



AGENDA

Joint Committee of the CT Energy Efficiency Board and the
Connecticut Green Bank Board
10 Franklin Square, New Britain, CT

Wednesday, October 22, 2014
1:30-3:30 p.m.

1. Call to Order
2. Public Comments
3. Approval of Meeting Minutes for July 16, 2014*
4. Governance – Review (and Approval) of Bylaws*
5. Financing
 - a. CGB Response to EEB Request for Assistance – Update on Progress
 - b. Residential Financing Update
 - c. Commercial and Industrial Financing Update
 - d. New Developments in Financing
6. Updates
 - a. On Bill Repayment
 - b. CGB Comprehensive Plan (FY 2015-FY 2016)
7. Other Business
8. Adjourn

*Denotes item requiring Committee action

Join the meeting online at <https://www4.gotomeeting.com/join/553695567>

Dial +1 (872) 240-3312

Access Code: 553-695-567

***Next Regular Meeting: TBD.
In the Commissioners Conference Room
at the Department of Energy and Environmental Protection
at 10 Franklin Square, New Britain, CT 06051***



RESOLUTIONS

Joint Committee of the CT Energy Efficiency Board and the
Connecticut Green Bank Board
10 Franklin Square, New Britain, CT

Wednesday, October 22, 2014
1:30-3:30 p.m.

1. Call to Order
2. Public Comments
3. Approval of Meeting Minutes for July 16, 2014*

Resolution #1

Motion to approve the minutes of the Joint Committee meeting for July 16, 2014.
Second. Discussion. Vote.

4. Governance – Review (and Approval) of Bylaws*

Resolution #2

WHEREAS, the Joint Committee of the Energy Conservation Management Board (the “ECMB”) and the Board of the Connecticut Green Bank (the “Green Bank”) (the “Joint Committee”) may establish bylaws pursuant to Section 16-245m of the Connecticut General Statutes;

NOW, therefore be it:

RESOLVED, that the duly appointed members of the Joint Committee approve the attached Bylaws dated October 22, 2014. Definitive approval of the Bylaws by the Joint Committee is contingent upon ECMB’s full board review and approval.

5. Financing
 - a. CGB Response to EEB Request for Assistance – Update on Progress
 - b. Residential Financing Update
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Joint Committee

Connecticut Energy Efficiency Board and the
Connecticut Green Bank Board

Department of Energy and Environmental Protection
October 22, 2014



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Agenda Item #1

Call to Order



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Agenda Item #2

Public Comments



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Agenda Item #3

Approval of Meeting Minutes of July 16, 2014



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Agenda Item #4

Governance – Review (and Approval) of Bylaws

Bylaws of Joint Committee

- The Committee shall **examine opportunities to coordinate the programs and activities contained in the plan** developed under section 16-245n(c) of the General Statutes with the programs and activities contained in the plan developed under section 16-245m(d)(1) of the General Statutes 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.**

Bylaws of Joint Committee (cont'd)

	Voting	Non-Voting	Total
Green Bank	2	2	4
CEEF	2	2	4
DEEP	1	0	1
Total	5	4	9

- Both funds formally appoint members – remove “from their respective boards” in the Membership section of the draft bylaws
- Appointed members will review and adopt joint committee bylaws
- Funding authorizations handled by each respective fund
- At least four meetings per year
- Quorum – 3 of the 5 voting members
- Committee Staff may assist upon majority vote



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Agenda Item #5a

Financing – CGB Response to EEB Request for
Assistance – Update on Progress

Overview of EEB Request for Assistance

■ C&I Priorities

- Work with the EEB and the Companies to evaluate C&I financing models not currently offered under EnergizeCT
- Work with the EEB and the Companies to optimize financing and incentives for C-PACE
- Help the EEB and the Companies explore alternative lower-cost capital sources for SBEA financing that do not increase total net program costs

■ Single-Family Residential Priorities

- Coordinate with the Companies and the EEB to ensure the effectiveness of single-family offerings under EnergizeCT

■ Multifamily Priorities

- Coordinate with the EEB and the Companies to ensure that the needs of multifamily customers are adequately met

CGB Response to EEB Request for Assistance

- Acknowledges DEEP policy on final decision of C&LM Plan that ratepayer supported C&LM financing products not undermine financing products offered by the private market
- **C&I Priorities**
 - Evaluate C&I financing models not currently offered under EnergizeCT – **proposed team, allocated \$50,000 for consultants, awaiting study results**
 - Optimize financing and incentives for C-PACE – **provided access to data, developing SIR calculator w/ and w/o CEEF incentives, equal treatment w/ CEEF incentives**
 - Alternative lower-cost capital sources for SBEA financing – **assist UI, potentially access \$5M from Green Loan Guaranty Fund, CGB budgeted**
- **Single-Family Residential Priorities**
 - Ensure the effectiveness of single-family offerings under EnergizeCT – **continue collaboration through residential financing committee**
- **Multifamily Priorities**
 - Ensure that the needs of multifamily customers are adequately met – **CGB BOD priority is low-income, continue collaboration through residential financing committee**



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Agenda Item #5b

Financing – Residential Financing Update

Residential Financing Update

- **HES Loan Re-Capitalization** – Working to secure \$10-15MM for CHIF
 - Supported by CGB credit enhancement. Product include: : 1) 0% loan, 2) Comprehensive Loan (2.99%) for credit challenged customers, and 3) Smart-E loan terms for credit challenged customers
 - “Prime” customers for Comprehensive Loan will move to Smart-E Bundle
 - CGB would provide loan loss reserve for CHIF, CGB would also support interest rate buy-downs for Smart-E Bundle and Comprehensive Loan through end of 2015 using ARRA \$’s
 - Working with CHIF on draft term sheet ahead of going out to potential capital providers
 - CGB can fund capital off balance sheet if capital providers not secured by the time CHIF needs \$’s (estimated early 2015)
 - CGB, Companies, CHIF, EEB will explore accessing Green Loan Guaranty Funds (bonding) as a mid-term solution
- **Other** – Coordination on multi-family financing, exploring condo financing; Cozy Home Loan re-launch in October; CGB low income focus for 2015

Residential Financing Update

▪ Market Study –

- Chris K. and Andy B. point for preliminary proposal (high level) to conduct study of contractors and customers
 - Premature to conduct impact, process, or market transformation evaluation due to small number of transactions
 - Suggest creation of Joint CEEF/CT Green Bank Working Group to develop and oversee market study
 - Perceptions of needs/challenges, awareness of existing products
 - Target execution Q1 2015



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Agenda Item #5c

Financing – Commercial and Industrial Financing Update

Optimize C-PACE Financing and Incentives

- Understanding by Joint Committee that no end-use customer who receives C-PACE financing will receive a different incentive from CEEF than customer who doesn't use C-PACE financing regardless of SIR (July 16, 2014)
- CEEF Consultants provided access to C-PACE CDMP data from SRS through NDA
- CGB working with SRS to develop an SIR calculator w/ and w/o CEEF incentives

Incentive Impact on SIR Impact

- Of the 106 projects reviewed, 48 projects met the screening criteria above meaning they had CEEF incentives and data was ‘complete’
- Then ran a Scenario Report “without CEEF incentives” on the 48 projects to assess the impact to SIR (among other metrics)
- Of the 48 project Scenario Reports “without CEEF incentives”:
 - 22 of the 48 project’s SIR dropped below 1.0
 - **So high-level ‘story’ is without CEEF incentives 46% of the C-PACE projects would not have made SIR > 1 requirement as originally scoped**

Evaluate C&I Financing Models Not Currently Offered – C-11 Market Research

- Build on C-11 market research survey and any follow-up research
- Work with the EEB and the Companies to explore products that may help fill the gap

SBEA Cost of Capital – CL&P

- NU is negotiating an arrangement that will lower its cost of capital

SBEA Cost of Capital – UI

- CGB work with UI to identify possible lower-cost sources of capital that are less expensive from an “all-in” standpoint
 - Meet with UI (Completion – by September 30, 2014) – assess their needs and what CGB can help with.
 - Develop the Concept (Completion – by March 31, 2015) – determine an approach that uses a limited amount of ratepayer capital to attract multiples of low-cost and long-term private capital, develop the box or parameters for financing acceptable by UI, and access the Green Loan Guaranty Fund.
 - Attract the capital and then launch and implement the solution

Lead by Example Update

- CT Green Bank RFQ for private capital lenders to state projects
- CEEF Incentives for ESPC projects
 - Existing \$2M cap per taxpayer ID
 - Probably appropriate and sufficient for municipal projects
 - Multiple state agency requests could overwhelm CEEF budgets
 - Working with CEEF to negotiate caps for state agencies
 - MOUs for caps for Executive branch agencies, UConn, BOR
 - To be paid at project completion based on documented energy savings
 - Intent is to use incentives to replace Green Bank \$ in revolving working capital facility to fund project preparatory costs



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Agenda Item #5d

Financing – New Developments in Financing



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Agenda Item #6

Updates

On Bill Repayment

- Received PURA approval for Smart-E OBR/Phase 1 in August
- Reconvening with Companies on IT development 10/24
 - Estimated 6 month development schedule
- Discussing cost recovery with Companies
 - What development/administrative Company costs CGB would pay, what would be recovered elsewhere (per PURA ruling or via C&LM funds)
- Reconvening EEB Working Group on 10/31
- Reached out to HI to leverage their consumer disclosure work
- Will engage with lenders when firm IT timelines are developed

CGB Comprehensive Plan (FY 2015-FY2016)

■ Policy

- Grounds each sector in state policy documents (CES, IRP, C&LM, etc) and outlines overall clean energy policy framework

■ Marketing

- Green Bank has a goal of *deploying* as well as attracting capital
- Highlight the marketing function of a Green Bank and provides an outline of the broad role it will play in this area
 - Channel partners (contractors, lenders, utilities)
 - Community-based campaigns (Solarize, Energize)
 - Online campaigns

CGB Comprehensive Plan (FY 2015-FY2016)

■ Financing

- Outlines capital needs required to meet state goals and emphasizes need for private capital
- Reinforces role of Green Bank in reducing subsidies and transitioning to financing
- Highlights DEEP C&LM decision statement that ratepayer-supported financing products should not undermine private market products

■ Goals

- Sets goals for each product for FY15



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Agenda Item #7

Other Business



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Agenda Item #8

Adjourn



**Joint Committee of the CT Energy Efficiency Fund
and the Connecticut Green Bank**
10 Franklin Square, New Britain, CT

Wednesday, July 16, 2014
1:30-3:30 p.m.

MINUTES¹ (Draft)

In attendance: Bryan Garcia, Jamie Howland (phone), Bill Dornbos, Brian Farnen, Kerry O'Neill, Norma Glover, Jessica Bailey (phone), Andy Brydges, Matt Gibbs, Pat McDonnell, Joe Swift, Bert Hunter (phone), Diane Duva, Eric Brown, Chris Kramer (phone), Ron Araujo, Jeff Schlegel (phone), Katie Dykes, Craig Diamond.

1. **Call to Order.** The meeting was called to order at 1:36 pm.
2. **Public Comments.** None.
3. **Approval of Meeting Minutes for April 23, 2014.** Ms. Glover move, Ms. Duva 2nd. Mr. Araujo and Mr. Howland requested minor changes which will be incorporated into the minutes. All voted in favor. Minutes approved with requested changes.
4. **Governance.** Mr. Farnen provided an overview of the draft joint committee bylaws and the legislation requiring them (Public Act 11-80). He explained that the joint committee would vote to approve the bylaws after its members were appointed. Mr. Howland said that the EEB would need to approve the draft bylaws as well. Mr. Howland also said that the committee needed to specify who could be a non-voting member. He said that from the EEB, all non-voting committee members would be non-voting EEB members (i.e., the utilities). Mr. Farnen said that for the Connecticut Green Bank (CGB), non-voting members could be staff or somebody else. In regard to the non-voting EEB members, Mr. Araujo suggested one representative of a gas utility and one representative of an electric utility. Mr. Garcia agreed with that suggestion. He said that Catherine Smith would appoint the voting members for CGB. Mr. Garcia said the goal of the committee should be to have all of the appointments complete by the Oct. 22 meeting so that the committee can approve the bylaws at that meeting.
5. **Financing**
 - a. **EEB Memo Follow-Up – Proposed Connecticut Green Bank Next Steps.** Mr. Kramer provided an overview of the memo that EEB submitted to CGB in

¹ Materials for this meeting can be found at Box.net: <https://app.box.com/s/a5i2l1kg5kpwfexbd5jz> and at [CGB website link].

February of 2014. He also provided an overview of CGB's response to the EEB memo.

- *Beyond SBEA and C-PACE – C&I Financing Market Gaps.* Mr. Garcia discussed CGB's response to EEB's request related to small business and C-PACE. Mr. Garcia said he agreed with the EEB's request, and suggested that a market assessment be conducted soon (for example, by Sept. 30). He said that the Evaluation Committee study in progress on small business barriers to financing could be one basis for that. Mr. Garcia also suggested that product development proceed after the market assessment, with a possible completion date by around March 31, 2015. Mr. Kramer suggested a process to that would involve CGB staff, EEB members, consultants, and the Companies. He said the end point is a financing product, not a new program. Mr. Garcia suggested a team for this effort: Les Tumidaj, Chris Kramer, Jessica Bailey, Bert Hunter, Matt Gibbs, Tim Simmonds, Roy Haller, and Pat McDonnell. Ms. Bailey said that they might have one potential model to look at. She also said that she would like to apply the Evaluation Committee small business barriers study on project-to-project basis. Mr. Garcia suggested that Ms. Bailey be the point person to coordinate the group. Ms. Bailey said she could build on the existing group with CGB and Companies.
- *SBEA Lower Cost of Capital.* Mr. Kramer provided an overview of this issue. Mr. Gibbs noted that CL&P is confidentially negotiating with a financial partner. He said that the negotiations will likely be completed soon, and at that time CL&P will announce the new interest rate on the small business loan program. Mr. Garcia proposed that CGB and the EEB consultants work with UIL to lower cost of capital for UIL's SBEA financing program. Mr. Garcia said that CGB might be able to access the Green Loan Guarantee Fund, which would be a \$20 million bond issuance (\$5M per year); he said this would be difficult to do. Mr. Garcia said he would send out information on the Green Guarantee Loan Fund.

b. Updates

- *Maximize C-PACE and Optimize CEEF Incentives.* Mr. Kramer provided an overview of this topic. Mr. Howland said that one idea is to analyze the Savings to Investment Ratio (SIR) of projects both with and without incentives. Ms. Bailey said she believes that number of projects will go down without the incentive. Mr. Howland agreed, but he said it still would be helpful just do the analysis. Ms. Glover said that we need use best practices to assure funds are being optimally spent. Mr. Brydges suggested that might need to think about how we provide incentives for large projects due to resource constraints (as with energy savings performance contracting projects). Mr. Hunter asked why we are discussing potentially reducing incentives for CPACE, as it is clear that we need the current incentive levels to help projects move forward. Mr. Garcia said that CPACE could be a good case study and learning tool regarding how you can optimize the balance of private sector capital and rate-payer funds.
- *Energize CT Single Family Products.* Mr. Schlegel said that at a later time, the joint committee should discuss how to move forward with a joint

evaluation of single family financing programs. There was no further discussion on this topic.

- *Energize CT Multifamily Products* - there was no discussion on this topic.

6. **Measuring Success of Incentive and Financing Programs.** Mr. Gibbs provided an overview of the how the EEB measures success of incentives and financing programs. Mr. Gibbs provided some background on how cost-effectiveness is calculated, and on different types of cost-effectiveness (e.g., utility cost test (UTC) and total resource cost test (TRC)). Mr. Garcia asked if the utilities had tried to calculate job creation benefits. Mr. Gibbs said that the utilities had not done that to date. Mr. Gibbs then discussed how the EEB does planning and reporting related to cost-effectiveness, along with the importance of market transformation. Mr. Garcia then provided an overview of how CGB measures the success of its program. He discussed CGB's "objective function" which he said is defined as "maximizing the amount of clean energy generated (or energy saved) per dollar of Green Bank capital at risk" (not "ratepayer funds at risk" as shown on the slide). Ms. Duva said CGB might consider looking at infrastructure benefits (e.g., distributed generation). Mr. Garcia mentioned that the objective function is not the only metric CGB uses, but it is an important one. He said that he would send out the objective function protocol to the committee. Mr. Garcia said that CGB was working on improving the objective function to incorporate more variables. Mr. Brydges said that CGB was developing an overall model for success metrics. Mr. Brydges presented the Financing Program Logic Model, which was adopted from a model in California. Mr. Brydges said that they would like to adjust this model to make it more specific to CGB. Mr. Garcia suggested that there could be an additional meeting to discuss this in the future.

7. Other Business - none

8. Adjourn: 3:40 pm

The agenda noted the following:

The next Regular Meeting will be Wednesday, October 22, 2014 from 1:30-3:30 p.m. The location will be the Commissioners Conference Room, Department of Energy and Environmental Protection, 10 Franklin Square, New Britain, CT.

**JOINT COMMITTEE OF THE ENERGY CONSERVATION
MANAGEMENT BOARD AND THE BOARD OF DIRECTORS OF
THE CONNECTICUT GREEN BANK**

BYLAWS

PURSUANT TO

Section 16-245m(d)(2) of the
Connecticut General Statutes

Adopted _____, 2014

ARTICLE I
NAME, PLACE OF MEETINGS

- 1.1. **Name of the Committee.** The name of the Committee shall be, in accordance with the Statute, the "Joint Committee of the Energy Conservation Management Board and the Connecticut Green Bank".
- 1.2. **Meetings of the Committee.** The meetings of the Committee shall be held at such place or places within the State of Connecticut as the Committee may designate.

ARTICLE II
COMMITTEE MEMBERSHIP

- 2.1. **Membership.** The Committee shall consist of no more than nine (9) members. Both the Board of Directors of the Connecticut Green Bank and the Energy Conservation Management Board shall appoint no more than (2) voting Directors [from their respective boards](#) and (2) nonvoting members ~~from their respective boards~~ to serve on the Committee. Additionally, the Commissioner of the Department of Energy and Environmental Protection, or her or his designee, shall be a voting ex officio member of the Committee.
- 2.2. **Term.** Each member of the Committee shall serve a term of two (2) years or until a successor is appointed, whichever is longer.
- 2.3. **Chairperson.** The Committee shall elect from its members a Chairperson who shall serve a term of one (1) year or until a successor is chosen by the Committee, whichever is longer. The Chairperson shall preside at all meetings of the Committee which he or she attends.
- 2.4. **Vice Chairperson.** The Committee shall elect from its members a Vice Chairperson who shall serve a term of one (1) year or until a successor is chosen by the Committee,

whichever is longer. In the absence or incapacity of the Chairperson, the Vice Chairperson shall perform all the duties and responsibilities of the Chairperson. In the absence or incapacity of the Vice Chairperson, or in case of his or her resignation or death, the Committee shall elect from amongst its members an acting Vice Chairperson during the time of such absence or incapacity or until such time as the Committee shall elect a new Vice Chairperson.

- 2.5. **Secretary.** A Secretary may be elected by the Committee. The Secretary shall perform the duties imposed by resolution of the Committee. In the absence or incapacity of the Secretary, or in case of his or her resignation or death, the Committee shall elect from amongst its members an acting Secretary who shall perform the duties of the Secretary during the time of such absence or incapacity or until such time as the Committee shall elect a new Secretary. The Secretary shall serve until a successor is elected by the Committee.

ARTICLE III POWERS AND DUTIES OF THE COMMITTEE

- 3.1. **Powers and Duties.** The Committee shall examine opportunities to coordinate the programs and activities contained in the plan developed under section 16-245n(c) of the General Statutes with the programs and activities contained in the plan developed under section 16-245m(d)(1) of the General Statutes 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.

ARTICLE IV COMMITTEE MEETINGS

- 4.1. **Regular Meetings.** Regular meetings of the Committee for the transaction of any lawful business of the Committee shall be held in accordance with a schedule of meetings established by the Committee, provided that the Committee shall meet at least four (4) times per calendar year.
- 4.2. **Special Meetings.** The Chairperson may, when the Chairperson deems it expedient, call a special meeting of the Committee for the purpose of transacting any business designated in the notice of such meeting.
- 4.3. **Legal Requirements.** All meetings of the Committee shall be noticed and conducted in accordance with the applicable requirements of the Connecticut Freedom of Information Act, including without limitation applicable requirements relating to the filing with the Secretary of the State of any schedule of regular meetings and notices of special meetings, meeting notices to Committee members, public meeting requirements, the filing and public availability of meeting agenda, the recording of votes and the posting or filing of minutes, the addition of agenda items at any regular meeting, and the holding of any executive session.
- 4.4. **Order of Business.** The order of business of any meeting of the Committee shall be as set forth in the agenda for such meeting, provided that the Committee may vary the order of business in its discretion.
- 4.5. **Organization.** At each meeting of the Committee, the Committee Chairperson, or in the absence of the Committee Chair, the Vice Chairperson, shall act as Presiding Officer. The Presiding Officer shall prepare or direct the preparation of a record of the business transacted at such meeting. Such record when adopted by a majority of the Committee

members in attendance at the next meeting and signed by the Committee Chairperson shall be the official minutes of the Committee meeting.

- 4.6. **Attendance.** Any member of a Committee may participate in a meeting of the Committee by means of teleconference, videoconference, or similar communications equipment enabling all Committee members participating in the meeting to hear one another, and participation in a meeting pursuant to this Section shall constitute presence in person at such a meeting.
- 4.7. **Quorum.** A quorum of the Committee shall consist of a minimum of at least three (3) voting members.
- 4.8. **Enactment.** When a quorum is present, an affirmative vote of a majority of voting members attending the Committee meeting shall be sufficient for action, including the passage of any resolution, except as may otherwise be required by these Bylaws or applicable law.
- 4.9. **Parliamentary Authority.** Robert's Rules of Order, current revised edition, shall govern the proceedings of the Committee when not in conflict with these Bylaws.

ARTICLE V

COMMITTEE STAFF

- 5.1. **Committee Staff.** The Committee may from time to time and upon a majority vote of the voting members request that employees and contractors from either the Connecticut Green Bank or the Energy Conservation Management Board assist the Committee with its work. Said assistance may include but not be limited to taking minutes of Committee meetings, conducting research or analyzing information.

**ARTICLE VI
AMENDMENT**

- 6.1. **Amendment or Repeal.** These Bylaws may be amended or repealed or new Bylaws may be adopted by the affirmative vote of not less than four (4) voting members of the Committee.

**ARTICLE VII
DEFINITIONS**

Definitions. Unless the context shall otherwise require, the following words and terms shall have the following meanings:

- 7.1.1. "Chairperson" means the Chairperson of the Committee appointed pursuant to these Bylaws.
- 7.1.2. "Committee" means the Joint Committee of the Energy Conservation Management Board and the Board of Directors of the Connecticut Green Bank.
- 7.1.3. "Connecticut Freedom of Information Act" means the Connecticut Freedom of Information Act, Connecticut General Statutes § 1-200 *et seq.*, as amended.
- 7.1.4. "General Statutes" means the Connecticut General Statutes, as amended.
- 7.1.5. "Majority", whether capitalized or lowercase, means one more than half.
- 7.1.6. "Presiding Officer" has the meaning attributed to that term in Article IV, Section 4.5 of these Bylaws.
- 7.1.7. "Secretary" means the Secretary of the Committee elected pursuant to these Bylaws.

7.1.8. "Statute" means Connecticut General Statutes § 16-245m(d)(2), as amended.

7.1.9. "Vice Chairperson" means the Vice Chairperson of the Committee elected pursuant to these Bylaws.

CEEF/CGB Areas of Collaboration

Residential:

- * **HES Loan Capitalization**: Joint exploration of private capital sources and credit enhancement options to maintain HES loan offerings, including 2.99% comprehensive loan.
- * **Evaluation**: Joint development of plan to conduct market evaluation of multiple residential financing products, to be followed by impact evaluation.
- * **OBR**: Joint development of on-bill repayment platform for residential loans.
- **Financing Wizard**: Collaborative development of online tool to help customers understand the best option to suit their needs.
- **Reporting**: Cooperation on dashboard reporting and development of financing matrix to highlight key information on financing projects.

Multifamily:

- **C-PACE**: CEEF incentives for C-PACE financed multifamily projects.
- **LIME Loan**: CGB credit enhancement and capitalization of CHIF Low Income Multifamily Energy (LIME) loan.
- **CHFA Demonstration Program**: Collaboration among CEEF and CGB to implement energy improvement process for CHFA financed properties with owner-paid utilities.

C&I:

- * **C-PACE**: Ongoing analysis of role of incentives in C-PACE projects.
- * **Market gaps**: Building on market research; discussions of further research needed to identify financing gaps and inform product solutions.
- * **SBEA**: Potential for collaboration with UI to identify capital source that would feed into existing program infrastructure while lowering all-in cost of capital.

MUSH:

- * **Lead by Example - ESPC**: Joint administration by CGB manager and CEEF-funded staff person. Ongoing discussions between program and utilities regarding approach to incentives, given large total incentive amount associated with project pipeline.

Evaluation:

- **Evaluation Framework**: Discussions and potential collaboration regarding development of a framework for overall evaluation of financing programs.

Marketing and Branding:

- **Energize CT**: Collaboration on marketing and branding under Energize CT.

* Highlighted for joint Board discussion.



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Memo

To: Energy Efficiency Board (EEB)

From: Bryan Garcia and Norma Glover (on behalf of the Board of Directors of the Connecticut Green Bank)

CC: Staff of the Connecticut Green Bank

Date: July 28, 2014

Re: Response to the EEB Suggestions on the Green Bank Priorities for Financing (of April 23, 2014)

The Board of Directors (BOD) of the Connecticut Green Bank (the Green Bank) appreciates the EEB suggestions on the Green Bank priorities for financing submitted to the Joint Committee of the Connecticut Energy Efficiency Fund (CEEF) and the Green Bank on April 23, 2014. The Green Bank completed the development of its programs and activities for its Comprehensive Plan for fiscal years 2015 and 2016 pursuant to Section 16-245n(c) of the CGS. As part of the planning process, and the subsequent approval of the Comprehensive Plan by the BOD of the Green Bank, this memo and the attached Comprehensive Plan outline our goals for the next two years which includes the input received from the EEB and your request for assistance with financing programs.

Commercial and Industrial Priorities

The EEB identified three (3) areas of priority for financing with respect to the commercial and industrial (C&I) sector to work with and assist the EEB and the Companies (i.e. CL&P and UI), including:

1. Evaluating C&I financing models not currently offered under EnergizeCT;
2. Maximizing the use of commercial and industrial property assessed clean energy (C-PACE) financing for CEEF projects, and optimizing the use of limited CEEF resources to support financial incentives; and
3. Exploring alternative lower-cost capital sources for Small Business Energy Advantage (SBEA) financing to reduce total net program costs to be procured by the Companies as a replacement source of capital and/or by the Green Bank.

Priority #1

With respect to the first priority, the Green Bank agrees to work with the EEB and the Companies to assess the market gaps for financing outside of the SBEA and C-PACE financing programs under EnergizeCT.

The Green Bank would propose the following process as a next step:

1. **Assess the Market** – identify what is the market? How big is the market? Who are the customers in the market? How do these customers differ from those in the SBEA and C-PACE programs? The market research completed by the EEB – the C-11 market research survey – should inform this process.
2. **Develop the Product** – determine an approach that uses a limited amount of ratepayer capital to attract multiples of low-cost and long-term private capital. Develop the box or identify the parameters that are acceptable to the EEB and the Green Bank that will be required of private capital providers to lend into this market.
3. **Attract the Capital** – put public capital to work more efficiently and effectively attract private capital investment in energy efficiency and renewable energy deployment. CEFIA has targeted \$5 million of Green Connecticut Loan Guaranty Fund bond funding in its FY15 budget to support this effort.
4. **Implement the Program** – once lower-cost private capital has been attracted, implement the program with contractors and consumers.

Through the Green Bank Comprehensive Plan, we have allocated \$50,000 in funds to support the development and implementation of this product – that is separate from the funds that CEEF should provide to this effort as well.

With regards to the team working on this product, here are the points of contact we suggest:

- **Connecticut Green Bank** – Jessica Bailey and Bert Hunter;
- **Companies** – Tim Simmonds (CL&P), Pat McDonnell (UI), and Roy Haller (UI); and
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The assessment of the market and subsequent development of the market will take place through the regular meetings of the Connecticut Green Bank and the Companies.

Priority #2

With respect to the second priority, the Green Bank agrees to continue to work with the EEB and the Companies to maximize the use of C-PACE financing for CEEF projects while optimizing the use of limited CEEF resources to support financial incentives. C-PACE is a financing tool for CEEF and the Green Bank that allows us to use limited ratepayer resources to attract private capital investment in clean energy (i.e. energy efficiency and renewable energy) deployment in Connecticut. In fact, the Green Bank recently closed on the first securitization of commercial and industrial energy efficiency and renewable energy projects through C-PACE.¹

With respect to optimizing the use of CEEF resources, the Green Bank would insist that CEEF not have different incentives or incentive levels for projects that use C-PACE financing (which is at present at least 80% funded by private capital with a target of 90% or more) versus those projects that do not seek financing or finance through other capital providers. If incentives or incentive levels

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are to change (i.e., be reduced), then they should change for everyone in the market. To assist our joint efforts, we can look at the savings to investment ratio (SIR) and the technical underwriting process with Sustainable Real Estate Solutions through C-PACE to guide us towards optimizing commercial and industrial incentives. We can look at SIR scenarios with and without CEEF incentives to analyze the impacts of financing deeper retrofits alongside incentives.

The Green Bank staff will continue its ongoing collaboration with the Companies through monthly meetings, regular sharing of deal flow information, joint outreach efforts and marketing, and streamlined approvals of C-PACE applications with CEEF incentives.

With respect to the progress the Green Bank has been making on C-PACE implementation in Connecticut, here are a few updates:

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The Green Bank staff looks forward to continuing to work with the EEB and Companies to deliver deeper and deeper energy savings and renewable energy deployment for building owners throughout the state.

Priority #3

With respect to the third priority, the Green Bank agrees to assist the EEB and the Companies to explore alternative lower-cost capital sources for SBEA financing that reduces total net program costs to be procured by the Companies and/or by the Green Bank. As noted, the Green Bank recognizes that the SBEA is a long-standing, successful, and award-winning program that provides on-bill financing to small commercial customers (i.e. peak demand between 10 kW to 200 kW) by using CEEF funds to buy down the interest rate of the utility shareholder capital from approximately 9.9% to 0.0% for a 4-year term loan. As long as the EEB and the Companies support the principle that “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,”² and that private capital is

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competitively procured, then the Green Bank can more effectively assist in attracting lower-cost private capital investment.

The Green Bank and the EEB have an additional capital source opportunity through the Green Loan Guaranty Fund. Pursuant to Section 16a-40f of the CGS, the Green Bank is authorized to guarantee loans for eligible energy conservation projects for individuals, qualified nonprofit organizations, and small businesses. In consultation with the EEB, Connecticut Health and Education Finance Authority (CHEFA), DEEP, and OPM, the Green Bank can request \$5 million of general obligation bond funds a year – to a total of \$20 million – to be placed into a fund used to guarantee authorized loans under the program. A loan guaranty to private capital providers like credit unions, community banks, and commercial banks, can be used to attract low-cost and potentially long-term private capital. The Green Bank’s Board of Directors approved of \$5 million in revenue for its FY 2015 budget to access the Green Loan Guaranty Fund. The Green Bank must work with CEEF and CHEFA to request these funds through the state bond allocation process.

It should be noted that CL&P is currently under an NDA for 3rd party financing for the SBEA so assistance from the Green Bank is not necessary.

The Green Bank proposes the following process as next steps:

1. **Meet with UI** – sit down with UI to assess what they want to see with regards to the Green Bank’s involvement with the SBEA product.
2. **Develop the Concept** – determine an approach that uses a limited amount of ratepayer or public capital to attract multiples of low-cost and long-term private capital. Develop the box or identify the parameters that are acceptable to UI that will be required of private capital providers to lend into this market. Consider accessing the Green Loan Guaranty Fund to attract private capital investment.
3. **Attract the Capital** – put ratepayer capital (or public capital – i.e. Green Loan Guaranty Fund) to work to more efficiently and effectively attract private capital investment in energy efficiency and renewable energy deployment through UI’s on-bill program.

Single-Family and Multifamily Residential Priorities

The EEB identified two (2) areas of priority for financing with respect to the residential sector to work with and assist it and the Companies, including:

4. Ensuring the effectiveness of single-family offerings under EnergizeCT; and
5. Ensuring that the needs of multifamily customers are adequately met.

Priority #4

With respect to the fourth priority, the Green Bank agrees to ensure the effectiveness of single-family offerings under EnergizeCT. We recognize that there is a longstanding history and back-and-forth between DEEP, CEEF and the Green Bank.³ The Green Bank acknowledges that

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there is a proliferation of financing offerings under EnergizeCT. The key points for the EEB to note are:

- **Comprehensive Energy Strategy** – the financing offerings of the Green Bank are designed to implement the full suite of strategies within the CES. From energy efficiency and renewable energy, to natural gas conversions and healthy home measures (i.e. asbestos removal, mold remediation, knob and tube wiring, etc.).
- **Private Capital** – the approach of the Green Bank is to use limited public resources to attract multiples of private capital investment in clean energy deployment in Connecticut. Creating a growing market that is less and less reliant on public funds over time is the focus of the Green Bank. Any evaluation of financing products and their costs must consider those that are subsidized, and the costs of those subsidies, versus those that are not.
- **Connecticut Green Bank** – the Governor and the Legislature established the Connecticut Green Bank to attract and deploy private capital to help the state meet its energy policy objectives. As long as private capital is not disadvantaged by having to compete with subsidized public capital, then confusion by contractors and customers can be avoided.

The Green Bank's Energize CT financing products (i.e. Smart-E Loan, CT Solar Loan, CT Solar Lease, Cozy Home Loan) provide contractors and consumers with easy access to affordable private capital that is convenient, attractive, economical and available – while at the same time allowing ratepayer subsidies to be reduced over time as the market grows. Note that the Green Bank does not consider the Smart-E Loan to be a “single measure” financing product.

The Green Bank looks forward to continuing to collaborate with the EEB and the Companies on consumer facing tools such as the financing wizard being developed for EnergizeCT.com to aid consumers in making smart decisions about financing. Additionally, the Green Bank looks forward to continued collaboration on evaluation approaches, focused initially on market transformation evaluations and then once programs are more established, impact and process evaluations. And we look forward to continuing to collaborate with the EEB and Companies on the joint OBR program.

Priority #5

With respect to the last priority, the Green Bank believes that coordination with the EEB and the Companies is absolutely critical to ensure that the needs of multifamily customers are adequately met. The Green Bank's BOD and staff recognize the challenges and complexities of this market segment as well as the importance of streamlining and mutually leveraging our respective programs, and are pursuing several strategies, including:

- **One-Stop Technical Assistance** – the Green Bank has partnered with New Ecology, Inc. (NEI) to provide assistance to owners of multifamily affordable housing (MFAH). Services can be secured as a one-stop-shop or individually. They include benchmarking and performance monitoring, energy assessments and audits, construction management, commissioning, as well as assistance in accessing financing for deeper upgrades. New Ecology is a nationally recognized leader in implementing energy improvements to MFAH. They have been funded by the JPB Foundation to implement best practices nationally. NEI selected Connecticut as its first market, bringing \$1 million of funding into our market. The Green Bank, NEI and the Companies (as well as the Connecticut Housing Finance Agency (CHFA) are coordinating on this effort.

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- **Credit Enhancement RFP** – the Green Bank has \$4 million allocated to an open RFP for credit enhancements to support project or program level multifamily financing, with a focus on the affordable market.
- **CHFA-CEFIA Energy Demonstration Program** – the Green Bank and CHFA are partnered on 5 pilot projects to help inform underwriting and EM&V requirements more broadly within the CHFA portfolio. This Program will also result in a manual and resource list for MFAH owners seeking to navigate the energy retrofit process. The pilot is being undertaken on five master-metered properties previously identified by CHFA. The Pilot process includes, for each property, energy benchmarking and auditing, definition of project scope to include all cost effective energy measures, financing, implementation, commissioning, and post project energy performance monitoring and verification. The Green Bank, CHFA, NEI, Urban Ingenuity and the Companies are collaborating on these projects.
- **WINN-HUD Open Market ESCO** – the Green Bank has committed up to \$1.87 million to the Multifamily Energy Loan fund to facilitate energy savings agreement in the multifamily housing market (40-300 units). Winn Development was awarded a HUD grant to pilot this program. This pilot program has not yet achieved success and is being refocused, and quite frankly has been a challenging initiative to get up and running and make progress on.
- **MacArthur Foundation** – as a result of the Green Bank's leadership in clean energy finance, MacArthur Foundation has invited a \$5 million program related investment (PRI) proposal from the Green Bank to support its multifamily affordable housing initiatives. The Green Bank proposes to use a significant portion of these funds to finance remediation of critical health and safety issues that impede weatherization and deeper energy improvements to MFAH. The Green Bank, Companies, and members of the CT Healthy Homes Initiative will partner here.
- **Condominium Financing** – the Green Bank has allocated \$5 million in FY15 for market rate financing product development with an initial focus on condominiums. Condominiums are a prime target for natural gas conversions, particularly in communities that have previously

been identified by the gas companies as having a large concentration of housing units on main with low use, and/or targeted for expansion of gas lines. The Green Bank seeks to work with the Companies on a pipeline of condo properties that need access to financing.

The Green Bank would ask the EEB and the Companies to continue to work together in the following areas:

1. To continue to collaborate on efforts to mutually leverage programs and streamline a holistic energy improvement process, making it easier for owners to access incentives, financing and other resources in a coordinated fashion.
2. To develop a comprehensive, statewide list of multifamily resources for the market (e.g. financing, incentives, programs, technical assistance, and infrastructure support); and
3. Coordinate on marketing efforts to the MFH sector as well as project pipeline review and processing.



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Memo

To: Energy Efficiency Board (EEB)

From: Bryan Garcia and Norma Glover (on behalf of the Board of Directors of the Connecticut Green Bank)

CC: Staff of the Connecticut Green Bank

Date: July 28, 2014

Re: Response to the EEB Suggestions on the Green Bank Priorities for Financing (of April 23, 2014)

The Board of Directors (BOD) of the Connecticut Green Bank (the Green Bank) appreciates the EEB suggestions on the Green Bank priorities for financing submitted to the Joint Committee of the Connecticut Energy Efficiency Fund (CEEF) and the Green Bank on April 23, 2014. The Green Bank completed the development of its programs and activities for its Comprehensive Plan for fiscal years 2015 and 2016 pursuant to Section 16-245n(c) of the CGS. As part of the planning process, and the subsequent approval of the Comprehensive Plan by the BOD of the Green Bank, this memo and the attached Comprehensive Plan outline our goals for the next two years which includes the input received from the EEB and your request for assistance with financing programs.

Commercial and Industrial Priorities

The EEB identified three (3) areas of priority for financing with respect to the commercial and industrial (C&I) sector to work with and assist the EEB and the Companies (i.e. CL&P and UI), including:

1. Evaluating C&I financing models not currently offered under EnergizeCT;
2. Maximizing the use of commercial and industrial property assessed clean energy (C-PACE) financing for CEEF projects, and optimizing the use of limited CEEF resources to support financial incentives; and
3. Exploring alternative lower-cost capital sources for Small Business Energy Advantage (SBEA) financing to reduce total net program costs to be procured by the Companies as a replacement source of capital and/or by the Green Bank.

Priority #1

With respect to the first priority, the Green Bank agrees to work with the EEB and the Companies to assess the market gaps for financing outside of the SBEA and C-PACE financing programs under EnergizeCT.

The Green Bank would propose the following process as a next step:

1. **Assess the Market** – identify what is the market? How big is the market? Who are the customers in the market? How do these customers differ from those in the SBEA and C-PACE programs? The market research completed by the EEB – the C-11 market research survey – should inform this process.
2. **Develop the Product** – determine an approach that uses a limited amount of ratepayer capital to attract multiples of low-cost and long-term private capital. Develop the box or identify the parameters that are acceptable to the EEB and the Green Bank that will be required of private capital providers to lend into this market.
3. **Attract the Capital** – put public capital to work more efficiently and effectively attract private capital investment in energy efficiency and renewable energy deployment. CEFIA has targeted \$5 million of Green Connecticut Loan Guaranty Fund bond funding in its FY15 budget to support this effort.
4. **Implement the Program** – once lower-cost private capital has been attracted, implement the program with contractors and consumers.

Through the Green Bank Comprehensive Plan, we have allocated \$50,000 in funds to support the development and implementation of this product – that is separate from the funds that CEEF should provide to this effort as well.

With regards to the team working on this product, here are the points of contact we suggest:

- **Connecticut Green Bank** – Jessica Bailey and Bert Hunter;
- **Companies** – Tim Simmonds (CL&P), Pat McDonnell (UI), and Roy Haller (UI); and
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The assessment of the market and subsequent development of the market will take place through the regular meetings of the Connecticut Green Bank and the Companies.

Priority #2

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The Green Bank would ask the EEB and the Companies to continue to work together in the following areas:

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2. To develop a comprehensive, statewide list of multifamily resources for the market (e.g. financing, incentives, programs, technical assistance, and infrastructure support); and
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Senate Bill No. 1243

Public Act No. 11-80

AN ACT CONCERNING THE ESTABLISHMENT OF THE DEPARTMENT OF ENERGY AND ENVIRONMENTAL PROTECTION AND PLANNING FOR CONNECTICUT'S ENERGY FUTURE.

Be it enacted by the Senate and House of Representatives in General Assembly convened:

Sec. 124. Section 16a-40f of the general statutes is repealed and the following is substituted in lieu thereof (*Effective July 1, 2011*):

(a) For the purposes of this section:

(1) "Participating qualified nonprofit organizations" means individuals, nonprofit organizations and small businesses;

(2) "Small business" means a business entity employing not more than fifty full-time employees;

(3) "Eligible energy conservation project" means an energy conservation project meeting the criteria identified, as provided in subsection (d) of this section; [and]

(4) "Participating lending institution" means any bank, trust company, savings bank, savings and loan association or credit union, whether chartered by the United States of America or this state, or any insurance company authorized to do business in this state that participates in the Green Connecticut Loan Guaranty Fund program; [.] and

(5) "Authority" means the Clean Energy Finance and Investment Authority.

(b) The [Connecticut Health and Educational Facilities Authority] authority shall establish the Green Connecticut Loan Guaranty Fund program from the proceeds of the bonds issued pursuant to section 16a-40d for the purpose of guaranteeing loans made by participating lending institutions to a participating qualified nonprofit organization for eligible energy conservation projects, including for two or more joint eligible energy conservation projects. In carrying out the purposes of this section, the authority shall have and may exercise the powers provided in section 10a-180.

(c) Participating qualified nonprofit organizations may borrow money from a participating lending institution for any energy conservation project for which the authority provides

guaranties pursuant to this section. In connection with the provision of such a guaranty by the [Connecticut Health and Educational Facilities Authority] authority, (1) a participating qualified nonprofit organization shall enter into any loan or other agreement and make such covenants, representations and indemnities as a participating lending institution deems necessary or appropriate; and (2) a participating lending institution shall enter into a guaranty agreement with the authority, pursuant to which the authority has agreed to provide a first loss guaranty of an agreed percentage of the original principal amount of loans for eligible energy conservation projects.

(d) In consultation with the [Office of Policy and Management] Energy Conservation Management Board and the Connecticut Health and Educational Facilities Authority, the Clean Energy Finance and Investment Authority shall identify types of projects that qualify as eligible energy conservation projects, including, but not limited to, the purchase and installation of insulation, alternative energy devices, energy conservation materials, replacement furnaces and boilers, and technologically advanced energy-conserving equipment. The authority, in consultation with said [office] entities, shall establish priorities for financing eligible energy conservation projects based on need and quality determinants. The authority shall adopt procedures, in accordance with the provisions of section 1-121, to implement the provisions of this section.

(e) The authority shall, in consultation with the Energy Conservation Management Board and the Connecticut Health and Educational Facilities Authority, (1) ensure that the program established pursuant to this section integrates with existing state energy efficiency and renewable energy programs; (2) establish performance targets for the program to ensure that the program in coordination with existing financing programs will enable efficiency improvements for at least fifteen per cent of single family homes in the state by 2020; (3) enter into agreements with participating lending institutions that provide loan origination services; and (4) exercise such other powers as are necessary for the proper administration of the program.

(f) Financial assistance provided by participating lending institutions pursuant to this section shall be subject to the following terms:

(1) Eligible energy conservation projects shall meet cost-effectiveness standards adopted by the authority in consultation with the Energy Conservation Management Board and the Connecticut Health and Educational Facilities Authority.

(2) Loans shall be at interest rates determined by the authority to be no higher than necessary to result in the participation of participating lending institutions in the program.

(3) The amount of a fee paid for an energy audit provided pursuant to this program may be added to the amount of a loan to finance the cost of an eligible project conducted in response to such energy audit. In such cases, the amount of the fee may be reimbursed from the fund to the borrower.

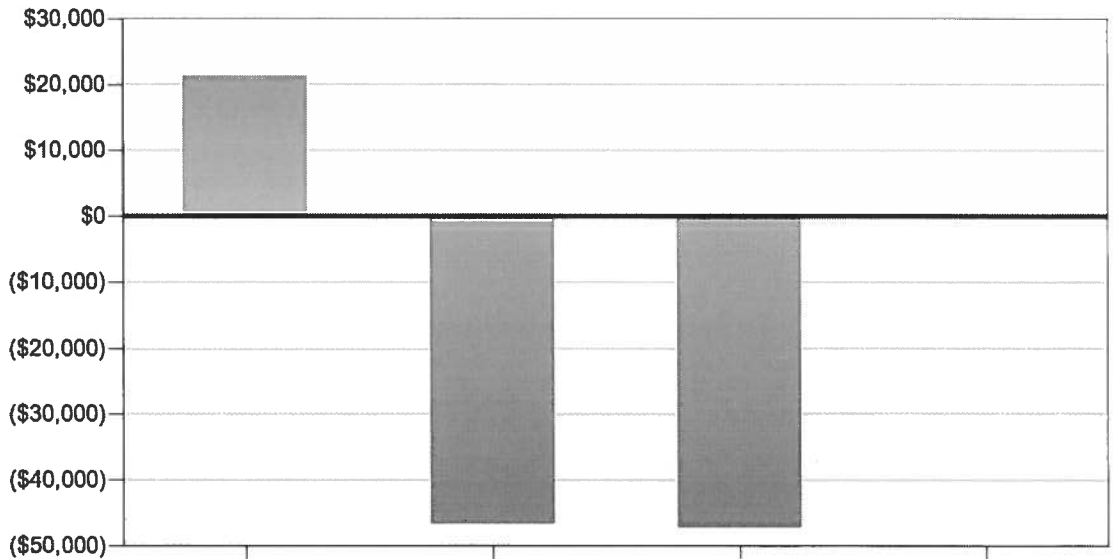
Scenario Comparison

The table below displays a summary comparison for the selected scenarios.

	Recommended		Alternatives	
	PACE 100% Financed 19 yrs @ 5.9%	Bank Loan 85% Financed 6 yrs @ 5%	Self-Funded	
Project Costs				
Net Installed Cost	\$124,694	\$124,694	\$124,694	
Percent Financed	100.0%	85.0%	0.0%	
Owner Out-of-Pocket Costs	\$0	\$18,704	\$124,694	
Finance Terms				
Interest Rate	5.90%	5.00%	N/A	
Finance Term	228 mo.	72 mo.	N/A	
Annual Debt Service	\$11,257	\$21,098	N/A	
Finance & Insurance Costs				
Closing Costs	\$3,741	\$3,180	\$0	
Energy Savings Insurance Premium	\$0	\$0	\$0	
Amount Financed	\$128,434	\$109,169	N/A	
Key Financial Metrics				
Average Annual Savings	\$5,683	(\$5,443)	\$15,504	
Net Present Value (NPV)	\$60,296	(\$46,539)	(\$61,279)	
Savings to Investment Ratio (SIR)	1.50	0.74	N/A	

Projected Cash Flows

Projected cash flows over the initial 5 years. (including initial investment)



Total Cash Flows (5 years)
Time to Positive Cash Flow *

	\$21,233	(\$46,676)	(\$47,176)
	Immediate	N/A	N/A

* Indicates the first time during the term at which the projected cash flows are positive.

STATE OF CONNECTICUT

PUBLIC UTILITIES REGULATORY AUTHORITY
TEN FRANKLIN SQUARE
NEW BRITAIN, CT 06051

**DOCKET NO. 14-05-40 JOINT APPLICATION OF CLEAN ENERGY FINANCE
AND INVESTMENT AUTHORITY AND ENERGY
EFFICIENCY BOARD FOR REVIEW AND APPROVAL OF
THE ON-BILL REPAYMENT PROGRAM**

August 27, 2014

DECISION

In this Decision, the Public Utilities Regulatory Authority (Authority or PURA) approves the on-bill loan repayment plan described in the July 24, 2014 Amended Application filed by the Connecticut Green Bank (Green Bank) and the Connecticut Energy Efficiency Board (CEEB). The General Statutes of Connecticut (Conn. Gen. Stat. Sec.) §16a-40m(b) provides that:

On or before April 1, 2014, the Energy Conservation Management Board and the Clean Energy Finance and Investment Authority, in consultation with the electric distribution companies and gas companies, shall establish a comprehensive residential clean energy on-bill repayment program financed by third-party private capital managed by the Clean Energy Finance and Investment Authority.

The Authority initiated this uncontested proceeding to review the Green Bank and CEEB application dated May 23, 2014. Green Bank, the CEEB, the Office of Consumer Counsel (OCC), the Commissioner of the Department of Energy and Environmental Protection (DEEP), The Connecticut Light and Power Company (CL&P) and The United Illuminating Company (UI) were designated as participants in this proceeding. On July 24, 2014, Green Bank and the CEEB filed an amended application seeking limited approval to implement the pay on bill element contained in Conn. Gen. Stat. Sec. § 16a-40m(b)(11) (Amended Application). No hearing is required by statute and no hearing was held. The Authority issued a Draft Decision on August 18, 2014. CL&P, UI, OCC and Green Bank filed Written Exceptions on August 22, 2014.

The Authority's scope of review is limited under Conn. Gen. Stat. §16a-40m(c) to reviewing three elements of the on-bill loan repayment program contained in sections

(b)(9), (b)(10) and (b)(11) of Conn. Gen. Stat. §16a-40m.¹ The Amended Application only places review of Conn. Gen. Stat. 16a-40m(b)(11) before the Authority.²

Conn. Gen. Stat. 16a-40m(b)(11) states one feature of on-bill repayment must be “[t]o provide that the on-bill repayment billing and collection services shall be available without regard to whether the energy or fuel delivered by the utility is the customer’s primary energy source.” With regard to Conn. Gen. Stat. 16a-40m(b)(11), the Amended Application describes the proposal as follows. Smart-E loans can be used to finance efficiency for all primary heating fuels, including oil and propane. Qualifying customers must: (i) meet the program and lender credit underwriting criteria; (ii) be proposing to improve owner-occupied, 1-4 unit residential buildings; and (iii) use a program-eligible contractor. The Green Bank and the CEEB proposal is to offer Smart-E on-bill repayment as an option in the Smart-E loan program that a customer may elect to participate in to repay the loan on their electric bill as opposed to directly with the lender. Amended Application, pp. 2 and 3. Green Bank and the CEEB propose that on-bill repayment be implemented by the electric distribution companies (EDCs), CL&P and UI. Specifically, the proposal calls for CL&P and UI to provide an "EnergizeCT Loan" line item on the monthly electric billing customers for their loan installment charges. A message area on the bill will provide customers with a telephone number to contact the loan servicer's customer service call center (as opposed to the EDCs) for Smart-E loan support. Id., p. 3. In the event that a customer fails to repay the Smart-E loan through the on-bill repayment program when due, after a seven-day grace period, the customer's Smart-E loan would be removed from the EDC on-bill repayment program and returned to direct billing by the lender. Id., p. 5. Any arrearage consequences, such as late payment charges calculated on unpaid Smart-E loan installments, will be assessed and billed separately after the account is removed from the on-bill repayment option and billed directly by the loan servicer. Id.

The Amended Application does not seek any ruling on cost recovery or rate treatment. In terms of costs, the EDCs will not extend credit to customers participating in the on-bill repayment program but will incur costs in the administering the program. Each EDC anticipates incurring less than \$100,000 for initial set-up to modify their

¹ Conn. Gen. Stat. 16a-40m(b)(9), (b)(10) and (b)(11) provide, in relevant part, that an on-bill loan repayment program shall have the following features:

- (b)(9) To establish program guidelines to address the ramifications of on-bill repayment and the risks associated with disconnection of service of low-income and hardship customers;
- (b)(10) To provide the assignment of repayment obligations to subsequent owners of the dwelling unit upon the development by the Energy Conservation Management Board and the Clean Energy Finance and Investment Authority of timely written notice guidelines to subsequent owners, except on-bill repayment amounts may not be directly charged to a tenant of a dwelling unit by a utility company pursuant to section 16-262e or a receiver pursuant to sections 16-262f, 16-262t, 47a-14h and 47a-56a to 47a-56k, inclusive; and
- (b)(11) To provide that the on-bill repayment billing and collection services shall be available without regard to whether the energy or fuel delivered by the utility is the customer’s primary energy source.

² At this time, Green Bank and CEEB are not requesting approval of the elements in sections (b)(9) (concerning disconnection for non-payment) or (b)(10) (concerning transferability of loan repayment obligation). Green Bank and CEEB state that these two elements need to be further developed and that Authority approval will be sought at a later date, if they seek to implement those elements as part of the on-bill repayment program.

billing systems to accommodate the on-bill repayment program features and then annual costs thereafter are anticipated to be about \$50,000 or slightly less for each company. Green Bank and the CEEB state that CL&P and UI may seek to recover prudently incurred costs and lost revenues resulting from implementing Conn. Gen. Stat. §16a-40m pursuant to Conn. Gen. Stat. §16-243p(a). Green Bank and the CEEB further state that when the EDCs seek rate recovery, the Authority is required to conduct a proceeding to determine the appropriate mechanism to obtain such recovery in a timely manner which may be one or more of the following: (1) approval of rates; (2) the energy adjustment clause; or (3) the federally mandated congestion charges. Amended Application, pp. 5 and 6. The CL&P and UI request that the Authority determine in this proceeding that the EDCs may recover program costs through the non-bypassable federally mandated congestion charges (FMCC). CL&P Written Comments dated July 24, 2014, p. 2 and UI Written Comments date August 12, 2014, p. 2.

The Authority reviewed the Amended Application pursuant to Conn. Gen. Stat. §16a-40m(c). The Authority hereby approves implementation of the on-bill repayment program with respect to Conn. Gen. Stat. §16a-40m(b)(11). The Authority's approval is limited to permitting the on-bill loan repayment program through implementation of a line item on the EDC's customer bill to collect the repayment of Smart-E Loans owed by companies' customers. The EDCs are directed to assist in implementing and then to administer on-bill loan repayment as described in the Amended Application. The Authority did not review and approve any of the Smart-E Loan program content or financing terms and conditions that may have been provided in the document entitled "CEFIA/EEB On-Bill Repayment Program Plan" or other parts of the original application filed with the Authority on May 29, 2014. The Smart-E Loans program content and financing terms and conditions are outside the scope of the Authority's review authority under Conn. Gen. Stat. §16a-40m(c) to review issues related to Conn. Gen. Stat. §16a-40m(b)(9), (b)(10), and (b)(11). The Smart-E Loans program content and financing terms and conditions falls under the auspices of the ECMB and CEFIA pursuant to Conn. Gen. Stat. §16a-40m(b).

On the issue of EDC recovery of costs associated with the on-bill loan payment program, Conn. Gen. Stat. §16-243p(a) provides that

An electric distribution company may recover its costs and investments that have been prudently incurred as well as its revenues lost resulting from the provisions of sections 16-1, 16-19ff, 16-50k, 16-50x, 16-243h to 16-243q, inclusive, 16-244c, 16-244e, 16-244u, 16-245d, 16-245m, 16-245n, 16-245z and 16-262i and section 21 of public act 05-1 of the June special session*. The Public Utilities Regulatory Authority shall, after a hearing held pursuant to the provisions of chapter 54, determine the appropriate mechanism to obtain such recovery in a timely manner which mechanism may be one or more of the following: (1) Approval of rates as provided in sections 16-19 and 16-19e; (2) the energy adjustment clause as provided in section 16-19b; or (3) the federally mandated congestion charges, as defined in section 16-1.

The Authority recognizes that Conn. Gen. Stat. §16-243p(a) ensures cost recovery of the EDCs' on-bill loan repayment administrative costs. The Authority requests that the Green Bank and the CEEB, in consultation with the EDCs and the OCC, explore funding the EDCs on-bill repayment program costs through sources other than increases to EDC rates, such as the Energy Efficiency Fund and the Clean Energy Fund. Until the next rate case for each EDC, the Authority directs the EDCs to seek cost recovery for any on-bill loan repayment program costs, which are not recovered through other funding sources, through the FMCC.³ As part of any request to recover program costs through the FMCC, the EDCs must submit information demonstrating that the EDCs requested funding of the program costs from the administrators of the Energy Efficiency Fund and the Clean Energy Fund and those administrators refused to fund the on-bill loan repayment program costs which the EDC seeks to recover through the FMCC.

³ The Authority will comply with contested case requirement of Conn. Gen. Stat. §16-243p(a) in each EDCs' next rate case. In the rate cases, the Authority will review and determine whether the appropriate mechanism to obtain such recovery in a timely manner is through: (1) Approval of rates as provided in sections 16-19 and 16-19e; (2) the energy adjustment clause as provided in section 16-19b; or (3) the federally mandated congestion charges, as defined in section 16-1. In the interim until CL&P and UI's next rate cases, for the purposes of allowing the on-bill repayment program to be implemented without unnecessary additional cost and delay, the Authority recognizes that cost recovery is statutorily permitted by this provision and approves cost recovery as described above through the FMCC. The FMCC is reviewed at least annually in an administrative proceeding pursuant to Conn. Gen. Stat. 16-19b. The Authority finds that it would be an absurd interpretation and implementation of the legislative intent behind Conn. Gen. Stat. §16-243p(a) to interpret this provision to require the Authority to conduct a full contested case on the single issue of determining which mechanism the EDCs must use to recover their forecasted annual administrative costs of approximately \$50,000. The administrative costs of conducting a single issue contested case proceeding taking into account labor costs alone for the Authority, Green Bank, UI, CL&P and OCC would exceed the EDCs estimated \$50,000 annual administrative costs of on-bill loan repayment program. Based on this analysis, the Authority will defer the contested case review of this issue and examine the issue as one piece of each EDCs overall future rate case.

**DOCKET NO. 14-05-40 JOINT APPLICATION OF CLEAN ENERGY FINANCE
AND INVESTMENT AUTHORITY AND ENERGY
EFFICIENCY BOARD FOR REVIEW AND APPROVAL OF
THE ON-BILL REPAYMENT PROGRAM**

This Decision is adopted by the following Commissioners:

Michael A. Caron

John W. Betkoski, III

Arthur H. House

CERTIFICATE OF SERVICE

The foregoing is a true and correct copy of the Decision issued by the Public Utilities Regulatory Authority, State of Connecticut, and was forwarded by Certified Mail to all parties of record in this proceeding on the date indicated.



Nicholas E. Neeley
Acting Executive Secretary
Public Utilities Regulatory Authority

August 27, 2014

Date

Connecticut Green Bank

Comprehensive Plan

Fiscal Years 2015 and 2016

July 18, 2014

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Executive Summary

In June of 2011, in nearly a unanimous bipartisan manner, the Governor and the Connecticut General Assembly set clean energy policy in a new course in our state.¹ A major component of that policy was the creation of the nation's first "green bank" – the Clean Energy Finance and Investment Authority (CEFIA), recently renamed the Connecticut Green Bank (the Green Bank).² Over the past couple of years, this quasi-public organization has been transformed from its predecessor, who invested over 80 percent of its resources in grants, rebates and subsidies to build a clean energy market in our state, to a new entity that now invests over 80 percent of its resources in loans, leases and credit enhancements to grow the clean energy market in our state. The Connecticut Green Bank has become a model for other states, as well as the federal government,³ that are seeking to use limited public resources to attract private capital investment in their clean energy economies in order to make clean energy more accessible and affordable to consumers.

The focus of the Green Bank is to attract and deploy capital to fill the investment gap needed to support the successful implementation of the state's clean energy policy goals. To that end, the organization has established a new vision:

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

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.⁴ The emergence of "Cli-Fi" (or climate finance) in the recent Intergovernmental Panel on Climate Change (IPCC) report,⁵ acknowledges the scale of investment and finance needed to transition to a global low-carbon economy at \$360 billion a year in order to stay within the two-degree Celsius safety zone. Although we know that the levels of investment necessary to achieve our national and global priorities are high, and that the repercussions for not addressing them can indeed be felt locally, Connecticut is doing its part to attract the billions of dollars necessary to achieve its ambitious clean energy policy objectives, which will result in a reduction of greenhouse gas emissions and the creation of jobs. From the \$1.5 billion necessary to convert 200,000 households from oil to natural gas and the \$1.5 billion of investment required to deploy rooftop solar photovoltaic (PV) systems on the roofs of 150,000 households, to the \$3 billion needed to reduce the energy consumption of our

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 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".

³ In the 113th Congress, H.R. 4522 was released in the U.S. House of Representatives and S. 2271 in the U.S. Senate to establish a national green bank to assist in the financing of qualified clean energy projects and qualified energy efficiency projects.

⁴ 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.
<http://dx.doi.org/10.1787/5k3xr8k6jb0n-en>

⁵ *Climate Change 2014: Mitigation of Climate Change* by the IPCC in Chapter 16 "Cross-Cutting Investment and Finance Issues" (April 12, 2014).

commercial and industrial property owners and over \$500 million investment to support the state government’s “Lead by Example” efforts to reduce energy consumption by 20 percent by 2018, the level of investment is large and will require a smarter and more efficient use of scarce public resources to attract multiples of private capital investment in our clean energy economy.

President Barack 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.”⁶

Attracting low cost and long-term private capital will make clean energy more accessible and affordable to consumers, resulting in greater and accelerated deployment. More deployment of clean energy at a quicker pace will help reduce greenhouse gas emissions and create jobs. The contents of this Comprehensive Plan for the Green Bank demonstrate how we plan on supporting our mission and the public policy objective of delivering consumers cheaper, cleaner and more reliable sources of energy while creating jobs and supporting local economic development.

As you will read, the Green Bank is capitalized by several public sources, including a system benefit charge created during electric restructuring and carbon allowance proceeds through the Regional Greenhouse Gas Initiative (RGGI). The legislature also provided it with other tools, including bonding and access to bond funds – a Special Capital Reserve Fund, Green Loan Guaranty Fund, and Renewable Energy and Efficient Energy Finance Account – that can be accessed to support the mission of the Green Bank. As part of the process for producing this Comprehensive Plan, an extensive review of current and historical public policy on clean energy in statute was conducted – which resulted in the discovery of Connecticut’s first clean energy policy passed in 1978 that can be applied to the current and future market for clean energy in our state. The results of that public policy review are included in an accompanying memo. The Green Bank will leverage a growing statewide energy brand of Energize Connecticut and manage cutting edge online and on-the-ground marketing strategies like Solarize and Energize to provide consumers with easy access to affordable capital for clean energy. By attracting and deploying private capital at 5, 10, or 20 to 1 of public funds, through public-private partnerships we can support the successful implementation of Connecticut’s clean energy policy goals that are required through statute (i.e. Public Act 11-80), regulation (i.e. Conservation and Load Management Plan), and planning (i.e. Comprehensive Energy Strategy and Integrated Resources Plan). Providing easier access to low cost and long-term private capital will make clean energy more affordable and accessible to consumers.

The Comprehensive Plan is structured around four consumer sectors that outline our approach, including:

- Residential Sector – single and multifamily properties
- Commercial and Industrial Sector

⁶ President Barrack Obama in a speech on American Energy on May 9, 2014.

- Institutional Sector – state, municipal, universities, schools, and hospital properties
- Infrastructure Sector – grid-tied projects, as well as statutorily required programs (i.e. Residential Solar Investment Program, Anaerobic Digester Pilot Program, etc.)

Within each sector there is a review of the regulatory and planning policies, an estimate of the total available market (TAM) and serviceable addressable market (SAM), product and program overviews, fiscal year 2015 targets (including number of projects, capital deployed, clean energy deployed, and energy generated and saved), benchmarks, and key performance indicators, and the objective function for projects within the sector.

The reader will notice several other important strategic initiatives that require coordination between the sectors as well as with outside partners, including, but not limited to the SunShot initiative to reduce “soft costs” from rooftop solar PV, a developing micro grid initiative, on bill repayment for residential customers, the development of several commercial sector financing products with the Connecticut Energy Efficiency Fund, and a multifamily and affordable housing portfolio of programs.

The Comprehensive Plan concludes with the budget reviewed and approved by the Board of Directors of the Connecticut Green Bank for Fiscal Year 2015. The budget outlines the revenues as well as the operations and program expenses necessary to implement the plan. The Comprehensive Plan will guide the decisions made by the Board of Directors and staff of the Connecticut Green Bank to meet its mission and is the formal document required by law that informs and directs future decisions of the organization.

Organization Overview

The Connecticut Green Bank (“the Green Bank”)⁷ 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 Bank leverages public and private funds to drive investment and scale-up clean energy deployment in Connecticut.

The Connecticut Green Bank’s purposes are:

- Developing 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;
- Supporting 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
- Stimulating 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 its board approved [Resolution of Purposes](#).

Vision

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

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.

Goals

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

1. To attract and deploy capital to finance the clean energy⁸ goals for Connecticut, including:

⁷ 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.

⁸ Public Act 11-80 defines "clean energy" broadly and includes familiar renewable energy sources such as solar photovoltaic, solar thermal, geothermal, wind and low-impact hydroelectric energy, but also includes fuel cells, energy derived from anaerobic digestion (AD), combined heat and power (CHP) systems, infrastructure for alternative fuels for transportation and financing energy efficiency projects.

- a. Help Connecticut in becoming the most energy efficient state in the nation;
 - b. Scale-up the deployment of renewable energy in Connecticut; and
 - c. Provide support for the infrastructure needed to lead the clean energy economy.
2. To develop and implement strategies that bring down the cost of clean energy in order to make it more accessible and affordable to consumers.
3. To reduce reliance on grants, rebates, and other subsidies and move towards innovative low-cost financing of clean energy deployment.

These goals support the implementation of Connecticut’s clean energy policies be they statutory (i.e., Public Act 11-80, Public Act 13-298), planning (i.e., Comprehensive Energy Strategy, Integrated Resources Plan), or regulatory in nature.

Metrics of Success

The following is a breakdown of the key metrics of success for the Connecticut Green Bank:

- **Objective Function** – maximizing the amount of clean energy generated (or energy saved) per dollar of ratepayer funds at risk;⁹
- **Attract Capital** – there are several measures used, including the total amount of public and private investment in clean energy; amount of private capital or non-ratepayer fund investment in Connecticut’s clean energy economy; amount of public capital or ratepayer fund investment in Connecticut’s clean energy economy; leverage ratio of the amount of public versus private investment in clean energy; the ratio of the amount of public funds invested in the form of subsidies (e.g., grants), credit enhancements (e.g., loss reserves), and financing (e.g., loans and leases); and credit quality of borrowers (e.g., FICO credit scores and debt-to-income ratios).
- **Deploy Capital** – there are several measures used, including the total amount of clean energy deployed (e.g., kilowatt (kW), kW peak, including summer and winter); amount of clean energy generated and/or saved (e.g., kilowatt-hour (kWh) and million British thermal units (MMBtu)) over a year and estimated lifetime of a project; savings to investment ratio; and customer acquisition costs or the amount of marketing expenses it costs to acquire a customer to install a project as well as per energy unit generated or saved over its lifetime.
- **Green Bank** – there are several metrics of success that are important for the green bank operations, including total, distribution, diversity, and growth of current and non-current assets,

⁹ Objective Function Protocol – Version 1.0 – http://www.ctcleanenergy.com/documents/5a_Objective_Function_Protocol_Version_1.0_Memo_061314.pdf

strength and management of the balance sheet, and sources, amount, and growth of revenues and minimization of expenses, including grants.

- **Public Benefit** – there are several measures used, including estimate of the direct, indirect and induced jobs created as a result of the total capital invested in clean energy deployment;¹⁰ an estimate of the amount of greenhouse gas emissions like carbon dioxide and methane, other air emissions like sulfur dioxide and nitrous oxides, and standard equivalencies (e.g., cars off the road and acres of trees) reduced over the life of a project.

These key metrics of success for the Green Bank are estimated for each of its programs and investments as well as tracked using established measurement and verification protocols, independently audited, and reported annually through a Comprehensive Annual Financial Review (CAFR).

Governance

Pursuant to Section 16-245n of the General Statutes of Connecticut, the powers of the Connecticut 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	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	Operation Fuel
Investment Fund Management	Appointed	Yes	Norma Glover	NJG Associates
Environmental Organization	Appointed	Yes	Matthew Ranelli ¹⁵	Shipman & Goodwin
Finance or Deployment	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 Harranty	IAM Connecticut
R&D or Manufacturing	Appointed	Yes	Mun Choi	University of Connecticut
President of the Green Bank	Ex Officio	No	Bryan Garcia	Connecticut Green Bank
Board of Connecticut Innovations ¹⁷	Ex Officio	No	(unfilled)	(unfilled)

¹⁰ The Connecticut Department of Economic Development (DECD) has approved the jobs estimates calculations as a result of the Green Bank financed clean energy projects – [click here](#).

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.

The Board of Directors is governed through the statute, as well as an [Ethics Statement](#) and [Ethical Conduct Policy](#), [Resolutions of Purposes](#), [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.^{18,19}

Organizational Structure

The organizational structure of the Connecticut Green Bank is comprised of four parts:

- **Corporate Division** – this division is responsible for providing support services to the investment and program divisions, including accounting, legal, marketing, and policy support to help them meet their goals.
- **Investment Division** – this division is responsible for *attracting capital* to finance the clean energy goals for Connecticut.
- **Program Division** – this division is responsible for *deploying capital* to meet the clean energy goals for Connecticut. There are four (4) program divisions –Residential (including multifamily), Commercial & Industrial, Institutional (e.g., state/municipal, universities, schools, hospitals (“SMUSH”)) and Statutory and Infrastructure.
- **Administrative Division** – through a memorandum of understanding (MOU) between Connecticut Innovations (CI) and the Connecticut Green Bank, various administrative services are provided to the Green Bank including human resources and information technology.

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, 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.

¹⁸ <http://ctcleanenergy.com/AboutCEFIA/CEFIABoardMeetings/tabid/604/Default.aspx>

¹⁹ <http://ctcleanenergy.com/AboutCEFIA/CEFIACommitteeMeetings/tabid/603/Default.aspx>

Public Policy

The Connecticut 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:²⁰

- **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 (Clean Energy Fund or CEF) to be administered by Connecticut Innovations (CI) and later on by the Connecticut 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 CEF 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 CEF on the actions to promote renewable energy sources, modifies the definition of clean energy for the CEF, and creates a “Municipal Renewable Energy and Efficient Energy Grant Account” for disaster relief centers and high schools to be run by CI through the CEF in consultation with the Department of Public Utility Control, Department of Education, and Department of Emergency Management and Homeland Security.²¹ The act also addresses energy improvement districts,

²⁰ Public Policy Review – Comprehensive Plan FY 2015 through FY 2016 Memo – http://www.ctcleanenergy.com/documents/5a_Public_Policy_Review_Comprehensive_Plan_Memo_061314.pdf

²¹ The bonds were authorized in Sec. 91 of PA 07-242 and codified in CGS Sec. 16-245bb. Sec. 30 of PA 10-44 decreased the authorization from \$50,000,000 to \$18,000,000, effective July 1, 2010.

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.

interconnection standards, property, sales, and use tax exemptions for clean energy, a definition for weatherization, and modifies the Class I and III RPS.

- **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 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 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, 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, and designates the Green Bank to oversee a \$20 million Green Loan Guaranty Fund, capitalized state bond funds, in consultation with the Energy Conservation Management Board (ECMB) and Connecticut Health and Educational Facilities Authority (CHEFA).
- **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 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 12-189** – “An Act Authorizing and Adjusting Bonds of the State for Capital Improvements, Transportation, and Other Purposes,” changes the “Municipal Renewable Energy and Efficient Energy Grant Account” to the “Renewable Energy and Efficient Energy Finance Account” and redirects the use of bond proceeds from CI to the Green Bank who must work in consultation with DEEP, DECD, and the State Treasurer.²³ The \$18 million in bond funds can be used for financial assistance for energy efficient generation with priority given to disaster relief centers and high schools as well as projects that use major system components manufactured or assembled in Connecticut.
- **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 pilots for natural gas conversions and energy efficiency, inclusion of thermal energy and electric storage technologies in the “Renewable Energy and Efficient Energy Finance Account” reinforcing the importance of financing towards the micro grid policy, 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 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.

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 Bank.²⁴

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 Comprehensive Energy Strategy (CES) and the 2012 Integrated Resources Plan (IRP) developed by DEEP’s

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

²³ Sec. 36 of PA 12-189 changed the administering entity in CGS Sec. 16-245bb from Connecticut Innovations, Incorporated, to Clean Energy Finance and Investment Authority and added investments, loans and other forms of financial assistance to allowable uses of proceeds, effective July 1, 2012.

²⁴ Special thanks to Kevin McCarthy and his team at the Office of Legislative Research for their support in reviewing this section.

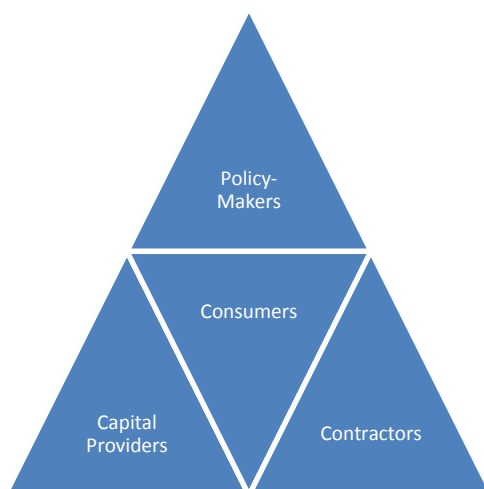
approval of the Electric and Natural Gas Conservation and Load Management Plan (C&LM Plan), and their impact on the programs of the Green Bank, are highlighted within each of the four programmatic sectors below. The Green Bank also interplays with the administrators of the Conservation and Load Management Fund (i.e. CL&P and UI) 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.

Stakeholders

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

- Consumers
- Capital Providers
- Contractors
- Policy-Makers

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



Consumers

A key Green Bank goal is to eliminate the financial barriers to energy efficiency upgrades and clean energy investment as well as reduce consumer reliance on grants, rebates, and other subsidies by, facilitating the transition to innovative low-cost financing of clean energy deployment using private capital. Consumers of all types (i.e., homeowners, renters, businesses, not-for-profits) seek cheaper, cleaner and more reliable sources of energy. Contractors must be able to provide consumers with comprehensive and “deeper” energy solutions while capital providers must offer consumers immediate cash flow positive returns by financing their investments. The Green Bank plays an important role in bringing consumers and contractors together by providing them with easy access to affordable capital so that they can implement energy solutions for their homes, businesses, or institutions.

Capital Providers

As a key goal is to attract capital to finance the clean energy goals for Connecticut and to develop and implement strategies that bring down the costs of clean energy (including lower interest rates, extended

maturities, etc.) to make it more accessible and affordable to consumers, working in partnership 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 and crowd-sourced investors that seek to finance and 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

As a key goal is to deploy capital to finance the clean energy goals for Connecticut and to develop and implement strategies that bring down the costs of clean energy (i.e., installed costs) to make it more accessible and affordable to consumers, working in partnership with qualified and certified contractors is also vital to the success of the green bank model. 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, and cost-effective clean energy and energy efficiency solutions and financing options for consumers.

Policy-Makers

The Connecticut 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. It is the mission of the Green Bank 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. Through its Board of Directors, the Green Bank has established a Comprehensive Plan that seeks to implement the objectives of policy-makers to deploy more clean energy at a faster pace while more efficiently managing public funds and attracting significantly more private capital. As the implementer of the C&LM Plan, the Energy Efficiency Board (EEB) and EDCs are important stakeholders for the Green Bank as well, including through the Joint EEB-Connecticut Green Bank Committee.

Financing

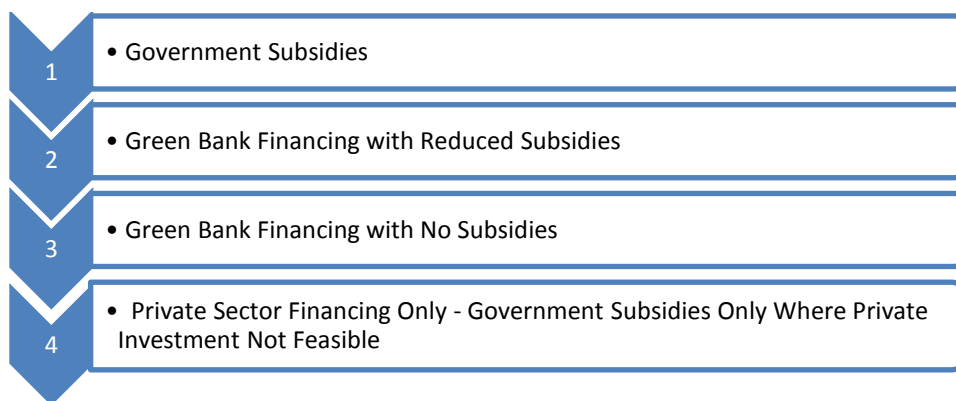
A major focus of the Green Bank is to attract private capital to finance the clean energy goals for Connecticut and to ensure that consumers and contractors are able to access cleaner, cheaper and more reliable sources of energy. Connecticut energy policy has ambitious goals and targets across all sectors. Goals such as:

- Enable energy efficiency improvements for at least 15% of single family homes in the state by 2020 – approximately 150,000 homes at \$10,000 to achieve 20% energy reduction would cost homeowners *\$1.5 billion* (PA 11-80, Sec. 124). Providing homeowners that use heating oil and can't access the natural gas expansion with access to low cost and long-term private capital to make their homes more energy efficient is important as well.
- Provide households and businesses with access to low cost and long-term private capital to help them convert from oil to natural gas for at least 200,000 households and 80,000 businesses in the state on-main in 10 years – at \$7,500 for an average cost of a household conversion with equipment yields an estimated cost to homeowners of *\$1.5 billion* (Natural Gas Expansion Plan). Assist households and businesses that convert to natural gas to also go deeper on energy efficiency is important as well.
- Realize the estimated potential market of over 150,000 households to install solar photovoltaic (PV) in the state – at an average cost of \$27,000 per system would require an investment of *\$4.0 billion* (PA 11-80, Sec. 106, Residential Solar Investment Program)
- Reduce energy use in State government buildings (which collectively spend approximately \$200 million annually on energy) at least 20% from 2010 levels by January 1, 2018, would require an investment of at least *\$500 million* (PA 11-80, Sec. 118)
- Realize opportunities for energy efficiency in the commercial real estate sector, estimated by HR&A to be approximately 400 million SF state-wide, could easily require *\$3 billion* (PA 12-2, C-PACE enabling legislation)

Meeting these goals 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, which will come from 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 consumers will pursue deeper measures. Recognizing that ratepayer resources are limited, achieving greater uptake of measures by providing consumers 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 consumers, resulting in greater and accelerated deployment. Federal funding support, while always welcome, has been reduced dramatically and the policy dysfunction of Washington would suggest that states not have high expectations for more funding in the years immediately ahead.

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 more than \$200 million in private investment from local, regional and national sources. This model offers Connecticut and other states the most promise to source the capital required to achieve ambitious policy objectives and to transition (ultimately) to a sustainable clean energy marketplace driven solely by private sector financing (see Figure 2).

Figure 2. Purpose of Green Bank Financing - Towards a Sustainable Clean Energy Marketplace



Acknowledging the importance of attracting more and more private capital to help Connecticut meet its clean energy 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*

Capitalization

The Connecticut Green Bank is capitalized through a number of public – state and federal – sources including ratepayers through a Systems Benefit Charge, greenhouse gas allowance proceeds, and bond and stimulus funds.

Systems Benefit Charge

As its main source of capitalization, the Green Bank receives a 1 mill surcharge called the Clean Energy Fund from customers of Connecticut Light & Power and United Illuminating. 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 nearly \$30 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 22a-174-31(f)(6)(c)(ii), In fiscal year 2015, the Green Bank will receive nearly \$16 million of RGGI funds designated for energy efficiency. It will receive all of the state RGGI funds for renewable energy. In fiscal year 2016, the Green Bank will continue to receive all the RGGI funds designated for renewable energy, but not for energy efficiency under the regulatory structure. The Green Bank uses the carbon allowance proceeds from the nation's first cap and trade program to provide financing for energy improvement projects through the 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) returning the funds back for future reinvestment to lower energy costs and improve the competitiveness of our businesses.

State Bond Funds

There are various sources of state bond funds and security that have been made available to the Green Bank to support its purposes including the ability to issue bonds backed by a special capital reserve fund, loan guarantee funds, and bonding to support renewable energy and efficient energy projects. The Green Bank will begin to plan on accessing such funds and security to support the further growth and development of key programs (e.g., small business, micro grids).

Special Capital Reserve Fund

The Special Capital Reserve Fund (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 – in essence, having a no-cost insurance policy. The Green Bank received \$50 million in SCRF authorization that can be placed on bonds issued for energy efficiency and clean energy programs.

Green Connecticut Loan Guaranty Fund

The Green Connecticut Loan Guaranty Fund provides the Green Bank with access to \$20 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.

Renewable Energy and Efficient Energy Finance Account

The Renewable Energy and Efficient Energy Finance Account of \$18 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.

Connecticut State Treasurer's Office

The Connecticut 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.

Federal Funds

Alongside public funds made available through state channels, the Green Bank has access to or expects to pursue federal funds including stimulus and revolving loan funds 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 for the Green Bank's residential financing programs including the Smart-E Loan, Cozy Home Loan, 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 between energy and water. 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 Guarantee

The U.S. Department of Energy (DOE) has established a \$4 billion renewable energy and efficient energy loan guarantee program to support innovative, renewable energy and energy efficiency projects in the U.S. that reduce, avoid or sequester greenhouse gases. From advanced grid integration and storage projects to waste to energy and efficiency improvements, the program can potentially support a unitary plan for the implementation of important clean energy projects in multiple locations throughout the state including micro grids, food waste to energy, and district heating and cooling. The Green Bank will explore with its partners the potential to access a large federal loan guarantee to develop a unitary plan that advances the energy, environment, and economic development policy objectives of Connecticut.

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 marketplace to finance a diverse array of energy efficiency and clean energy investment across all sectors. Since its formation, the Green Bank has attracted more than \$200 million in private investment from local, regional and national sources. These investments are the quintessential public private partnerships for clean energy finance. Investments such as:

- 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 while creating ~150 direct jobs (i.e., manufacturing, construction, and servicing).
- A unique combination of a tax equity investor, a syndicate of debt providers and the Green Bank to create a \$60 million fund for rooftop solar PV (i.e., residential lease financing for solar PV and solar hot water systems and commercial leases/PPAs for solar PV).
- A \$5 million crowd-funded solar loan program supported by the Green Bank that will ultimately enable ordinary citizens to finance their neighbors' solar PV systems.

- A 2nd loss reserve provided by the Green Bank (using \$2.5 million of ARRA funds) to attract \$30 million of private capital for Smart-E Loans offered by nine local community banks and credit unions offering state-wide coverage. A plan for repayment of these loans on the utility bill was statutorily approved in 2013 and is presently making its way through the appropriate channels for regulatory approval.
- 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 portfolio of commercial, industrial, non-profit, and multifamily projects.

These partnerships with private capital are positive signs that the funds are 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 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 Smart-E loan for homeowners is available at 5-year rates starting at 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% to 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 Comprehensive Energy Strategy that cost more to implement and deliver benefits to the homeowner over somewhat longer payback periods. In these cases, the 10 and 12 year maturities for the Smart-E loan and the 15 year maturity for the 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 up to 20 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 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 "concessional rates" to market rates of return). The Green Bank will also provide other credit enhancements, such as loan 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 used to attract \$50 million in tax equity and debt investment, 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 Comprehensive Energy Strategy.

Marketing

A major focus of the Green Bank is to not only attract capital to finance the clean energy goals for Connecticut, but to also *deploy* capital. Through the statewide brand of Energize Connecticut (or EnergizeCT), consumers and contractors are provided with easy access to incentives and financing. Through the Connecticut Green Bank, more and more private capital is being attracted and deployed in our state to support clean energy. Through various marketing channels including our utility partners, local lenders and contractors, on the ground community efforts, and online, more and more consumers are receiving access to cleaner, cheaper, and more reliable sources of energy. As utilities' customer engagement platforms are developed and implemented in 2015 and 2016, an abundance of data will become available and the Green Bank plans to integrate the data into its programs.

Energize Connecticut

Energize ConnecticutSM 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 they need to make it easy 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 Bank, the state, and the local electric and gas utilities. The Green Bank's market-facing products and programs operate 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

Connecticut Green Bank

In May of 2014 through Public Act 14-94, the Clean Energy Finance and Investment Authority (CEFIA) became the Connecticut Green Bank. As the former name of the organization was thought to be long, confusing, and difficult to pronounce, the new name needs very little explanation, has more resonance, is friendlier and is closer to the mission of the organization.

The Green Bank is guided by its knowledgeable, collaborative, helpful, and solutions-oriented people – its most important asset – by providing contractors and consumers with easy access to affordable private capital. Attracting low cost and long-term private capital will make clean energy more accessible and affordable to consumers, resulting in greater and accelerated deployment.

For more information, go to www.ctcleanenergy.com²⁵

²⁵ The future website of the Connecticut Green Bank is www.connecticutgreenbank.com

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.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., United Illuminating, Connecticut Light & Power, 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. CEFIA will work with CEEF and DEEP to share data to better inform marketing tactics to acquire customers for energy efficiency and renewable energy improvements.

Local Lending Partners

The Green Bank partners with local lenders including credit unions, 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 consumers with easy access to affordable capital. With low interest loans that have long maturities, consumers 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 Comprehensive Energy Strategy – 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,²⁶ Neighbor to Neighbor Energy Challenge, Solarize Connecticut, and Energize Norwich.

²⁶ 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 contributions from the Emily Hall Tremaine Foundation, John Merck Fund, Pew Charitable Trusts, Rockefeller Brothers Fund, Surdna Foundation, and others.

Clean Energy Communities

A joint program of the Green Bank and CEEF, the Clean Energy Communities program provides cities and towns across Connecticut with rewards for advancing the clean energy goals of the state.²⁷ There are three (3) things a city or town must do to become a Clean Energy Community:

1. Make a Commitment – make a municipal pledge to save energy in municipal buildings, voluntarily purchase clean energy, and establish a consumer-friendly marketplace for clean energy (e.g., expedient and low-cost permitting processes).
2. Take Action – fulfill the pledge by helping households, businesses and institutions to save energy and install clean energy through various incentive and financing programs.
3. Receive Rewards – earn points that can be redeemed for clean energy systems and grants for energy-saving projects.

There are currently 95 communities in the state – representing 70 percent of the population – that have joined the program.

Solarize

Solarize ConnecticutSM is a program designed to encourage the adoption of residential solar PV systems by deploying a coordinated education, marketing and outreach effort, combined with a tiered pricing structure that provides increasing savings to homeowners as more people in a community go solar.²⁸ The program, in partnership with SmartPower and the John Merck Fund, is designed based on a proven residential aggregation model to bring down the cost of solar PV when more and more residents sign-up for a pre-selected installer offering. The more residents that sign-up to install solar, the more price decreases for everyone who participates – see Table 2.

Table 2. Consumer Benefits from Solarize Connecticut within the Residential Solar Investment Program (as of May 30, 2014)

Performance Metric	Solarize	Non-Solarize	Total
# of Installations	1,117	2,500	3,617
Installed Capacity (kW)	7,980	17,739	25,719
# of Cities and Towns	31	138	169
Installed Cost (\$/kW _{STC})	\$3,833	\$4,662	\$4,405
Costs Saved (\$)	\$6,615,420	-	\$6,615,420

As a result of Solarize Connecticut, the “soft costs” of customer acquisition are decreased from \$300-\$600 per kilowatt installed to between \$50 to \$100 per kilowatt installed – reducing overall system costs by up to 20 percent or about \$6,000 per project. As a result of the program nine of the “Top 10” cities and towns in installed capacity, watts per capita, and penetration rate for residential solar PV participated in the Solarize program. Through a federal grant from the U.S. Department of Energy through the Solar Energy Evolution Diffusion Study (SEEDS), Yale University, New York University,

²⁷ <http://www.energizect.com/communities/programs/clean-energy-communities>

²⁸ www.solarizect.com

SmartPower and the Green Bank are evaluating the relative performance, cost-effectiveness, scalability, and persistence of the community-based campaign model.²⁹

The Solarize Connecticut model is being adapted beyond the geographic boundaries of cities and towns to include affinity groups such as large employers (e.g., colleges and universities) and membership-based organizations (e.g., faith and environmental groups) through programs like Solarize U.³⁰

Energize

Based on the success and adaptation of the Solarize Connecticut model for creating significant consumer demand for clean energy, the Comprehensive Energy Strategy goal to convert hundreds of thousands of households from heating oil to natural gas, and Section 52 of Public Act 13-298 “An Act Concerning Implementation of Connecticut’s Comprehensive Energy Strategy and Various Revisions to the Energy Statutes,” the Energize campaign was developed by the Green Bank, DEEP, SmartPower, and Norwich Public Utilities (NPU) to support heating oil to natural gas conversions and energy efficiency upgrades in Connecticut households.

Energize Norwich, the pilot program, was launched by the Green Bank in partnership with the Town of Norwich, NPU, SmartPower, and two local lenders – Eastern Savings Bank and Core Plus Federal Credit Union. The pilot program established a stretch target of converting 400 households to natural gas in 6 months. As a result of the strong partnership between the parties and a successful outreach campaign, the target was achieved delivering over 400 natural gas conversions in less than 6 months. The pilot program created so much consumer demand for natural gas conversions that NPU had to expand their working crews in order to handle more jobs.

The success of the Energize Norwich pilot will lead to further experimentation with NPU in the Town of Norwich and an expansion into other cities and towns across Connecticut that have expressed interest to the Green Bank in supporting a similar campaign for natural gas conversions and energy efficiency upgrades for their households.

Digital and Online Media

Another important marketing channel is digital 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, Twitter, and other online information resources. The Green Bank uses 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.

Customer Classifications

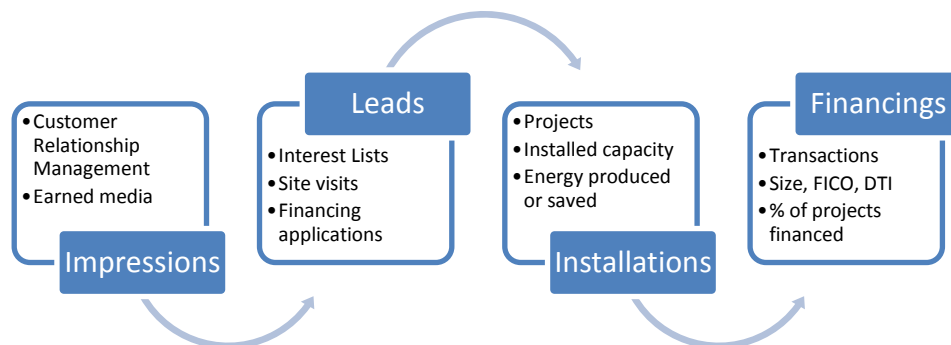
In order to achieve the ambitious energy policy objectives of Connecticut, it is important to ensure that consumers are not only increasingly becoming more educated and aware of what they can do to improve their situation, but more importantly to also use public incentives and financing from private capital sources to take action and do something. Increasing consumer education and awareness by

²⁹ <http://solarizect.com/us-department-of-energy-grant-award-validates-success-of-solarize-connecticut-program/>

³⁰ <http://solarizect.com/solarize-u-announced/>

making strong impressions and generating leads will drive more consumers to install clean energy technologies and use more private capital to finance those projects – see Figure 3.

Figure 3. Customer Classifications from Awareness to Acquisition



- **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., Residential Solar Investment Program), 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., MMBtu’s), 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 transactions, credit scores of borrowers and the trends towards increased financing over time.

Customer Acquisition

The Connecticut Green Bank has developed a set of customer acquisition cost metrics for its financing products and marketing initiatives that includes:

- **Acquisition Cost per Install** – determining the costs – or marketing expenditures – per installation or customer acquired. For example, a marketing budget for Solarize of \$100,000 that leads to the installation of solar PV systems on 220 homes would have an acquisition cost of about \$450 per household.

- **Market Share from Financing** – tracking over time the percentage of customers that use financing products from private capital sources with and without the Green Bank support, will help transition the market from grants, rebates, and subsidies and move towards low-cost and long-term private capital. For example, in communities that are implementing Solarize campaigns, there are a greater percentage of households that are using financing than self-funding projects – which will help the market transition away from subsidies and towards private investment in the future.
- **Acquisition Cost per Energy Unit** – determining the acquisition costs per energy unit will help the Green Bank determine how effectively its marketing resources can be allocated to generate clean energy or save energy. For example, if the acquisition costs per install for solar PV on households is \$450, and that system is expected to produce 175,000 kWh over its 25-year lifetime, then the acquisition cost per energy unit is \$0.0025/kWh.

Over time, the goal is to reduce customer acquisition costs per install, see a gradual increase in the use of financing by consumers over time as subsidies are reduced, and lowering the acquisition cost per unit of clean energy produced or energy saved – see Table 3.

Table 3. Customer Acquisition Costs – Example for Community-Based Campaigns

Customer Acquisition Costs	Acquisition Cost per Install	Market Share from Financing Trends				Acquisition Cost per Energy Unit
		Q1	Q2	Q3	Q4	
Solarize Connecticut	\$450	35%	44%	36%	8%	\$0.0025/kWh or \$0.75/MMBtu
Energize Norwich	\$225	13%	32%	24%	26%	\$1.16/MMBtu (boiler) \$0.71/MMBtu (furnace)

Statutory and Infrastructure Sector

The Statutory and Infrastructure Sector is focused on implementing statutorily mandated programs³¹ as well as infrastructure projects³² 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 Statutory and Infrastructure Sector programs support the implementation of the CES and 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 outlined, including, but not limited to:

- Expanding access to and realizing the full potential of combined heat and power;
- Working with municipalities to expand programs and policies that drive down the cost of in-state renewable resources;
- Developing and deploying micro grids to support critical services and ensure public safety during electricity outage crises; and
- Expanding virtual net metering opportunities to promote deployment of large-scale renewable systems.

Programs such as the U.S. Department of Energy SunShot Initiative Rooftop Solar Challenge and the Anaerobic Digester and Combined Heat and Power Pilot Programs are but a few examples where the Green Bank's Statutory and Infrastructure Sector is supporting the implementation of the CES.

Recognizing that in the future the 2012 IRP estimates a shortage in renewable energy credits for Class I Renewable Portfolio Standard compliance, more in-state generation of Class I resources will help to alleviate an expectation of higher RPS policy compliance costs. Also, should there be challenges in the near future reducing peak demand in the summer and winter, the Green Bank's support of more behind-the-meter and grid-tied clean energy systems, as well as storage, will release some cost pressures as a result of increasing peak demand.

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

³¹ Examples of statutorily mandated programs would be, but are not limited to, Sections 103 (i.e., anaerobic digester and combined heat and power pilot programs) and Section 106 (residential solar investment program) of Public Act 11-80.

³² 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.

Conservation and Load Management Plan

The Statutory and Infrastructure Sector programs support the implementation of programs in the C&LM Plan. Specifically, the deployment of solar PV systems through the Residential Solar Investment Program (RSIP) supports several of the programs in Chapter 3 (i.e., Residential Programs) of the C&LM Plan, including:

- **Home Energy Solutions (HES)** – every residential solar PV project is required to undertake a HES assessment or an equivalent energy audit.
- **Residential Behavior Program** – every residential solar PV installation includes a real-time Wi-Fi or cellular enabled monitoring system that measures the amount of energy produced from the system. On average, these systems produce nearly 70% of the energy consumption needs of the household. The data collected from these systems is made available online and serves as a way for the homeowner to adjust their behavior in order to reduce their energy consumption to equate to the level of clean energy production.

The RSIP of the Statutory and Infrastructure Sector supports the implementation of several of the programs within the C&LM Plan intended to reduce energy consumption through weatherization and behavior-based strategies. As the current installed costs of residential solar PV continue to decline below \$4.00 per watt and the accompanying incentives from the Green Bank through the RSIP drop below \$1.00 per watt as the market transitions towards financing, clean energy will become increasingly cost-effective, delivering quicker paybacks and greater returns that can be reinvested in deeper household energy efficiency measures.

TAM and SAM

For the Statutory and Infrastructure Sector, there are several Total Addressable Market (TAM) and Serviceable Addressable Market (SAM) scenarios with respect to residential solar PV, anaerobic digesters, and combined heat and power.

Residential Solar PV

Per Public Act 11-80, the Green Bank is to structure and implement a residential solar investment program which shall result in a minimum of 30 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 Geostellar³³ to use big-data geomatics to determine the technical and economic viability (i.e., TAM) and market penetration (i.e., SAM) in Connecticut (see Tables 4 and 5).

Table 4. Residential Solar PV Market in Connecticut and Penetration – By Customers

Market Definition	Market Size (# of Customers)	Current Penetration (2013)
All of Connecticut	1,609,735	0.21%
Residential Sector	1,454,651	0.24%

³³ www.geostellar.com

Technically Viable Rooftops	659,312	0.52%
Economically Viable Rooftops	506,714	0.68%

Table 5. Residential Solar PV Market in Connecticut and Penetration – By Generation

Market Definition	Market Size (MWh)	Current Penetration (2013)
All of Connecticut	29,492,338	0.09%
Residential Sector	12,757,633	0.21%
Technically Viable Rooftops	6,559,940	0.41%
Economically Viable Rooftops	3,915,000	0.69%

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 about 120 times the legislative target of 30 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, satisfying the state’s Class I RPS.

Anaerobic Digesters

Per Public Act 11-80, the Green Bank is to set aside \$2 million a year to pilot a 3-year anaerobic digester (AD) program to provide grant, loan, or power purchase agreement support to no more than five (5) projects. 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)³⁴ identifying all Connecticut large 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

³⁴ Updated Mapping of Food Residual Generation in Connecticut by the Department of Energy and Environmental Protection (Spring 2012)

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 Bank³⁵ 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. This TAM is directly correlated to the dairy cow population in Connecticut, which currently is estimated to be around 20,000. The market size below is a rough order of magnitude based on information gathered from several recent studies and case studies for farm AD applications. From these studies it is estimated that the manure from 1,000 cows can provide enough methane to support a generator capacity of 250 kW. Determining the serviceable available market is a bit tougher because 60% of Connecticut dairy farms are either 100 cows or less. In order for any of these farms to make an AD installation feasible it would require partnering and aggregating feedstock with other local farmers. There are only a handful of farms that are large enough, 800 plus cows, to even consider a small scale AD project without supplementing the feedstock with organic food waste.

Both food waste and waste sludge are dependent on the number of feedstock generators (see Table 6). The table below shows a preliminary estimate of the market by annual electricity generation for projects using the feedstock.

Table 6. Anaerobic Digester Market in Connecticut for Food Waste, Waste Water Treatment Sludge, and Animal Waste

Market Definition	Market Capacity (MW)	Market Size (MWh)
Food Waste (SSOM)	9.6	75,923
WWTF Sludge	2.7	21,318
Animal Waste (Farm)	TBD	35,040
Total	12.3	132,281

Micro Grid Combined Heat and Power

Per Public Act 11-80, the Green Bank is to set aside \$2 million a year to pilot a 3-year CHP program to provide grant, loan, or power purchase agreement support to no more than fifty megawatts of projects.

³⁵ Report to CEFA of Results of Anaerobic Digester Project by Fuss & O’Neill for the Connecticut Green Bank (January 21, 2014)

Given that Public Act 11-80 established two CHP programs, a pilot program administered by the Green Bank and a proscriptive program managed by DEEP, the Green Bank’s CHP pilot will concentrate on the funding of micro grid projects that can utilize a CHP installation. As funding for micro grid projects under General Statutes of Connecticut, Section 16-243y, as modified by Public Act 13-298, Section 34, does not include incentive for the generation portion of a micro grid project, the Green Bank can make better use of its CHP Pilot Program funding by supporting critical facility micro grid projects. Because this change in the use of CHP Pilot Program funding was recently decided, staff has yet to determine the TAM and SAM for the micro grid CHP market.³⁶

The Green Bank currently has approximately \$25 million of CHP projects in the pipeline. The average installed cost of these projects fall in the range of \$2,500 to \$4,000 per kilowatt. If all the projects get built it would add 8 MW of additional installed clean energy capacity into Connecticut.

Product or Program Overview

The Statutory and Infrastructure Sector has established the following program targets for FY 2015 (see Table 7).

Table 7. Statutory and Infrastructure Sector Fiscal Year 2015 Targets

Program	Projects	Capital Deployed	Clean Energy Deployed (MW)	Annual Clean Energy Generated and Saved (MMBtu)
RSIP	3,200	\$92,160,000	23.1	91,556
AD	5	\$90,000,000	6.8	300,849
CHP	12	\$25,000,000	8.0	383,515
Total	3,217	\$207,100,000	37.9	775,920

Meeting these targets would generate 137,863 MWh of clean energy (or 470,528 MMBtu’s) and save 775,921 MMBtus annually and 2,282,548 MWh of clean energy (or 2,425,316 MMBtu’s) and save 12,371,234 MMBtus over the life of the projects.

Residential Solar Investment Program

The Residential Solar Investment Program (RSIP) requires that a minimum of 30 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.

³⁶ As noted in the Comprehensive Energy Strategy, the TAM for industrial CHP – which is not a “critical facility” – is approximately 700 MW. To date, there is about 260 MW of CHP deployments (i.e. SAM), leaving about 440 MW of opportunity for investment, or over \$750 million.

Benchmarks

Below are some of the Benchmarks to be used to compare the Residential Solar Investment Program with other states in the region.

Table 8. Benchmark of Residential Solar PV Program Incentives

Benchmarks	CT	MA	NJ	NY
Electric Retail Rate (\$/kWh)	\$0.1723	\$0.1477	\$0.1533	\$0.1826
Installed Cost (\$/W)	\$4.26	\$4.85	\$4.00	\$4.90
Incentive (\$/W) ³⁷	\$1.17	\$2.97	\$1.50	\$1.68
Net Cost to Customer	\$3.09	\$1.88	\$2.50	\$3.22
Payback	11	9	11	11
Average Size System (kW)	7.3	6.3	7.8	7.3
Energy Efficiency Requirement	Audit	Encouraged	No	Encouraged

Key Performance Indicators

Below are the Key Performance Indicators that will be used to measure the success of the RSIP for FY 2015 against previous fiscal years.

- 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

Anaerobic Digester and Combine Heat and Power Pilot Program

Per Public Act 11-80 Section 103, the Green Bank is to develop a three-year pilot program for AD and CHP by setting aside \$2 million a year for each pilot for three years – for a total of \$12 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, and no more than 50 MW of CHP projects each to not exceed 5 MW in size. Both pilot programs support projects at no more than \$450 per kW on a grant basis. The pilots commenced at the end of FY 2012 and are to be evaluated with a report submitted to the Energy and Technology Committee prior to January 1, 2015.

To date, four AD projects have been approved or are seeking approval by the staff from the Green Bank Board of Directors for a total of 5.75 MW and \$14 million in sub-debt, and three CHP projects totaling 3.7 MW and about \$1 million in grants have been commissioned with an open solicitation to provide loan or PPA financing for additional projects.

³⁷ Includes present value of all state incentives (i.e., SRECs, state tax credit, etc.)

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.

CHP deployment is common in Connecticut and throughout the New England region. Through the MassSaves program in Massachusetts, incentives for CHP include payments for feasibility studies, procurement, and installation – projects less than 150 kW receive \$750 per kW up to \$112,000; projects greater than 150 kW and less than 2 MW receive a payment amount that is determined by the utility administrator and can be approximately 50 percent of the installed cost of a small to medium sized project; and projects greater than 2 MW receive incentives commensurate with the availability of funds.

Key Performance Indicators

Below are the Key Performance Indicators that will be used to measure the success of the AD and CHP pilot programs for FY 2015.

- 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

Objective Function

The objective functions for the average sized project underneath each program are computed below (see Table 9).

Table 9. Objective Function for a Typical Project Under the Statutory and Infrastructure Sector Programs

Program	Lifetime Energy Generated and/or Saved (MWh’s / MMBtu)	Dollars of Ratepayer Funds at Risk (\$’s) ³⁸	Objective Function (kWh’s Generated and/or MMBtu Saved per \$1 of Ratepayer Funds at Risk)
RSIP			
▪ EPBB	187.8 / 641	\$3,838	48.9 / 0.1669
▪ PBI	187.8 / 641	\$4,949	37.9 / 0.1295
AD			

³⁸ It should be noted that both Green Bank use of grants and loans in the “dollars of ratepayer funds at risk” result in lower and higher objective functions for grants and loans respectively as more capital is required to support the financing of projects.

▪ Food Waste Only	107,000 / 768,133	\$720,000-\$4,012,984	29.6-148.6 / 0.1914-1.0668
▪ Food Waste and WWTF Sludge	193,000 / 1,460,516	\$720,000-\$3,384,000	58.8-268.1 / 0.4316-2.0285
CHP	270,000 / 2,001,240	\$630,000-\$1,260,000	214.3-428.6 / 1.5883-3.1766

Other Areas of Strategic Importance

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

The DOE's SunShot Initiative 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. 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.³⁹ 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 Guide⁴⁰ which completes and packages permitting recommendations and tools developed or begun in Round I. FY 2015 activities will focus on outreach to municipalities, solar PV installers and other stakeholders to implement the Permitting Guide and achieve soft cost reductions.

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 over the next couple fiscal years, and significantly greater 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 would further add to soft cost reductions.

Micro Grid Initiative

The Green Bank plans to develop micro grid specific financing structures in FY 2015 and 2016, centered around, but not limited to, DEEP's activities. DEEP has released two rounds of Request for Proposals (RFP) to source micro grid projects, the second of which is due August 2014. Winners of the RFP will receive DEEP grants to cover the cost of micro grid interconnection. The Green Bank has partnered with DEEP to assist winners in both rounds access financing and transaction structuring for the generating assets of the micro grid. The Green Bank will leverage its current programs, including C-PACE, Lead by Example, and Anaerobic Digestion and CHP pilots to bring low-cost capital to these micro grid projects. At the end of the pilot period, the existing CHP program will transition into the Green Bank's micro grid support efforts. The Green Bank has also set aside \$5 million to support micro grid projects not falling into one of these categories, which will be leveraged with private capital.

³⁹ Final Project Report is available for download at www.energizect.com/sunrisene.

⁴⁰ See the Permitting Guide tab at www.energizect.com/sunrisene.

Alternative Fuel Vehicle Infrastructure

Alternative Fuel Vehicles and Infrastructure are included in the definition of “clean energy” in Public Act 11-80. Specifically, vehicles powered by “natural gas, electricity, hydrogen or propane,”⁴¹ all represent savings of between 20-60%⁴² over typical gas-powered vehicles. The Green Bank is planning to release an RFP for alternative fuel vehicle infrastructure pilot programs in FY 2015 to source innovative structures and paths to market for the financing of commercially available systems. The Green Bank does not invest in early stage companies and technologies that aren’t commercially available in the marketplace. Instead, its focus is narrow and intended to attract private investment in the scaling up of an alternative fuel vehicle infrastructure for vehicles that use clean energy. Additionally, the Green Bank plans to conduct a community-based marketing campaign pilot around residential electric vehicle purchasing in FY 2015.

⁴¹ <http://www.cga.ct.gov/2014/FC/2014HB-05117-R000335-FC.htm>

⁴² http://olgpropane.com/alternative_fuel_vehicle_conversion.html and <http://www.greenfleetmagazine.com/natural-gas>

Clean Energy Storage

Storage is reaching an inflection point in the market, moving from commercialization of technologies to deployment at scale, as evidenced by several recent developments:

- **Tesla Gigafactory:** Tesla will announce the location of its' Gigafactory to mass produce Lithium Ion batteries at the end of the year. This factory alone will result in savings of roughly 30% on Li-Ion costs, which have declined 40% since 2010.
- **Residential PV + Storage Programs:** In 2014, SunPower launched two residential pilots in California and Australia that pairs solar with storage. SolarCity has a similar pilot program in California.
- **Advances in Commercial-Scale Storage:** In 2014, STEM, a California-based storage-as-a-service company, has launched a demand response pilot linking a collection of behind the meter batteries.

Broadly, there are three potentially-economic applications for storage across all sectors:

- **Standalone revenue / savings applications** are highly dependent on a specific customer rate structure and the utility rates available in a given area, but may include: time-of-use arbitrage and demand response payments for residential and commercial customers and frequency regulation for commercial and grid-scale users.
- **Value-add for solar installation:** use of solar plus battery backup enables residential and customer users to either reduce the capital cost of their solar installation (if net metering tariffs can enable net metering with stored energy) and/or increase the potential size / coverage of solar installations without having to sell power back to the grid at a wholesale rate. For grid-scale operators, distributed generation plus storage at scale would provide a cheaper alternative than peak plants, without the intermittency inherent with wind and solar.
- **Increased resilience:** The use of distributed generation plus storage can provide a cleaner, cheaper and more reliable on-site alternative to diesel generators for commercial and residential customers. A recent report by Rocky Mountain Institute suggests that LCOE of solar plus battery is roughly \$0.4/kwh at the commercial level, competitive with diesel generators.

While there is significant momentum behind storage, challenges to scale remain such as lifetime maintenance and performance; technology improvements; economic returns; and uncertainty around interconnection process, net metering, and rate structures. California has been the biggest initial market for storage because of a self-generation incentive that provides \$1.62/W for Advanced Storage technology up to 1MW, and a step-down thereafter and a recent mandate for 1.3 GW of storage by 2020.

The Connecticut Green Bank has numerous opportunities in its residential, C-PACE and microgrid programs to incorporate storage and support bringing it to scale, creating urgency in addressing the policy and regulatory questions to deliver cleaner, cheaper and more reliable sources of energy.

Residential Sector

The Residential Sector is focused on deployment of residential financial products for renewable energy, natural gas conversions, and energy efficiency projects, 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 CES and 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 74,000 state residents have participated in the HES program through 2013 (less than 10% of eligible customers statewide), less than 10% of those who complete the HES audit go on to install deeper energy savings measures, curtailing the program's gross impact to date in the absence of a strong call to action mobilized by low-cost financing.

DEEP's 2012 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.

Conservation and Load Management Plan

The 2013-2015 Conservation and Loan Management Plan proposes to transform the HES program to a true market-based program with a strong emphasis on leveraging private investment utilizing low-cost financing options, focusing on deep energy retrofits, and enhancing the sales and marketing of the monetary value of those energy savings. As described in the C&LM Plan, "an increasingly important component of the Department's strategy to meet the state's energy efficiency goals is using limited ratepayer and public funds to leverage private capital investment in energy efficiency." The Plan echoes the CES too noting that "the development of these financing programs is critical to moderate ratepayer costs of energy efficiency programs over time," by scaling private capital investment in clean energy, lowering the cost of borrowing, and doing more with fewer ratepayer resources.

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

- Monthly residential financing meetings with DEEP, EEB Chair, EEB consultants, 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

- Joint development of an on-bill repayment program through collaboration with the Green Bank/EEB On-Bill Repayment Working Group and the Utility Working Group.

TAM and SAM

Solar PV

For Solar, the TAM is calculated to be the total number of residences with rooftops viable for siting a solar array. Using a weighted average analysis of county data by Geostellar, we calculate this value as 506,714 residences (see Table 10).

Table 10. Residential Solar PV TAM in Connecticut

County	# of Residential Rooftop Sites	% Viable	# Viable Residential Rooftop Sites
Fairfield	107,883	51%	54,718
Hartford	194,144	90%	175,273
Litchfield	52,034	85%	44,468
Middlesex	34,433	87%	29,970
New Haven	161,738	85%	137,316
New London	61,093	63%	28,684
Tolland	26,423	54%	14,316
Windham	21,564	56%	11,968
Total	659,312		506,714

Approximately 83% of Connecticut’s residents meet the minimum credit requirements in order to qualify for Green Bank financing. Based on data from the six-month period from Nov. 1st, 2013 through April 30th, 2014 during which the Green Bank’s Residential financing products were available, approximately 18.8% of RSIP projects during that period utilized Green Bank financing, yielding a net total addressable market for Green Bank PV financings of 78,981 households. Since the launch of the Green Bank’s residential financing products in FY 2014 for PV systems (i.e., CT Solar Lease, CT Solar Loan, and Smart-E), a total of 398 systems have been financed, yielding a share of the total addressable market of 0.50% (see Table 11).

Table 11. Residential Solar PV TAM and SAM for the Green Bank Financing Products in Connecticut

Total # Viable Residential Rooftops		506,714
Fraction that Qualify for Credit Requirements	83.0%	420,572
Fraction Utilizing Green Bank Financing – TAM	18.8%	78,981
Total # of the Green Bank Financings (as of 05/16/14)		398
Share of Addressable Market – SAM		0.50%

Natural Gas Conversions

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 12).

Table 12. 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. 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 May 7th, Green Bank financing has resulted in 28 natural gas conversions, or .014% of the addressable market. 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 backed by private capital. This is an ongoing area of focus for DEEP, the Green Bank, the utilities and EEB.

Deeper Energy Efficiency

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. There are 1.4 million residential properties in Connecticut, approximately 82% of which are low-rise single family or multi-unit (1-4), 1,148,000 in total. The Green Bank estimates that approximately 83% of homeowners are credit eligible to qualify for Green Bank energy efficiency financing. This yields a total addressable market of 952,840 credit eligible households. While industry estimates vary widely, and by type of equipment, it is estimated that on average 1% of HVAC equipment is replaced each year nationally – this includes lower efficiency models. However, using this method, the Green Bank estimates a total addressable market of 9,530 projects per year.

Based on Smart-E project data through May 7th, the Green Bank has financed 90 projects incorporating high efficiency heating, cooling or hot water equipment in its first year. Therefore, the Green Bank’s share of the total addressable market is 0.0001%, and 0.94% of the current market. The Green Bank’s Smart-E financing for deeper residential energy efficiency projects currently competes against the Connecticut Housing Investment Fund’s Residential Energy Efficiency and Energy Conservation Loan financing programs, a ratepayer-subsidized financing product. 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.

Product or Program Overview

The Residential Sector has established the following program targets for FY 2015 (see Table 13).

Table 13. Residential Sector Fiscal Year 2015 Targets

Program	Projects	Capital Deployed	Clean Energy Deployed (MW)	Annual Clean Energy Generated and Saved (MMBtu)
Smart-E	300	\$4,050,000	0.72	5,518
CT Solar Lease	390	\$14,625,000	2.81	10,919
CT Solar Loan	455	\$9,327,500	3.28	12,745
Cozy Home Loan	50	\$500,000		680
Total	1,195	\$28,502,500	6.81	29,862

Meeting these targets would generate 7,342 MWh of clean energy (or 25,052 MMBtu's) and save 4,809 MMBtus annually and 182,524 MWh of clean energy (or 622,798 MMBtu's) and save 68,000 MMBtus over the life of the projects.

Energize CT Smart-E Loan

In partnership with Connecticut's community banks and credit unions, household customers are offered low-interest (between 4.49% to 6.99%) and long-term (5 to 12 year terms) financing for a range of credit quality consumers (no less than 640 FICO) 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 20% of a loan can be used for healthy home measures (e.g., asbestos remediation, lead abatement) and other related improvements. The Smart-E Loan program uses \$2.8 million of repurposed ARRA-SEP funds for a second loan loss reserve and interest rate buy-downs to attract nearly \$30 million of private capital.

Cozy Home Loan

The Cozy Home Loan program is a credit enhancement program that uses \$410,000 of repurposed ARRA-SEP funds as a loan loss reserve and interest rate buy down to attract \$2.5 million of private capital from Community Development Financial Institutions (i.e. Opportunity Finance Network). The product, administered by the Housing Development Fund, provides 10-year loans for technologies that are consistent with the goals of the Comprehensive Energy Strategy to households below 80% of area median income in the Fairfield, Litchfield, and New Haven counties.

Energize CT Solar Loan

In partnership with a crowd-sourced fund (i.e. Mosaic) and a servicer (i.e. Sungage Financial), a 15-year solar loan product is offered to a range of credit quality consumers (no less than 680 FICO) interested in solar PV. A specialty product designed for solar PV, interest rates are affordable at 6.49% and the CT Solar Loan may re-amortize after the ITC is received by the borrower to ensure the positive cash flow of energy savings from solar PV exceeding the debt service of the loan.

Energize CT Solar Lease

In partnership with state and regional banks (i.e. First Niagara Bank, Webster Bank, Liberty Bank, and Peoples United Bank), a tax equity investor (i.e. US Bank), an insurer (i.e. Assurant), and a servicer (i.e. AFC First Financial), a 20-year solar lease product is offered to a range of credit quality consumers (no less than 640 FICO) interested in solar PV and a 15-year lease product is offered for solar thermal hot water. The solar PV side of the CT Solar Lease, provides electricity at a rate that is typically 10-20% lower than the standard offer and has both fixed and variable rates.

Benchmarks

The Green Bank will benchmark residential financing program progress in the following way:

- Number of projects financed
- Level of energy savings/clean energy production achieved
- Ratio of public to private capital deployed

Key Performance Indicators

Below are the Key Performance Indicators that will be used to measure the success of the residential financing programs for FY 2015.

- Number of applications received
- Application approval rate
- Average FICO and DTI
- Average loan size, term and rate
- Delinquency and default rate
- 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
- RSIP market penetration;
- Ratio of public to private capital deployed
- Successful innovation in marketing and outreach (ex: performance-based customer acquisition)

Objective Function

The objective functions for the average sized project underneath each program are computed below.

Table 14. Objective Function for the Residential Sector Programs

Program	Lifetime Energy Generated and/or Saved (MWh's / MMBtu)	Dollars of Ratepayer Funds at Risk (\$'s) ⁴³	Objective Function (kWh's Generated and/or MMBtu Saved per \$1 of Ratepayer Funds at Risk)
Smart-E Loan – Solar PV	187.8 / 641	\$5,938	31.6 / 0.1079
Smart-E Loan – Bundles			
• Gas Conversion ⁴⁴	- / 1,165	\$844-\$3,594	- / 1.9727-0.4632
• Solar PV ⁴⁵	- / 2,345	\$5,783-\$8,533	- / 0.4054-0.2749
• Solar Hot Water ⁴⁶	- / 1,681	\$869-\$2,869	- / 1.9333-0.5857
• Windows ⁴⁷	- / 1,140	\$356-\$2,106	- / 3.2000-0.5412
CT Solar Loan	187.8 / 641	\$11,118	16.9 / 0.0576
CT Solar Lease – PV	187.8 / 641	\$11,036	17.0 / 0.0581
CT Solar Lease – SHWS	- / 378	\$3,568	- / 0.1060

Other Areas of Strategic Importance

On-Bill Repayment Program

The Smart-E Loan will be the first loan product available under a new on-bill repayment program being developed jointly with the EEB and electric utilities (in June 2013, the State of Connecticut General Assembly authorized On-Bill Repayment (“OBR”) in Section 58 of Public Act 13-298, codified in Section 16a-40m of the Connecticut General Statutes). The OBR program is being developed as an open market platform that will ultimately allow multiple financing products access to repayment through the utility bill. The legislation authorizes transferability of the repayment obligation and disconnection of service (with applicable consumer protections) for non-payment of obligation. The OBR program is being developed in phases.

Solar and Energy Efficiency Market Integration

The Green Bank will be piloting a variety of strategies to encourage consumers to combine solar energy installations with energy efficiency. This will include special offers such as interest rate buy-downs for qualifying projects that combine solar and efficiency; contractor matchmaking events to encourage partnerships between solar installers and efficiency contractors; and a variety of pilot marketing strategies.

⁴³ For Smart-E Loan Bundles, the Dollars of Ratepayer Funds at risk includes CEFIA only (i.e. higher value) as well as CEFIA and CEEF rebates (i.e. lower value), resulting in a higher and lower objective function respectively.

⁴⁴ Gas conversion bundle includes pairing a high efficiency boiler or furnace conversion from oil to natural gas with attic and wall insulation and ductless mini-split

⁴⁵ Solar PV bundle includes a high efficiency boiler or furnace conversion from oil to natural gas with attic and wall insulation, and ductless mini-split

⁴⁶ Solar hot water bundle includes attic and wall insulation, and ductless mini-split

⁴⁷ Window bundle includes attic and wall insulation

Institutional Sector

The Institutional Sector is focused on the development and deployment of programs that support investments in energy efficiency and renewable energy projects at state buildings as well as in municipal, university, school and hospital (MUSH) settings in order to provide cheaper, cleaner and more reliable sources of energy while creating jobs and supporting local economic development.

This sector is particularly limited in its ability to generate revenue to pay for energy projects, and often credit constrained which makes borrowing difficult. The Green Bank is focused on the development of low- or no-upfront cost financing mechanisms that use energy savings to fully finance investments in comprehensive retrofits that can address the aging infrastructure issues common to the MUSH market.

Comprehensive Energy Strategy and Integrated Resource Plan

The CES seeks to deepen efficiency investments beyond simple measures such as changing out light bulbs to those that address heating and ventilation systems, insulation, and other deeper efficiency improvements. For state and municipal buildings, the CES describes Connecticut's Lead by Example program, which was created in 2011 to fund energy efficiency improvements in state and local government buildings through a standardized Energy Savings Performance Contracting (ESPC) process that enables state agencies and municipalities to implement comprehensive energy retrofits that are paid for by guaranteed future energy savings and can be structured to require no upfront capital investment. The first municipal and state participants in the performance contracting program launched projects in 2013.

The CES and IRP identify programs, policies, and strategies not only for lowering utility bills and improving the environmental performance of Institutional Sector facilities, but also for increasing their resilience and reliability for Connecticut's citizens. The Green Bank will play an important role in developing innovative finance structures that enable credit-constrained Institutional customers to borrow to meet this commitment to energy efficiency and reliability.

Conservation and Load Management Plan

The increased funding for the conservation and load management programs approved by DEEP in October 2013 was designed to complement numerous other initiatives the State has undertaken to reduce energy costs in Connecticut. In the Institutional Sector, these include the development of the standardized Energy Savings Performance Contracting (ESPC) process within the Lead by Example program, third party financing programs for hospitals and acute care facilities, and education, outreach, and assistance with energy benchmarking for Connecticut schools and municipalities. In the C&LM plan, several initiatives were outlined to assist that Sector in contributing their share of the State's 20% by 2018 energy reduction goal. Increased funding in the C&LM plan included budget for a Program Manager for the Lead by Example program to accelerate the development of ESPC projects in state agencies and municipalities, enhanced training and consultation for the Lead by Example and Energy Savings Performance Contract programs, as well as increased program budgets for a number of applicable commercial and industrial (C&I) programs (Institutional Sector customers are generally eligible to participate in C&I Program offerings as applicable).

Key areas for collaboration between CEEF and the Green Bank include:

- The Lead by Example program, in which CEEF incentives for comprehensive retrofits encourage deeper efficiency measures, and the Green Bank is assisting in developing financing mechanisms or providing guidance to customers on financing options.
- Performance contracting, which is to be further supported in the C&LM plan both by increased benchmarking as an assessment tool to evaluate baseline energy use for ESPC projects, and by the provision of energy consumption data to support strategic energy management practices among municipalities and schools.
- The design of programs (e.g., positioning rebates or financing products to encourage bundling of deeper measures), and the delivery of programs (e.g. partnerships with state and local government) including the development of collateral and targeted messages, which can be supported by the increased C&LM marketing budget.

TAM and SAM

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, we use data that exists on various unit measures of the MUSH market segments, 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. This data will be refined over time (see Table .

The Green Bank's estimates of the total number of facilities and square footage of buildings in Connecticut's Institutional sector are presented in the table below. Overall, the sector is estimated to include about 300 million square feet, and at an estimated energy cost of about \$3/square foot where exact energy expenditures are unavailable, the MUSH sector in Connecticut is estimated to currently spend over \$900 million per year on energy.

Table 15. Institutional Sector TAM in Connecticut

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	\$88.5
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	\$246.5
Hospitals	37	Hospitals	22	5	\$66.5
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. 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). The development of an off-credit financing structure, described in the program section below, will be necessary to unlock the market potential of those portions of the MUSH sector that are more credit constrained (i.e. hospitals, private colleges/universities and private schools).

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 16).

Table 16. Institutional Sector SAM in Connecticut

Market Segment	Estimated TAM (million ft ²)	Estimated Market Penetration	Estimated SAM (million ft ²)	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

The Institutional Sector has established the following program targets for FY 2015 (see Table 17).

Table 17. Institutional Sector Fiscal Year 2015 Targets

Program	Projects	Capital Deployed	Clean Energy Deployed (MW)	Annual Clean Energy Produced and Saved (MMBtu)
Lead By Example – State	7	\$125,000,000	-	266,668
Lead By Example – Municipal	6	\$25,000,000	-	166,667
Institutional Off Credit ESA	2	\$10,000,000	-	66,668
CT Solar Lease	10	\$6,000,000	2.0	8,370
Winn-LISC MF Open Market ESCO	5	\$2,000,000	0.5	2,093
Total	30	\$168,000,000	2.5	510,466

For the primarily energy efficiency driven programs, including the Lead By Example and Off Credit Energy Savings Agreement (ESA) programs, meeting these targets would save 500,000 MMBtus annually and 7,500,000 MMBtus over the life of the projects. For the primarily clean energy focused programs, including the CT Solar Lease and Open Market ESCO programs, meeting these targets would generate 3,000 MWh of clean energy annually, and 76,500 MWh of clean energy over the life of the projects.

Lead by Example – State and Municipal Facilities

The State of Connecticut created a standardized ESPC Program for use by state agencies and municipalities, as required by Connecticut General Statutes 16a-37x. The program is intended to help state and municipal governments implement a portfolio of comprehensive energy savings measures with no upfront capital. The costs of the energy retrofits are paid for by guaranteed future savings from utility and maintenance budgets. ESPC projects will be implemented by qualified Energy Service Companies (QESPs) that are on contract with the State of Connecticut. In addition, project hosts will receive technical support from a pool of pre-qualified professional energy

The Green Bank participates in the implementation of the State’s ESPC program by assistance and support with outreach and education about the state ESPC program as well as providing guidance to the state and municipalities on financing

CT Solar Lease

As discussed above, in the residential sector, the Green Bank has established the CT Solar Lease program, in partnership with state and regional banks, a tax equity investor, an insurer, and a servicer. Though primarily intended for residential customers, a portion of the Solar Lease facility has also been reserved for municipal or institutional projects, where it is offered as a 20-year power purchase agreement which enables the third-party owner of the PV system to access federal tax credits.

Institutional Off-Credit ESA Program

The Green Bank has previously tested an off-credit energy savings agreement (ESA) model through a \$1 million pilot program called Campus Efficiency Now; two projects were contracted at private colleges in Connecticut. In that program, loans were made to a special purpose entity (SPE) that contracted separately for the project's construction, and the sale of the energy savings. For the energy savings, the SPE entered into an ESA with the project host to pay for the energy saved at a rate discounted from the host's retail utility rates, creating immediate savings for the host while assigning the performance risk and debt obligation to the SPE. Because it does not create a long term debt obligation for the host, these types of projects can be treated as an off-balance sheet and off-credit ownership and financing approach, which, as discussed above, is critical for credit constrained segments of the Institutional sector such as hospitals and private education facilities.

Seeking to expand on the Campus Efficiency Now pilot to enable both more and larger projects, the Green Bank intends to create or facilitate an off-credit ESA model for financing clean energy projects with private capital or through non-taxpayer supported bonds. Such a model has been tested in the State of Maryland by the Maryland Clean Energy Center (MCEC), which, like the Green Bank, has bonding authority.

The Green Bank believes the off-credit ESA model is replicable in Connecticut, and the Green Bank will be able to utilize this model to raise financing for Institutional sector projects such as hospitals, private colleges/universities, or independent schools; it may also be a viable financing mechanism for state or municipal ESPC projects in addition to some commercial projects that are unable to utilize C-PACE.

Winn-LISC Open Market ESCO

In the fall of 2011, Winn Development applied for and was awarded a \$5.25 million grant from HUD, with a letter of support from the Green Bank, to pilot an innovative energy efficiency loan fund designed to facilitate energy savings agreements (ESAs) in the multifamily low-income housing developments. The program operates in Connecticut, Massachusetts and New York.

The Green Bank has supported Winn through the program development process and, in August 2013, the Green Bank executed a *Master Credit Enhancement and Participation Agreement*, committing up to \$1.87MM for Connecticut projects financed through this program.

Unfortunately, Winn has not made hoped-for progress in selling the program and closing loans because of structural issues with the financing that are not attractive to owners. The Winn team is pursuing an extension of the program with HUD, through FY2015, and currently believes that the program may be best suited to the implementation of solar PV. The Green Bank will continue to support Winn as they work to identify projects that can be successful.

Benchmarks

The Green Bank will benchmark Institutional sector program financing in the following way:

- Number of projects financed
- MW installed, average system size, and annual and lifetime MWh produced
- Ratio of public to private capital deployed
- Project square footage
- Total project investments (\$)
- Project investments per capita
- Project investments per square foot
- Job years created
- Time from project conception to contracting

Key Performance Indicators

The Green Bank will track the following indicators of performance:

- Avoided greenhouse gas emissions
- Job years created
- Ratio of public to private capital deployed
- Delinquency and default rate
- Average energy production per project
- Percentage reductions in energy consumption
- Annual and lifetime MMBtu saved
- MW clean energy installed, average system size, and annual and lifetime MWh produced, where clean energy generation is installed
- Ratepayer funds expended (utility incentives or other)
- Number of applications received and approved
- Number of applications awarded ZRECs
- Number of applications that proceed to construction
- Average PV system size
- Delinquency and default rate
- Contractor engagement – percent of eligible contractors bringing in applications/repeat applications
- Outreach and education – number of institutions attending presentations

Objective Function

The objective functions for the average sized project underneath each program are computed below (see Table 18). Objective functions for the LBE and Institutional ESA programs are very high because it is assumed that the Green Bank is playing primarily a facilitative role, and that no further credit enhancement will be necessary for these projects. Therefore, ratepayer funds are limited to program administrative costs (i.e. salaries).

Table 18. Objective Function for the Institutional Sector Programs

Program	Lifetime Energy Generated and/or Saved (MWh's / MMBtu)	Dollars of Ratepayer Funds at Risk (\$'s)	(kWh's Generated and/or MMBtu Saved per \$1 of Ratepayer Funds at Risk)
CT Solar Lease ⁴⁸	2,683 / 9,153	\$89,143	30.1 / 0.1027

⁴⁸ Sample 100 kW project

Commercial and Industrial Sector

The Commercial and Industrial Sector is focused on the implementation of commercial and industrial property assessed clean energy (C-PACE) 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 C&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 “all cost effective” and a goal of going deeper with energy efficiency is mentioned. C-PACE enables these deeper projects, with the average C-PACE project becoming 45 to 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 British Thermal Units 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).

This data, coupled with data the Green Bank commissioned about the location, size and class of buildings in Connecticut from HR&A Associates, a leading real estate advisory firm, is important in determining our goals for this sector.

Conservation and Load Management Plan

Among the many goals outlined in the C&LM plan, there are several that impact the C&I sector and The Green Bank's C-PACE program. Indeed, it is noted that the companies should coordinate with the Green Bank on C-PACE financing. That coordination has been ongoing and fruitful.

- The focus on promoting deeper upgrades by aligning incentives to reward comprehensive projects is also a place of overlap.
- The focus on marketing in the C&LM plan is consistent with the Green Bank's goals of increasing volume for its financing products. During 2015 the Green Bank will integrate customer segmentation efforts and data driven analytics to increase market penetration in targeted Residential and C&I areas.
- As noted in the C&LM plan, the Companies will continue their efforts to leverage CEEF funds through promotion and enhancement of CEEF financing offerings, coordination with partners' complementary programs (CPACE, LBE-ESPC) in an effort to reduce financing costs, etc. We have seen many building owners go deeper with their projects when combining incentives with C-PACE financing. In fact, several projects meet the Savings to Investment Ratio (SIR) criteria of C-PACE due to utility incentives.
- C-PACE's ongoing collaboration with C&I Committee of the EEB includes the following:
 - Monthly meetings with United Illuminating and Northeast Utilities
 - Regular sharing of deal flow information
 - Joint outreach efforts and marketing
 - Streamlined approvals of C-PACE applications with EEB incentives.

TAM and SAM

The Total Addressable Market (TAM) for the C-PACE program is approximately 83% of Rentable Building Area (RBA) in Connecticut and the Share of Addressable Market (SAM) is approximately 0.2%.⁴⁹

We calculate TAM as the total square feet of RBA for Commercial & Industrial buildings within C-PACE municipalities divided by the total square feet of RBA for all Commercial & Industrial buildings in the state of Connecticut. We calculate SAM as the total square feet of RBA for all closed C-PACE projects divided by the total square feet of RBA for all Commercial & Industrial buildings in C-PACE municipalities.

The TAM calculation shows that the program has secured over 4/5 of the commercial and industrial building stock in the state of Connecticut as eligible applicants for C-PACE, an impressive statistic for the

⁴⁹ HR&A CT Building Data 2013

program’s first year of existence. The SAM calculation demonstrates that completed C-PACE projects account for roughly 0.2% of all Commercial & Industrial building area in C-PACE eligible municipalities, an equally important metric for the program.

Commercial Facilities

TAM for Commercial buildings is approximately 84%. SAM for Commercial buildings is approximately 0.5%.⁵⁰

Industrial Facilities

TAM for Industrial buildings is approximately 77%. SAM for Industrial buildings is approximately 0.01%.⁵¹

Product or Program Overview

The Commercial and Industrial Sector has established the following program targets for FY 2015 (see Table 19).

Table 19. Commercial & Industrial Sector Fiscal Year 2015 Targets

Program	Projects	Capital Deployed	Clean Energy Deployed (MW)	Annual Clean Energy Generated and Saved (MWh / MMBtu)
C-PACE	63	\$50,000,000	8.8	114,517

Meeting these targets would generate 10,000 MWh of clean energy (or 34,121 MMBtu’s) and save 80,395 MMBtus annually and 244,000 MWh of clean energy (or 818,913 MMBtu’s) and save over 2,000,000 MMBtus over the life of the projects.

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

In January 2013, the Green Bank introduced the C-PACE program. C-PACE is one of the country’s first statewide programs to provide 100 percent upfront financing for energy upgrades to commercial, industrial and nonprofit buildings. Under this program, property owners obtain financing needed to make key energy improvements, and then repay it as a benefit assessment charge on their property tax bill. Because the payments can be spread over a period of up to 20 years, owners save on energy costs immediately and for years to come. The financed improvements increase the building’s value, while preserving the building owner’s capital and credit lines for core investments.

C-PACE financing is available for a wide range of clean energy and energy efficiency improvements, including new boilers and chillers, upgraded insulation, new windows or solar installations. Energy audits and construction costs can also be financed through C-PACE.

⁵⁰ *Ibid.*

⁵¹ *Ibid.*

C-PACE has been a notable success in deploying clean energy throughout the state. Eighty Connecticut municipalities, together accounting for 83 percent of the state’s commercial and industrial building stock, have signed onto the program. Since launching C-PACE, the Green Bank has approved 30 projects totaling \$23 million all financed with a \$40 million warehouse facility using the Green Bank’s balance sheet. This has resulted in the deployment of 3.7 MW of clean energy and will lead to an estimated 160 million kWh in electric savings and over 320 million MMBTU in fuel savings over the lifetime of the projects. Total savings in avoided electric and fuel costs will exceed \$38M in aggregate for the benefited property owners.

Working with its group of qualified capital providers, the Green Bank auctioned its first group of transactions and secured private capital to purchase the initial \$30 million portfolio of transactions that the Green Bank has and will originate. This has allowed the Green Bank to replenish its funding warehouse facility and leverage its resources at a ratio of 4:1 with the potential to achieve a leverage ratio of 9:1 through a subsequent financing round.

Benchmarks

Because there are several other states operating PACE programs, it is useful for the Green Bank to benchmark ourselves against the rest of the country. We will benchmark our progress in the following way:

- Number of projects completed
- Level of energy savings achieved
- Ratio of public to private capital deployed

We will benchmark ourselves against the best C-PACE programs in the country, including California, Florida, Michigan, New York, and Ohio.

Key Performance Indicators

Throughout the year, we will continually monitor the performance of the C-PACE program based on the following indicators:

- Number of applications coming in;
- Number of C-PACE towns opting into;
- Speed of approval process for applications;
- Size of the project and level of energy savings;
- Ratio of public to private capital deployed
- Growth into new markets (ex: multifamily)
- Successful innovation in marketing and outreach (ex: 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 using C-PACE financing

Objective Function

The objective functions for the average sized project underneath each program are computed below (see Table 20).

Table 20. Objective Function for the Commercial and Industrial Sector Programs

Program	Lifetime Energy Generated and/or Saved (MWh's / MMBtu)	Dollars of Ratepayer Funds at Risk (\$'s) ⁵²	Objective Function (kWh's Generated and/or MMBtu Saved per \$1 of Ratepayer Funds at Risk)
C-PACE – Solar PV			
• Small ⁵³	64,703	\$29,000	52.5 / 0.1795
• Medium ⁵⁴	151,424	\$95,600	37.5 / 0.1275
• Large ⁵⁵	1,290,076	\$500,595	60.5 / 0.2070
C-PACE – EE ⁵⁶	138,307	\$358,169	- / 0.3862
C-PACE – EEPV ⁵⁷	80,150	\$507,153	- / 0.1580
C-PACE – CHP ⁵⁸	9,295	\$74,493	- / 0.1250
CT Solar Lease	2,683 / 9,153	\$89,143	30.1 / 0.1027

Other Areas of Strategic Importance

Small Business Energy Advantage (SBEA)

While C-PACE is a tool that works for many building owners in the C&I sector, due to the rigor of the review process it is not a financing option well-suited for very small projects. The C&I Program will be working with the EEB to determine how the Green Bank should work with this sector in FY 2015.

Non-C-PACE Commercial Financing Product

In addition to C-PACE, the C&I program will engage a consultant to consider other financial offerings in the C&I market. For example, C-PACE does not work for condominiums and we would like to be sure that market is covered with an offering from the Green Bank. Also, we are learning that some borrowers like the idea of an off-balance sheet offering, so we will explore an Energy Services Agreement (ESA) model.

⁵² Principal value of the C-PACE loans held by CEFIA after the sell down of 80% of the value of the transaction to a private capital investor.

⁵³ 55 kW small ZREC project

⁵⁴ 157 kW medium ZREC project

⁵⁵ 954 kW large ZREC project

⁵⁶ 290 Pratt Street in Meriden, CT

⁵⁷ 100 Roscommon in Middletown, CT

⁵⁸ YMCA in Meriden, CT

Multifamily Market Rate and Affordable Housing

The Green Bank is developing several multifamily and affordable housing (MFAH) programs, which is a new area of program development and a priority for the Green Bank. The Green Bank has established working relationships with key channel partners to begin sourcing transactions utilizing a variety of financing options.

Implementing energy improvements in the MFAH market has been difficult to achieve, both in Connecticut and nationally, because of challenges related to securing financing, split incentives between owners and tenants, lack of reliable performance data and case studies to build investor confidence, as well as various other challenges. Therefore, a key tenet of the Green Bank's MFAH strategy has been to identify and bring in national leaders, from within and outside Connecticut, with demonstrated ability to "crack the multifamily housing nut" and successfully build and close transactions and run programs. The Green Bank has several strong partnerships in place, each with nationally recognized MFAH experts on their teams, and who are bringing resources to Connecticut to build the market – attracted by the cutting edge clean energy leadership and activities underway in Connecticut.

As with all Green Bank programs, our approach is to use the minimum level of Green Bank funds necessary to support the market, and then to reduce the Green Bank's participation over time as the market takes off and the private sector takes over. The Green Bank has four major multifamily affordable housing initiatives:

1. *Building the Multifamily Market through C-PACE*
2. *Building the Multifamily Market through Community Development Financial Institution's (CDFI) and Strategic Partners*
3. *WINN-HUD open market ESCO*
4. *CT Housing Finance Authority Partnership*

Additionally, the Green Bank will be developing market rate multifamily financing options, with an initial focus on condominium financing to support natural gas conversions in communities where the gas companies are focused on low use and/or line expansion (although any financing developed will support the full range of clean energy measures).

Background

Connecticut's Multifamily and Affordable Housing (MFAH) sector presents a critical imperative and significant opportunity for investment in clean energy improvements, with a priority focus on affordable housing, and targeted to:

- Reduce energy costs for residents as well as energy and energy-related maintenance costs for building owners,
- Fund all cost effective energy measures, within the context of a building's lifetime capital improvement plan, including energy related capital improvements, and
- Improve the safety, health and comfort of low income residents.

This MFAH opportunity sits at the nexus of priorities established by the CES, [Governor Malloy's Commitment to Affordable Housing](#) including more than \$360 million for State funded affordable housing projects for seniors, working families, young professionals and other residents, and [the Green Bank's Comprehensive Plan](#). It includes an important partnership with the CT Housing Finance Authority (CHFA), which finances approximately 45% of the State's affordable, multifamily units⁵⁹ and has a [stated policy](#) to require cost effective energy efficiency measures in all multifamily developments as well as support for the use of renewable and alternative energy.

The Green Bank's multifamily initiative began with a review of the MFAH sector to identify priority opportunities and challenges as well as holding exploratory meetings to establish relationships with sector leaders and key stakeholders including: CHFA, U.S. Department of Housing and Urban Development (HUD), CT based Community Development Financial Institutions (CDFI's), Utilities (CL&P and UI), CT Housing Coalition, Community Action Councils, CT Department of Public Health (DPH), Operation Fuel, and various private and non-profit housing developers. The Green Bank's overarching strategy in building deployment capacity in the multifamily affordable housing sector is to identify and fill gaps and leverage Green Bank resources by supporting and partnering with organizations identified with a demonstrated track record of success both in Connecticut and nationally.

Market Opportunity

Deployment of cost effective energy efficiency and renewable energy improvements in multifamily housing is sorely lacking in Connecticut (and nationally) and presents significant opportunity for investment. The Green Bank estimates, conservatively, that potential annual utility cost savings for the multi-family housing sector is on the order of \$125 million per year⁶⁰.

Much of this housing stock was built before 1970 and now faces significant needs for energy updates and other capital improvements. Approximately 45% of multifamily housing units in Connecticut are located in properties with 20 or more units, which are predominantly concentrated in the State's largest cities (Bridgeport, Hartford, New Haven, Stamford, Waterbury), as well as located near existing or planned natural gas lines. Many are heated by oil furnaces and electrical heating systems, offering significant opportunity for fuel conversion to natural gas as well as other clean energy measures.

The "Fuel Poverty" Imperative. Home energy bills present a significant financial burden to low-income residents in Connecticut, where about one in five households cannot afford to pay their energy bills. These findings are based on a [study recently commissioned by Operation Fuel](#). The annual home energy affordability gap currently is about \$700 million for more than 295,000 Connecticut households with

⁵⁹ Over the past 40 years, CHFA has provided financing for the acquisition, construction and/or rehabilitation of more than 35,800 units of affordable rental housing for families and the elderly across Connecticut.

⁶⁰ This number assumes approximately 250,000 units in multi-family buildings (defined as buildings with 5 or more units) with potential to reduce average annual utility costs on the order of about \$500/unit).

incomes at or below 200 percent of the Federal Poverty Level. This means that the average low-income household owes about \$2,363 more in energy bills than it can afford to pay⁶¹.

The primary source of energy assistance for Connecticut's lower-income households is the [federal *Low-Income Home Energy Assistance Program \(LIHEAP\)*](#). With a CT state allocation of about \$76 million, LIHEAP covers less than 11 percent of the state's home energy affordability gap. As a result, Connecticut's lower-income families and elderly residents must often choose between energy, food and other basic necessities and look to organizations such as Operation Fuel for energy assistance.

Initiatives

The Green Bank's overall market development approach responds to the key gaps and challenges identified above and, with several strategic partners, are supporting the following initiatives:

1. ***C-PACE multifamily loans***, made on the basis of projected energy cost savings, and secured by a public benefit assessment and lien on the property. C-PACE projects will include CHFA financed properties as well as market rate multifamily rental properties that can secure the lender consent required for C-PACE financing. Properties are anticipated to contain 100 units or more, given the project size needed to make C-PACE economics work. The Green Bank secured Urban Ingenuity as its C-PACE multifamily housing partner who will be responsible for sourcing C-PACE multifamily transactions, providing technical assistance to owners in developing and submitting applications, and structuring and financing C-PACE eligible energy upgrades.
2. ***Unsecured multifamily loans***, made on the basis of projected energy cost savings, with credit enhancements from the Green Bank, predominantly anticipated to consist of loan loss reserves. Given the programmatic and financial barriers described above, many MFAH properties, especially those with existing HUD or Federal Housing Administration (FHA) financing or insurance, are banned from securing the lender consent required for C-PACE financing and, in most cases, can take on unsecured debt only. This category includes HUD funded public housing, all FHA and HUD funded or insured properties, as well as many of the underserved 3- to 6-unit buildings in our large cities, which are often over 100 years old, and in great need of energy and other capital improvements. The Green Bank has supported the establishment of the Multifamily Permanent Energy Loan Program with the Connecticut Housing Investment Fund, focused specifically on affordable multifamily. The Green Bank is providing a \$300,000 loan loss reserve and an initial \$1MM capitalization.
3. ***WINN-HUD Open Market ESCO***, in the fall of 2011, WINN Development applied for and was awarded a \$5.25 million grant from HUD, with a letter of support from the Green Bank, to pilot an innovative energy efficiency program designed to serve multifamily low-income housing developments. This HUD innovation initiative was established to facilitate "game-changing" solutions to effective investment of private capital to improve the energy efficiency of low-income multifamily housing. The WINN proposal – *Multifamily Energy Loan Fund* – created a loan fund to

⁶¹ The Affordability Gap measures the dollar amount by which actual home energy bills exceed affordable home energy bills. If a Connecticut household has an annual income of \$12,000 and an annual home energy bill of \$3,000, that household has a home energy burden of 25% ($\$3,000 / \$12,000 = 0.25$). An *affordable* home energy burden is set at 6% of annual income.

facilitate energy savings agreements (ESA) in the multifamily (40-300 units) housing market. The program operates in Connecticut, Massachusetts and New York. The Green Bank has supported WINN through the program development process and, in August 2013, the Green Bank executed a *Master Credit Enhancement and Participation Agreement*, committing up to \$1.87MM for Connecticut projects financed through this program.

4. **CHFA Pilots**, in 2013 the Green Bank and CHFA signed a Memorandum of Agreement (MOA) that recognized the importance and benefits of cooperation between the two organizations in accelerating the implementation of energy efficiency and renewable energy improvements for owners and tenants of affordable multifamily rental housing. To this end, and in an effort to streamline and coordinate program offerings, the Green Bank and CHFA continue to collaborate and share information related to proposed loan programs and funding availability, respective project pipelines, as well as energy monitoring and verification (EM&V) initiatives and requirements. CHFA and the Green Bank are collaborating on a pilot initiative to help inform multifamily EM&V and underwriting requirements. The pilot will be undertaken on five (5) master-metered properties previously identified by CHFA. The Pilot process includes, for each property, energy benchmarking and auditing, definition of project scope to include all cost effective energy measures, financing, implementation, commissioning, and post project energy performance monitoring and verification. Work will be carried out by the Green Bank's C-PACE and multifamily housing technical advisors, with oversight from the Green Bank's MFAH and C-PACE teams. The implementation of energy improvements for all 5 properties is anticipated to take about 1 year, with 3 years of energy monitoring post commissioning.
5. **Credit Enhancement RFP** – The Green Bank has \$4MM allocated to an open RFP for credit enhancements to support project or program level multifamily financing, with a focus on the affordable market.

MFAH Strategic Partners

As the Green Bank's MFAH Technical Assistance Partner, the team of [New Ecology](#) and [CNT Energy](#) will be recommended to multifamily property owners as a trusted energy advisor and owner's agent to help navigate the energy improvement process including: benchmarking, auditing, scoping, financing, implementing, commissioning and post-completion monitoring. [New Ecology](#) and [CNT Energy](#) are both nationally recognized leaders in building and operating successful MFAH energy improvement programs. They have been funded by the [JPB Foundation](#) of NY, focused on poverty alleviation, to develop the *National Delivery Network for Energy-Efficiency Services to Multifamily Affordable Housing Owners*. Connecticut has been strategically identified as one of their first locations, where this team has opened and staffed an office and will invest approximately \$1,000,000 (\$500,000 cash/ \$500,000 in-kind) to help build the market.

MFAH Channel Partners

We have identified the following organizations as key channels partners for building the Green Bank's MFAH pipeline, and have begun to establish working relationships with each. CHFA, in particular, is a critical partner, with whom the Green Bank has been working closely on all our MFAH initiatives, including program development and sourcing deals.

- Connecticut Housing Finance Authority (CHFA)
- Connecticut Housing Coalition
- Community Action Councils
- Community Development Financial Institutions (CDFI's)
- Federal Department of Housing and Urban Development (HUD)
- Large multifamily property owners and developers, both private and non-profit
- Public Housing Authorities, both state and federally financed
- Utility companies CL&P and UI, including properties deferred from weatherization and other energy improvements due to health and safety hazards

New Initiatives

The Green Bank will be developing market rate financing programs with an initial focus on the condominium market. Condominiums are a prime target for natural gas conversions, particularly in communities that have previously been identified by the gas companies as having a large concentration of housing units on main with low use, and/or targeted for expansion of gas lines. The Green Bank's strategy will be to work with lenders active in the condo financing market and develop products that leverage the Green Bank's credit enhancements and encourage lenders to finance clean energy projects. The Green Bank will look to encourage lending in buildings with challenges that prevent the use of C-PACE financing, don't meet FHA guidelines, require longer maturities or more generous underwriting criteria, etc.

Distressed Municipalities and Equitable Distribution of Funds

Per Section 101 of Public Act 11-80, the Green Bank is to provide an equitable share of its funding for "small and large customers with a maximum average monthly peak demand of one hundred kilowatts in census tracts in which the median income is not more than sixty percent of the state median income".

As of FY 2013 and FY 2014, the Green Bank has approved, closed, and completed funding in FY 2013 of \$20.1M and FY 2014 of \$78.7M. Of that funding, \$6.4 million and \$11.5 million was in census tracts⁶² below sixty percent of the state median income (see Table 21), and \$7.7 million and \$19.8 million was in distressed municipalities⁶³ for FY 2013 and FY 2014 respectively (see Table 22). About 30% of the system benefit funds collected from ratepayers is from economically disadvantaged communities.

⁶² According to the Federal Financial Institutions Examination Council's website, there are 834 census tracts in Connecticut and 155 of those are below 60% State Household Median Income level of \$41,546.

⁶³ DECD ACS 2011 Median Income is \$69,243

Table 21. Percentage of Green Bank Funding to Census Tracts below 60% of the State Median Income for FY 2013 and FY 2014

Funding	Census Tracts Below 60% of State Median Income (FY 2013)	Census Tracts Below 60% of State Median Income (FY 2014)
Approved Funding	\$17,771	\$4,316,517
Closed Funding	\$0	\$6,363,187
Completed Funding	\$6,367,989	\$662,786
Total Below 60% SMI Funding	\$6,385,760	\$11,450,620
Total Funding	\$20,072,450	\$78,731,843
% of Funding	32%	15%

Table 22. Percentage of Green Bank Funding to Distressed Municipalities for FY 2013 and FY 2014

Funding	Distressed Municipality Funding (FY 2013)	Distressed Municipality Funding (FY 2014)
Approved Funding	\$123,322	\$10,351,763
Closed Funding	\$654,596	\$7,859,160
Completed Funding	\$6,914,819	\$1,601,769
Total Distressed Funding	\$7,692,738	\$19,812,692
Total Funding	\$20,072,450	\$78,731,843
% of Funding	38%	25%

To further invest its resources in economically disadvantaged communities, the Green Bank expects to:

- Support a portfolio of financing programs in the multifamily and affordable housing sector; and
- Continue to support targeted community-based strategies (i.e., Solarize and Energize) that promote clean energy in economically disadvantaged communities (e.g., Bridgeport and Windham).

FY 2015 Budget

The fiscal year 2015 budget can be found at – [click here](#).

FY 2015 Targets and Estimated Economic and Environmental Benefits

The FY 2015 targets established by the staff of the Green Bank are ambitious (see Table 23).

Table 23. FY 2015 Targets by Sector for the Connecticut Green Bank

Sector	Program Budget ⁶⁴ (\$000's)	Operations Budget (\$000's)	Total Capital Deployed (\$000's)	Clean Energy Deployed (MW)	Annual Clean Energy Generation (MWh)	Annual Energy Savings (MMBtu)
Statutory and Infrastructure	\$35,900	\$3,209	\$207,100	37.2	137,863	305,393
Residential	\$9,313	\$3,629	\$28,503 ⁶⁵	6.8 ⁶⁶	7,342 ⁶⁷	4,809
Institutional	\$1,875	\$1,002	\$168,000	2.5	3,000	500,000
Commercial and Industrial	\$10,000	\$3,905	\$50,000	8.8	10,000	114,516

By investing \$135 million in programs and operations by the Green Bank in FY 2015 to attract and deploy nearly \$450 million of capital deploying clean energy, will result in an estimated economic development benefit of 6,856 jobs –2,634 direct and 6,856 indirect and induced (see Table 24).

Table 24. Estimated Economic and Environmental Benefits of Achieving the FY 2015 Targets

	Direct Jobs	Indirect and Induced Jobs	Total Jobs ⁶⁸
Statutory and Infrastructure ⁶⁹	920	1,473	2,393
Residential	200	321	521
Institutional	1,243	1,995	3,238
Commercial and Industrial	271	433	704
Total	2,634	4,222	6,856

CEFIA will work with the Department of Energy and Environmental Protection to create a tool, similar to the job calculator, to estimate environmental benefits such as greenhouse gas emissions resulting from clean energy production (i.e., MWh) and energy savings (i.e., MMBtu's) over the life of the projects.

⁶⁴ Includes all program loans, investments, credit enhancements and incentives (net of sell-off) that have targets developed

⁶⁵ Over 85% of the financing that occurs through the Residential Sector programs, will support the deployment of rooftop solar PV. The remaining is heavily weighted towards natural gas conversions.

⁶⁶ These solar PV projects are supported by the RSIP underneath the Statutory and Infrastructure Sector programs. They are simply noted here, but don't count towards the total.

⁶⁷ Ibid

⁶⁸ These job estimates are based on multipliers determined as a result of work performed by Navigant Consulting for the *Connecticut Renewable Energy and Energy Efficiency Economy Baseline* study completed in March 2009 and subsequently updated in 2010. The calculators used to produce the estimates were reviewed and approved by the Department of Economic and Community Development in December 2013.

⁶⁹ The estimate for CHP jobs created is a professional estimate made by CEFIA staff, and based on the Navigant Study findings. The estimate does not include AD projects as this technology was not included in the original study.

Key Definitions

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, 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 Bank to promote investment in clean energy in accordance with a comprehensive plan developed by Connecticut 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.

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 Bank pursuant to Conn. Gen. Stat. § 16a-40e and Conn. Gen. Stat. § 16a-40f, the fund is used for the purpose of guaranteeing loans made by participating lending institutions to a participating qualified nonprofit organization for eligible energy conservation projects, including for two or more joint eligible energy conservation projects.

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.

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.

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).

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.”

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 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.

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, CRRRA, and UCONN student fees. Pursuant to Conn. Gen. Stat. § 16-245mm, the Green Bank received \$50 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.



Memo

To: Connecticut Green Bank Board of Directors
From: Bryan Garcia, President and CEO, and Jeffrey Schub, Consultant
CC: Board of Directors
Date: June 13, 2014
Re: Objective Function Protocol – Version 1.0

Overview

The objective function (OF) is a metric that measures the amount of clean energy generated or energy saved per public dollar at risk in an energy project. The OF can be presented either as units of energy per dollar, or dollars per unit of energy. The dollars included in the OF represent the number of dollars that are invested or used to support a given investment. For example, a grant, a loan and a loan loss reserve fund are public dollars used to support a clean energy project. (This is explained in further detail below.) The OF can be measured for various time periods. The 1-year OF captures the amount of energy created or saved in the first year of the project per dollars spent. Similar OF's can be calculated for 5-year, 10-year or lifetime periods. The basic formula for the OF is as follows:

$$\frac{(Energy\ Generated\ or\ Saved) * (1\ +/-\ \% \ Realized)}{CEFIA\ Rebates + Program\ and\ Administrative\ Cost + Credit\ Enhancements + Amount\ of\ Financing - REC\ Revenue}$$

The numerator captures the amount of energy generated or saved and the denominator captures the number of dollars at risk in a project.¹ The OF is calculated at the project level, and can be aggregated by programs, by sector, by geography, by contractor and for the entire organization. It is important to note that metrics like return on investment and recycling are not reflected in the OF. However, these are critical organizational measurements that should be captured and reviewed alongside the OF.

Numerator of the Objective Function

Energy Generated or Saved

This is the amount of clean energy generated by renewables, or the amount of energy saved by energy efficiency over the specified period of time for the specific OF measured. OF can be by a 1 year, 5 year, 10 year or project lifetime term. Clean energy is measured in kWh, and energy saved is measured in MMBtus. For any transactions that have both generation and efficiency, the generation can be converted to MMBtus. OF calculated prior to project implementation will require energy forecasts. However, real data should be substituted for forecasts as it is collected upon project completion. This difference between forecast and real energy is captured in the "realization" term. For instance, if it is found that a

¹ Some of these dollars earn a return, while others are permanently expended. This distinction is not meant to be captured in the OF. Rather, this metric captures the amount of green bank resources devoted to a specific project. The amount of return those dollars earn may be captured in a separate metric.

solar project is generating 10% more kWh's than expected, then the Energy Generated figure can be multiplied by 1.10 to properly account for this unexpected increase.

Denominator of the Objective Function

State Rebates

Rebates include any cash subsidy from the Green Bank that goes to the relevant clean energy or energy efficiency project. Examples include the RSIP EPBB and PBI. These figures should be expressed in present value, so a stream of payments like the PBI needs to be converted to real terms. In future versions of this calculation, the Green Bank may want to include all state or ratepayer funded rebates (as outlined below).

Program and Administrative Costs

At this stage of organizational and metric development, the OF will not include the Green Bank's program and administrative costs. Many Green Bank programs are still at an early stage of market and program development. This means that the resulting cost, on a per project basis, will be higher than is expected during a "steady-state" of market adoption. These costs will be tracked, and will be included in future versions of the OF (as outlined below).

Credit Enhancements

This cost category includes any dollars specifically committed to support the credit of the underlying borrower in order to draw in greater private investment. Examples include interest rate buy downs, loan loss reserves, or guarantees. Dollars paid to allow the bank to offer a lower interest rate to consumers would be included in this category. The number of dollars the Green Bank commits to a loan loss reserve would also be captured. For example, the Green Bank has put \$3.5 million into a reserve to support the Solar Lease 2 product. Each individual project's share of that \$3.5 million would be included in the OF.²

Amount of Financing

This accounts for the total dollars that the Green Bank provides to customers in the form of equity, loans or leases. The figure included in the denominator is the actual principal of the investment. For instance, if the Green Bank finances 100% of a C-PACE project that costs \$1 million, then that entire figure will be included in the denominator. For lending funds like CT Solar Loan and Solar Lease 2, the Green Bank's capital commitment will be calculated on a per loan basis.

REC Revenue

The Green Bank's capital commitment in the forms outlined above is offset by RECs that it retains for RSIP grants. The Green Bank is free to then sell these RECs and keep the proceeds. This money offsets the dollars at risk associated with the project and should be subtracted from the denominator of the OF. REC revenue will be calculated based on expected prices using a forward pricing curve, and should be discounted to the present value of the future REC revenue. The Green Bank has some level of visibility into future REC prices five six years out, and these prices should be used for the calculation. Beyond six years there is less visibility into specific REC prices, but there is still a high level of certainty that the RECs will have value greater than zero. Therefore the price for year 6 should be assumed to apply to RECs generated in years 6 through 10. And then a price equal to 50% of the year 6 price should be applied to RECs generated in years 11 through 15. There is too much uncertainty about future REC markets and prices to assume any value for RECs beyond the 15 year time horizon. The single value attributable to the RECs over this 15 year period will be applied to a project's OF no matter the OF horizon. For example, a project's 5-year OF and lifetime OF will have the same total REC value in the denominator.

² These funds were technically from ARRA, but they are treated here as Green Bank dollars, as the Green Bank has discretion over how they are used. This effectively makes them Green Bank dollars for decision-making purposes.

Discount Rate

The appropriate discount rate for the Green Bank could be based on numerous possible inputs, such as: 1) the rate of inflation; or 2) the rate of ratepayer dollars; or 3) market cost of capital; or 4) risk-free rate; or 5) the state's cost of capital; or 6) some other reasonable assumption. It has been determined that option #5 will be used for the discount rate and thus 3% will be used for the OF. This is based on the rationale that marginal cost of an additional dollar to the Green Bank, if it were to raise funds using its bonding authority through the state, would roughly equal the cost of Connecticut's general obligation bonds. Connecticut is currently raising funds at 2.66%. Adding in a small premium for the Green Bank's quasi-public status yields an assumed discount rate of 3%

Version 2.0 – Thinking Ahead

This version of the OF, Version 1.0, represents the organizations first attempt to formalize this metric. Moving forward, the Green Bank may want to add additional sources of revenue or expense, or build in greater accuracy or nuance to the calculations. Listed below are several possible additions for Version 2.0.

- **CEEF Rebate** – The present objective of the OF is to measure the impact the Green Bank has, as an organization, through its clean energy investments and grants. In the future, though, the OF can be expanded to consider the impact of state or other ratepayer dollars overall, which would include rebates from CEEF.
- **Energy or Environmental Attribute Revenue** – In the future, the Green Bank may be able to earn additional revenue on its investments by monetizing certain energy or environmental attributes. Forward capacity markets and other ancillary benefits may present an opportunity for the Green Bank to extract even greater value for each dollar it spends.
- **Servicing Costs** – It is reasonable to expect that the Green Bank will incur loan servicing costs in the future as the organization will necessarily work to ensure loan repayments. This may be an additional expense calculation to be included in the denominator of a Version 2.0 OF.
- **Program & Administrative Costs** – Version 2.0 of the OF should include the program and administration costs associated with each Green Bank program. Over time, these per-project costs should normalize as demand becomes steady and start-up costs are no longer needed. These costs can be calculated by allocating program-specific costs, including salaries and marketing, across each project in a given program.

In addition, general administrative costs for the Green Bank will also be allocated per project.

Also, as CEEF rebates are included in the future OF, program and administrative costs associated with CEEF grant programs should also be included. This presents challenges, as it may be difficult to accurately capture these costs from the utilities that administer the program. In sum, the program and administrative costs of the Green Bank and CEEF will be included in the OF as follows.

	Include Program & Admin Costs	Exclude Program & Admin Costs
Green Bank Only	Track for FY 2015 (OF Version 2.0)	Calculate for FY 2015 (OF Version 1.0)
Green Bank and CEEF	Calculate for FY 2016 (OF Version X)	Track for FY 2015 (OF Version 2.0)