and monitoring program performance towards objectives. Lean process improvements are constantly being conducted, and performance is being regularly communicated to staff and the Board of Directors. Having ongoing data collection, analysis, and reporting alongside quarterly communications to stakeholders will lead to continuous improvement of programs and processes.

It should be noted that the Green Bank does require customers that utilize its financing programs (e.g., C-PACE and the Smart-E Loan) to sign data release forms (see examples provided in Appendix III and Appendix IV). The Green Bank anticipates that the use of actual energy consumption data pre (i.e., 1 to 3 years before) and post project completion (i.e., through the life of the financing) will help the Green Bank communicate the value of financing clean energy improvements to existing and prospective customers. The Green Bank is also in the process of establishing an official customer privacy policy that balances the need to protect customer privacy while at the same time providing information that can be used for public disclosure including, but not limited to auditing, reporting, and evaluation. Collecting data through surveys during the financing process should also be pursued. In an effort to support national data standardization and collection efforts, consideration should also be given to the Connecticut Green Bank being a pilot participant in the State Energy Efficiency Action Network

(SEEAction Network) Financing Solution Working Group's residential loan data standardization efforts.[25]

5.5 Step 5 – Independent Audit and Reporting, and Impact and Process Evaluation

Once select indicators and KPIs, and data collection and analysis methods have been established, and various programs and products have been implemented, the independently audited Comprehensive Annual Financial Report (CAFR) will be the mechanism to publicly report on results, and as appropriate independent evaluation of programs will be conducted.

5.5.1 Independent Audit and Reporting

A CAFR is a set of government financing statements comprising the financial report of a state, municipal or other government entity that complies with the accounting requirements promulgated by the Governmental Accounting Standards Board (GASB). GASB provides standards for the content of a CAFR in its annually updated publication *Codification of Governmental Accounting and Financial Reporting Standards*. A CAFR is compiled by a state, municipal or other governmental accounting staff and "audited" by an external American Institute of Certified Public Accountants (AICPA) certified accounting firm utilizing GASB requirements. It is composed of three sections – Introductory, Financial, and Statistical.

- **Introductory** – contains the Letter of Transmittal, Board of Directors, and Organization Chart;
- **Financial (Audited)** – contains the Independent Auditor's Report, Management's Discussion and Analysis (unaudited), Basic Financial Statements (i.e., Statement of Net Position, Statement of Revenues, Expenditures, and Changes in Net Position, State of Cash Flows, and Notes to Financial Statements), and other required supplementary information; and
- **Statistical (Unaudited)** – contains various Financial Statistics (e.g., Financial Trends, Revenue Capacity, Debt Capacity, Demographic and Economic Information, and Operating Information) and Non-Financial Statistics (e.g., Governance, Income, Measures of Success, Market Transformation, etc.).

As the "gold standard" in government reporting, the CAFR is the mechanism the Green Bank uses to report its fiscal year financial and statistical performance to its stakeholders.

5.5.2 Impact Evaluation

With respect to the independent evaluation of programs, some of the work might be done in-house (e.g., data collection, surveys, etc.) as part of the project implementation process, while a majority of the work (e.g., interviews, sampling, etc.) will be done at a later point by an independent evaluation contractor. To ensure quality assurance and quality control given the evaluative use of the data and its implications regarding the assessment of programs, having the ability to retain independent evaluators is important in order to examine the impacts of a particular program. As with financial audits,

[25] 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

independent evaluation of program results can help instill confidence in stakeholder support, insights, and observations of the Green Bank.

5.5.3 Process Evaluation

In the context of the Green Bank programs, a process evaluation is a systematic assessment of a program for the purposes of 1) documenting program operations at the time of the examination and 2) identifying and recommending improvements that can be made to the program to increase the program's efficiency or effectiveness for acquiring energy resources while maintaining high levels of participant satisfaction.[26]

[26] Adopted from New York State Process Evaluation Protocols Dr. Katherine Johnson, April 2013, and California Energy Efficiency Evaluation Protocols The TecMarket Works Team, April 2006

6. Net Impact Analysis

Net impact analysis attempts to identify the impacts (e.g., energy savings, job creation, etc.) that would not have happened in the absence of a program. Net impact analysis thus tries to determine what share of savings can be attributed to a program. For example, Green Bank program participants might have implemented their clean energy project even without the loan for two reasons:

1. They also received a rebate or an incentive, which was equally or more important in their decision to go ahead with the project than the loan; and/or

2. They might have used alternative sources of financing, e.g., through private lenders or equipment vendors, or may have paid for the project using their savings.

In order to have an indication of the Green Bank programs' true impacts, when necessary, efforts should be made to determine what portion of the Green Bank supported projects (and the resulting savings) would not have happened in the absence of the program. Thus, some form of attribution analysis, either quantitative or qualitative, should be included in the Green Bank evaluation plans. The results can be used to inform both program reporting and consideration of program design adjustments.

6.1 Quantitative Assessment: Net-to-Gross Ratio (NTGR)

Rigorous determination of net impacts requires establishing a NTGR that represents the share of the savings that are directly attributable to the program. This typically includes consideration of both free-ridership and spillover. Free-ridership and participant spillover are often assessed through questions in a participant survey; consideration of non-participant spillover is less common in net impact evaluations and would require a non-participant or market actor survey.

Many of the Green Bank programs co-exist with utility administered energy efficiency programs or other government incentives, which creates challenges to establishing a NTGR or its components for the Green Bank's programs. This should not, however, dissuade attempts to consider and implement approaches to estimate these effects.

6.2 Qualitative Assessment

An alternative to establishing a NTGR is to perform a qualitative assessment of the impact of Green Bank financing on the completed projects. This could include asking participants about the relative importance of different factors (e.g., including the loan and any rebates or incentive received) on their decision to complete the clean energy project or asking about the likelihood of completing the project in the absence of the financing.

In the absence of surveys, an expert opinion may provide qualitative assumptions to assign savings. Although this is not an accepted attribution technique, it may provide a framework to assess progress toward increasing the uptake of measures types specifically targeted in the program objectives (e.g., longer payback or non-incented measures).

While these qualitative approaches do not provide a value to be applied to program savings, they provide insights into the importance of the Green Bank financing in completing the clean energy projects.

7. Cost-Benefit Analysis

Assessing the costs and benefits of the Green Bank's programs plays an important role to demonstrate the effectiveness of the Green Bank investments and provides a tool for comparing results among Green Bank programs. These can be assessed from the customers' perspective (i.e., the participant), the program administrator's (i.e., the Green Bank) perspective, or a wider societal perspective. Each perspective provides an important measure of the Green Bank's overall impact, and the cost-benefit ratio for each can be derived and tracked over time for Green Bank's individual programs and overall portfolio.

The three ratios presented below relate the costs borne by each stakeholder to the primary benefit sought:

- **Societal Perspective:** Economic development (e.g., jobs supported) and environmental protection (e.g., GHG emissions reduced) to the associated costs;
- **Green Bank Perspective:** Clean energy production (i.e., energy savings and clean energy production) to the associated investments (e.g., public, private, and total investment); and
- **Participant Perspective:** Project benefits to the associated participant costs.

These three different perspectives on the Green Bank program or portfolio provide a picture of Green Bank's effectiveness in delivering on each key objective – see Appendix V for C-PACE project example results.

7.1 Societal Perspective: Environmental and Economic Objectives

The societal perspective cost-benefit analysis attempts to capture the Green Bank's effectiveness in achieving its overarching goals of supporting economic development and environmental protection.

- **Employment Objective ($ invested / job-year supported)**[27]
  = Green Bank Investments / estimated direct, indirect and induced job-years supported
- **GHG Reduction Objective (tons CO_2 eq. / $1,000 invested)**[28]
  = Estimated GHG reductions resulting from clean energy supported / Green Bank Investments

If Green Bank applies the Carbon Count methodology, then the GHG reductions are attributed simply by the portion of the overall project costs financed by the Green Bank investment. At a minimum, the portion of the overall project implementation costs covered by utility incentives should be calculated, and the corresponding portion of GHG reductions removed from the total. The value of other state and federal incentives (RECs and tax credits) should be noted in the results to support full disclosure, and it

[27] The framework presents the investment value per job-year supported to express the employment cost-benefit – that is, the cost to acquire a unit of the benefit, here one job-year supported by the Green Bank. For some audiences it may be more appropriate to present the result as a benefit-cost ratio – that is, the inverse of the Employment Objective metric as presented above (job-years supported per $1,000 invested)

[28] For cross state and other comparison purposes the equation above presents the metric from the benefit-cost perspective. For other purposes it may be valuable to derive the cost to acquire a ton of CO_2 eq. (i.e., the inverse of the above equation).

should be determined whether the associated portion of GHG reductions should be removed from the total credited to Green Bank.[29]

7.2 Green Bank Perspective: Public Cost of Clean Energy (PCCE)

The PCCE captures the ratio of the present value of public monies invested to the overall savings achieved by Green Bank supported projects.

- **Public Cost of Clean Energy ($ / MMBTU)**
  = Net Present Value of Public Costs / Total Clean Energy Delivered

Public Costs include the Net Present Value (NPV) of Green Bank investments in the program, as well as the NPV of all state incentives (e.g., utility and RECs) and federal incentives (e.g., investment tax credits, depreciation, etc.) received by or assigned to program participants.

Total Clean Energy Delivered includes the total of all financed project lifetime energy saved or clean energy generated

The relationship between public investments and the value of total clean energy delivered (benefits) can also be presented in absolute terms, as net benefits, shown below. This provides a benefit-cost indicator that expresses the magnitude of net economic benefits returned to the public.

- **Public Net Benefits of Clean Energy** = NPV Total Clean Energy Delivered – NPV of Public Costs

In the cases where Green Bank can successfully attribute savings between its programs (i.e., financing), state and federal incentives (e.g., utility efficiency programs, REC's, tax credits etc.), then a more precise measure of Green Bank's own cost per unit of clean energy delivered can be defined as such:

- **Green Bank Cost of Clean Energy ($ / MMBTU)**
  = NPV of Green Bank Investments / Attributable Clean Energy Delivered[30]

The Green Bank Cost of Clean Energy captures just the Green Bank's direct cost (or net return) for delivering clean energy. Comparison between this result and the PCCE result provides a tool to assess the degree to which Green Bank program can deliver clean energy at a reduced public cost. As above, net benefits of the Green Bank investments can be calculated:

- **Green Bank Net Benefits of Clean Energy** = NPV Total Clean Energy Delivered – NPV of Green Bank Investments

These indicators provide a view of the magnitude of economic benefits in relation to the associated costs of public or Green Bank investments.

[29] The inclusion or exclusion of the portion of GHG financed through tax credits and RECs should be determined by following the rules of any third-party green bond assessment methodology applied by Green Bank, such as the Carbon Count method referenced above.

[30] In the absence of savings attribution data, the Green Bank Cost of Clean Energy may be expressed per unit energy *supported.* However, it is essential to note that the Green Bank Cost of Clean Energy (supported) is not directly comparable to the Green Bank Cost of Clean Energy (attributable).

7.3 Participant Perspective: Savings to Investment Ratio (SIR)

The participant's SIR is the ratio of the present value of the savings (benefits) accrued to the participant to the present value of the costs incurred by the participant to implement and finance the project. Benefits may include energy and demand cost savings, as well as state and federal incentives paid to the participant. Some quantifiable non-energy benefits, such as operations and maintenance savings, may also be included. Costs typically include financing repayment costs, any unfinanced portion of the overall investment (not covered by utility incentives) and maintenance costs. In general, a project or program is deemed cost-effective to participants if the SIR is greater than one.

- **Individual Participant SIR** = NPV of Benefits_p / NPV of Costs_p
- **Total Program Participants SIR** = $\sum$NPV of Benefits_n / $\sum$NPV of Costs_n

As in Section 7.2 above, the relationship between individual participant or total program participants benefits and costs can be presented as net benefits, shown below. Here this provides a benefit-cost indicator that expresses the magnitude of net economic benefits returned to the individual participant or the pool of program participants.

- **Individual Participant Net Benefits** = NPV of Benefits – NPV of Costs
- **Total Program Participants Net Benefits** = $\sum$Individual Program Net Benefits

  or

- **Total Program Participants Net Benefits** = $\sum$ NPV of Benefits_n - $\sum$ NPV of Costs_n

An average project SIR, below, can also be a useful indicator for program management and reporting. It should be calculated across the same group of participants as the average project SIR, below (i.e. specific year or years, project type, program lifetime, etc.).

- **Average Project SIR_p** = Total Program Participants SIR / Participants_n

8. Appendix I – Statutorily Required Reporting

Per statute, the Connecticut Green Bank is required to file the following organizational reports:

- **Annual Report** – per C.G.S. Section 1-123(a), an annual report to the Governor, the Auditors of Public Accounts, and two copies to the Legislative Program Review and Investigations Committee.[31] Per C.G.S. Section 245n(f)(1), the Green Bank must also file an annual report to DEEP, the Legislative Commerce Committee, and the Legislative Energy and Technology Committee on its activities including those undertaken in collaboration with the Energy Conservation and Load Management Fund. The Green Bank also provides every chief elected official within Connecticut's cities and towns once a year a cover letter, fact sheet, and annual report.

- **Quarterly Financial Cash Flow Reports** – per C.G.S. Section 1-123(b), a quarterly report to the Office of Fiscal Analysis and shall include, but not be limited to, for each fund and account of the agency:

    1. Beginning fiscal year balance;
    2. All funds expended and all revenue collected by the end of the quarter; and
    3. Total expenditures and revenues estimated at the end of the fiscal year.

- **Quarterly Personnel Status Reports** – per C.G.S. Section 1-123(c), a quarterly report to the Office of Fiscal Analysis and shall include, but not be limited to the total number of employees by the end of the quarter.

Per statute, the Green Bank is required to file the following programmatic reports:

- **Anaerobic Digester and Combined Heat and Power** – per Public Act 15-152, a report on the anaerobic digester pilot program and whether it should continue. This is due on or before January 1, 2018 to the Legislative Energy and Technology Committee, with additional copies to the clerks of the Senate and House, the Office of Legislative Research, and the State Librarian.

- **REEEFA Report** – per C.G.S. Section 16-245aa(d), an annual report on the effectiveness of the Renewable Energy and Efficient Energy Finance Account (REEEFA) to the Legislative Energy and Technology Committee.

- **Residential Solar Investment Program** – per C.G.S. Section 16-245ff, files a report by January 1, 2017 and every two years thereafter to the Legislative Energy and Technology Committee on its progress toward deploying 300 MW of residential solar PV.

Per the Green Bank's enabling statute, the Green Bank:

[31] The annual report includes information detailed in the audited annual Comprehensive Annual Financial Report.

- **Develop Standards** – must develop standards to govern the administration and investments of the Green Bank before providing financing support.[32]

- **Disclosure** – must make information regarding the rates, terms and conditions for all of its financing support transactions and annual reviews available to the public.[33]

- **Clean Energy Expertise** – may expend funds for evaluations that support clean energy technologies and expand the expertise of individuals, businesses and lending institutions with regard to clean energy technologies.[34]

[32] C.G.S. Section 16-245n(d)(B)
[33] C.G.S. Section 16-245n(d)(F)
[34] C.G.S. Section 16-245n(c)

9. Appendix II – Program Performance Indicators

The following program performance indicators were identified through interviews with staff of the Green Bank from various programs and products. These indicators are important from the perspective of the Connecticut Green Bank – the program administrator. There are other actors (e.g., lenders, policy-makers, rating agencies, and investors) and use cases (e.g., program design, eligibility criteria, loan and cash management, loan refinance, and securitization) outside of the Connecticut Green Bank's evaluation framework,[35] but this represents a beginning to data that will be collected, analyzed and reported.

Financing Supply

The following is a list of the program performance indicators for financing supply, including if it is an indicator of market transformation or market performance indicator (MPI), its measurability, and the source of data:

CODE	INDICATOR	MPI	MEASURABILITY	DATA SOURCE
S1	Total Available Program Loan Pool		High	= S2 + S3
S2	Available Public Loan Pool		High	GB Program Data
S3	Available Private Loan Pool	x	High	GB Program Data
S4	Ratio of Available Public to Private Loan Pool	x	High	= S2 / S3
S5	Total Public Funds Invested		High	= S6 + S7 + S8 + S9
S6	Total GB Loans to Participants		High	GB Program Data
S7	Other Public Loans to Participants		Low	Program Data
S8	Total Public Incentives Provided to Program Participants (IOU, RECs etc.)		Medium	GB Program Data, Incentive Program Data
S9	Total Tax Credits Issued to Program Participants (Federal ITCs, etc.)		Low	Program Data
S10	Green Bank Funds Available for Credit Enhancements		High	GB Program and Planning Data
S11	Total Private Funds Invested		High	= S12 + S13
S12	Private Third-Party Loans Delivered		Medium	Lender data and surveys
S13	Participant Funds Leveraged		Medium	GB program data, EM&V (participant survey)
S14	Bond Sales to Support Program Lending		Medium	GB Financial Data
S15	Total Public Loans to Participants		High	= S6 + S7
S16	Ratio of Public to Private Capital Deployed (Leverage Ratio)	x	Medium	= S5 / S11
S17	Ratio of GB Financing to Incentives		High	= S6 / S8
S18	Interest Rate: Weighted Average and Distribution	x	High	GB Program and Lender Data
S19	Loan Term: Weighted Average and Distribution	x	High	GB Program and Lender Data
S20	Customer Cost of Capital through GB		Medium	GB Program and Lender Data
S21	Financing Delivered for Energy Improvements (EE/RE)		Medium	GB Program and Lender Data
S22	Financing Delivered for Non-Energy Improvements		Low	GB Program and Lender Data
S23	Non-Debt Financing Delivered (Participants)		Medium	GB Program Data, EM&V (Participant Survey)
S24	Geographic Coverage of Private Lenders	x	High	GB Program Data
S25	Number of PACE Towns Opting In	x	High	GB Program Data
S26	% of Eligible Population Located in PACE Towns	x	High	GB program Data, Secondary Data

[35] 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.

Financing Demand

The following is a list of the program performance indicators for financing demand, including if it is an indicator of market transformation, its measurability, and the source of data:

CODE	INDICATOR	MPI	MEASURABILITY	DATA SOURCE
D1	Total Value of Loans Issued	x	High	GB Program Data
D2	Number of Loans Issued	x	High	GB Program Data
D3	Loan Amount: Average and Distribution	x	High	GB Program and Lender Data
D4	Number of Customer Applications	x	Medium	GB Program and Lender Data
D5	Application Approval Rate	x	High	Program Data + GB Administration Data
D6	Green Bank Customer Acquisition Cost		High	GB Program Data
D7	Number of Customer Inquiries	x	Medium	GB Program Data
D8	% of Target Customers Aware of EE Loans	x	Medium	EM&V (General Population Survey)
D9	Number of Active Enrolled Contractors	x	High	GB Program Data
D10	Geographic Coverage of Active Contractors	x	High	GB Program Data
D11	% of Active Contractors with > X Applications	x	High	GB Program Data
D12	Number of New Contractors Bringing in Applications	x	High	GB Program Data
D13	% of Eligible Contractors Aware of EE Loans	x	Medium	EM&V (Contractor Survey)
D14	% of Active Contractors Growing their EE Business	x	Medium	EM&V (Contractor Survey)
D15	% of Active Contractors Cooperating with Others to Achieve Deeper Savings	x	Medium	EM&V (Contractor Survey)
D16	Portion of Total Addressable Market (TAM) Reached		Medium	GB Program Data, EM&V, Secondary Data
D17	Portion of Serviceable Addressable Market (SAM) Reached	x	Medium	GB Program Data, EM&V, Secondary Data

Loan Performance and Risk Profile

The following is a list of the program performance indicators for loan performance and risk profile, including if it is an indicator of market transformation, its measurability, and the source of data:

CODE	INDICATOR	MPI	MEASURABILITY	DATA SOURCE
P1	Annual Default Rate		High	GB Program and Lender Data
P2	Average Delinquency Rate (Days Past Due)		Medium	GB Program and Lender Data
P3	Early Repayment Rate		Low	GB Program and Lender Data
P4	FICO Scores: Average and Distribution	x	High	GB Program and Lender Data
P5	Debt-to-Income (DTI) Ratio: Average and Distribution	x	Medium	GB Program and Lender Data
P6	Loan-to-Value (LTV) Ratio: Average and Distribution		Medium	GB Program and Lender Data
P7	Other Borrower Credit Quality Indicators (TBD)		Medium	GB Program and Lender Data
P8	Maximum Loan Term Offered		High	GB Program and Lender Data
P9	Minimum Interest Rate Offered		High	GB Program and Lender Data

Impacts and Benefits

The following is a list of the program performance indicators for impacts and benefits, including if it is an indicator of market transformation, its measurability, and the source of data:

CODE	INDICATOR	MPI	MEASURABILITY	DATA SOURCE
I1	Capacity of Renewable Energy Systems Financed		High	GB Program Data
I2	Verified Demand Reduction from Renewable Energy Systems		Medium	GB Program Data / EM&V
I3	Estimated Energy Generated from Renewable Energy Systems		High	GB Program Data
I4	Verified Energy Generated from Renewable Energy Systems		Medium	GB Program Data / EM&V
I5	Estimated Demand Reduction from Energy Efficiency		High	GB Program Data
I6	Verified Demand Reduction from Energy Efficiency		Medium	GB Program Data / EM&V
I7	Estimated Energy Savings from Energy Efficiency		High	GB Program Data
I8	Verified Energy Savings from Energy Efficiency		Medium	GB Program Data / EM&V
I9	Project Depth: Average Energy Savings		High	GB Program Data
I10	Project Depth: % Projects With Multiple Measures		High	GB Program Data
I11	Jobs Created		Low	GB Program Data and Macro-Economic Factors
I12	Greenhouse Gas Emissions Reductions		Medium	GB Program Data and Energy GHG Intensity Factors
I13	Participant Non-Energy Benefits (TBD)		Low	GB Program Data
I14	Program Attribution		Low	EM&V (Participant survey)
I15	Average Project Savings-to-Investment Ratio (SIR)		High	GB Program Data
I16	Total Program SIR		High	GB Program Data
I17	Public Cost of Energy		High	GB Program Data

10. Appendix III – Example Data Release Form (C-PACE)

CUSTOMER RELEASE OF UTILITY DATA FORM

Utility and Fuel Supplier Information

Customer Name: _____

Electric Utility: _____ Account #:_____

Gas Utility: _____ Account #:_____

Other Fuel Supplier: _____ □ Oil □ Propane Account #:_____

If necessary, attach additional account numbers to this form.

Utility and Fuel Supplier and Program Information Release

Utility Customer Doing Business on the Property ("Company") **(only necessary if different from C-PACE Borrower)**	**C-PACE Borrower ("Borrower")**
Company Name:	**Borrower Name:**
Company Address:	**Borrower Address:**

PROJECT INFORMATION RELEASE – As a participant in the Connecticut Property Assessed Clean Energy (C-PACE) program and pursuant to Section 3.1(g) of the Financing Agreement between the Connecticut Green Bank ("Green Bank") and the Borrower dated _____, 2015 (the "Agreement"), I certify that I am a duly authorized representative of the Company/Borrower that is a customer of the above-named utility and that I hereby authorize and give permission to the utilities and/or fuel suppliers named above to release to the Green Bank and to any of its program partners, for their confidential use in connection with recording and calculating energy savings resulting from clean energy measures made pursuant to the Agreement at the Utility Service Address identified below. This permission is given for the following Data:

1) The monthly and interval usage, charges, and sales for fuels and/or utilities for the Release Period set forth below; and
2) Any supporting project documentation pertaining to calculating energy savings for efficiency measures.

In addition to the use of this Data for the Project, the Data may also be anonymized or aggregated to be used for non-commercial research purposes.

RELEASE PERIOD – This authorization covers Data for the period starting with the completion of the project and ending on the date of the complete repayment of the benefit assessment pursuant to the Agreement.

I hereby release and hold harmless the Green Bank, any Green Bank program partners, the above-named utilities and energy suppliers, and their affiliates and their respective directors, employees, officers and agents from any and all liabilities, damages, losses, penalties, claims, demands, suits and proceedings of any nature whatsoever associated with the dissemination and use of such account and program information and this authorization. An electronic copy of this authorization may be accepted with the same authority as the original.

Customer Signature: _____ Date: _____

Printed Name: _____

Email & Phone Number: _____

Mailing Address (if different)**: _____**

Utility Service Address (if different): _____

11. Appendix IV – Example Data Release Form (Smart-E Loan)

CUSTOMER RELEASE OF UTILITY DATA FORM

WHY WE NEED A RELEASE – For Connecticut Green Bank to offer more Smart-E Loans over time, we need access to utility account and actual energy usage data for your home, energy costs, underwriting and loan repayment records, as well as data on energy saving measures installed in your home (collectively "Data"). This Data will allow us to aggregate and understand estimated and actual savings for home energy improvements provided by participating contractors, ensure that installed measures are delivering the expected energy savings, and understand the performance of these loans. This Data will also be used by the Connecticut Green Bank to evaluate the effectiveness of Smart-E Loans. We take the security and privacy of your information very seriously. The Connecticut Green Bank will protect the confidentiality of your Data in compliance with all applicable laws. Data may be anonymized and released in the aggregate, but we will never release personal data, and we will never sell or rent aggregated data.

ENERGY USAGE, CONSERVATION, UNDERWRITING and REPAYMENT INFORMATION RELEASE – As the holder of the above accounts, I hereby authorize and give permission to the utilities, energy suppliers, and loan providers named above to release the Data to Connecticut Green Bank or its agents for confidential use in connection with calculating estimated and actual energy savings, tracking my loan repayment record, and for evaluating the effectiveness of this financial product. This permission is given for 1) my historic and future energy usage and monthly and total amount of energy used at my utility service address; 2) the total monthly price charged for fuels used by my household; 3) my loan repayment record; and 4) program-related information. In addition to the use of the Data for the evaluation of the Smart-E Loan product, the Data may also be anonymized and released in the aggregate.

PROGRAM DATA RELEASE – As a recipient of financing supported by the Connecticut Green Bank, a quasi-public agency of the State of Connecticut, I hereby authorize Connecticut Green Bank to access my Data and release it to program partners for confidential use in connection with calculating estimated and actual energy savings, evaluation of the effectiveness of this product, and understanding performance of this type of financing in the aggregate; and, in addition, I authorize Connecticut Green Bank to use my anonymized data or anonymized aggregated energy usage data.

RELEASE PERIOD – This authorization covers Data for the period starting 18 months before the date below and ending at the time of repayment of the loan.

I certify that I have read and understand the program requirements and that I must use proceeds I obtain through a Smart-E loan to install energy-related measures based on, or non-materially modified from, the individual contractor(s)' proposal(s), which are submitted with this Proposal Cover Sheet and Data Release Form for eligibility approval. I understand that my contractor must submit this sheet, along with a proposal for energy upgrades to the Connecticut Green Bank for technical approval. A list of Participating Lenders, including a summary of applicable fees and charges, can be obtained at www.EnergizeCT.com/smarte. However, I understand that receipt of a loan is contingent upon the eligibility of the measures proposed for financing, and I must obtain a signed, itemized proposal from an approved contractor.

The actual amount of the Loan will be determined by the actual costs of all approved measures. The loan amount may be net of any additional state rebates from my utility company, the Connecticut Energy Efficiency Fund and/or Connecticut Green Bank.

I understand that completing this Proposal Cover Sheet and Data Release Form does not guarantee approval for a loan or membership in a participating lending institution. Loans must be provided directly by a Participating Lender. I understand that I should not complete any measures listed in my application or otherwise rely on the funds of the Loan until I receive a formal commitment from a Participating Lender.
Connecticut Green Bank is a "public agency" for purposes of the Connecticut Freedom of Information Act ("FOIA"). Information received pursuant to this proposal will be considered public records and will be subject to disclosure

under the FOIA, except for information falling within one of the exemptions in Conn. Gen. Stat. Sections § 1-210(b) and § 16-245n(d), which may be withheld at Connecticut Green Bank's discretion.

HOMEOWNER:

I hereby release and hold harmless the Connecticut Green Bank, the above-named utilities and energy suppliers and loan account holders, and their affiliates, employees, officers and agents from any and all liability associated with the dissemination and use of such account and program information and this authorization.

I have read, understood, and agree to the Terms and Conditions above.

Loan Applicant signature(s): _____ *Date:* _____

Printed Name: _____

Mailing Address: _____

Utility Service Address: _____

CONTRACTOR:

By my signature below, I certify that, to the best of my knowledge, the information listed on this form is correct.

Contractor Signature: _____ *Date:* _____

12. Appendix V – Sample Cost-Benefit Analysis (C-PACE)

Based on the cost-benefit assessment framework presented in the Evaluation Framework, a sample analysis is presented for a C-PACE project that includes energy efficiency, renewable energy, and fuel switching measures within a single financing package. A summary of the results is presented immediately below in Table 1; the calculation details and sources references follow Table 1.

Table 1: Summary of Cost-Benefit Analysis Results for Sample C-PACE Project

Societal Perspective	**Results**		
GHG Reduction Objective	3.07	tons CO_2 eq. per $1,000	(lifetime)
	0.19	tons CO_2 eq. per $1,000	(annual)
Employment Objective	$ 53,363	per job-year	(invested)
Green Bank Perspective	**Results**		
PCCE	$ 10.93	per MMBTU	(net public cost)
GB cost of energy	$ -0.12	per MMBTU (supported)	(net return to GB)
Customer Perspective	**Results**		
Net Present Value	$ 490,927		(lifetime)
SIR	1.08		(financing period)
SIR	1.19		(lifetime)

Calculation Details and Sources

The results summarized above were generated by applying the best available data on the project and C-PACE program, based largely on the *ex-ante* estimates of project performance, and organization-wide program delivery costs.

Table 2: Project Financing Details Provided in the C-PACE Scenario Report

Total project implementation costs		$2,689,570	
Utility incentives		$234,860	
Portion financed		91%	
C-PACE capital (Green Bank investment)		$2,454,710	
C-PACE interest rate		5.60%	
C-PACE financing term		16	years
Estimated project lifetime (longest lasting measure)		25	years
Portion of project financed		100%	
Discount rate applied for present value analysis		6%	
Energy inflation rate		3%	
Employment supported (direct + indirect)	*(lifetime)*	46	job-years
Energy savings	*(lifetime)*	66,327	MMBTU
Estimated GHG reductions	*(lifetime)*	8,266	tons CO_2

1. Societal Perspective: Environmental and Economic Objectives

The societal perspective cost-benefit analysis was performed using data readily available from the C-PACE Scenario report as such:

Employment Objective ($ invested / job-year supported)
= Green Bank Investments / estimated direct, indirect and induced job-years supported

GHG Reduction Objective (tons CO_2 eq. / $1,000)
= Estimated GHG reductions resulting from clean energy supported / Green Bank Investments

The GHG reductions are dependent on the energy performance of the supported systems, and will be influenced by fluctuations in the electrical utility grid intensity throughout the lifespan of the project; thus there is some degree of uncertainty to the GHG reduction estimates. The total GHG reductions delivered was reduced by the portion of the project implementation costs covered by utility incentive (9%).

2. Green Bank Perspective: Public Cost of Clean Energy (PCCE)

The PCCE for the sample project was calculated through a present value analysis of all cash flow streams, including energy savings, C-PACE program costs, ZREC payments, utility incentives and tax credits (including accelerated depreciation). These collectively totaled $725,009. The total clean energy delivered was provided in the Scenario Report, and is stated in Table 1 above.

Public Cost of Clean Energy ($ / MMBTU)
= Present Value of Public Costs / Total Clean Energy Delivered

The analysis assumes the performance of the systems will provide the expected energy cost savings, and that energy prices will increase steadily; in this case a 3% per year assumption was applied in the C-PACE Scenario Report which provided a portion of the input data used in this analysis.

The Green Bank Cost of Clean Energy was assessed based on an estimation of overall C-PACE program costs from the 2013 FY Green Bank Audited Financial Statement, Town Administration Costs, and total C-PACE Program Capital Advanced from 2013-2015 (provided from the C-PACE database). In the absence of attribution results, the results represent the average cost (or return) per MMBTU *supported* by Green Bank financing.

Green Bank Cost of Clean Energy ($ / MMBTU)
= NPV of Green Bank Investments / Total Clean Energy Delivered (Supported)

Table 3: C-PACE and Green Bank Program Cost Data

Net GB commitments June 2014	*Total*	$63,529,051
	C-PACE	$14,294,826
	% for C-PACE	23%
2013 FY GB Administration	*(from audited financial statements)*	$1,811,000
2013 FY GB Organizational Costs	*(from audited financial statements)*	$1,180,000
C-PACE municipal costs 2013-2015		$100,228
GB Capital Advanced for C-PACE Program Financing	*2013-2015*	$33,613,832
Portion of GB Capital Advanced for Sample Project	*(Project's portion of 2013-2015 C-PACE total)*	7%

The data presented in Table 3 above represents available inputs used to determine the C-PACE program costs, which are presented in Table 4 below. With time it is expected that the Green Bank will develop more precise measures of the C-PACE (and other financing program) administrative and running costs, and possibly be able to attribute file management and customer acquisition costs to specific projects. This will support a more accurate assessment of the overall cost/return of individual C-PACE project financing to Green Bank.

Table 4: Estimated Program Costs Attributable to the Project

NPV Loan to Green Bank	*$93,460.53*	(net return for GB)
Attributable Municipal Costs	*-$36,596.51*	
Attributable GB Admin + Org. Costs	- $49,147.91	
Net GB costs/benefit	$7,716.10	(net return for GB)

The results suggest that Green Bank generates a small net return for this project, which helps to slightly lower the overall PCCE result above. However, this result does not account for Green Bank's impact to enable or to increase the scope or size of the project. If attribution studies were performed, it may show that Green Bank's influence to lower the PCCE is much greater than the small net return generated for Green Bank indicates in Table 4.

Participant Perspective: Savings to Investment Ratio (SIR)

The lifetime SIR was calculated for this project based on the ratio of the total present value of the C-PACE assessment repayments, and the present value of the energy bill savings. The project NPV is also presented to show the extent of the participating customer's return for the C-PACE investment over the operating period of the measure with the longest EUL (25 years) for the solar PV system.

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 *Solar PV Installation – Residential*	Capital Invested	Company Overhead and Margin	Project Cost after Overhead and Margin	Labor (% of project cost)	Non-labor Costs (% of project costs)
	A	B	C=Ax(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=Fx1.3	H=Cx(D/G)	I	J=HxI	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.

845 Brook Street, Rocky Hill CT 06067 • 300 Main Street, 4th Floor, Stamford CT 06901
860.563.0015 **www.ctgreenbank.com**

CONNECTICUT GREEN BANK

EVALUATION FRAMEWORK
SOCIETAL PERFORMANCE

CONNECTICUT GREEN BANK

Environmental Impact Overview

An important measurement of success for the Connecticut Green Bank (Green Bank) and its programs is how our investment activity improves the air quality of the state. This will be measured by the decrease in the amount of nitrogen oxides (NO_x), sulfur dioxide (SO_2) and carbon dioxide (CO_2) emitted by the region's fossil fuel electric generation due to Green Bank projects.

The Green Bank will use the US Environmental Protection Agency's (EPA) Avoided Emissions and Generation Tool (AVERT) to calculate and report on the environmental benefits of the Green Bank's clean energy investment activity in Connecticut.

Estimated Generation/Savings for 2016 is calculated by using the Avert emissions factors in **Table 1**:

Table 1: AVERT Factors

Technology	CO_2 tons / MWh	NO_x lbs / MWh	SO_2 lbs / MWh
Solar PV	0.5621	0.5754	0.4107
Energy Efficiency	0.5432	0.4803	0.3397
Energy Efficiency/PV	0.5528	0.5285	0.3754
Wind	0.5372	0.4284	0.3333

Using this method, the following is an example of changes to emissions based on 60 MW additions of either clean generation or improved energy efficiency:

Table 2: AVERT Examples

Capacity:	60 MW			
Technology	Annual expected generation change (MWh)	CO_2 savings (tons)	NO_x savings (lbs)	SO_2 savings (lbs)
Solar PV	79,220	44,520	45,580	32,480
Energy Efficiency	63,090	34,260	30,300	21,430
Wind	104,930	56,370	44,920	34,980

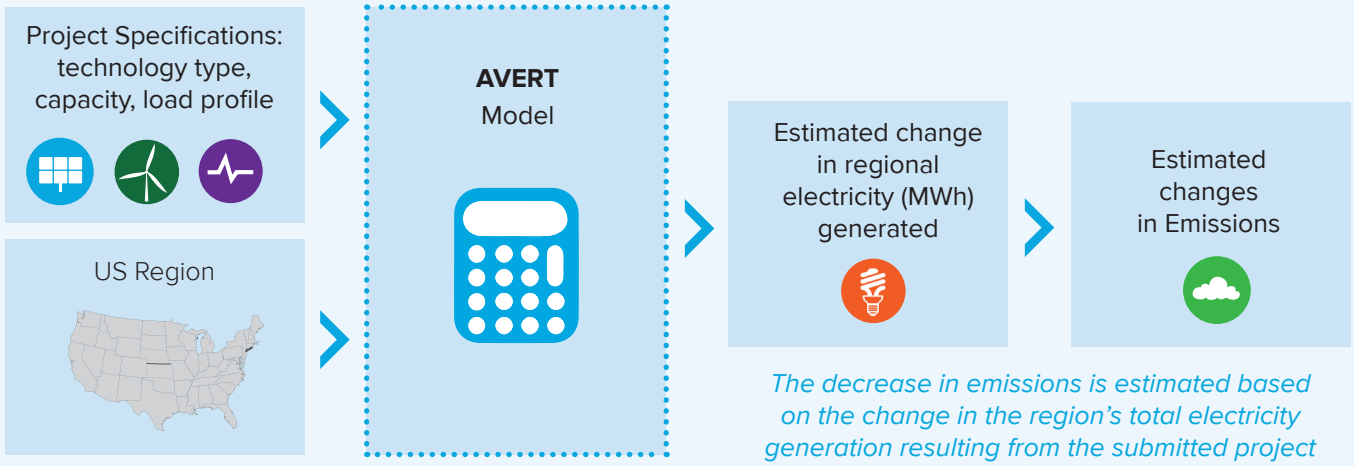
Using the type of calculation outlined above, the Green Bank will include Societal Perspective benefits as well as the environmental impact of its programs in its Comprehensive Annual Financial Report, green bonds issuances, and other communications. Further information about AVERT is available at: https://www.epa.gov/sites/production/files/2015-08/documents/avert_decision_makers_fact_sheet_2-13-14_final_508.pdf

Methodology

Previously, the Green Bank and its predecessor, the Connecticut Clean Energy Fund, estimated these impacts by using the results of the 2007 New England Marginal Emission Rate Analysis to calculate the expected annual and lifetime kWh savings of energy and production of clean energy. After working with the Connecticut Department of Energy and Environmental Protection (DEEP) and the US Environmental Protection Agency, the Green Bank has adopted the EPA's Avoided Emissions and Generation Tool (AVERT) to calculate the air quality benefits associated with Green Bank projects.

AVERT is a complex model that represents the dynamics of electricity dispatch based on the history of actual generation in a selected year for a specified region. For Green Bank purposes, the model generates the expected annual change to regional electricity generation based on a specific clean energy project or projects, then calculates the decline in emissions based on the reduction in resources required. The graphic below is a simplified representation of the model.

Figure 1: AVERT Flow



To maximize the model's accuracy, the Green Bank has derived average project emissions factors by technology (solar, wind, EE) from its completed projects. It then applies these factors to the annual projected generation for individual projects to calculate the estimates of the expected NO_x, SO_2, and CO_2 savings. The Green Bank will update these factors annually based on changes to the regional generation profile and typical project sizes.

Figure 2: Green Bank AVERT Operationalized Flow

The Green Bank multiplies individual projects' generation and/or savings in kWh by the derived AVERT emissions factors to estimate changes in emissions.

Example of Environmental Equivalencies

The Green Bank uses the EPA's AVERT tool to translate the contributions made by Green Bank projects to the region's air quality. The decreases in CO_2 and NO_x in the example in **Table 2** above can also be demonstrated through common activities or environmental equivalencies as shown in **Table 3** below.

Table 3: Environmental Equivalencies

Capacity:	Equivalencies							
60 MW	Greenhouse gas emissions from:		CO_2 emissions from:				Carbon sequestered by:	
Technology	Miles driven by an average passenger vehicle	Tons of waste recycled instead of landfilled	Gallons of gasoline consumed	Pounds of coal burned	Homes' energy use for one year	Incandes-cent lamps switched to	Tree seedlings grown for 10 years	Acres of U.S. forests in one year
Solar PV	96,795,798	12,817	4,544,600	43,097,690	4,265	1,431,686	1,046,698	38,231
Energy Efficiency	74,488,411	9,863	3,497,260	33,165,473	3,282	1,101,742	805,478	29,421
Wind	122,560,178	16,229	5,754,248	54,569,111	5,400	1,812,761	1,325,300	48,407

Further information about the EPA equivalency Calculator is available at:
https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator

In the examples above, the Connecticut Green Bank would apply the Societal Perspective to report the environmental impact results in its Comprehensive Annual Financial Report in the following manner: "In FY 2016 there was a total deployment of nearly 60 MW of Residential Solar PV in Connecticut. Through the Connecticut Green Bank's support, about 44,520 tons of CO_2, 45,580 pounds of NO_x, and 32,480 pounds of SO_2 emissions were saved, which is equivalent to 4,544,600 gallons of gasoline consumed, 1,431,686 incandescent lamps switched to LEDs, or carbon sequestered from 38,231 acres of U.S. forests in a year."

continued >

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 Energy and Environmental Protection

The Connecticut Department of Energy and Environmental Protection (DEEP) was established on July 1, 2011 with the consolidation of the Department of Environmental Protection, the Department of Public Utility Control, and energy policy staff from other areas of state government. It is charged with conserving, improving and protecting the natural resources and the environment of the state of Connecticut as well as making cheaper, cleaner and more reliable energy available for the people and businesses of the state. The agency is also committed to playing a positive role in rebuilding Connecticut's economy and creating jobs – and to fostering a sustainable and prosperous economic future for the state. For more information about the Connecticut Department of Energy and Environmental Protection, please visit www.ct.gov/deep.

About the United States Environmental Protection Agency

The mission of the EPA is to protect human health and the environment. For more information about the United States Environmental Protection Agency, please visit www.epa.gov.

845 Brook Street, Rocky Hill CT 06067 • 300 Main Street, 4th Floor, Stamford CT 06901
860.563.0015 **www.ctgreenbank.com**

PosiGen Solar Lease and Energy Efficiency Program Participant Internet Survey

November 9, 2016 – Wave 1 Version

Email Invitation

SENDER EMAIL: PosiGen_Survey@opiniondynamics.com

EMAIL SUBJECT: PosiGen Solar Lease and Energy Efficiency Program

Dear <NAME>,

You recently completed the installation of your new solar panels. We hope you are enjoying your new equipment! We are interested in getting feedback regarding your experience participating in the *PosiGen Solar Lease and Energy Efficiency Program*. The information collected in this brief survey will help us improve the program for other customers like you.

As a token of our appreciation, each participant who completes this survey will be entered into a drawing to win one of eight $20 gift cards.

You can access the survey by clicking on the button below.

If you would like to complete the survey in more than one session, or if you need to exit out of the survey for any reason, you can return to the last question you answered by clicking on the link from this email. You can use your computer, smartphone, or tablet to complete this survey.

If you have any questions about this survey, please feel free to contact Nick McKay from Opinion Dynamics via either email (nmckay@opiniondynamics.com) or phone (800-966-1254). Opinion Dynamics Corporation is an independent market research firm that is administering this survey on behalf of Connecticut Green Bank and PosiGen.

Thank you in advance for your assistance!

Sincerely,

Madeline Priest

Assistant Manager, Residential Programs, Connecticut Green Bank

Madeline.Priest@ctgreenbank.com

Opening Screen

Thank you for agreeing to participate in this survey about the *PosiGen Solar Lease and Energy Efficiency Program*. We are interested in your experience with the program and the impact it may have had on your household. PosiGen and the Connecticut Green Bank plan to use the information from this survey to improve the green energy programs and services they offer to households in Connecticut.

This survey will take about 10 minutes to complete. If you would like to complete the survey in more than one session, or if you need to exit out of the survey for any reason, you can return to the last question you answered by clicking on the link from the original email.

All responses will remain confidential and will only be reported in aggregate with other responses.

As a token of our appreciation, each participant who completes this survey will be entered into a drawing to win one of eight $20 gift cards.

If you have any questions about this survey, please feel free to contact Nick McKay (nmckay@opiniondynamics.com or 800-966-1254) at Opinion Dynamics Corporation, the independent market research company administering this survey on behalf of Connecticut Green Bank and PosiGen.

A. Awareness

A1. How did you first hear about the *PosiGen Solar Lease and Energy Efficiency Program*? [RANDOMIZE OPTIONS 1-5]

01. From a program representative at an event
02. From a program representative who came to my door
03. Saw an ad on TV
04. Heard about it on the radio
05. From a community group or meeting
00. Other, specify

[SKIP IF A1=98]

A2. Did you hear about the *PosiGen Solar Lease and Energy Efficiency Program* in any other ways?

1. Yes
2. No

[ASK IF A2=1]

A3. How else did you hear about the PosiGen Solar Lease and Energy Efficiency Program? [RANDOMIZE OPTIONS 1-5]

01. From a program representative at an event
02. From a program representative who came to my door
03. Saw an ad on TV
04. Heard about it on the radio
05. From a community group or meeting
00. Other, specify

B. Energy Conservation Measures

B0. In addition to the solar panels, did you receive any other energy conservation measures through the PosiGen Program?
Other energy conservation measures might have included energy efficient light bulbs, programmable thermostats, and insulation. Customers who received such measures pay an additional $10 per month.
1. Yes
2. No
8. Don't know

[ASK IF B0=1]

B1. In addition to the solar panels, which of the following energy conservation measures did you receive through the PosiGen Program?
Please provide a response for each listed measure.

	Yes	*No*	*Don't know*
a. Programmable thermostat	❍	❍	❍
b. Energy efficient light bulbs	❍	❍	❍
c. Recessed can covers	❍	❍	❍
d. Insulation	❍	❍	❍
e. Attic tent	❍	❍	❍
f. Boiler cleaning/tune-up	❍	❍	❍
g. Toilet tank bank	❍	❍	❍
h. Chimney pillow	❍	❍	❍
i. Carbon monoxide/smoke detector	❍	❍	❍

[ASK IF B0=2]

B2. Why did you not install any other energy conservation measures at the time the solar panels were installed? [OPEN END]

B3. PosiGen is considering expanding the energy conservation measures offered through the *PosiGen Solar Lease and Energy Efficiency Program*. How interested would you be in the following measures, if the program offered them at an additional monthly cost? [RANDOMIZE LIST OF A-C]
For each listed measure, please indicate your level of interest.

	Not at all interested	*Not very interested*	*Somewhat interested*	*Very interested*
a. Energy efficient air conditioning	❍	❍	❍	❍
b. Energy efficient space heating	❍	❍	❍	❍
c. Energy efficient water heating	❍	❍	❍	❍

C. Motivation/Attribution

Energy Audit

The next few questions are about the energy audit that you received as part of your participation in the *PosiGen Solar Lease and Energy Efficiency Program*.

C1. Before the energy audit that you received through PosiGen, had you ever had an energy audit at your current home or another home? [MULTIPLE RESPONSE FOR OPTIONS 1 AND 2]

1. Yes, at our current home
2. Yes, at another home
3. No
8. Don't know

C2. If you had not received the energy audit through the *PosiGen Solar Lease and Energy Efficiency Program*, how likely is it that you would have had an audit done at your home?

Not at all likely										Extremely likely
0	1	2	3	4	5	6	7	8	9	10

Solar Panels

The next few questions are about your decision to install the new solar panels.

C3. Please rate the importance of the following factors in your decision to install the new solar panels. *Please provide a response for each factor. If something does not apply to you, just select "Not applicable".* [ROTATE]

Not at all Important										Extremely Important	Not applicable
0	1	2	3	4	5	6	7	8	9	10	n/a

a. Information provided by the PosiGen program representative
b. Information from program marketing materials
c. The monthly lease rate offered by the program
d. The approval process (no credit score required)
e. The convenience of bundling the solar installation with the additional energy conservation measures
f. Recommendation from friends/neighbors
g. Information received at community meetings or events

C3n. Were there any other factors that were important in your decision to install the new solar panels?

1. Yes
2. No

[ASK IF C3n=1]

C3nn. What other factors were important in your decision to install the new solar panels? [OPEN END]

[ASK IF C3n=1]

C3o. What rating would you give to these other factors that were important in your decision to install the new solar panels?

Not at all Important										Extremely Important	Not applicable
0	1	2	3	4	5	6	7	8	9	10	n/a

C4a. Before learning about the solar panels available through the PosiGen Program, had you considered solar panels for your home?

1. Yes
2. No

[ASK IF C4a=1, ELSE SKIP TO C4d]

C4b. Had you considered purchasing or leasing solar panels for your home?

1. Purchasing
2. Leasing
3. Both purchasing and leasing
8. Don't know

C4c. Why did you not go ahead and install solar panels when you considered it prior to your participation in the PosiGen Program? *Please select all that apply.*

01. Panels were too expensive
02. Applied for a loan but did not qualify
03. Process was too complicated
04. Did not think savings would be worth the cost
00. Other, specify

C4d. If you had not installed the solar panels through the PosiGen Program, how likely is it that you would have installed solar panels on your own or through another program or offering?

Not at all likely										Extremely likely
0	1	2	3	4	5	6	7	8	9	10

[ASK IF C4d>0]

C4e. And if you had installed solar panels on your own or through another program or offering, what is the likelihood that you would have installed them within 12 months of when you did?

Not at all likely										Extremely likely
0	1	2	3	4	5	6	7	8	9	10

Energy Savings Agreement

[ASK IF B0=1, ELSE SKIP TO SECTION D]

The next few questions are about your decision to install the additional energy conservation measures and enter into an energy savings agreement with PosiGen.

C5. Please rate the importance of the following factors in your decision to install the additional energy conservation measures. *Please provide a response for each factor. If something does not apply to you, just select "Not applicable".* [ROTATE]

Not at all Important										Extremely Important	Not applicable
0	1	2	3	4	5	6	7	8	9	10	n/a

a. Information provided by the PosiGen program representative
b. Information from program marketing materials
c. Information provided by the audit report
d. The monthly energy savings agreement rate offered by the program
e. The approval process (no credit score required)
f. The convenience of combining the additional energy conservation measures into one bundle
g. The convenience of bundling the additional energy conservation measures with the solar installation
h. Recommendation from friends/neighbors
i. Information received at community meetings or events

C5n. Were there any other factors that were important in your decision to install the additional energy conservation measures?

1. Yes
2. No

[ASK IF C5n=1]

C5nn. What other factors were important in your decision to install the additional energy conservation measures? [OPEN END]

[ASK IF C5n=1]

C5o. What rating would you give to these other factors that were important in your decision to install the additional energy conservation measures?

Not at all Important										Extremely Important	Not applicable
0	1	2	3	4	5	6	7	8	9	10	n/a

C6. If you had not installed the additional energy conservation measures through the PosiGen Program, how likely is it that you would have installed them on your own?

Not at all likely										Extremely likely
0	1	2	3	4	5	6	7	8	9	10

[ASK IF C6>0]

C7. And if you had installed the additional energy conservation measures on your own, what is the likelihood that you would have installed them within 12 months of when you did?

Not at all likely										Extremely likely
0	1	2	3	4	5	6	7	8	9	10

D. Bill Impacts/Perception of Savings

D1. Following the installation of the solar panels [SHOW IF ESA B0=1: "and the other energy conservation measures"], have you noticed a reduction in your household's cost of electricity?

Please think about what you used to pay for your monthly electric bill compared to what you <u>now</u> pay each month for your solar lease [SHOW IF B0=1: ", your energy savings agreement,"] and your electric bill combined.

1. Yes, noticed reduction
2. No, cost of electricity is about the same
3. No, cost of electricity has increased
8. Don't know

[ASK IF D1=1, ELSE SKIP TO SECTION E]

D2. On average, how much do you think you are saving per month? *Your best guess is fine.*

1. Less than $10
2. $10 - $25
3. $26 - $50
4. $51 - $75
5. $76 - $100
6. More than $100
8. Don't know

D3. Are these monthly bill savings more than, less than, or about what you expected when you decided to participate in the program?

1. More than what I expected
2. Less than what I expected
3. About what I expected
8. Don't know

E. Program Experience/Satisfaction

The next few questions are about your experience with the *PosiGen Solar Lease and Energy Efficiency Program*.

E1. How would you rate your satisfaction with the following components of the *PosiGen Solar Lease and Energy Efficiency* Program? *Please provide a response for each program component*.

Extremely Dissatisfied										Extremely Satisfied	Not applicable
0	1	2	3	4	5	6	7	8	9	10	n/a

a. The application process
b. The technician who completed the energy audit in your home
c. The audit report

[ASK IF E1a<7]

E2a. Your response suggests that you are not fully satisfied with the <u>application process</u>. Why did you give this rating? [OPEN END]

[ASK IF E1b<7]

E2b. Your response suggests that you are not fully satisfied with the technician who completed the energy audit in your home. Why did you give this rating? [OPEN END]

[ASK IF E1c<7]

E2c. Your response suggests that you are not fully satisfied with the audit report. Why did you give this rating? [OPEN END]

E3. How would you rate your satisfaction with the following components of the *PosiGen Solar Lease and Energy Efficiency* Program? *Please provide a response for each program component*.

Extremely Dissatisfied										Extremely Satisfied	Not applicable
0	1	2	3	4	5	6	7	8	9	10	n/a

a. The contractor who installed the solar panels
b. Your new solar panels
c. The monthly lease cost of your solar panels

[ASK IF E3a<7]

E4a. Your response suggests that you are not fully satisfied with the contractor who installed the solar panels. Why did you give this rating? [OPEN END]

[ASK IF E3b<7]

E4b. Your response suggests that you are not fully satisfied with your new solar panels. Why did you give this rating? [OPEN END]

[ASK IF E3c<7]

E4c. Your response suggests that you are not fully satisfied with the monthly lease cost of your solar panels. Why did you give this rating? [OPEN END]

[ASK IF B0=1]

E5. How would you rate your satisfaction with the following components of the *PosiGen Solar Lease and Energy Efficiency* Program? *Please provide a response for each program component*.

Extremely Dissatisfied										Extremely Satisfied	Not applicable
0	1	2	3	4	5	6	7	8	9	10	n/a

a. The technician who installed the energy conservation measures
b. Your new energy conservation measures
c. The monthly cost of your energy savings agreement

[ASK IF E5a<7]

E6a. Your response suggests that you are not fully satisfied with the technician who installed the energy conservation measures. Why did you give this rating? [OPEN END]

[ASK IF E5b<7]

E6b. Your response suggests that you are not fully satisfied with your new energy conservation measures. Why did you give this rating? [OPEN END]

[ASK IF E5c<7]

E6c. Your response suggests that you are not fully satisfied with the monthly cost of your energy savings agreement. Why did you give this rating? [OPEN END]

E7. How would you rate your satisfaction with your participation in the *PosiGen Solar Lease and Energy Efficiency* Program overall?

Extremely Dissatisfied										Extremely Satisfied	Not applicable
0	1	2	3	4	5	6	7	8	9	10	n/a

[ASK IF E7<7]

E8. Your response suggests that you are not fully satisfied with the *PosiGen Solar Lease and Energy Efficiency Program* overall. Why did you give this rating? [OPEN END]

E9a. Would you recommend the *PosiGen Solar Lease and Energy Efficiency Program* to friends or family in Connecticut?

1. Yes
2. No
8. Don't know

[ASK IF E9a=2]

E9b. Why would you not recommend the *PosiGen Solar Lease and Energy Efficiency Program* to friends or family in Connecticut? [OPEN END]

F. Demographics

You are almost done. The last few questions are general questions about your household.

F1a. What type of fuel do you use to heat your home? *Please select all that apply.*

01. Oil
02. Natural Gas
03. Electricity
04. Propane
00. Other, specify
98. Don't know

F1b. What type of fuel does your home use for water heating?

01. Oil
02. Natural Gas
03. Electricity
04. Propane
00. Other, specify
98. Don't know

F2. Including yourself, how many people currently live in your home year-round? [NUMERIC OPEN END 1-97; ALLOW BLANK AS REFUSED]

F3. In what year were you born? [NUMERIC OPEN END 1900-2015; ALLOW BLANK AS REFUSED]

F4. What is your highest level of education?
1. Less than a high school degree
2. High school degree
3. Technical/trade school program
4. Associates degree or some college
5. Bachelor's degree
6. Graduate / professional degree, e.g., J.D., MBA, MD, Ph.D.
9. Prefer not to answer

F5. Please check the range that best describes your household's total annual income for 2015, before taxes.
1. Less than $15,000
2. $15,000 – $24,999
3. $25,000 – $49,999
4. $50,000 – $74,999
5. $75,000 – $99,999
6. $100,000 – $124,999
7. $125,000 or more
9. Prefer not to answer

Final Screen

This concludes this survey. Thank you again for your participation!

Please provide the following information so that we can mail your $20 gift card. [ALLOW TO SKIP AS REFUSE]

MA1. Name: [OPEN END]

MA2. Mailing Address: [OPEN END]

Please click the SUBMIT button to submit your responses.

Opinion Dynamics

Boston | Headquarters

617 492 1400 tel
617 497 7944 fax
800 966 1254 toll free

1000 Winter St
Waltham, MA 02451

PosiGen Solar Lease for All Program

Survey Administration Guide – Draft

February 17, 2017

Table of Contents

1. Introduction

This document provides guidance to assist the Connecticut Green Bank in administering the PosiGen Solar Lease online survey to future waves of program participants, using SurveyMonkey's Platinum Package.

The remainder of this document covers the following topics:

- Accessing the PosiGen survey
- Survey editing and logic
- Formatting and loading survey sample
- Sending email invitations and reminder emails
- Technical support
- Downloading and formatting data

2. Accessing the PosiGen Survey

To access the PosiGen survey, first log into the SurveyMonkey platform using this link: https://www.surveymonkey.com/ and enter the Connecticut Green Bank's login information:

- Username: CTGreenbank
- Password: SolarPV1

Then click on the link to the "PosiGen Solar Lease and Energy Efficiency Program Customer Survey".

3. Survey Editing and Logic

Survey administrators can edit and modify all sections of the PosiGen survey via the "Design Survey" tab. You can access each question using the scroll bar on the right, or by skipping to a specific page using the gray drop-down button just above the survey header (it will display "P1" while you are on the first page). Note that SurveyMonkey uses page numbers, rather than question numbers, to reference the different parts of the survey.

We do not recommend making changes other than changes in question wording, due to the advanced skip logic that is built into the survey. For example, the wording in the question in Figure 1 below can be modified, but the placement of the question in the survey should not be changed as many subsequent skips are based on it.

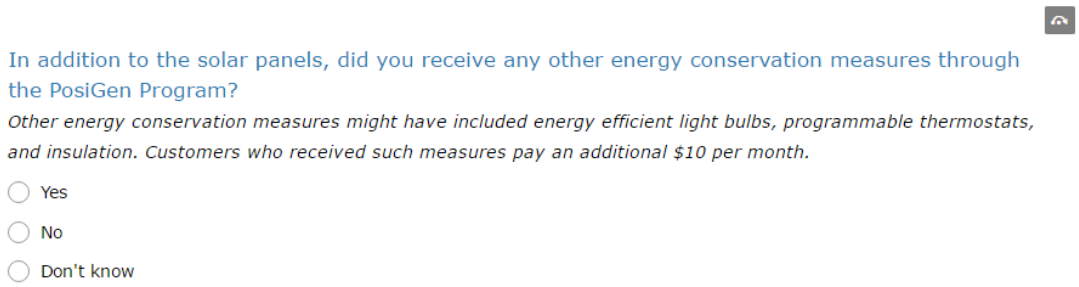
Question Editing

To change question wording, hover over the question and click on the green "Edit" button. You can then edit the text for the question as well as the response options. In "Edit" mode, you can also modify the available response options: click the green "+" to add a new response option, click the red "X" to delete a response

option,[1] or click "⊘" to hide/unhide a response option. Click "Save" to save any edits or "Cancel" to undo them.

When changing question wording and response options, care should be taken if those questions have skip logic associated with them as a substantive modification might affect the validity of the skip. You can view a question's logic by exiting the "Edit" mode and selecting "Page Logic" and "Advanced Branching Logic" just above the question.

Figure 1. Question Example

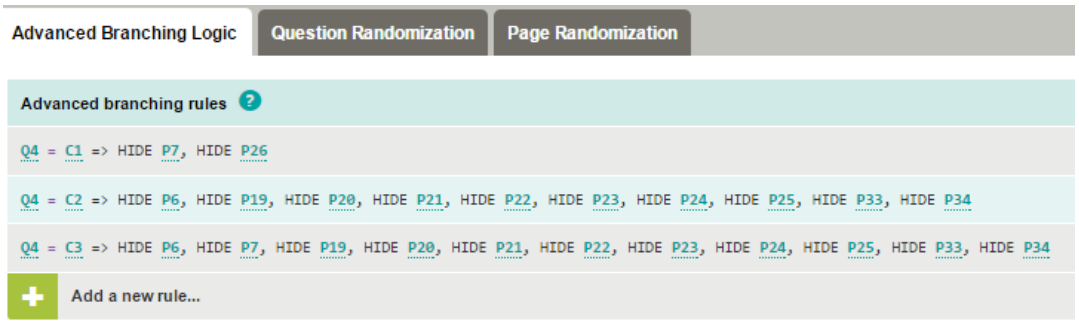


Skip Logic

Figure 2 illustrates the logic associated with this question. In this example:

- Q4 is the question shown in Figure 1.
- C1, C2, and C3 refer to the three response options for Q4 (i.e., C1=Yes, C2=No, C3=Don't know).
- P6 through P34 refer to pages, containing questions that are skipped, based on the answer to Q4.

Figure 2. Branching Logic Example



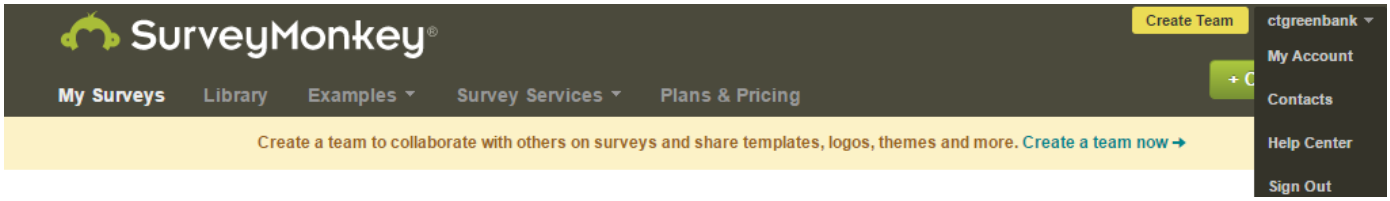
In this example, it is clear that changing the content of the response option would result in faulty skips later in the survey, unless the skip logic is also changed.

[1] Note that this option is not available for questions that currently have a response within SurveyMonkey.

4. Formatting and Loading Participant Sample

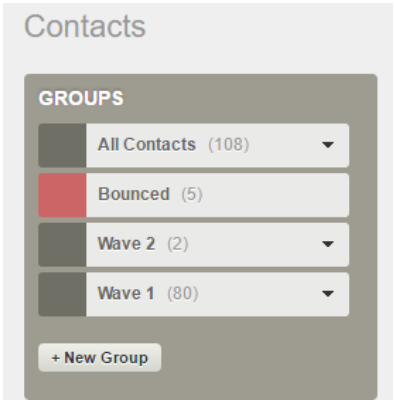
Participant sample can be uploaded to SurveyMonkey in multiple ways. The most straightforward method is to select the "Contacts" option from the black "ctgreenbank" drop-down button in the very top right corner of the page (see Figure 3; you might have to scroll back up to see the black "SurveyMonkey" bar, if you are in the middle of the survey).

Figure 3. Adding Contacts



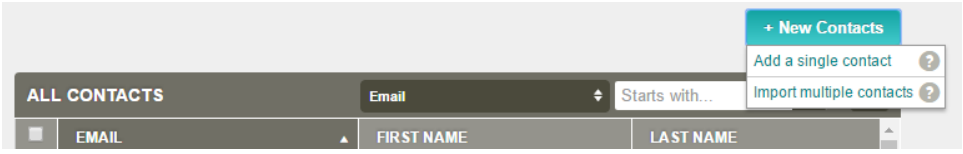
After "Contacts" is selected, first create a new Group by clicking the "+ New Group" button (see Figure 4). You can give it a descriptive name, such as Wave 2 or some other identifier.

Figure 4. Adding a Contact Group



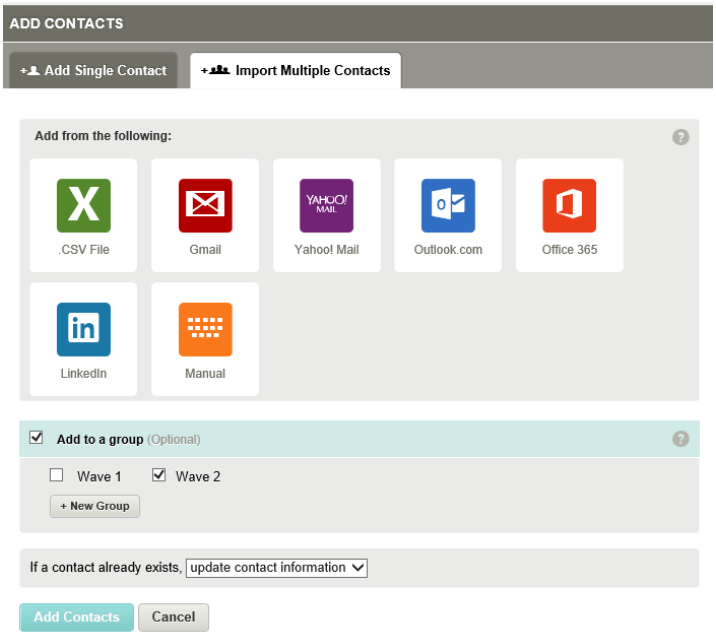
Once you have created a new group for your sample, you can bring in the sample, using the "+ New Contacts" button. SurveyMonkey provides the option to "Import multiple contacts" (see Figure 5).

Figure 5. Importing Multiple Contacts



For the pretest and Wave, we used the CSV file method to import contacts. All newly added contacts should be assigned to a group using the "Add to a group" function. The default will be the newly created group (see Figure 6).

Figure 6. Importing a CSV File



The only required field for uploading a sample file is the "Email" field; however, for ease of survey administration, the contacts' full names should be added into the sample at the same time as their email addresses. The default SurveyMonkey contact information format requires the email recipients' first and last names to be contained in two different columns within the CSV file. However, since the sample data received for the Pretest and Wave 1 of the PosiGen survey contained the recipients' first and last names in a single cell within the Excel/CSV file, we included the full name in the "First Name" field. Note that the "Email" field is limited to 255 characters while the "First Name" field is limited to 50 characters. An example of a CSV file, containing sample, is shown in Figure 7Figure 7 below.

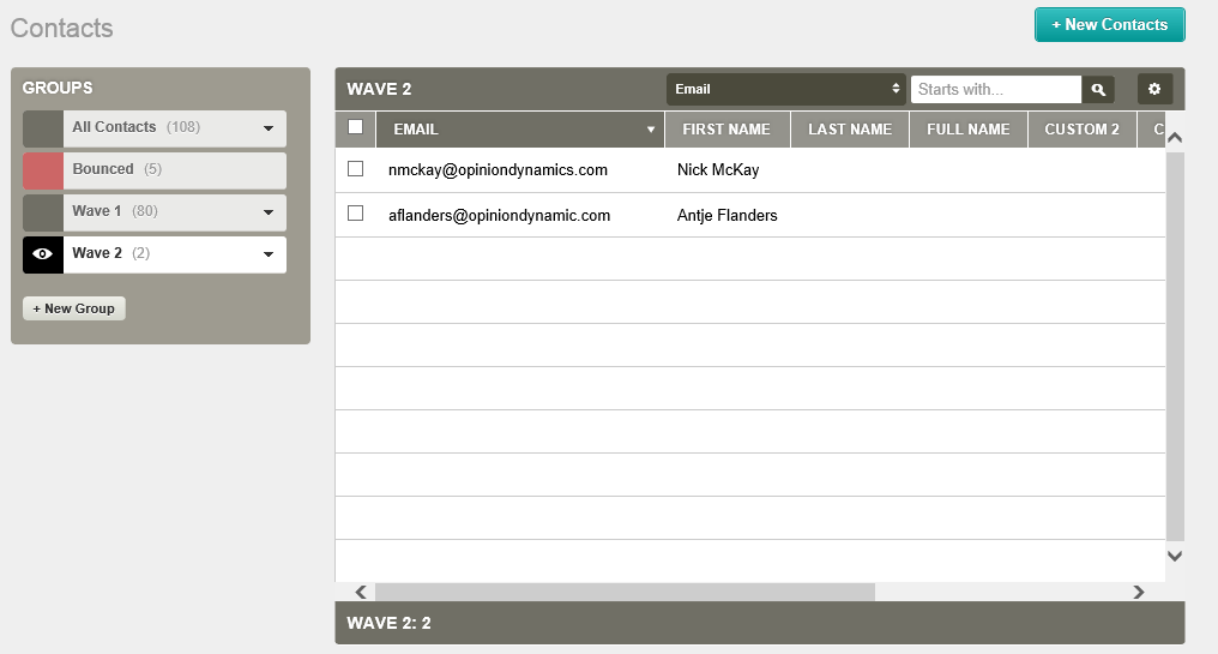
Figure 7. Sample Fields

	A	B	C
1	EMAIL	FIRST NAME	LAST NAME
2	aflanders@opiniondynamic.com	Antje Flanders	
3	nmckay@opiniondynamics.com	Nick McKay	

Once you are ready to upload the information, click on the green ".CSV File" button, then select "Browse…" and locate your file on your computer/network. The name of your file will appear next to the "Browse…" button. Click "Add Contacts" at the bottom of the page.

If the upload was successful, you will see a notification that "X contacts were added" to the group. You will also see the new contacts in the main window (if you do not see the new contacts, try resorting the list by clicking on the "Email" header.) Figure 8 below shows the newly uploaded sample.

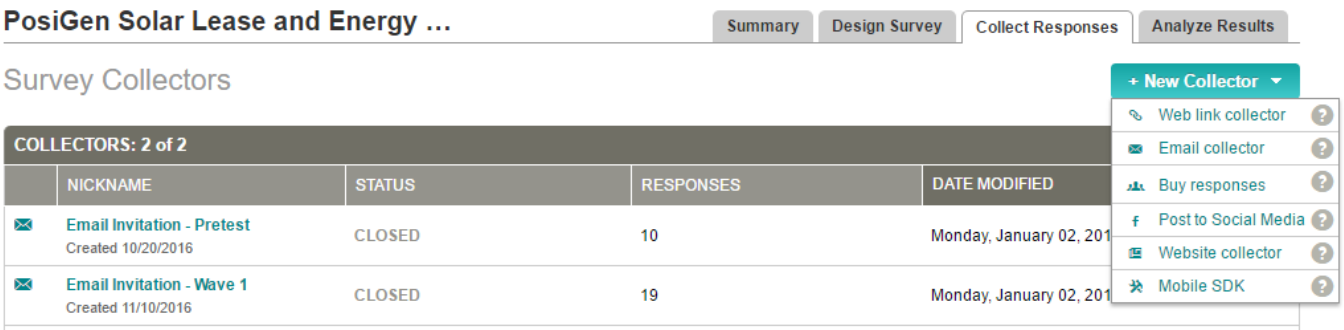
Figure 8. Uploaded Sample



5. Sending Email Invitations and Reminder Emails

After adding the new contacts, navigate to the "My Surveys" section of SurveyMonkey (this option is located in the brown area in the upper left-hand corner of the webpage), select the survey ("PosiGen Solar Lease and Energy Efficiency Program Customer Survey"), and then select the "Collect Responses" tab near the top of the screen. A new "Collector" should be created for each new survey wave. The list of current PosiGen survey collectors currently includes "Email Invitation - Pretest" and "Email Invitation – Wave 1" (see Figure 9).

Figure 9. Creating a New Collector



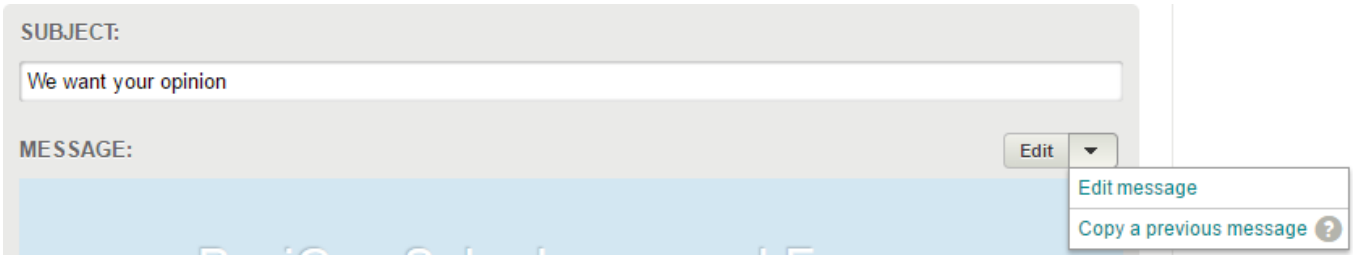
From the "+ New Collector" drop-down menu, select "Email collector" – this type of collector allows the most options for customization, including: the invitation message, targeted reminder messages, and the ability to track the status of individual respondents. After selecting the collector type, a message editor will appear. The simplest way to create a new message is to select the "Copy a previous message" option from the "Edit" drop-down menu (see Figure 10). You can then select one of the invitation emails used in either the Pretest or Wave 1. We recommend to copy and modify the following invitation and reminder emails for future survey waves:

- For invitation emails: “PosiGen Solar Lease and Energy Efficiency Program 11/10/2016” (Previously used for Wave 1)
- For 1st reminder emails: “Reminder: PosiGen Solar Lease and Energy Efficiency Program 11/16/2016” (Previously used for Wave 1)
- For 2nd reminder emails: “Reminder: PosiGen Solar Lease and Energy Efficiency Program 11/29/2016” (Previously used for Wave 1)

For reference purposes, the text of the invitation email and the two reminder emails is located in Appendix A.

Invitation and Reminder Messages Used in Wave 1

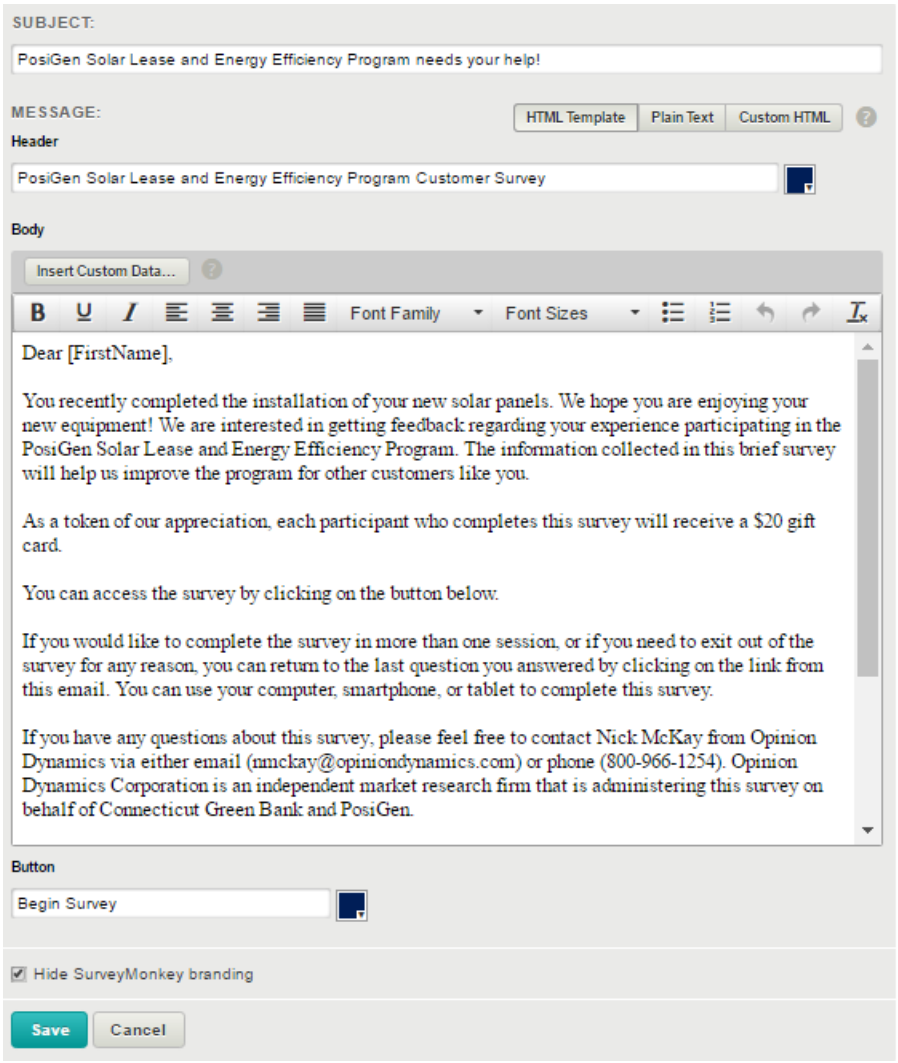
Figure 10. Copying a Previous Message



After selecting a previous message, the message will appear and can be modified as needed. Make sure that the option to “Hide SurveyMonkey branding” is selected before sending any messages to contacts. Also make sure that the salutation line read-in (see Figure 11) matches the field in which the contact’s name was placed. This should be the case, if the prior instructions for sample field naming were followed.

SurveyMonkey Platinum provides the option to insert other information associated with the contact, using the “Insert Custom Data” function. To use this function, the additional information would have to be loaded into SurveyMonkey in the same CSV file as the sample.

Figure 11. Modifying the Message



To add survey invitation recipients, select the "Add Recipients" button (see Figure 12) and then the "Contacts" option (see Figure 13). This will allow you to use the contact information for the group previously imported to SurveyMonkey.

Figure 12. Adding Survey Recipients – 1

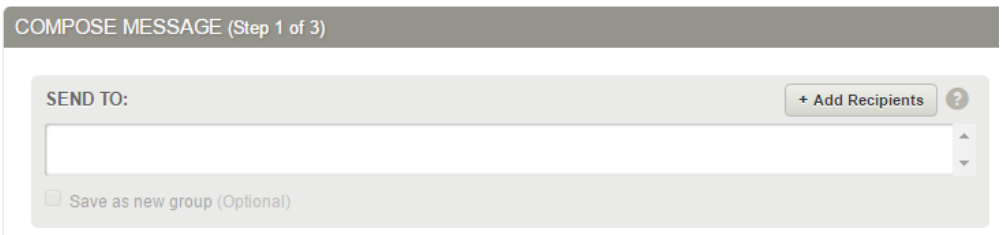
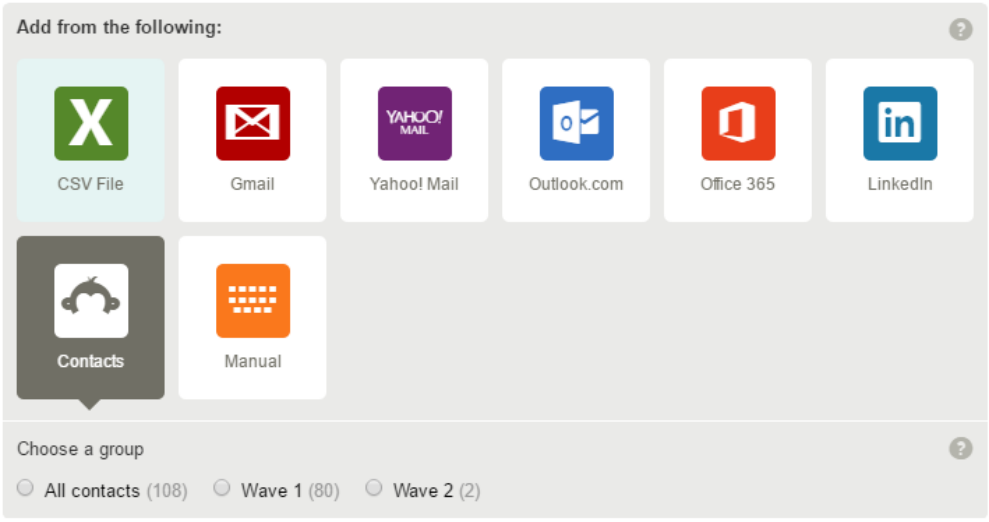


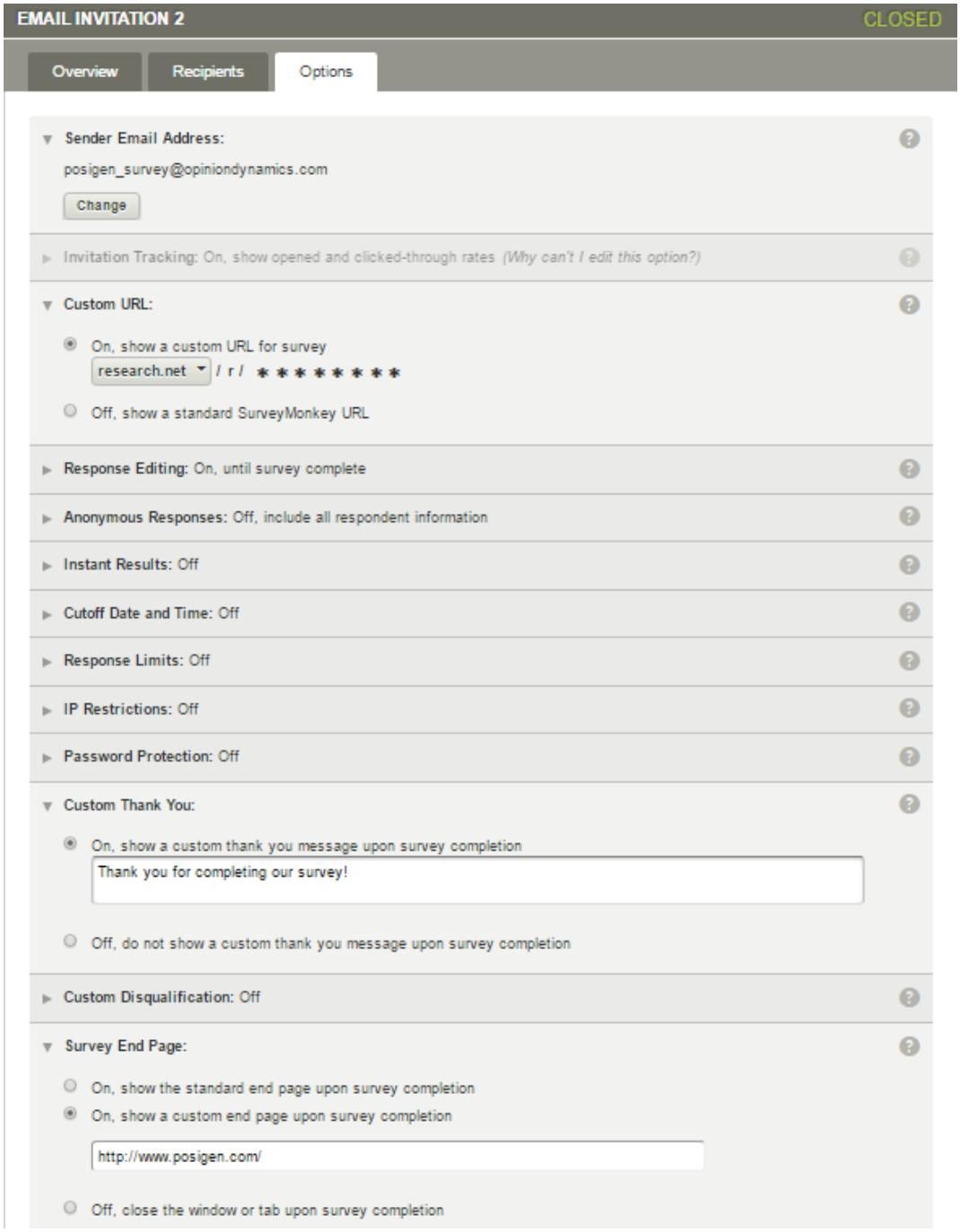
Figure 13. Adding Survey Recipients – 2



After completing the invitation email message and selecting the survey recipients, save the message using the green "Save" button in the bottom left corner.

Then click the "Next" button to review options available to customize the email invitation. The options selected in Figure 14 were used for the Pretest and for Wave 1, and are suggested to be used in future waves. The email address billing@ctgreenbank.com is the default "Sender Email Address" for the initial email invitation because it is the email tied to the SurveyMonkey account. However, the "Sender Email Address" can be changed to any valid email address; the contacts will see that email address as the sender of the survey. In addition, if the survey invitees reply to the invitation email, it will be sent to the "Sender Email Address". Therefore, the Sender Email Address should be an address that the survey administrator can easily monitor for any communications from survey invitees.

Figure 14. Email Invitation Options

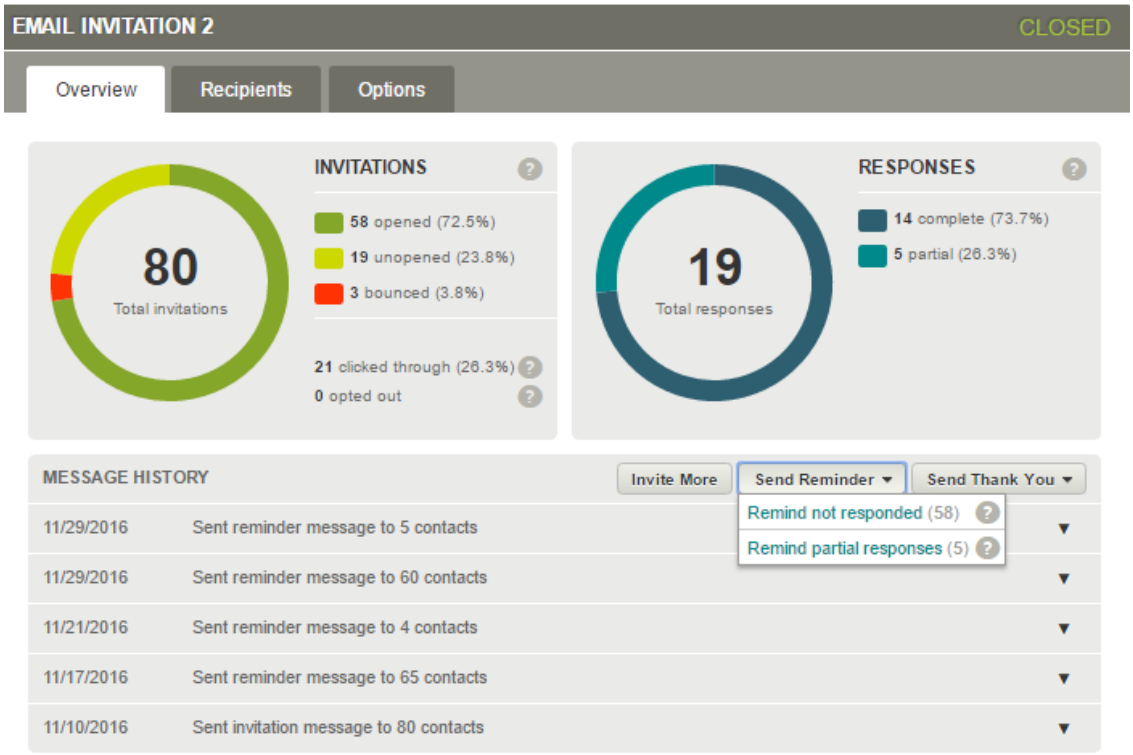


SurveyMonkey provides the option to send invitations immediately, or to schedule them to be sent at any time.

To send email reminders, go to the "Summary" tab, select the relevant "Collector" in the "Response Summary" section, and click the "Send Reminder" button (see Figure 15). There are two types of reminder emails: one for contacts who have not responded to the survey and one for contacts who have started the survey but have not completed it. While you cannot send a single email reminder to both groups, it easy to create one and then

duplicate and modify it, using the method for sending email invitations outlined above. Reminders retain the same options as their original email invitations; the only update needed to email reminders is the email reminder text. Figure 15

Figure 15. Email Invitation Reminders



6. Technical Support

There were no questions sent by either survey respondents or survey invitees during either the Pretest or Wave 1.

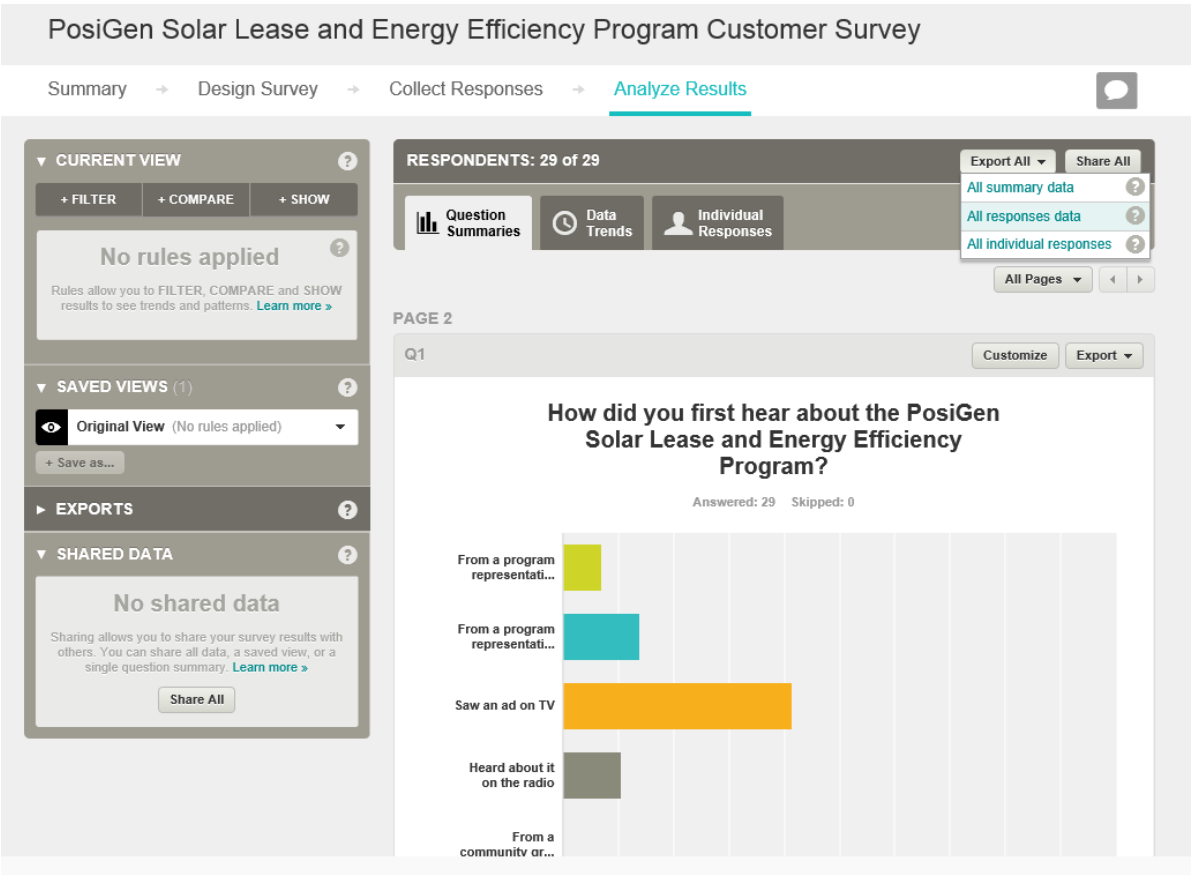
For future survey waves, the survey administrator should monitor the number of "Bounced" (undeliverable) survey invitations and the number of invitees who have "opted out" of receiving further communication from the Connecticut Green Bank through SurveyMonkey. Both are tracked on the invitation overview tab (see Figure 15).

7. Downloading and Formatting Data

Once the survey fielding process has been completed, survey data can be downloaded via the "Analyze Results" tab. SurveyMonkey provides multiple options for downloading survey results, including downloading to Excel, SPSS, and PDF.

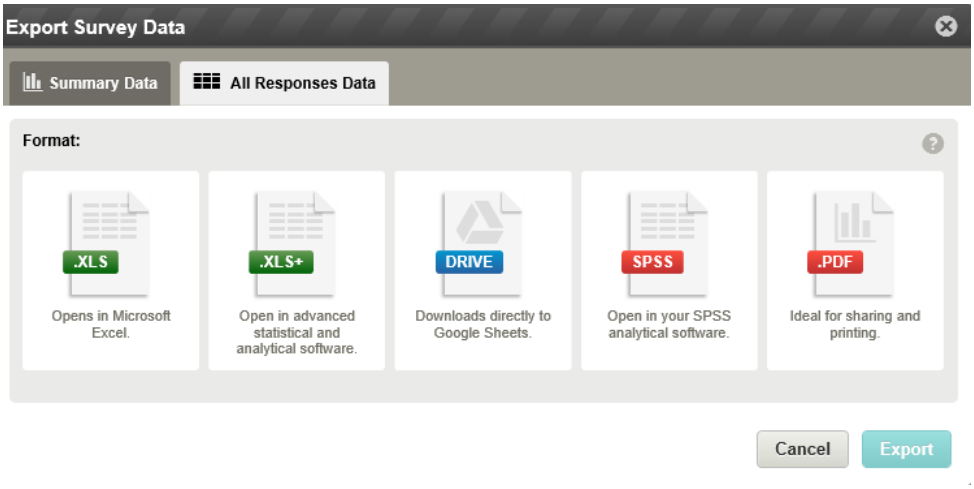
There are multiple options for exporting the response data. We recommend using the "Export All" option in the top right corner, followed by "All Responses Data" option (see Figure 16).

Figure 16. Exporting Data



You can then select the format of the data (see Figure 18).

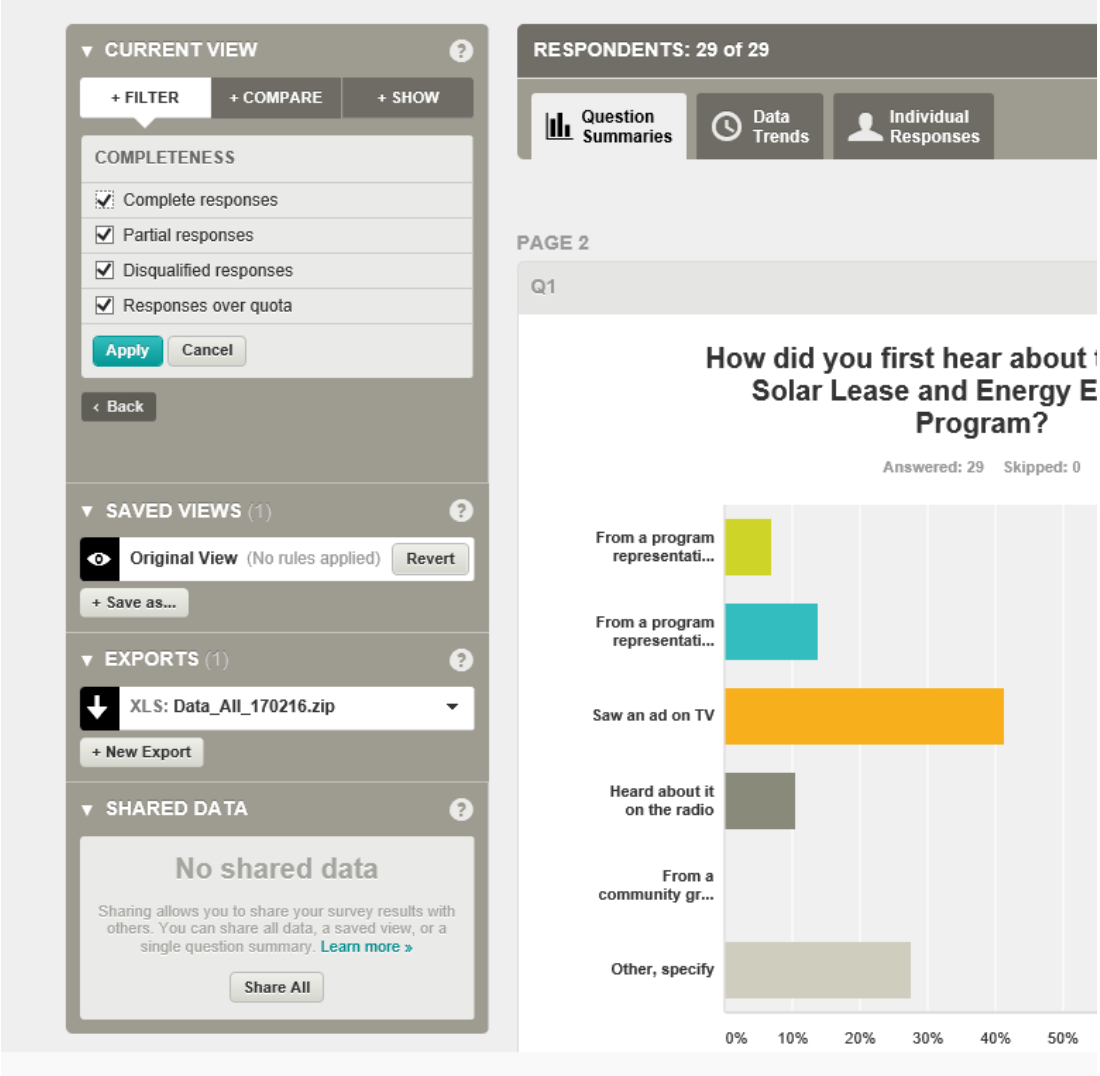
Figure 17. Data Format Options



Once you specify the file format and click on “Export,” the file name will appear in the vertical bar at the left-hand side of the screen (Data_All_170216.zip, in the example in Figure 18). This might take a few seconds.

There are multiple filtering options, including removing incomplete responses. We recommend exporting all responses, and remove any undesired data as part of the data cleaning and analysis, outside of the SurveyMonkey platform.

Figure 18. Export Options



Once downloaded into Excel (or another data format), the results should require minimal data cleaning in most cases. We provide data cleaning suggestions in the accompanying PosiGen Survey Results and Freeridership Algorithm Excel workbook.

Appendix A. Invitation and Reminder Messages Used in Wave 1

Invitation Email

Dear [FirstName],

You recently completed the installation of your new solar panels. We hope you are enjoying your new equipment! We are interested in getting feedback regarding your experience participating in the PosiGen Solar Lease and Energy Efficiency Program. The information collected in this brief survey will help us improve the program for other customers like you.

As a token of our appreciation, each participant who completes this survey will be entered into a drawing to win one of eight $20 gift cards.

You can access the survey by clicking on the button below.

If you would like to complete the survey in more than one session, or if you need to exit out of the survey for any reason, you can return to the last question you answered by clicking on the link from this email. You can use your computer, smartphone, or tablet to complete this survey.

If you have any questions about this survey, please feel free to contact Nick McKay from Opinion Dynamics via either email (nmckay@opiniondynamics.com) or phone (800-966-1254). Opinion Dynamics Corporation is an independent market research firm that is administering this survey on behalf of Connecticut Green Bank and PosiGen.

Thank you in advance for your assistance!

Sincerely,

Madeline Priest
Assistant Manager, Residential Programs, Connecticut Green Bank
Madeline.Priest@ctgreenbank.com

First Reminder Email

Dear [FirstName],

This is a friendly reminder that we are interested in getting your valuable feedback regarding your experience participating in the PosiGen Solar Lease and Energy Efficiency Program. The information collected in this brief survey will help us improve the program for other customers like you.

As a token of our appreciation, each participant who completes this survey will be entered into a drawing to win one of eight $20 gift cards.

You can access the survey by clicking on the button below.

If you would like to complete the survey in more than one session, or if you need to exit out of the survey for any reason, you can return to the last question you answered by clicking on the link from this email. You can use your computer, smartphone, or tablet to complete this survey.

If you have any questions about this survey, please feel free to contact Nick McKay from Opinion Dynamics via either email (nmckay@opiniondynamics.com) or phone (800-966-1254). Opinion Dynamics Corporation is an independent market research firm that is administering this survey on behalf of Connecticut Green Bank and PosiGen.

Thank you in advance for your assistance!

Sincerely,

Madeline Priest
Assistant Manager, Residential Programs, Connecticut Green Bank
Madeline.Priest@ctgreenbank.com

Final Reminder Email

Dear [FirstName],

We need your feedback! It is not too late to be entered into the drawing to win one of eight $20 gift cards.

We are interested in getting your valuable feedback regarding your experience participating in the PosiGen Solar Lease and Energy Efficiency Program. The information collected in this brief survey will help us improve the program for other customers like you.

You can access the survey by clicking on the button below.

Please complete this survey by Monday, December 5th in order to be entered into the drawing to win a $20 gift card.

If you would like to complete the survey in more than one session, or if you need to exit out of the survey for any reason, you can return to the last question you answered by clicking on the link from this email. You can use your computer, smartphone, or tablet to complete this survey.

If you have any questions about this survey, please feel free to contact Nick McKay from Opinion Dynamics via either email (nmckay@opiniondynamics.com) or phone (800-966-1254). Opinion Dynamics Corporation is an independent market research firm that is administering this survey on behalf of Connecticut Green Bank and PosiGen.

Thank you in advance for your assistance!

Sincerely,
Madeline Priest
Assistant Manager, Residential Programs, Connecticut Green Bank
Madeline.Priest@ctgreenbank.com

For more information, please contact:

Antje Flanders
Vice President

617 492 1400 tel
617 497 7944 fax
aflanders@opiniondynamics.com

1000 Winter St
Waltham, MA 02451

845 Brook Street, Rocky Hill, CT 06067
T 860.563.0015
ctgreenbank.com

CONNECTICUT GREEN BANK

Memo

To: Connecticut Green Bank Board of Directors

From: George Bellas (VP Finance and Administration)

Date: July 21, 2017

Re: Review and proposed revisions to Internal Accounting Control Procedures

---

It is a best practice to review the Connecticut Green Bank ("CGB") 's internal accounting control procedures with the CGB Audit, Compliance and Governance ("ACG") Committee and recommend revisions, if necessary, to these procedures to reflect changes in the organization and its programs.

On July 10th staff met with the ACG Committee to review the following internal accounting control procedures, which are included in your Board materials:

CGB 101 – Purchasing and Accounts Payable

CGB 102 – Consulting and Advisory Services

CGB 103 – Credit Cards

CGB 104 – Mobile Devices

CGB 105 - Fixed Assets and Depreciation

After review and discussion with staff, the ACG Committee recommends the Board approve the following minor revisions to these procedures:

CGB 103 – Credit Cards – Substitute the Chief Legal Officer in place of the President and CEO as the second approver along with the VP of Finance of all credit card invoices.

CGB 104 – Mobile Devices – discontinue the partial subsidy for a cell phone purchase by newly hired employees who have been approved by senior management to receive reimbursement for monthly cell phone service.

CGB 105 - Fixed Assets and Depreciation – Increase the threshold for capitalizing fixed asset purchases from $500 to $1,000.

RESOLUTION

WHEREAS, on July 11, 2017, the Audit, Compliance and Governance Committee recommended that the Board of Directors (the "Board") approve the proposed revisions to Internal Accounting Control Procedures as presented.

Now, therefore be it:

RESOLVED, that the Board hereby approves the proposed revisions to Internal Control Procedures outlined in the Memo dated July 21, 2017 (along with attachments) which was submitted to the Board.

845 Brook Street, Rocky Hill, CT 06067
T 860.563.0015
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Connecticut Green Bank and Component Units

Accounting Department
Internal Controls and Procedures
Index

845 Brook Street, Rocky Hill, CT 06067
T 860.563.0015
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CONNECTICUT GREEN BANK

CGB - 101
Revised May 25, 2016

Purchasing and Accounts Payable Policies and Procedures

I. Purpose: To provide procedures for procurement methods and completion of related documents.

II. Scope: This procedure applies to the purchase of supplies, materials, services, sponsorships, memberships, software and capital assets for all departments within the Connecticut Green Bank (CGB) as well as for all affiliates for which CGB provides accounting and financial reporting services, whether operating or programmatic in nature.

III. Responsibility:

Procurement of supplies will be facilitated through the department of finance and administration. Procurement of services will be facilitated by the person requiring the services. Subscriptions will be facilitated by the marketing and outreach department. All named parties are responsible for using good purchasing methods for optimizing price savings, quality and value of products, vendor working relationships, and for assuring proper control and inspection as required by these policies. All named parties will utilize purchase orders or such other purchasing documents that are developed and revised from time to time as necessary by the department of finance and administration.

IV. Procedure:

A. ORDER PLACEMENT AND APPROVALS

1. Office supplies - and other goods and services used in the normal course of business are approved by the VP, Finance and Administration ("VPF") or the Director of Operations ("DOO").
2. Office furniture, fixtures and equipment - must be approved by the President & CEO or the DOO.
3. Subscriptions and Reference Materials – Subscriptions to magazines, newspapers, on-line reference and search services, etc. must be approved by the President and CEO or the DOO.
4. Computer Equipment and Software - All purchases of computer equipment, software and related items must be in writing. All purchases

under $1,000 will be approved by the Office Manager. All purchases $1,000 or greater will follow the approval process outlined in B1 below.

5. Travel and Entertainment – All business travel and entertainment must be approved by the employee's immediate supervisor. All requests for reimbursement of T&E expenses greater than $1,000 must follow the approval guidelines set forth in Section B below. All international travel must be pre- approved by the President &CEO. All international travel by the President & CEO must be pre- approved by the Chairperson of the CGB Board. See the Company Travel and Entertainment Policy for guidelines on business expenditures that will be reimbursed.
6. Financial Assistance- The process of approving financial assistance consisting of grants, loans, loan guarantees, debt and equity investments or other financial products is outlined in the bylaws and operating procedures of the CGB.
7. Sponsorships and Memberships – All CGB sponsorships and memberships must be approved by Director level staff and the DOO.
8. Consulting and Advisory Services – See CGB – 102 for procedures related to internal management of consulting and advisory services.
9. Legal Fees – Due to the nature of legal fees, approval for fees is obtained when the invoice is received. All invoices will be forwarded to the Chief Legal Counsel and DOO for their approvals before payment is made.

B. PROCESSING OF VENDOR INVOICES FOR GOODS AND SERVICES

1. Approval of Invoices – must be obtained prior to sending to Accounts Payable for payment processing.
    a. Goods and Services –
        - Invoice < $1000 – requires signature of project/department manager level or higher.
        - Invoice equal to or greater than $1,000 –requires the signature of one of the following: VPF; DOO; Chief Legal Officer; President & CEO; EVP and Chief Investment Officer; collectively named "Management".
        - Invoice equal to or greater than $5,000 – requires 2 signatures from Management.
        - Invoice equal to or greater than $25,000 – requires 2 signatures from. Management, one of which must be the President and CEO.
        - Non-budgeted items –requires signature of VPF as well as approval according to $ limit approval procedures noted above.
        - Finance Assistance up to $25,000 – requires 2 signatures from Management, one of which must be the President & CEO or the DOO or, in both their absence, the VPF.
        - Finance Assistance (as defined in A6 above) equal to or above $25,000 – requires 2 signatures from Management,

one of which must be the President & CEO or in his or her absence the VPF.

- Consulting and Advisory Services – See CEFIA – 102
- Re-occurring charges – for disbursements that occur on a regular basis (rents, equipment lease payments, etc. the VPF must approve the invoice A second signature from a member of Management is not required.
- Transfers of funds between CGB and its affiliates for working capital purposes – transfers of funds between CGB and its affiliates for working capital purposes will only require the approval of the VPF at time of transfer. Documentation of the transfer will be forwarded to the President and CEO for review and sign off within 2 business days after transfer. All transfers will be executed by wire transfer which require approval and release by 2 authorized check signers.

2. Approval in the absence of the President &CEO – If the President & CEO is unavailable for a period of time to approve invoices or purchases enumerated in section A above, he/she may delegate his/her authority to approve such purchases and invoices to the VPF or in the absence of the VPF, the DOO, Chief Investment Officer or Chief Legal Officer in writing. The VPF or such other designee listed above must then submit all such items to the President & CEO upon his/her return to the office and obtain approval from the President & CEO at that time.

3. Payment of invoices –
    a. Accounts Payable will process invoices for payment when all approvals are obtained by requestor.
    b. Payment of invoices will be made based on vendor terms.
    c. Check signing:
        - Invoice and all related documents are submitted to Accounts Payable.
        - Check amounts equal to or greater than $5,000 require 2 signatures
        - The Board of Directors will authorize specific senior level positions to sign checks on behalf of the Company. This authorization will be documented in the Board meeting minutes.

4. Check requests
    a. A check request may be used as approval documentation for invoices. Invoices may be signed directly as well. The finance and administration department will develop and maintain check request forms.

5. Wire/ACH transfers

a. The processing of wire/ACH disbursements will follow the same process for checks as documented in section 3c. above with the exception that all wires or ACH transactions require that 2 authorized check signors are required to execute the transaction: one to initiate and approve and one to release the transaction.

b. Financial Assistance – No wire/ACH will be initiated until the VPF has reviewed all appropriate executed legal documents to verify that the disbursement is being made in accordance with the requirements of such documents.

845 Brook Street, Rocky Hill, CT 06067
T 860.563.0015
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CONNECTICUT GREEN BANK

CGB – 102
Revised May 25, 2016

Consulting and Advisory Services

I Purpose: Pursuant to operating procedures initially adopted by the Board of Directors of the Connecticut Green Bank (CGB) on December 16, 2011 as amended from time to time; CGB may contract for consulting and advisory services as part of its operations and programs.

II. Scope: These services may include expertise or specialized advice, training, research or analysis, special projects or other work where the (a) appropriate experience, skills or expertise is not then available among the staff because of workload or other constraints, (b) the time duration, frequency of need or other nature of the services does not justify employing staff to provide such services, or (c) Board of Directors has determined that the use of such services is warranted and in the best interest of CGB. These procedures also apply to all affiliates of CGB for which CGB provides accounting and financial reporting services. CGB and its affiliates are collectively referred to as the "Company" in these procedures.

III. Responsibility: All staff contracting for consulting and advisory services must follow this procedure.

IV. Procedure:

A. Request for Services - All such services will be requested through the use of the Company's standard Approval Release Slip (ARS). The ARS will be attached to a draft Professional Service Agreement (PSA) developed and revised from time to time as necessary by the Company's legal department. Upon the approval of the ARS by staff as outlined below in section B, a PSA will be executed between the Company and the provider of the services requested.

B. Approval of ARS and execution of PSA:

1. Approval of ARS: All ARS forms require the following sign offs before the Company's legal department will process the related PSA: 1) the manager who has budget responsibility for the program seeking the services, 2) the VPF, 3) the DOO and 4) the Chief Legal Officer.

2. Execution of the PSA: The President & CEO will execute all PSA's on behalf of the company. However, see 5 below.
3. ARS requests greater than $75,000 to $150,000 must be approved in writing by the President and CEO and Chairperson of the Board prior to execution of PSA under B1 above.

4. ARS requests greater than $150,000 must follow the RFP requirements in section C prior to execution of PSA under B1 above.

5. Execution of PSA's and approval of ARS requests the absence of the President & CEO – If the President & CEO is unavailable for a period of time to execute PSAs or approve ARS's as required, he/she may delegate his/her authority to approve purchases to the VPF or in the absence of the VPF the DOO, Chief Investment Officer or Chief Legal Officer in writing. The VPF must then forward all items approved under this section to the President & CEO upon his/her return to the office and obtain approval from the President and CEO at that time.

6. All ARS requests will be reviewed by the DOO and VPF to ensure that the requested disbursement falls within the appropriate departmental budget for the current fiscal year prior to approval**.**

C. PSA duration and RFP requirements

1. Duration - The duration of PSAs for consulting or advisory services will generally not exceed one year without written approval of the President & CEO.

2. Whenever possible, an RFP is to be completed prior to entering into any contract in an amount over $150,000 in any one fiscal year.

3. Contractors with multiple contracts - CGB may engage the same contractor for several different projects or for continuations of a single project during a fiscal year. A PSA which will, if executed, result in cumulative expenditures to the contractor exceeding $150,000 in any one fiscal year will require, whenever possible, that an RFP be completed prior to the execution of the PSA.

D. Recordkeeping

1. The department of finance and administration will prepare and maintain a summary of all outstanding contracts. The summary will include the name of the contractor, a brief description of the services/project, the total amount of the contract and actual amount paid to date.

2. The VPF will be responsible for monitoring the status of approved contracts and ensuring that all contracts are in compliance with these operating procedures.

845 Brook Street, Rocky Hill, CT 06067
T 860.563.0015
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CGB – 103
Revised May 25, 2016

Credit Card Policy and Procedures

I. Purpose:

To provide procedures for the use of Connecticut Green Bank, ("CGB") owned credit cards by authorized employees of the CGB.

II. Policy/Scope:

CGB owned credit cards will be issued to those employees who are designated as purchasing agents for CGB by the President and CEO. CGB owned credit cards will be used for official CGB business to purchase goods and services on behalf of CGB or to make travel arrangements on behalf of CGB employees who are traveling on CGB business. CGB owned credit cards shall not be used for personal or private business. Intentional misuse or fraudulent abuse of any CGB owned credit card may result in disciplinary action, up to and including dismissal. In addition, the authorized holder of the CGB owned credit card shall promptly reimburse CGB for any unacceptable or unauthorized purchases.

III. Responsibility:

The Vice President, Finance and Administration ("VPF") shall be responsible for the administration of the CGB credit card account.

IV. Procedures:

1. The President and CEO ("CEO") and the Director of Operations ("DOO") are authorized purchasing agents of the CGB. The CEO shall provide the VPF with a list of additional employees who are authorized purchasing agents for CGB. This list will be updated from time to time by the CEO as circumstances warrant. A credit card dollar limit will be approved by the CEO for each authorized purchasing agent.

2. The VPF as administrator of the CGB credit card account will approve and submit an application to the credit card issuer requesting that a card be issued (with the authorized dollar limit) to the CGB purchasing agent.

3. Once the CGB credit card is issued to the authorized purchasing agent, the purchasing agent will be responsible for maintaining adequate documentation supporting all purchases made with the credit card. This documentation shall be attached to the monthly credit card invoice and submitted to the VPF for review and approval. The VPF will review

the documentation submitted to determine that the expenditure was for an appropriate business purpose. The credit card invoice will be approved by the VPF and the Chief Legal Officer (CLO)~~CEO~~.

4. It is the purchasing agent's responsibility to monitor his or her account for unauthorized activity. All unauthorized activity should immediately be reported to the credit card issuer and VPF for appropriate action.

5. Purchasing agents who have been issued a CGB owned card will be responsible for safeguarding the card at all times. The purchasing agent is responsible for immediately and properly reporting a lost or stolen card to the credit card issuer and the VPF.

6. A copy of this policy will be provided to each purchasing agent. The purchasing agent will be required to acknowledge receipt of the policy.

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T 860.563.0015
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GREEN BANK

CGB – 104

Revised July 5, 2017

Mobile Device Policy and Reimbursement Procedure

Policy

The Connecticut Green Bank ("CGB") often must have immediate access to key employees. Accordingly, CGB will provide mobile devices with cell and internet access to an employee if the employee's responsibilities require the employee to be out of the office on Company business and the employee needs to be in contact with CGB staff or its partners during that time.

Procedure

Mobile device plans bundle "voice" minutes and "data" minutes for a monthly fee.

Employees can be reimbursed for the associated monthly voice and data charges by submitting an approved employee expense report with appropriate backup including dates of service to the accounting department on a monthly basis up to the limit established by the organization. If an employee's cell phone service is part of a "family" plan, the employee will only be reimbursed for the charges allocated to their cell phone number. Dollar limits will be reviewed and adjusted periodically by the President and CEO and the Director of Operations ("DOO"). Pre-Approval forms may be obtained from the accounting department. All requests for mobile communications devices and associated voice/data plans must be approved by the DOO. ***Charges incurred that were not pre-approved or above the pre-approved limit will be the responsibility of the employee.***

Costs outside of this procedure will be reviewed on a case by case basis and should seek pre-approval whenever possible.

845 Brook Street, Rocky Hill, CT 06067
T 860.563.0015
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CONNECTICUT GREEN BANK

CGB 105

Fixed Assets and Depreciation

I. Purpose: To set policy and controls over the recording of fixed assets related depreciation.

II. Scope: This policy applies to all purchases of furniture, equipment, software and leasehold improvements.

III. Responsibility: The Controller is responsible monitoring and tracking fixed assets and related depreciation.

IV. Procedure:

a. All computer hardware and software, office furniture and equipment, and leasehold improvement items purchased with a value greater than $1,000~~500~~ are capitalized and recorded as fixed assets.

b. The Staff Accountant records the fixed asset vendor invoice to the appropriate fixed asset account. Invoices are approved using internal accounting control procedure CGB 101 – Purchasing and Accounts Payable

c. The Senior Accountant reviews fixed asset purchases on a monthly basis and inputs the appropriate financial information in the Intacct business system using the following categories and useful lives:

   i. Furniture and Equipment – 5 years
   ii. Computer Hardware – 3 years
   iii. Computer Software – 3 or 2 years
   iv. Leasehold Improvements – 5 years or life of lease, whichever is less

d. Depreciation is calculated by Intacct using the straight-line method on a yearly basis, and reconciled monthly.

845 Brook Street, Rocky Hill, CT 06067
T 860.563.0015
ctgreenbank.com

CONNECTICUT GREEN BANK

Memo

To: Connecticut Green Bank Board of Directors

From: Eric Shrago, Director of Operations

CC: Bryan Garcia, President and CEO

Date: July 21, 2017

Re: Q4 Progress to Targets

The following memo outlines Connecticut Green Bank (CGB) progress to combined Q1, Q2, Q3 and Q4 goals for fiscal year 2017 as of June 30, 2017, the end of the fiscal year.

Infrastructure Sector
The Infrastructure sector is below its target this year due to slower growth than anticipated in the Residential Solar Investment Program (RSIP), resulting from a combination of factors:

- A decrease in electricity rates from July through December 2016[1]
- Nationwide flattening/slowdown in the residential solar PV market in calendar year 2016
    - Changes in the third-party ownership landscape, with major companies struggling with profitability and customer acquisition costs, resulting in business model changes, market exits, and bankruptcies
    - Market flattening expected to continue in most markets except emerging markets and those with high incentives
    - In Connecticut, Solar City withdrew from RSIP, NRG withdrew from the state and eventually from residential solar PV in favor of commercial and utility scale PV, and several large companies participating in RSIP went bankrupt including Sungevity, One Roof, and Sun Edison
- Solarize program transitioned to the private sector with SmartPower partnering with local installers on a "pay for performance" model.
- Installers have said that "low hanging fruit" customers have been taken

CT's largest residential solar PV market player with over 40% share in prior years, Solar City exited RSIP in calendar year 2016 with plans to aggregate and monetize the renewable energy credits (RECs) themselves. They appear to be continuing to install systems in Connecticut but are registering the systems in Massachusetts as Class I renewable resources and monetizing the RECs in the Massachusetts market. These approximately 450 projects represent roughly 3.5 MW, assuming an average step 10 project size of 7.7 kW, and there may have been other Solar City projects installed in CT in FY17 that are not accounted for. The Solar City exit from RSIP was a large factor in the RSIP

[1] Eversource's generation rate dropped from 9.555 cents/kWh to 6.606 cents/kWh in July 2016, then increased to 7.874 cents/kWh in January 2017. During the same timeframe, Avangrid's generation rate decreased from 10.7358 cents/kWh to 8.0224 cents/kWh, then increased to 9.2641 cents/kWh.

falling short of its target, though other company exits and bankruptcies and additional factors outlined above also contributed.

Despite national and local challenges and the exit of major players, existing and new entrants have been steadily picking up the slack, with Sun Run, Vivint, Posigen, SunPower, Sunnova, and Ross Solar the RSIP market leaders in FY17. Many local companies continue to maintain a strong presence, though some have shifted more business toward commercial projects due to richer incentives available through the ZREC program. The market appears to have stabilized at a rate of between 3.1 and 3.6 MW of RSIP submissions per month since March 2017. Green Bank staff will continue to monitor market trends and will consider whether marketing efforts may be helpful in FY18.

In the context of broader market trends and the state of Connecticut's fiscal status and climate change mitigation efforts, the strategy for supporting RSIP going forward will not focus primarily on increasing project volume but rather on elements such as:

- Sustained orderly development of a stable, resilient, residential solar PV market not dependent on incentives
- Maintaining a stable installer base including strong local company presence
- Continuing to support access to affordable financing through loans and third party providers
- Continuing to increase adoption of solar among LMI households through additional research and analysis to understand opportunities in the Connecticut solar market
- Training the market for the long term by supporting consumer education and protection, as well as installation technology diversity (e.g., energy efficiency)
- Continuing to reduce barriers to PV adoption
- Supporting a "Solar Plus" model of adoption of solar PV in combination with complementary technologies such as energy storage, electric vehicles, renewable thermal technologies, energy efficiency, demand response, and home energy management systems to increase the value of solar to the grid and to customers

The Anaerobic Digester and Combined Heat and Power programs have 4 approved projects that staff is working with the developers to close.

Table 1. Statutory and Infrastructure Sector Q4 Progress to Targets

	Projects		Capital Deployed		Capacity	
Product/Program	Closed	Target	Closed	Target	Closed	Target
Anaerobic Digesters	-	1	-	$18,000,000	-	1.6
CHP	1	-	$3,401,392	-	0.8	-
Residential Solar	5,024	6,000	$138,068,370	$173,165,071	38.9	47.4
Infrastructure Total	**5,025**	**6,001**	**$141,469,762**	**$191,165,071**	**39.7**	**49.0**

Residential Sector

Smart-E has exceeded its targets for the year in terms of number and principal value of loans despite a significantly lower than projected average loan size (due to more HVAC loans with lower project cost) and the overall drag on consumer demand for energy upgrades due to continued low fuel prices and more moderate temperatures on average for the past 2 years. Strong performance in the HVAC Channel for cooling equipment was due to hard work developing contractors in that space by CGB staff. The Capital for Change (C4C)/HES channel launched on December 1st after nearly a year delay and finally came on strong with a robust pipeline – in fact C4C is now our top lender. The quarter's

volume was further boosted by the launch of our reduced special offer interest rates from 2.99% to 0.99% on May 8th through the end of the year which showed strong uptake. [Note – full Smart-E Loan data from the community bank and credit union partners will be available in late July or early August]

The Low-to-Moderate-Income lease program offered through PosiGen exceeded its targets, having essentially achieved the annual target by the end of the 3rd fiscal quarter. Of note, 70% of customers are low-to-moderate income and 99.9% of customers receive direct install measures through the Home Energy Solutions program. Additionally, two-thirds of customers have taken advantage of the Energy Savings Agreement (ESA) offering which provides even further energy savings (this is a high percentage of customers going "deeper" relative to the experience in the Home Energy Solutions program, which averages ~30%).

In the 4th quarter, the Multifamily programs closed 2 term loans for $374K and 1 pre-development loan, and for the year overall financed a smaller number of projects that are significantly larger in size than originally forecast – and due to 2 multi-million dollar deals, the Gross Investment Target for the year was exceeded by over $7 million. As noted previously, one of these large deals was a $10.8 million new construction project in Bridgeport designed to house very low income and homeless families including homeless veterans, whereby a $75,000 Green Bank pre-development loan made in early 2016 financed the project's high performance energy standard design. The previously mentioned C4C/LIME projects on hold due to contractor compliance issues are still unresolved, as the contractor is suspended from Green Bank programs. Previously indicated "lumpiness" of deal sizes and 2-3 year project cycles continue to be characteristics of this sector, but there is a robust pipeline of early stage projects. Benchmarking feeds the top of the pipeline and we currently have 1,381 buildings representing 23,000 units or about ~10% of all multifamily units in CT benchmarked.

Table 2. Residential Sector Q4 Progress to Targets

	Projects		Capital Deployed		Capacity	
Product/Program	**Closed**	**Target**	**Closed**	**Target**	**Closed**	**Target**
Smart-E	517	254	$8,543,246	$5,873,447	1.2	1.1
Low Income Loans/Leases (PosiGen)	627	500	$17,336,078	$15,250,000	3.8	3.4
Multi-Family (Term Only)	14[2]	17	$18,910,606	$11,140,000	1.0	0.9
Multi-Family (Pre-Dev)	4	-	$106,950	-	-	-
Resi Total	**1,162**	**771**	**$44,896,880**	**$32,263,447**	**6.1**	**5.4**

Table 3. Smart-E Channel Breakout

	Projects	
Channel	**Closed**	**Target**
Smart-E	517	254
CHIF/HES	171	20
EE/HVAC	181	126
Solar	126	108
Blank	39	-

[2] Closed projects support 1,268 units of affordable rental housing.

Commercial, Industrial, & Institutional Sector

The Commercial, Industrial, & Institutional Sector is below its target for the year because of low demand in the C-PACE program, which can be attributed to several factors:

- 9 projects that had been originated and technically developed by the program were "lost" to alternative funding sources. While not contributing to C-PACE goals, they still fulfil our clean energy deployment policy goal as these projects would likey not have happened without the program and the energy savings value proposition made by the technical development
- Low energy prices and moderate temperatures have reduced demand for energy efficiency and renewable energy.
- The C-PACE target incorporated a large amount of manufacturing projects through the Energy on the Line program. The original assumption was that the grant offered through this program would expedite the typically long C-PACE sales process, leading to closing in FY17. However, the grant has caused CGB to get involved earlier in the decision-making process, leading to longer sales times. Staff views this positively as it means projects are happening because of the program that wouldn't have happened otherwise. They will just close later than anticipated.
- Decreased demand from the contractor channel. Projects from our top-performing contractors decreased and, in some cases, disappeared entirely. While new contractor recruitment remains strong, with an average attendance of 12 at the monthly C-PACE contractor trainings, it has proved tough to develop "repeat contractors" who do multiple projects. 71% of contractors who do one project have failed to bring another project to the program.

The program did see several highlights in FY17:

- Surpassed $100MM in C-PACE financing closed in Connecticut
- Entrance of several new 3rd party capital providers into the market
- For the first time in the country, the first successful transfer of a C-PACE assessment through the sale of a building.

The Commercial and Institutional Lease had a successful year, exceeding targets and laying the groundwork for growth in fiscal year 2018. Thanks to strong uptake by municipalities and a robust contractor base, the program exceeded its FY17 targets. Staff closed on a new solar fund with Onyx that will enable this successful product to continue. CGB is negotiating another fund (SL3), expected to close in FY18, to fill market gaps with customers and markets that don't meet the criteria for Onyx.

Table 4. Commercial and Industrial Q4 Progress to Targets

	Projects		Capital Deployed		Capacity	
Product/Program	Closed	Target	Closed	Target	Closed	Target
CPACE	38	66	$15,278,194	$35,430,000	3.7	9.8
Commercial Lease	30	28	$32,491,862	$21,000,000	10.6	7.0
CEBS	1	-	$1,648,000	-	-	-
C&I Total*	**60**	**84**	**$44,753,461**	**$48,930,000**	**12.5**	**14.3**

* excludes duplicates for CPACE backed commercial leases.

CGB Total

Table 5. CGB Q4 Progress to Targets

	Projects		Capital Deployed		Capacity Installed (MW)	
Product/Program	**Closed**	**Target**	**Closed**	**Target**	**Closed**	**Target**
Commercial, Industrial and Institutional	60	84	$44,753,461	$48,930,000	12.5	14.3
Residential	1,162	771	$44,896,880	$32,263,447	6.1	5.4
Infrastructure	5,024	6,001	$141,469,762	$191,165,071	39.7	49.0
Strategic	1	-	$4,538,212	-	-	-
Total CGB*	**5,459**	**6,856**	**$212,749,474**	**$272,358,518**	**53.0**	**68.7**

* excludes duplicates for RSIP records using Smart-E financing, residential low income (Posigen) records from RSIP and commercial solar lease records using CPACE and multi-family commercial leases.

845 Brook Street, Rocky Hill, CT 06067
T 860.563.0015
ctgreenbank.com

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: July 21, 2017

Re: Infrastructure Sector Programs – Program Performance towards Targets for FY 2017

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) 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 2017 and 2018.

Performance Targets and Progress

With respect to the Comprehensive Plan approved by the Board of Directors of the Green Bank on July 22, 2016 and revised on January 20, 2017,[1] the following are the performance targets for FY 2017 and progress made to targets for the Infrastructure Sector Programs (see Table 1) as of June 30, 2017.

Table 1. Program Performance Targets and Progress Made to the Comprehensive Plan for FY 2017

Key Metrics	Program Performance Original Targets (as of 07/22/16)	Program Performance Revised Targets (of 01/20/17)	Program Progress[2]	% of Goal
Capital Deployed[3]	$300,302,000	$191,165,071	$141,469,762	74%

[1] For mid-year revisions to budget and targets, see "Q2 Progress to Targets" memo of January 11, 2017 on page 190 – click here

[2] Includes only closed transactions

[3] Capital Deployed is used to measure Investment actuals to targets and it includes fees related to financing costs and adjustments for Fair Market Value which are not included in the Gross System Cost. It represents: the Fair Market Value for

Key Metrics	Program Performance Original Targets (as of 07/22/16)	Program Performance Revised Targets (of 01/20/17)	Program Progress[2]	% of Goal
Investment at Risk[4]			$13,370,444	
Private Capital[5]			$128,099,318	
Deployed (MW)	66.2	49.0	39.7	81%
# of Loans/Projects	6,379	6,001	5,025	84%
Leverage Ratio			10.6	

In summary, for Infrastructure Sector Programs in FY 2017, there were 5,025 projects (achieving 84% of the goal) requiring $141.5M of investment (achieving 74% of the goal) that led to the deployment of 39.7 MW of clean energy deployed (achieving 81% of the goal), that delivered a leverage ratio of about 11:1 for private to public funds invested.

Executive Summary for the Infrastructure Sector Programs

The following is a bulleted executive summary of the Infrastructure Sector Programs:

- RSIP milestones since program inception: Over 170 MW approved (more than 50% of 300 MW policy target), nearly 145 MW completed, $100M invested in incentives at 7:1 leverage across all steps
- SHREC Master Purchase Agreement approved by PURA and executed with EDCs
- SHREC aggregation process approved by PURA and Transaction Confirmation Agreement executed with EDCs for the 2017 Tranche, including 2015 and 2016 Vintage SHRECs
- Sale of 40,000 CGB residential and commercial Class I RECs (i.e., non-SHREC RECs)
- Quantum Biopower Southington AD plant achieved commercial operation
- Completed DOE SunShot Rooftop Solar Challenge project and SunShot Prize competition, achieving stabilization of residential solar PV soft costs at about 50% of total costs and improvement in associated processes
- DOE SolSmart technical advisor contract winner ($19K) to continue work with municipalities on solar PV permitting and zoning improvements
- DOE SunShot grant award of $162K over three years to inform LMI research and strategy

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Infrastructure Sector Programs

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

- **Residential Solar Investment Program** – $13.1 million in subsidies[6] from the Green Bank has attracted $128.3 million of funds from other sources.

Commercial/Residential Leases, the Amount Financed or Gross System Cost (whichever is greater) for CPACE, the Amount Financed for Residential financing products and the Gross System Cost for all other programs.

[4] 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.

[5] Private Investment is based on the Gross System Cost and does not includes adjustments related to financing costs or Fair Market Value.

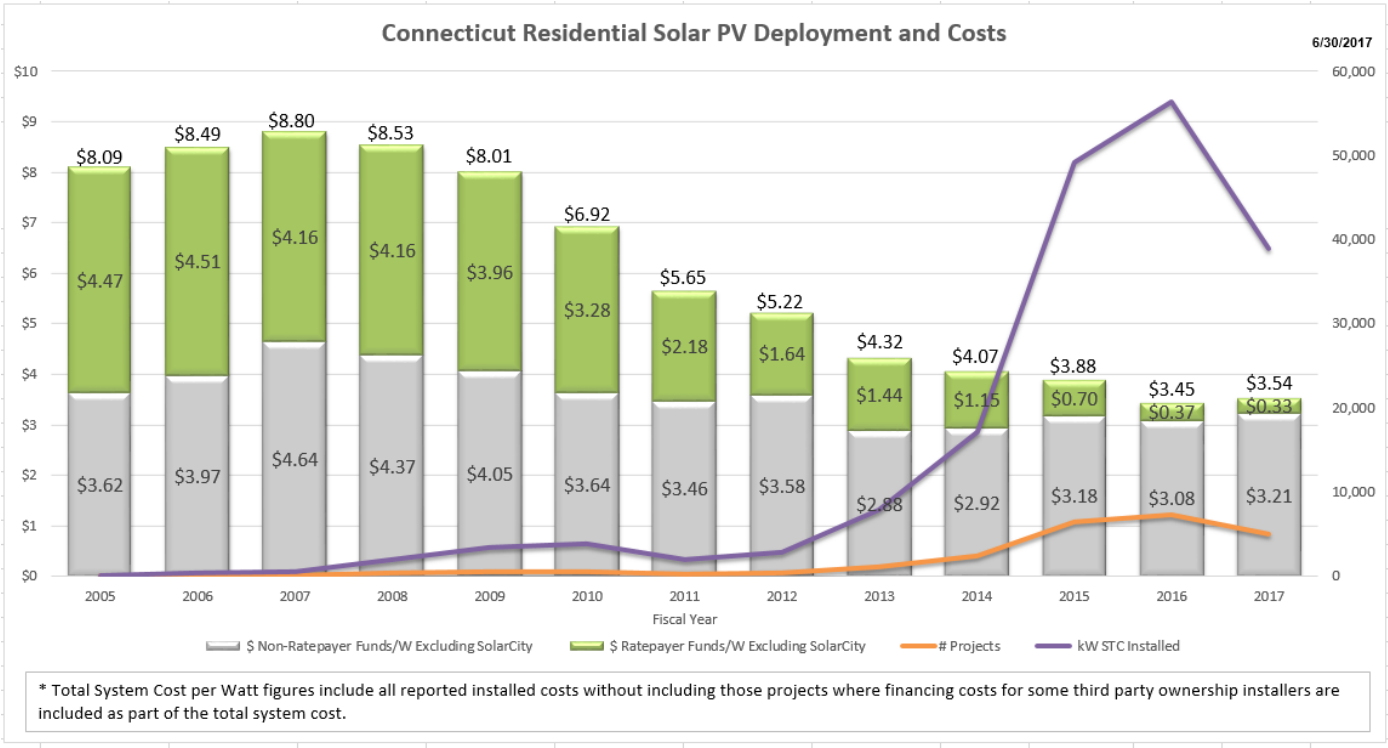
[6] Note the distribution of EPBB and PBI and the 6-year payout of the PBI.

Table 2. RSIP Overview for FY 2017

Program Data	Submitted but not Closed	Closed[7]	Total
Projects	124	5,024	5,148
Installed Capacity (MW)	1.1	38.9	40.0
Lifetime Clean Energy Produced (MWh)	30,458	1,108,319	1,138,777
Annual Combined Energy Generated & Saved (MMBtu)	4,157	161,159	165,316
Subsidies ($'s)	$276,962	$12,867,584	$13,144,546
Credit Enhancement ($'s)	$0	$0	$0
Loans or Leases ($'s)	$0	$0	$0
Total Green Bank Investment ($'s)	$276,962	$12,867,584	$13,144,546
Private Capital ($'s)	$3,065,090	$125,200,786	$128,265,876
Direct Job Years	17	538	555
Indirect & Induced Job Years	13	704	717
Lifetime Tons of CO2 Emissions	17,122	623,022	640,144

The residential solar PV market in Connecticut has seen a dramatic improvement over the past decade (see Figure 1). Installed costs have decreased by over 60% from a high of $8.80/W in 2007 to $3.54/W in FY17. Incentives have decreased by over 90% from a high of $4.51/W in 2006 to $0.33/W today.

Figure 1. Installed Cost ($/W – Y1 Axis) and Installed Capacity (kW – Y2 Axis) by Fiscal Year



[7] Based on nearly 10-years of historical experience, 91% of projects approved result in project completions.

Since RSIP's inception in FY12, installed costs have decreased 32%, incentives have decreased 80%, and capacity additions increased over 1200% from 2.9 MW in FY12 to 38.9 in FY17.

RSIP capacity additions decreased 31% from 56.4 MW in FY16 to 38.9 MW in FY17. FY17 deployment of 38.9 MW is 18% or 8.5 MW lower than the FY17 target of 47.4 MW. Factors contributing to this gap include:

- A decrease in electricity rates from July through December 2016[8]
- Nationwide flattening/slowdown in the residential solar PV market in CY16, including:
  - Changes in the third-party ownership landscape, with major companies struggling with profitability and customer acquisition costs, resulting in business model changes, market exits, and bankruptcies;
  - Market flattening expected to continue in most markets except emerging markets and those with high incentives; and
  - In Connecticut, Solar City withdrew from RSIP, NRG withdrew from the state and eventually from residential solar PV in favor of commercial and utility scale PV, and several large companies participating in RSIP went bankrupt including Sungevity, One Roof, and Sun Edison
- Solarize program transitioned to the private sector with SmartPower partnering with local installers on a "pay for performance" model
- Installers have said that "low hanging fruit" customers have been taken

CT's largest residential solar PV market player with over 40% share in prior years, Solar City exited RSIP in calendar year 2016 with plans to aggregate and monetize the renewable energy credits (RECs) themselves. They appear to be continuing to install systems in Connecticut but are registering the systems in Massachusetts as Class I renewable resources and monetizing the RECs in the Massachusetts market. These approximately 450 projects represent roughly 3.5 MW, assuming an average step 10 project size of 7.7 kW, and there may have been other Solar City projects installed in CT in FY17 that are not accounted for. The Solar City exit from RSIP was a large factor in the RSIP falling short of its target, though other company exits and bankruptcies and additional factors outlined above also contributed.

Despite national and local challenges and the exit of major players, existing and new entrants have been steadily picking up the slack, with Sun Run, Vivint, Posigen, SunPower, Sunnova, and Ross Solar the RSIP market leaders in FY17. Many local companies continue to maintain a strong presence, though some have shifted more business toward commercial projects due to richer incentives available through the ZREC program. The market appears to have stabilized at a rate of between 3.1 and 3.6 MW of RSIP submissions per month since March 2017. Green Bank staff will continue to monitor market trends and will consider whether increasing marketing efforts may be helpful in FY18.

The Green Bank has been successful in implementing the SHREC in accordance with Public Act 15-194 and Public Act 16-212[9] The Green Bank and the state's electric

[8] Eversource's generation rate dropped from 9.555 cents/kWh to 6.606 cents/kWh in July 2016, then increased to 7.874 cents/kWh in January 2017. During the same timeframe, Avangrid's generation rate decreased from 10.7358 cents/kWh to 8.0224 cents/kWh, then increased to 9.2641 cents/kWh.

[9] PA 15-194: https://www.cga.ct.gov/2015/act/pa/pdf/2015PA-00194-R00HB-06838-PA.pdf, and PA 16-212: https://www.cga.ct.gov/2016/act/pa/pdf/2016PA-00212-R00SB-00366-PA.pdf.

distribution companies (EDCs) together negotiated a master purchase agreement (MPA) for SHRECs and submitted a unified MPA draft to PURA. PURA created docket number 16-05-07 and issued the docketed final decision on January 25, 2017, approving the MPA. The MPA was executed by the EDCs in February 2017; it requires the Green Bank to sell and the EDCs to purchase the EDCs' Buyer's Percentage Entitlement of SHRECs associated with the electricity produced by qualifying RSIP projects[10]. The Buyer's Percentage Entitlement is 80% for Eversource and 20% for United Illuminating.

In addition, a SHREC aggregation process was approved by PURA, allowing RSIP to obtain Class I REC certifications for RSIP projects in the 2017 Tranche.[11] On July 1, 2017, the Green Bank and the EDCs executed Transaction Confirmation Agreements for the 2017 Tranche, listing all RSIP projects in the tranche, representing a total, aggregate installed capacity of 47.176 MW-DC for 2015 and 2016 vintage SHRECs.

It should be noted that all subsidies, administrative costs, and other expenses for the RSIP are to be cost recovered through the pricing and sale of SHRECs as specified in the MPA between the Green Bank and the EDC's. Tranche 1, including 2015 and 2016 vintage SHRECs were priced at $50 per REC over the 15-year MPA.

- **CHP and AD Pilot Programs** – Of the $13.4 million of Green Bank investment in these projects (see Tables 3 and 4), $58.0 million of private capital has been attracted to support them.

Table 3. CHP Pilot Program Overview for FY 2017

Program Data	Approved	Closed	Total
Projects	1	1	2
Installed Capacity (MW)	2.5	0.8	3.3
Lifetime Clean Energy Produced (MWh)	295,650	94,017	389,667
Annual Combined Energy Generated & Saved (MMBtu)	118,735	304,445	423,180
Subsidies ($'s)	$0	$0	$0
Credit Enhancement ($'s)	$0	$0	$0
Loans or Leases ($'s)	$1,000,000	$502,860	$1,502,860
Total Green Bank Investment ($'s)	$1,000,000	$502,860	$1,502,860
Private Capital ($'s)	$4,000,000	$2,898,532	$6,898,532
Direct Job Years	31	21	52
Indirect & Induced Job Years	50	34	83
Lifetime Tons of CO2 Emissions	-	55,000	55,000

[10] "SHREC Project" means a qualifying residential solar PV system, which is a solar photovoltaic project that (i) receives funding from the CT Green Bank [and for which the incentive was approved January 1, 2015 or later], (ii) is certified by PURA as a Class I renewable energy source, as defined in subsection (a) of CGS Section 16-1, (iii) emits no pollutants, (iv) is located on the customer-side of the revenue meter of a one-to-four family home, (v) serves the distribution system of an EDC, and (vi) which is capable of producing SHRECs.

[11] "Tranche" for a given year, shall include all SHRECs generated by SHREC Projects that were not included in a prior Tranche that first begin producing SHRECs in time to be included in the Trading Period for the first quarter of such year. For example, the 2017 Tranche will include all SHRECs created in NEPOOL GIS on July 15, 2017 and thereafter in accordance with NEPOOL GIS Operating Rules for the duration of the Tranche Delivery Term.

Table 4. AD Pilot Program Overview for FY 2017

Program Data	Approved	Closed	Total
Projects	3	-	3
Installed Capacity (MW)	6.2	-	6.2
Lifetime Clean Energy Produced (MWh)	651,744	-	651,744
Annual Combined Energy Generated & Saved (MMBtu)	277,362	-	277,362
Subsidies ($'s)	$0	$0	$0
Credit Enhancement ($'s)	$0	$0	$0
Loans or Leases ($'s)	$11,860,109	$0	$11,860,109
Total Green Bank Investment ($'s)	$11,860,109	$0	$11,860,109
Private Capital ($'s)	$51,139,891	$0	$51,139,891
Direct Job Years	-	-	-
Indirect & Induced Job Years	-	-	-
Lifetime Tons of CO2 Emissions	-	-	-

For a breakdown of the use of Green Bank resources for 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 2017[12]

Program	Subsidies		Credit Enhancements		Loans and Leases		Total
RSIP	$12,867,584	100%	$0	0%	$0	0%	$12,867,584
CHP	$0	0%	$0	0%	$502,860	100%	$502,860
AD	$0	0%	$0	0%	$0	0%	$0
Total	$12,867,584	96%	$0	0%	$502,860	4%	$13,370,444

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 2017[13]

Key Metrics	RSIP	CHP Program	AD Program	Total Program Progress
Date of Program Approval	Feb 2012	Feb 2012	Feb 2012	
Date of Program Launch	Mar 2012	Jun 2012	Dec 2012	
Ratepayer Capital at Risk	$12,867,584[14]	$502,860	$0	$13,370,444
Private Capital	$125,200,786	$2,898,532	$0	$128,099,318
Deployed (MW)	38.9	0.8	-	39.7
# of Loans/Installations	5,024	1	-	5,025
Lifetime Production (MWh)	1,108,319	94,017	0	1,202,335
Annual Combined Energy Generated & Saved (MMBtu)	161,159	304,445	0	465,604

[12] Includes only closed transactions

[13] Includes only closed transactions

[14] Includes incentives over the 6 year course of term of the agreement

"Top 5" Headlines

The following are the "Top 5" headlines for Infrastructure Sector Programs for FY 2017:

1. Quantum Biopower unveils the state's first food-to-energy facility

   The Southington Observer

   Southington is now home to Connecticut's first food waste-to-renewable-energy facility, bringing cutting edge technology and a new spin on recycling.

2. Connecticut Gets Federal Grant To Improve Solar Access For Low- And Moderate-Income Homeowners

   Hartford Courant

   Connecticut is getting a $160,000 federal grant for a three-year effort to increase the number of low- and moderate-income people able to take advantage of the state's solar-power programs.

3. The Connecticut Green Bank, EnergySage announce state-sponsored solar marketplace

   Solar Power World

   As the exclusive online partner to the Connecticut Green Bank, EnergySage and its full set of resources are now available to Connecticut residents in search of comprehensive solar information via GoSolarCT.com.

4. Green Bank Hopes State Lawmakers Won't Dip Into Its Funds

   Hartford Courant

   Four years ago, just 2,019 Connecticut homes relied on solar energy. Today, the number of homeowners across the state with panels on their rooftops totals nearly 22,000.

5. Property Rounds: Local solar market growth slows despite new offerings

   The Hour

   When solar first came on the scene as an affordable option, Brian Tilford saw as many homeowners installing photovoltaic systems "because it was cool," in his words, as those who saw the long-term savings they could generate.

Lessons Learned

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

- **The residential solar PV market is dynamic and sensitive to a lot of factors including national trends and market forces** - The Green Bank needs to continue to stay informed of these trends and monitor RSIP by examining data on a regular basis (currently done every week) and talking to the industry.

- **RSIP leveraging ongoing operational improvements and upgrading of technology platforms and resources** - RSIP recognizes the need for continued improvements to better

manage the fleet of over 20,000 projects, both in terms of incentive application and project completion paperwork processing, as well as monitoring of solar PV electricity production in order to monetize RECs and SHRECs. RSIP will be launching a new PowerClerk platform in August 2017 that will provide better functionality, increase efficiency and assist with data validation. Secondly, RSIP is exploring use of outside resources to assist with monitoring of production data and trouble-shooting of system issues. Thirdly, the RSIP team continues to review and validate data in the PowerClerk and Locus platforms to ensure high data quality that meets program needs. Lastly, the team continues to make process improvements on an ongoing basis to increase work efficiencies and address emerging challenges.

- **Consumer protection efforts are growing in importance in the residential solar PV market** - The Green Bank, the State of CT Department of Consumer Protection (DCP) and the Office of Consumer Counsel (OCC) have seen an increase in consumer complaints due to rapid industry growth in recent years, a large percentage of third party owned projects installed by national companies, and the continuing need to better educate customers. The Green Bank works closely with other agencies, in particular DCP, to address and prevent complaints. RSIP staff have become educated on state of CT consumer protection laws and have shared information with RSIP contractors and third party system owners to help prevent future issues. RSIP staff worked with the residential financing and marketing teams to update the format and content of GoSolarCT.com to provide a trusted, online source of information for solar PV customers in the state. This site includes a portal to the EnergySage Marketplace, a platform that allows customers to obtain and compare quotes.

- **In the context of broader market trends and the state of Connecticut's fiscal status and climate change mitigation efforts, the strategy for supporting RSIP going forward will not focus primarily on increasing project volume but rather on elements such as the following**:
    - Sustained orderly development of a stable, resilient, residential solar PV market not dependent on incentives – including net metering in time
    - Maintaining a stable installer base including strong local company presence
    - Continuing to support access to affordable financing through loans and third party providers
    - Continuing to increase adoption of solar among LMI households through additional research and analysis to understand opportunities in the Connecticut solar market
    - Training the market for the long term by supporting consumer education and protection, as well as installation technology diversity (e.g., energy efficiency)
    - Continuing to reduce barriers to PV adoption
    - Supporting a "Solar Plus" model of adoption of solar PV in combination with complementary technologies such as energy storage, electric vehicles, renewable thermal technologies, energy efficiency, demand response, and home energy management systems to increase the value of solar to the grid and to customers
- **Residential solar PV soft costs stabilized by DOE SunShot efforts** - In understanding the impact of Green Bank participation in DOE SunShot funded efforts to address soft costs for residential solar PV, data analysis revealed that soft costs had been steadily increasing over the past decade as a percentage of total costs until the timeframe of the SunShot Rooftop Solar Challenge and SunShot Prize projects. During the project period, soft costs

were stabilized at about 50% of total project costs. RSIP will continue working with municipalities to improve permitting and zoning through participation in the SolSmart program.

- **Success of state's first food waste-to-renewable energy facility will demonstrate opportunity to economically generate clean electricity and recycle waste in Connecticut** – AD using food waste and other organics is relatively new to the New England region. The project economics can be favorable when there are multiple revenue streams including tipping fees paid by food waste generators. Per the source-separated organics recycling legislation, large commercial food waste generators are required to bring their source-separated organic materials (SSOM) to a recycling facility, unless there is not a suitable facility within a 20-mile radius of the generator. The Green Bank is also looking to support two farm AD projects which would combine manure and SSOM feedstocks. There are significant financial as well as performance benefits to co-digesting manure with food waste.

Infrastructure Sector Programs FY 2018 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 8):

Table 8. Number of Projects, Capital Deployed, and Clean Energy Deployed (MW)

Program	# of Projects	Capital Deployed	Clean Energy Deployed (MW)
RSIP	4,431	$136,300,000	37.0
AD	1	$20,000,000	1.6
Total	4,432	$156,300,000	38.6

For Infrastructure Sector Programs, there are 13.6 full time equivalent staff members supporting two (2) different products and programs.

845 Brook Street, Rocky Hill, CT 06067
T 860.563.0015
ctgreenbank.com

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: July 21, 2017

Re: Residential Sector Programs – Program Performance towards Targets for FY 2017

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 2017 and 2018.

Performance Targets and Progress

With respect to the Comprehensive Plan approved by the Board of Directors of the Green Bank on July 22, 2016 and revised on January 20, 2017,[1] the following are the performance targets for FY 2017 and progress made to targets for the Residential Sector Programs (see Table 1) as of June 30, 2017.

Table 1. Program Performance Targets and Progress Made to the Comprehensive Plan for FY 2017

Key Metrics	Program Performance Original Targets (as of 07/22/16)	Program Performance Revised Targets[2] (as of 01/20/17)	Program Progress[3][4]	% of Goal
Capital Deployed[5]	$36,599,000	$32,263,447	$44,896,880	139%

[1] For mid-year revisions to budget and targets, see "Q2 Progress to Targets" memo of January 11, 2017 on page 190 – click here

[2] Multifamily Predevelopment financing target were not set for fiscal year 2017.

[3] Includes only closed transactions.

[4] Includes $106,950 in Capital Deployed, $106,950 in CGB Investment, and $25,500 in Private Capital for 4 Multifamily Predevelopment financing.

[5] Capital Deployed is used to measure Investment actuals to targets and it includes fees related to financing costs and adjustments for Fair Market Value which are not included in the Gross System Cost. It represents: the Fair Market Value for

Key Metrics	Program Performance Original Targets (as of 07/22/16)	Program Performance Revised Targets[2] (as of 01/20/17)	Program Progress[34]	% of Goal
Investment at Risk[6]			$6,755,866	
Private Capital[7]			$40,090,009	
Deployed (MW)	5.4	5.4	6.1	113%
# of Loans/Projects	1,093	775	1,162	151%
Leverage Ratio			6.8	

In summary, for Residential Sector Programs in FY 2017, there were 1,162 projects (achieving 151% of the goal) requiring $44.9MM of investment (achieving 139% of the goal) that led to the deployment of 6.1 MW of clean energy deployed (achieving 113% of the goal), that delivered a leverage ratio of 7:1 for private to public funds invested.

Executive Summary for the Residential Sector Programs

The following is a bulleted executive summary of the Residential Sector Programs:

- Exceeded targets for all programs, though it should be noted that Multifamily Programs benefited from one $10.8 million “whale” deal this year
- Broke the $100 million threshold with $123 million of cumulative activity in the sector, including $95 million in residential 1-4 (3,500 projects) and $28 million in multifamily (70 projects)
- Unbelievably clean portfolio performance (3 defaults and fewer than 15 delinquencies) allowed us to recruit 6 Smart-E lenders to the credit-challenged version of the program, and extend maturities to 15-20 years for qualified borrowers, unsecured – a significant program enhancement that greatly expands access to affordable financing
- Invested in $5.3 million of project systems in the PosiGen Solar for All program
- Invested an additional $2.5 million in Capital for Change to further capitalize the Low Income Multifamily Energy (LIME) Loan
- Made $6 million of ARRA-SEP funds available to the Smart-E interest rate buydown program and launched 0.99% special offers
- Received $1.5 million of Regional Greenhouse Gas Initiative funds from CT Department of Energy and Environmental Protection to establish a revolving loan fund for energy related health and safety improvements.
- Experian dataset analyzed for credit trends to better communicate the financial capacity of CT low-to-moderate income (LMI) communities
- Performed Nielsen customer segmentation analysis of PosiGen and CT solar customers in LMI census tracts to support solar industry targeted marketing for LMI customers

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Commercial/Residential Leases, the Amount Financed or Gross System Cost (whichever is greater) for CPACE, the Amount Financed for Residential financing products and the Gross System Cost for all other programs.

[6] Includes funds from the Clean Energy Fund, RGGI allowance revenue, repurposed ARRA-SEP funds, and other resources that are managed by Green Bank 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.

[7] Private Investment is based on the Gross System Cost and does not includes adjustments related to financing costs or Fair Market Value.

- Partnered with Department of Public Health and the nonprofit Green and Health Homes Initiative to initiate research into sustainable funding streams from the CT health sector to support health and safety remediation at scale

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Residential Sector Programs – Single Family

The following are brief descriptions of the progress made under the Comprehensive Plan for FY 2017 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 0.99-2.99% rates for installing multiple eligible measures or converting to natural gas or installing renewable heating and cooling technologies (see Table 2).

Table 2. Energize CT Smart-E Loan Overview for FY 2017 (Lender data is as of June 30, 2017)

Program Data	Approved	Closed	Total
Projects	309	517	826
Installed Capacity (MW)	0.3	1.2	1.5
Lifetime Clean Energy Produced (MWh)	12,178	58,973	71,152
Annual Combined Energy Generated & Saved (MMBtu)	3,624	19,637	23,261
Subsidies ($'s)	$0	$0	$0
Credit Enhancement ($'s)[8]	$3,143	$763,399	$766,542
Loans or Leases ($'s)	$0	$0	$0
Total Green Bank Investment ($'s)	$3,143	$763,399	$766,542
Private Capital ($'s)	$4,956,961	$9,597,945	$14,554,906
Direct Job Years	7	31	37
Indirect & Induced Job Years	9	41	50
Lifetime Tons of CO2 Emissions	6,769	32,639	39,408

For a breakdown of the Smart-E Loan Channel, see Table 3.

Table 3. Energize CT Smart-E Loans by Channel

Smart-E Loan Channel	Original Target	Revised Target	Closed	% of Goal
C4C/HES	250	20	171	855%
EE/HVAC	145	126	181	144%
Solar PV	143	108	126	117%
Blank	-	0	39	0%
Total	538	254	517	204%

[8] 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 Includes $341,751 in loan loss reserves and $421,648 in interest rate buydowns.

For a breakdown of the Smart-E Special Offers, see Table 4.

Table 4. Energize CT Smart-E Loan Special Offers

Smart-E Loan Special Offer	Closed	% of Special Offers	% of All Loans
Bundle	227	59%	44%
Natural Gas Special Offer	80	21%	15%
Heat Pump Special Offer	78	20%	15%
Total	385	100%	74%

For a breakdown of Smart-E loan volume by credit score band, see Table 5.

Table 5. Energize CT Smart-E Credit Scores

Credit Ranges						
Unknown	**<639**	**640-679**	**680-699**	**700-719**	**720+**	**Grand Total**
2	14	40	52	47	362	517
0%	3%	8%	10%	9%	70%	

For a breakdown of Smart-E loan volume and investment by census tracts categorized by Area Median Income (AMI) bands, see Table 6. It should be noted that Smart-E is not an income targeted program and only in April began offering the expanded credit-challenged version of the program, opening up new opportunities to partner with mission-oriented lenders focused on reaching consumers in underserved lower income markets.

Table 6. Energize CT Smart-E Projects by AMI Band

Census Tracts by AMI Band	Total Households (HHs) in Band	% of Total HHs in Band	# of FY17 Projects	% of FY17 Projects in Band	# of Cumulative Projects	% of Cum. Projects in Band	Cum. Projects / 1,000 HHs	Cum. Capital Deployed	Cum. Capital Deployed / HHs
<60%	286,875	21%	32	6%	62	5%	0.2	$878,703	$3.06
60%-80%	179,161	13%	55	11%	125	11%	0.7	$1,576,936	$8.80
80%-100%	258,787	19%	82	16%	222	19%	0.9	$3,3511,968	$12.95
100%-120%	228,577	17%	130	25%	263	23%	1.2	$4,889,361	$21.39
>120%	381,962	29%	218	42%	422493	42%	1.3	$9,570,206	$25.06
Total	1,335,362	100%	517	100%	1,165	100%	0.9	$20,267,174	$15.18

- **PosiGen Solar for All** – a solar PV lease and energy efficiency ESA financing program that focuses on the low to moderate income (LMI) market segment. Supported by $5 million subordinated debt investment, with an additional $5 million option from the Connecticut 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 7). All projects include light weatherization and efficiency provided by HES or HES-IE.

Table 7. PosiGen Solar for All Overview for FY 2017 (data is as of June 30, 2017)

Program Data	Approved	Closed	Total
Projects	48	627	675
Installed Capacity (MW)	0.3	3.8	4.1
Lifetime Clean Energy Produced (MWh)	8,683	109,368	118,051
Annual Combined Energy Generated & Saved (MMBtu)[9]	1,185	14,926	16,112
Subsidies ($'s)	$0	$0	$0
Credit Enhancement ($'s)	$0	$0	$0
Loans or Leases ($'s)	$432,000	$5,643,000	$6,075,000
Total Green Bank Investment ($'s)	$432,000	$5,643,000	$6,075,000
Private Capital ($'s)	$742,250	$11,693,078	$12,435,328
Direct Job Years	3	42	45
Indirect & Induced Job Years	4	54	59
Lifetime Tons of CO2 Emissions	4,881	61,479	66,360

For a breakdown of PosiGen Solar for All volume and investment by census tracts categorized by Area Median Income bands, see Table 8. As an income-targeted program, this table illustrates the degree to which the goal of serving consumers in lower income communities is being met.

Table 8. PosiGen Projects by AMI Band

Census Tracts by AMI Band	Total Households (HHs) in Band	% of Total HHs in Band	# of FY17 Projects	% of FY17 Projects in Band	# of Cumulative Projects	% of Cum. Projects in Band	Cum. Projects / 1,000 HHs	Cum. Capital Deployed	Cum. Capital Deployed / HHs
<60%	286,875	21%	240	38%	376	39%	1.3	$10,182,168	$35.49
60%-80%	179,161	13%	129	21%	191	20%	1.1	$5,245,922	$29,28
80%-100%	258,787	19%	116	19%	173	18%	0.7	$5,066,577	$19,58
100%-120%	228,577	17%	53	8%	90	9%	0.4	$2,559,954	$11.20
>120%	381,962	29%	89	14%	131	14%	0.3	$3,841,190	$10.06
Total	1,335,362	100%	627	100%	961	100%	0.7	$26,895,812	$20.14

Residential Sector Programs – Multifamily

The following are brief descriptions of the progress made under the Comprehensive Plan for FY 2017 in the Residential Sector Programs for Multifamily properties:

- **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 Capital for Change and supported by $3,500,000 of seed capital and $625,000 of ARRA-SEP and

[9] Includes an additional 13.3 MMBtu for each project for the HES audit.

Green Bank funds for a loss reserve, a Catalyst Loan Fund for gap financing and health and safety remediation supported by Green Bank capital and Regional Greenhouse Gas Initiative funds provided by DEEP, and C-PACE and solar PPA options, leveraging the C&I sector programs (see Table 9). 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 (see Table 10). Units served this fiscal year are noted in Table 11.

Table 9. Multifamily Term Financing Overview for FY 2017

Program Data	Approved	Closed	Total
Projects	4	14	18
Installed Capacity (MW)	0.1	1.0	1.1
Lifetime Clean Energy Produced (MWh)	-	4,837	4,837
Annual Combined Energy Generated & Saved (MMBtu)	-	660	660
Subsidies ($'s)	$0	$0	$0
Credit Enhancement ($'s) [10]	$0	$130,897	$130,897
Loans or Leases ($'s)	$0	$137,120	$137,120
Total Green Bank Investment ($'s)	$0	$268,017	$268,017
Private Capital ($'s)	$3,021,825	$18,773,486	$21,795,311
Direct Job Years	-	2	2
Indirect & Induced Job Years	-	3	3
Lifetime Tons of CO2 Emissions	-	2,719	2,719

Table 10. Multifamily Pre-Development Financing Overview for FY 2017

Program Data	Approved	Closed	Total
Projects	22	4	26
Installed Capacity (MW)	-	-	-
Lifetime Clean Energy Produced (MWh)	-	-	-
Annual Combined Energy Generated & Saved (MMBtu)	-	-	-
Subsidies ($'s)	$0	$0	$0
Credit Enhancement ($'s)	$0	$0	$0
Loans or Leases ($'s)	$64,276	$81,450	$145,726
Total Green Bank Investment ($'s)	$64,276	$81,450	$145,726
Private Capital ($'s)	$2,778,041	$25,500	$2,803,541
Direct Job Years	-	-	-
Indirect & Induced Job Years	-	-	-
Lifetime Tons of CO2 Emissions	-	-	-

Table 11. Multifamily Number of Units

	Approved	Closed	Total
Affordable	1,133	1,168	2,301
Market Rate	413	100	513
Total # of Multifamily Units	1,546	1,268	2,814

[10] This is the actual loan loss reserve position of the LIME loan as of 6/30/2017

For a breakdown of the use of Green Bank resources for Residential Programs – see Table 12.

Table 12. Distribution of Green Bank Funds Invested in Projects and Programs through Subsidies, Credit Enhancements, and Loans and Leases for FY 2017[11]

Program	Subsidies		Credit Enhancements		Loans and Leases		Total
Smart-E Loan	$0	0%	$763,399[12]	100%	$0	0%	$763,399
PosiGen	$0	0%	$0	0%	$5,643,000	100%	$5,643,000
Multifamily Term	$0	0%	$130,897	49%	$137,120	51%	$268,017
Multifamily Pre-Development	$0	0%	$0	0%	$81,450	100%	$81,450
Total	$0	0%	$894,296	14%	$5,861,570	87%	$6,755,866

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 13):

Table 13. Program Progress Made for FY 2017[13]

Key Metrics	Smart-E	PosiGen	Multifamily Term[14]	Multifamily Pre-Dev	Total Program Progress
Date of Program Approval	Nov 2012	Jun 2015	Oct 2013 – Jan 2017	Oct 2013 – Oct 2015	
Date of Program Launch	Nov 2013	Jul 2015	Oct 2013 – Jan 2017	Oct 2013 – Oct 2015	
Ratepayer Capital at Risk	$763,399	$5,643,000	$268,017	$81,450	$6,755,866
Private Capital	$9,597,945	$11,693,078	$18,773,486	$25,500	40,090,009
Deployed (MW)	1.2	3.8	1.0	-	6.1
# of Loans/Installations	517	627	14	4	1,162
Lifetime Production (MWh)	58,973	109,368	4,837	0	173,178
Annual Combined Energy Generated & Saved (MMBtu)	19,637	14,926	660	0	35,223

"Top 5" Headlines

The following are the "Top 5" headlines for Residential Sector Programs for FY 2017:

1. CT Green Bank Strengthens Commitment to Low-Income Residents

   Natural Resources Defense Council

   Appointment Betsy Crum, a veteran professional in affordable housing development and finance, to Board of Directors strengthens Connecticut Green Bank's commitment to low-to-moderate income residents.

[11] Includes only closed transactions

[12] Includes $341,751 in loan loss reserves and $421,648 in interest rate buydowns.

[13] Includes only closed transactions

[14] Multifamily is a collection of individual programs, each with their own approval and launch dates.

2. Connecticut Green Bank offering low interest loans for bundled energy efficiency projects, like solar

   Solar Power World

   The Connecticut Green Bank, in association with Energize CT, select local lenders, and contractors, is offering an extraordinarily low rate of 0.99% on home energy improvement loans.

3. Public-Private Partnership Launches 'Solar For All' Program In Hartford

   Solar Industry Magazine

   At an event on Tuesday, Hartford, Conn., Mayor Luke Bronin and other stakeholders announced a new public-private partnership to make clean energy more accessible and affordable to homeowners in the city.

4. GRID Alternatives, Connecticut Green Bank Kick Off Low-Income Solar Program

   Solar Industry Magazine

   Nonprofit solar installer GRID Alternatives expands into Connecticut through a collaboration with the Connecticut Green Bank to install no-cost solar on multifamily affordable housing units across the state.

5. Solar Panels Will Power Manchester Public Housing Complex

   Hartford Courant

   A solar panel array at the housing authority's Westhill Gardens complex is to provide all the energy required for the 199 apartments and office.

Lessons Learned

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

- **A stellar record of loan performance to date gave mission-oriented Smart-E lenders the confidence to adopt an expanded underwriting box for credit-challenged customers and to consider 15-20 year terms** – With no delinquencies and 2 defaults on a portfolio of nearly 1,000 unsecured consumer loans, 6 out of our 11 Smart-E lenders agreed to adopt the credit-challenged version of the program, which drops the minimum credit score from 640 down to 580 and raises the debt-to-income ratio from 45% to 50% (and waives it entirely for credit scores above 680). Furthermore, these lenders agreed to consider loan with maturities of up to 15 to 20 years, *unsecured*, for credit-qualified borrowers. This is a tremendous achievement for the program, and a testament to the clean performance of the portfolio, the quality of borrowers attracted to the program, and the value these borrowers are seeing in the projects they are financing. We will be focusing on the credit-challenged market in the coming year with an updated analysis of statewide income and credit trends and targeted outreach with lenders focused on this underserved market.

- **Engaging contractors through training and marketing materials drives demand for residential single-family programs** – The single family residential team continued their efforts of training contractors in person to ensure their sales and back office staff were comfortable talking about the Smart-E Loan program with customers, yielding particular success among HVAC companies. In addition, having a centralized, online platform for marketing materials that are easy to access on demand makes contractors more comfortable bringing up financing options.

- **Targeted community based outreach is the best way to engage traditionally difficult to reach communities** – PosiGen surpassed the goals set for them by the Green Bank by working with groups like Operation Fuel, Hartford Habitat for Humanity, Neighborhood Housing Services, and faith community partners, in partnership with door to door outreach and direct mail to specific customer segments. However, we've learned that not all community groups are equipped to partner on outreach for energy financing. Lessons learned this year have been incorporated into screening for partner recruitment and selection for LMI and credit-challenged community outreach for our financing programs.

- **We continue to make inroads in solar penetration for the LMI market, but there is more to do** – We have seen a 3800% increase in solar penetration in LMI census tracts since 2012, and while PosiGen is part of that success, it is not solely responsible for the 4,100 systems now installed. Green Bank staff has been communicating to the solar market the opportunity to finance LMI customers in CT, since income and credit don't correlate in our state, and we have consistently communicated to the market our progress in increasing penetration in LMI census tracts. This focused message has paid off in growth in this underserved market segment, narrowing the gap in the rates of market penetration. We have furthered this work with additional LMI customer segmentation analysis which will enable both PosiGen and companies using a traditional credit underwrite to more effectively target LMI solar customers.

- **The Green Bank continues to be viewed as the authority on residential solar in the market, even for areas we don't have purview over, including real estate transactions involving solar and consumer protection issues** – To manage this, the Green Bank has established ongoing coordination meetings on consumer protection items with staff at the Department of Consumer Protection and the Office of Consumer Council. We have begun proactively engaging with the real estate sector, holding solar education meetings with realtor groups and engaging with regional and national efforts to incorporate solar information into multiple listing services and other real estate information databases.

- **The multifamily pipeline continues to be lumpy and long, but the focus on strategic financing interventions (pre-development resources, mid-cycle, solar, gap, health & safety term financing) appears to be the right approach** – This year saw deals closed that have been in our pipeline over 3 years, and it also saw deal sizes for term loans that ranged from ~$100,000 to over $10 million. The pipeline for pre-development projects and for term loans is strong, but it will clearly take time to build this market, and even when built, we should expect timelines of up to 2-3 years in the affordable multifamily space. It is too early to tell what to expect for average deal sizes. It should be noted that our strategic approach to our suite of program interventions and our

deep engagement with the housing agencies has garnered national attention as a smart model for clean energy financing for this sector.

- **Leveraging strategic partnerships is core to our multifamily approach and delivers huge dividends, but execution risks and partner capacity are a challenge** – Now that our multifamily programs are launched and running, we need to evaluate and improve our processes with strategic partners to ensure a customer experience that is truly friendly/easy to use, effective, and delivers on the Green Bank's brand promise. In conjunction, we are ready to push on getting the word out about our programs and successes through a robust marketing, communications and outreach strategy.

- **Continued structural alignment with the utility programs is needed to achieve scaled impact in the multifamily sector** – Utility company goals and programs in the multifamily sector are not yet structurally aligned with Green Bank goals and programs for mid-cycle properties. Despite significant alignment efforts and progress, these structural impediments prevent scaled impact and, in some cases, put the programs in competition. Previous alignment processes, focused on CHFA and DOH funded properties, have been incredibly successful, resulting in transformational impacts on the market. We need to achieve the same with the utility companies for mid-cycle properties.

- **Distressed properties, especially co-ops, are coming to the Green Bank as lender of last resort for technical assistance and financing** – The co-op channel has been severely underserved for decades, with properties in critical physical and financial distress because of failing building systems and crushing energy costs. These properties require significant technical assistance, but can be turned around and preserved as critical affordable housing resources.

- **Split incentive challenges continue to impact investment in the multifamily sector** – Tenant paid utilities continue to be an impediment to owners investing in clean energy improvements. As a first step in addressing this challenge, we will help develop low-cost, replicable tools that make solar sub-metering easy. Related to this issue, policies related to utility allowances need to be evaluated in conjunction with DOH and CHFA and redesigned to incent best practices by owners/developers and to reduce tenant energy burdens.

Residential Sector Programs FY 2018 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 15):

Table 15. Number of Projects, Capital Deployed, and Clean Energy Deployed (MW)

Program	# of Projects	Capital Deployed	Clean Energy Deployed (MW)
Smart-E Loan	440	$8,153,050	1.3
PosiGen Solar for All	720	$20,087,746	4.5

Multifamily Term Loans	16	$7,550,000	0.6
Multifamily Predevelopment Loans	9	$188,400	-
Total	1,185	$35,979,196	6.4

For Residential Sector Programs, there are 13.2 full time equivalent staff members supporting four (4) different products and programs. In addition, staff also support ongoing asset management operations of closed programs CT Solar Lease and CT Solar Loan.

845 Brook Street, Rocky Hill, CT 06067
T 860.563.0015
ctgreenbank.com

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: July 21, 2017

Re: Commercial, Industrial and Institutional Sector Programs – Program Performance towards Targets for FY 2017

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 2017.

For a program description and information on the Total Addressable Market and Serviceable Addressable Market (SAM), please see the FY 2017 and FY 2018 Comprehensive Plan.

Performance Targets and Progress

With respect to the Comprehensive Plan approved by the Board of Directors of the Green Bank on July 22, 2016 and revised on January 20, 2017,[1] the following are the performance targets for FY 2017 and progress made to targets for the Commercial, Industrial and Institutional Sector Programs (see Table 1) as of June 30, 2017.

Table 1. Program Performance Targets and Progress Made to the Comprehensive Plan for FY 2017

Key Metrics	Program Performance Original Targets (as of 07/22/16)	Program Performance Revised Targets (of 01/20/17)	Program Progress[2]	% of Goal
Capital Deployed[3]	$56,800,000	$48,930,000	$44,753,461	91%

[1] For mid-year revisions to budget and targets, see "Q2 Progress to Targets" memo of January 11, 2017 on page 190 – click here

[2] Includes only closed transactions

[3] Capital Deployed is used to measure Investment actuals to targets and it includes fees related to financing costs and adjustments for Fair Market Value which are not included in the Gross System Cost. It represents: the Fair Market Value for Commercial/Residential Leases, the Amount Financed or Gross System Cost (whichever is greater) for CPACE, the Amount Financed for Residential financing products and the Gross System Cost for all other programs.

Investment at Risk[4]			$6,208,094	
Private Capital[5]			$38,545,367	
Deployed (MW)	14.8	14.3	12.5	87%
# of Loans/Projects	94	84	60	71%
Leverage Ratio			7.2	

In summary, for Commercial, Industrial and Institutional Sector Programs in FY 2017, there were 60 projects (achieving 71% of the goal) requiring $44.8M of investment (achieving 91% of the goal) that led to the deployment of 12.5 MW of clean energy deployed (achieving 87% of the goal), that delivered a leverage ratio of 7:1 for private to public funds invested.

Executive Summary for the CI&I Sector Programs

The following is a bulleted executive summary of the Infrastructure Sector Programs:

- Broke $100MM threshold for C-PACE-backed financing
- Doubled 3rd party capital providers that are active in Connecticut
- Exceeded the goal for Commercial and Institutional Lease
- Unlocked the state college system for solar and made progress on state facilities
- CGB has been working with Eversource, Avangrid and the Energy Efficiency Board to attract private capital to the Small Business Energy Advantage financing program. CGB ran an RFP to the capital markets that attracted private capital responses totaling $300MM. In FY18, CGB hopes to close on a facility with one of these capital providers to provide a larger pool of cheaper capital for the award-winning utility program

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Commercial, Industrial and Institutional Sector Programs

The following are brief descriptions of the progress made under the last comprehensive plan in the Commercial, Industrial and Institutional 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 2017

Program Data	Approved	Closed	Total
Projects	9	38	47
Installed Capacity (MW)	0.7	3.7	4.4
Lifetime Clean Energy Produced (MWh)	20,086	128,483	148,569
Annual Combined Energy Generated & Saved (MMBtu)	3,244	14,227	17,470
Subsidies ($'s)	$0	$0	$0
Credit Enhancement ($'s)	$0	$0	$0

[4] 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.

[5] Private Investment is based on the Gross System Cost and does not includes adjustments related to financing costs or Fair Market Value.

Program Data	Approved	Closed	Total
Loans or Leases ($'s)	$1,669,047	$3,140,789	$4,809,836
Total Green Bank Investment ($'s)	$1,669,047	$3,140,789	$4,809,836
Private Capital ($'s)	$2,415,251	$12,137,406	$14,552,656
Direct Job Years	17	56	74
Indirect & Induced Job Years	26	76	102
Lifetime Tons of CO2 Emissions	11,288	71,810	83,098

- **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. In 2017, CGB successfully closed out its SL2 commercial PPA fund and closed on a new facility with Onyx that will enable this successful product to continue. CGB is negotiating another fund (SL3), expected to close in FY18, to fill market gaps with customers and markets that don't meet the criteria for Onyx.

  At the end of FY17, CGB closed on the first two PPAs with schools within the Connecticut State Colleges and Universities. This significant accomplishment will "unlock" the CSCU market for further development in FY18 and plays a key role in helping the State of Connecticut "Lead by Example".

Table 3. CT Solar Lease Overview for FY 2017

Program Data	Approved	Closed	Total
Projects	-	30	30
Installed Capacity (MW)	-	10.6	10.6
Lifetime Clean Energy Produced (MWh)	-	301,012	301,012
Annual Combined Energy Generated & Saved (MMBtu)	-	33,944	33,944
Subsidies ($'s)	$0	$0	$0
Credit Enhancement ($'s)	$0	$0	$0
Loans or Leases ($'s)[6]	$0	$2,931,619	$2,931,619
Total Green Bank Investment ($'s)	$0	$2,931,619	$2,931,619
Private Capital ($'s)	$0	$29,560,243	$29,560,243
Direct Job Years	-	88	88
Indirect & Induced Job Years	-	116	116
Lifetime Tons of CO2 Emissions	-	169,209	169,209

For a breakdown of the use of the Green Bank resources for Commercial, Industrial and Institutional 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 2017

Program	Subsidies		Credit Enhancements		Loans and Leases		Total*
C-PACE	$0	0%	$0	0%	$3,140,789	100%	$3,140,789

[6] Based on the Objective Functions for the CT Solar Lease, the loan financing represents about 26% of the value of the lease.

CT Solar Lease	$0	0%	$0	0%	$2,931,619	100%	$2,931,619
CEBS	$1,000,000	100%	$0	0%	$0	0%	$1,000,000
Total*	$1,000,000	16%	$0	0%	$5,208,094	84%	$6,208,094

**Totals are adjusted to remove projects that overlap programs*

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 2017[7]

Key Metrics	C-PACE	Commercial Lease	CEBS	Total Program Progress*
Date of Program Approval	Sep 2012	Jun 2013	-	
Date of Program Launch	Jan 2013	Sep 2013	-	
Ratepayer Capital at Risk	$3,140,789	$2,931,619	$1,000,000	$6,208,094
Private Capital	$12,137,406	$29,560,243	$648,000	$38,545,367
Deployed (MW)	3.7	10.6	-	12.5
# of Loans/Installations	38	30	1	60
Lifetime Production (MWh)	128,483	301,012	23,311	400,501
Annual Combined Energy Generated & Saved (MMBtu)	14,227	33,944	6,630	54,800

**Totals are adjusted to remove projects that overlap programs*

"Top 5" Headlines

The following are the "Top 5" headlines for Commercial, Industrial and Institutional Sector Programs for FY 2017:

1. Connecticut Green Bank Recognizes Energy Contractors, Projects and Advocates with PACEsetter Awards 3/9/17
   CONNTACT
   The **Connecticut Green Bank** announced the winners of its 2016 PACEsetter Awards during a ceremony in early March at the **Energize Connecticut Cente**r in North Haven.

2. Bloomfield Manufacturing Company Goes Solar 7/10/16
   HARTFORD COURANT
   The solar project is the largest financed by the **Connecticut Green Bank**'s solar program.

3. Danbury company secures first Energy on the Line grant 8/10/16
   CT POST
   "Connecticut manufacturers feel the burden of energy costs more than anyone, and we're excited to see **C-PACE** put manufacturers back in control of their businesses through the Energy on the Line program," Bryan Garcia, president and CEO of the **Connecticut Green Bank**.

[7] Includes only closed transactions

4. More city schools going solar 4/25/17
   MILFORD MIRROR
   The board unanimously approved the motion, which recommends authorizing the **Connecticut Green Bank**, its affiliates, designees, and/or assignees …

5. Curtis Packaging completing $2.5 million project to improve energy efficiency 10/4/16
   NEWS TIMES
   The venture is being financed over a period of 16 years and is expected to produce energy cost savings of $4.5 million over the life of the project.

Lessons Learned

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

- **Two Types of C-PACE Contractors** – 29% of contractors who have done a C-PACE project have used C-PACE financing multiple times. These are the most valuable allies of the program and CGB staff and other C-PACE capital providers continue to work closely with these contractors to keep C-PACE a part of their business. 71% of contractors who have done a C-PACE project have not used program again. Figuring out the barriers that prevent them from coming back, along with continued recruitment of new contractors, will be key to program growth.

- **Campaigns and Partnerships** – the focused marketing and grant offering to the manufacturing sector through the Energy on the Line campaign was a success. CGB is trying a similar approach through partnerships with energy auditors, contractors, relationship managers and other stakeholders to test various approaches and duplicate its success without having to offer the grant.

- **Open Market** – Connecticut's open market platform continues to attract capital providers, with two more becoming qualified in FY17. The general focus on larger deals and long development time for projects means the program should start to see more activity from third party capital providers in FY18.

- **PPA** – While the Green Bank's PPA product continues to see strong demand, with PPA prices declining as installation costs continue to fall, existing utility tariff structures for small commercial customers remain a barrier. To the extent that ZREC prices have trended up in the last 12-24 months, that is in large part due to developers seeking to compete with avoided utility costs that account for only generation and minor ancillary charges, as opposed to the fully loaded cost of delivering energy from the grid. More and more, this is resulting in PPA contracts that are positioned to customers as "long-term hedges" against uncertain electric costs, rather than as deals promising immediate savings.

- **Energy Services Agreements** – Signals from leading ESA providers we have engaged suggest demand for "smaller" ESAs (up to $2.5M) in CT remains limited and that private banks are sometimes stepping up to provide longer-term debt capital for ESAs on terms similar to what the Green Bank piloted in our project for the Bridgeport International Academy. In 2017, we learned of at least one provider with a strong pipeline in CT for their Managed Energy Services Agreement (MESA), which is a variant of an ESA that

includes the MESA provider maintaining a more active ongoing energy management role for the end customer. We are now engaged with that provider to better understand customer appetite for a more "hands-on" solution and how we can partner on financing. To build ESA pipeline we continue to monitor the C-PACE "parking lot" and are also engaged with other energy management solutions providers to assess potential for an ESA structure to accelerate deployment of their offering.

- **Small Business Energy Advantage (SBEA)** – We continue to work closely with Eversource and UI/AVANGRID, the EEB, and JP Morgan to develop a facility to fund customer loans made through the SBEA program in Connecticut. Primary goals remain increasing the pool of capital available, lowering the cost of funds, and maintaining the streamlined and successful operational aspects of the SBEA program. Ongoing negotiations with the utilities and JP Morgan have provided a valuable opportunity for the Green Bank to gain insight into the opportunities and challenges within the utilities' signature CI&I offering and learn how best to attract additional private capital into clean energy investments in CT. Pending successful resolution of the state budget proposal to diminish CEEF funding, we hope to reach agreement on a facility with the utilities and JP Morgan with support from the EEB during Q32017.

Commercial, Industrial, and Institutional Sector Programs FY 2018 Targets

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

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

Program	# of Projects	Capital Deployed	Clean Energy Deployed (MW)
C-PACE	51	$24,400,000	6.4
CT Solar Lease	25	$15,000,000	6.3
Total without SBEA[8]	67	$34,000,000	10.4
SBEA[9]	1,600	$28,000,000	-
Total with SBEA	1,667	$62,000,000	10.4

For Commercial, Industrial, and Institutional Sector Programs, there are 13 full time equivalent staff members supporting three (3) different products and programs.

[8] Total has been adjusted to back-out CPACE backed Commercial Leases to prevent double counting.

[9] Pending approval from the Utilities.

CONNECTICUT GREEN BANK

845 Brook Street
Rocky Hill, Connecticut 06067

300 Main Street, 4th Floor
Stamford, Connecticut 06901

T: 860.563.0015
F: 860.563.4877
www.ctcleanenergy.com

Memo

To: Connecticut Green Bank Board of Directors

From: Ben Healey, Director, Clean Energy Finance, and Diego Hentschel, Summer Associate

Cc: Bryan Garcia, President and CEO; Bert Hunter, EVP and CIO; Brian Farnen, General Counsel and CLO; Mackey Dykes, VP Commercial and Industrial Programs

Date: July 14, 2017

Re: Refinancing the Historic Cargill Falls Mill C-PACE Project

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Proposed Investment Summary

The previously approved C-PACE project at 58 Pomfret Street, Putnam, CT (the "Historic Cargill Falls Mill" or "HCFM") consists of an approximately 900 kW hydroelectric investment, which is part of a much larger redevelopment of an existing mill property into mixed-use residential and commercial space, including a significant set-aside for affordable units. The hydroelectric portion of the project is currently partially operational, with the larger 600 kW turbine having been placed in service in May and a smaller 300 kW unit expected to come online in September. The Green Bank authorized $4,700,000 to fund the hydro project, first through a $2,350,000 investment per Deployment Committee approval on January 15, 2015 (executed via a financing agreement between the Green Bank and the project developers on March 11, 2015), and later through an increase of $2,350,000 to HCFM, per full Board of Directors ("Board") approval on March 3, 2016 and a subsequent amended and restated financing agreement executed on April 11, 2016. In accordance with the direction of the Board, Green Bank staff sourced Enhanced Capital ("Enhanced") to acquire a senior tranche of our investment, equivalent to $1,200,000, per a joinder, assignment and modification agreement entered into between the Green Bank, Enhanced, and the project developers on August 3, 2016, effectively reducing the Green Bank's outright exposure to $3,500,000.

Although it was a success to bring in private capital to take a position in this project during the riskiest portion of its construction period, the cost of Enhanced's funds is higher than what the Green Bank is now able to offer the project through a back-leverage facility that staff is currently negotiating with Bank of America ("BofA"), further details of which follow below. Additionally, utilizing BofA funds will give the Green Bank greater flexibility to structure the project's repayment profile so as to align with underlying cash flows, both in the short term via a cash sweep approach and after the larger redevelopment project has reached completion through a more traditional amortization profile. As such, staff is requesting Board authorization to use Green Bank funds to take Enhanced out of its position, to amend the terms of the existing financing agreement to ensure that future project cash flows and debt service payments are well aligned, and to subsequently use BofA capital (or another capital source if the BofA deal does not come to fruition) to replace the Green Bank funds used to take out Enhanced.

Project Status Update
Before discussing the status of the work at HCFM, it is worth reminding the Board of the complexity and context of this project. This is not a standard C-PACE project, but rather a total construction effort that has required building demolition, crossing rights-of-way, excavation and dewatering, major equipment installation, and significant manpower. The hydro portion of the larger HCFM project is the foundation (literally) of all the redevelopment work to come, and as such, the Green Bank's investment is not only allowing for the development of the project's hydroelectric infrastructure, which will power the redeveloped mill site for years into the future, but it is also serving as a key component of the project's broader commercial success.

As the hydro project nears completion, the developers of HCFM are in parallel working with the Department of Housing to close on funding for the overall mill redevelopment, which will follow shortly after their selected general contractor – [redacted], who recently completed work on the [redacted] redevelopment project in that town – has finalized its guaranteed maximum price for the project.

In terms of the hydro project's status, the larger of the two project turbines ("T2") came online this past spring, and the smaller turbine ("T1") is progressing according to a modified schedule and is expected to be fully installed and operational by the end of September 2017. All Green Bank and Enhanced funds have been fully deployed, all major equipment has been purchased and is either on site or in a secure warehouse, and the project's remaining installation costs will be covered by a USDA grant previously awarded to the project and for which funds were released upon the completion of T2.

With respect to the remainder of the mill redevelopment project, which will commence upon the completion of the hydro facility, the investors for the overall mill redevelopment have approved or pre-approved almost all required capital, subject to the final audited project costs that [redacted] is now determining.

Construction plans – including full architectural, mechanical, electrical, and plumbing (MEP), structural, and civil plans – are ready to be bid out, with construction expected to begin this fall (see Exhibit 1 – The Lofts at Cargill Falls Mill Construction Schedule).

The combination of funding from the Green Bank and Enhanced has allowed the project to reach this point, but Enhanced's relatively high-cost and shorter-term capital is not the best long-term fit for the project now. Rather, using BofA capital will allow the Green Bank to substitute one pool of private capital for another, but with greater Green Bank control of the underlying loan so that we can adjust the project's repayment profile to reflect HCFM's cash flow position, both while the mill redevelopment continues and then into the future. As stated in the memo addressed to the Board and approved on January 20, 2017, BofA proposed a $10 million loan to the Green Bank at a [redacted] annual interest rate, with a back-dated amortization over the last three years of a ten-year tenor. This structure will allow the Green Bank to pass through a lower overall cost of capital to the HCFM project, while also setting aside excess HCFM cash flows during the initial interest-only period of the loan to cover amortization required in the out years of the BofA loan. Staff has had continuous conversations with BofA staff, and expects to close the transaction no later than Q4 2017.

Proposed Refinancing Strategy
Staff proposes to use Green Bank funds (with the intent to have such later be replenished by a portion of BofA's loan) to repurchase the outstanding balance that Enhanced has in the HCFM project. As previously mentioned, staff expects that the BofA transaction will close no later than Q4 of this year, but by repurchasing Enhanced's portion of the loan now, the Green Bank can optimize the loan structure around the project's current cash flows and provide increased flexibility needed to support the ongoing redevelopment effort.

Once the Green Bank takes Enhanced out of its loan position, staff proposes to amend the existing C-PACE loan docs as follows:

- Structure an ongoing cash sweep of all project revenues (energy, RECs, and capacity payments) until the full mill redevelopment is completed. This sweep will carry a target interest rate in the mid- to high single digits (the "Target Rate"). If the cash sweep leads to payments above the Target Rate, then excess cash will be applied to the principal balance of the benefit assessment. If the cash sweep misses the Target Rate, then the deficiency will accrue and be capitalized into the principal balance; and

- Once the redevelopment project comes online, that principal balance will begin to amortize over a 25-year period, in line with the existing loan documentation.

For the avoidance of doubt, staff wants to make clear to the Board that substituting BofA for Enhanced funds does represent a change in the project's risk profile for the Green Bank. With Enhanced in the capital stack over the last year, the Green Bank has been in a first-loss position due to the senior/sub structure of the transaction, but our funds at risk have totaled only $3.5 million. However, under the new structure proposed herein, the Green Bank will revert to its sole position in the HCFM stack (that is, we will no longer be subordinated), with $4.7 million of total capital invested, of which ultimately $1.2 million will be funded by BofA. It is important to note that because the BofA facility is expected to be full recourse to the Green Bank, if the HCFM project fails to perform, the Green Bank will nonetheless be on the hook for full repayment to BofA. Thus, while the same amount of ratepayer dollars will be invested in both cases, under the new structure, the Green Bank is reassuming some repayment risk in exchange for obtaining lower-cost, longer-term capital and more control over the project's financing. At the same time, this increase in repayment risk does not, in practical terms, represent an increase in Green Bank exposure to any expected loss. We base this view on the CBRE-New England "Broker's Opinion of Value ("BOV")" – a professional analysis of real estate market trends and statistics, market rent comparables, and the property's strengths and weaknesses, so as to provide an indication of the property's real estate market position. That analysis – performed prior to the Green Bank's original investment – suggested the property should be valued at between $3M and $3.5M, before the planned expenditure of well over $20M+ to redevelop the mill buildings. Accordingly, in the event (due to non-payment by HCFM) that the Green Bank needed to foreclose on the property, at any realized value for the property in excess of the $1.2 million that Enhanced would have been entitled to receive ahead of the Green Bank under the current arrangement, the Green Bank's potential loss under the proposed revised structure would be identical.

The assumptions / pro forma on the following page reflect the project's expected cash flow profile, based on staff's most recent analysis.

Modeling Assumptions

Total Approved Balance	$4,700,000
Balance Expected on 8/01/2017[1]	$5,048,204
Interest Rate (term)	6.25%
Term (yrs)	25
Cash Sweep Period (yrs)	2
Cash Sweep Interest Rate (to be finalized)	9%
ZREC Award ($/MWh)	$94.40
Remaining ZREC Period (yrs)	12.25
Class I REC Price (post-ZREC) ($/MWh)	$15
Expected Annual Generation (kWh)	2,953,000
ISO-NE Wholesale Rate (per kWh)	$0.05
Initial PPA Price upon Lease-Up (per kWh)	$0.15
Annual PPA Escalator	$1.00%
Annual O&M Costs	59,058

Simplified Pro Forma

Year	**1**	**2**	**3-->12**	**13[3]-->27**
Net Revenue	367,500	367,355	6,115,928	6,606,771
Debt Service Due	(454,338)	(454,338)	(4,182,562)	(6,273,843)
Debt Service Paid	(367,500)	(367,355)	(4,182,562)	(6,273,843)
Free Cash Flows	-	-	1,933,366	421,080
DSCR	0.81x	0.81x	1.46x	1.05x

Effective Interest Rate	7.28% (vs. 9% Target Rate)	6.25%

Cash Deficiency vs. 9% Target Rate	(173,822)	-	-

[1] Considers interests accrued as per A&R Agreement entered into on August 3, 2016

[2] Current ZREC Contract expires after year 12

[3] Year 16 PPA price = ~$0.17 / kWh and ISO-NE Wholesale Rate = ~$0.06 / kWh

Notwithstanding current expectations, staff is aware that the overall mill redevelopment remains a high risk until it is completed. As such, staff conducted downside scenario analyses, where the redevelopment is simply unsuccessful, meaning that all the electricity generated by the hydro project would be sold back to the grid at the wholesale rate assumed throughout the model. The cash flows in that case are still enough to repay the BofA loan, and there is even a projected effective rate of return for the Green Bank of 3.5% over 27 years, which means that even under such a stressed scenario, the project allows for a total recovery of our investment assuming no other unexpected costs.

Risks and Mitigants

Hydro Project Completion Risk

At this point, Green Bank staff perceives this as a low risk compared to the project status from a year ago. Construction onsite is nearing completion, all critical equipment has been manufactured and is either in service or awaiting installation, and the entire project development team is closely focused on successful project completion within the next 60-90 days. With T2 now online and generating electricity, and T1 well underway, staff expects that the project will be fully completed in Q3 or early Q4.

Operational Risk

Green Bank staff perceives this as a low to medium risk. Based on construction and equipment choices, especially a locally sourced set of turbines with established operating performance and a ready supply of spare and replacement parts, the development team has largely bounded this risk. Additionally, appropriate business interruption insurance policies are in place, and the Green Bank has insisted on the budgeting of sufficient funds for competent O&M support going forward. However, given the inexperience of the development team, there is bound to be a learning curve during the project's first few years in operation, which the Green Bank will seek to mitigate through regular expert review and reporting protocols.

ZREC Contract Risk

ZREC contract risk is no longer an issue. The ZREC contract conditions were honored when T2 came online, and therefore the ZREC contract is in effect, and the contract period exceeds the terms of BofA loan by two years.

Redevelopment Project Completion Risk

This remains the biggest risk associated with this project. The HCFM developers have secured most of the capital stack required to complete the redevelopment project, but that financing has yet to close. And even assuming they do successfully close (which Green Bank staff believes is likely), there is still 18-24 months of construction in front of the team, plus the need to market and lease the redeveloped property. If all of these items do not come together, then the hydro project will be left exporting energy to the grid and earning a wholesale rate, rather than a higher PPA rate that could be three to four times as valuable. It is also important to stress that this is a key economic development project for a distressed region with additional state and federal involvement and support.

However, as was discussed earlier in this memo, so long as the hydro project is completed and generating energy, the project should nonetheless enjoy sufficient cash flows to repay the Green Bank, with further security for the financing of course provided through the C-PACE benefit assessment mechanism.

BofA Loan Closing Risk

Given the progress reached to date with BofA, Green Bank staff perceives this as a low risk. BofA funding is not linked to this project or its specific risk profile, but rather corresponds to an ongoing effort by BofA to increase its commitments for community development financial institutions and similar entities like the Green Bank so as to advance BofA's green lending platform. Based on the status of

BofA's credit review and their expressed desire to do a deal with the Green Bank, staff fully expects that closing with BofA should occur no later than Q4 2017.

Conclusion

Significant work on the Historic Cargill Falls Mill project remains, but the hydro is partially up and running and nearly completed, and closing on the broader redevelopment work is expected within the quarter. The project's upside potential continues to justify Green Bank efforts to help bring it to fruition. Not only is this the country's first PACE-secured hydro project, but upon completion it will support a mixed-use, mixed-income mill redevelopment that will help revitalize downtown Putnam and provide much-needed affordable housing in the state's "quiet corner." While project risks clearly remain, many have already been mitigated, others are reasonably hedged at this point, and the proposed financing strategy provides a path forward even in a downside scenario. Thus, subject to the Board's approval, Green Bank staff looks forward to finalizing the hydro portion of the project and continuing to provide support, in partnership with our colleagues in state government, for the overall mill redevelopment that we expect to break ground soon.

Resolutions

WHEREAS, the Board previously approved a C-PACE benefit assessment with a not-to-exceed amount of $4,700,000 to Historic Cargill Falls Mill, LLC ("HCFM"), the property owner of 58 Pomfret Street, Putnam, CT to finance the construction of specified clean energy measures (the "Project") in line with the State's Comprehensive Energy Strategy and the Green Bank's Strategic Plan; and

WHEREAS, Enhanced Capital Connecticut Fund V ("Enhanced Capital") acquired $1,200,000 of the original Green Bank's investment (the "Senior Benefit Assessment"), leaving the Green Bank with a total $3,500,000 exposure at the time (the "Subordinated Benefit Assessment"); and

WHEREAS, both the Senior Benefit Assessment and the Subordinated Benefit Assessment have accrued interest to date under the terms of the existing financing agreement with HCFM (the "Financing Agreement"), for a total combined balance of approximately $5,000,000;

WHEREAS, the Green Bank is currently negotiating a loan facility with Bank of America ("BofA") that is expected to close in 2017 and for which C-PACE projects will be an eligible use of funds; and

WHEREAS, the Green Bank now seeks to refinance the Financing Agreement.

NOW, therefore be it:

RESOLVED, that the President of the Green Bank and any other duly authorized officer of the Green Bank, is authorized to execute and deliver an amended Financing Agreement in a total amount not to exceed the sum total of the Senior Benefit Assessment and the Subordinated Benefit Assessment plus any and all interest accrued, with terms and conditions consistent with the memorandum submitted to the Board dated July 14, 2017, 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 July 21, 2017;

RESOLVED, that the President of the Green Bank and any other duly authorized officer of the Green Bank, is authorized to apply BofA funds to the Project so as to fully replace Enhanced Capital's position in the existing capital stack;

RESOLVED, that before executing an amended Financing Agreement, the President of the Green Bank and any other duly authorized officer of the Green Bank shall receive confirmation that the C-PACE transaction continues to meet 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 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 instrument.

Submitted by: Bryan Garcia, President and CEO; Bert Hunter, EVP and CIO; Ben Healey, Director, Clean Energy Finance

Exhibit 1 – The Lofts at Cargill Falls Mill Construction Schedule

REDACTED