



CLEAN ENERGY
FINANCE AND INVESTMENT AUTHORITY

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Rocky Hill, Connecticut 06067

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August 13, 2014

Dear Connecticut Green Bank Deployment Committee Members:

Thank you for your willingness to hold a special meeting of the Deployment Committee on Wednesday, August 20, 2014 from 4:00-5:00 p.m. in the Colonel Albert Pope Board Room of the Green Bank at 845 Brook Street, Rocky Hill, CT 06067.

We are focusing on a recommendation for approval of one of our key programs as well as a discussion on its accompanying financing programs as support, including:

- **Residential Solar Investment Program** – we are proposing a Step 5 incentive for the RSIP of 10 MW of installed capacity at a level of \$0.65/W for the HOPBI and an economically equivalent rate of \$100/MWh for the PBI. This proposed Step 5 incentive is equivalent to the present value of a 15-year ZREC priced at \$50, or 10% below the ACP of \$55 for the Class I RPS in Connecticut. We look forward to discussing the progress we have made on the RSIP to date, including achieving the legislative target under budget and ahead of schedule, and recommending how we can continue to support the realization of the market potential for residential solar PV in Connecticut.
- **CT Solar Loan** – we are looking forward to discussing how we would like to improve the CT Solar Loan product by introducing a 20-year option – it is now 15-years only – and allowing the loan funds to be used to also include battery storage for those households that want reliability. The expansion of the term will provide greater cash flow to household customers who want more money in their pockets today versus over time. In addition, the CT Solar Loan has proven so popular that commitments for loans will soon exceed the existing cap of \$5 million approved by the Board of Directors in July 2013. To accommodate this growth which we arrange these loans for sell-down to capital providers, we would also like to expand the current warehouse for the CT Solar Loan from \$5 million to \$7.5 million.
- **CT Solar Lease** – we are preparing to fix the interest rates for the debt funded portion of the facility by engaging in interest rate swaps. This will ensure that the leasing company's cost of funds is hedged as required by the credit agreement with the First Niagara loan syndicate. As provided for in the credit agreement, First Niagara is the arranger of these interest rate swaps in consultation with the Green Bank's Finance team. In addition, Finance has been working with US Bank and First Niagara to consider changes to the contractual arrangements to accommodate the extra demand for municipal and commercial PPAs and leases as well as possibly extending the overall arrangements by a year (to 2016).

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

Have a great rest of the week and weekend. We look forward to seeing you (or hearing you) next week.

Sincerely,

A handwritten signature in blue ink, appearing to read 'Bryan Garcia', with a long horizontal flourish extending to the right.

Bryan Garcia
President and CEO



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AGENDA

Deployment Committee of the
Connecticut Green Bank
845 Brook Street, Rocky Hill, CT 06067
Wednesday, August 20, 2014
Special Meeting
4:00-5:00 p.m.

Staff Invited: Jessica Bailey, George Bellas, Andy Brydges, Mackey Dykes, Brian Farnen, Bryan Garcia, Dale Hedman, Bert Hunter, and Kerry O'Neill

1. Call to order
2. Public Comments – 5 minutes
3. Approval of meeting minutes for May 15, 2014* – 5 minutes
4. Statutory and Infrastructure Updates and Recommendations* – 40 minutes
 - a. Residential Solar Investment Program*
5. Residential Sector Program Updates – 10 minutes
 - a. CT Solar Loan (i.e., expansion of the warehouse, inclusion of battery storage, and 20-year term)
 - b. CT Solar Lease
6. Adjourn

*Denotes item requiring Board action

Join the meeting online at <https://www4.gotomeeting.com/join/480241623>

Dial +1 872) 240-3401

Access Code: 480-241-623

***Next Regular Meeting: Monday, September 8, 2014 from 2:00-3:00 p.m.
Colonel Albert Pope Board Room at the
Clean Energy Finance and Investment Authority, 845 Brook Street, Rocky Hill, CT***



CLEAN ENERGY FINANCE AND INVESTMENT AUTHORITY

RESOLUTIONS

Deployment Committee of the
Connecticut Green Bank
845 Brook Street, Rocky Hill, CT 06067

Wednesday, August 20, 2014
Special Meeting
4:00-5:00 p.m.

Staff Invited: Jessica Bailey, George Bellas, Andy Brydges, Mackey Dykes, Brian Farnen,
Bryan Garcia, Dale Hedman, Bert Hunter, and Kerry O'Neill

1. Call to order
2. Public Comments – 5 minutes
3. Approval of meeting minutes for May 15, 2014* – 5 minutes

Resolution #1

Motion to approve the minutes of the Deployment Committee for May 15, 2014 Regular Meeting and March 14, 2014 Special Meeting. Second. Discussion. Vote.

4. Statutory and Infrastructure Updates and Recommendations* – 40 minutes
 - a. Residential Solar Investment Program*

Resolution #2

WHEREAS, Section 106 of Public Act 11-80 “An Act Concerning the Establishment of the Department of Energy and Environmental Protection and Planning for Connecticut’s Energy Future” (the “Act”) requires the Connecticut Green Bank (Green Bank”) to design and implement a Residential Solar Photovoltaic (“PV”) Investment Program (“Program Plan”) that results in a minimum of thirty (30) megawatts of new residential PV installation in Connecticut before December 31, 2022;

WHEREAS, as of August 1, 2014, the Program Plan has thus far resulted in approximately thirty-two (32.0) megawatts of new residential PV installation application approvals in Connecticut; and

WHEREAS, pursuant to Section 106 of the Act, the Green Bank has prepared a Program Plan and a declining incentive block schedule (“Schedule”) that offer direct financial incentives, in the form of homeowner performance-based incentives (“HOPBI”)

or performance-based incentives (“PBI”), for the purchase or lease of qualifying residential solar photovoltaic systems, respectively.

NOW, therefore be it:

RESOLVED, that the Green Bank Deployment Committee (Deployment Committee) hereby recommends to the Green Bank Board of Directors (the “Board”) the approval of the Schedule of Incentives as set forth in Table 3 of the Due Diligence Package dated August 20, 2014 to achieve 10.0 MW of solar PV deployment;

RESOLVED, that the Deployment Committee hereby recommends that the Board direct staff that at the point where 6.0 MWs of committed capacity is reached during Step 5 of the Schedule, or earlier if staff deems it appropriate, to release a report that makes a recommendation to the Deployment Committee on the Step 6 and beyond for capacity allocation and incentive levels; and

RESOLVED, that the Deployment Committee hereby recommends that the Board adopt a resolution stating that by (a) the point of the Step 5 incentive where 8.0 MW of committed capacity is reached for either the PBI or the HOPBI models or (b) June 30, 2015 whichever comes first, the Board will approve a Step 6 capacity allocation and incentive level to ensure the sustained and orderly deployment of the residential solar market in Connecticut.

5. Residential Sector Program Updates – 10 minutes
 - a. CT Solar Loan (i.e., expansion of the warehouse, inclusion of battery storage, and 20-year term)
 - b. CT Solar Lease
6. Adjourn

*Denotes item requiring Board action

Join the meeting online at <https://www4.gotomeeting.com/join/480241623>

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Access Code: 480-241-623

***Next Regular Meeting: Monday, September 8, 2014 from 2:00-3:00 p.m.
Colonel Albert Pope Board Room at the
Clean Energy Finance and Investment Authority, 845 Brook Street, Rocky Hill, CT***



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Deployment Committee of the Clean Energy Finance and Investment Authority

Agenda Item #1

Call to Order

August 20, 2014



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Deployment Committee of the Clean Energy Finance and Investment Authority

Agenda Item #2

Public Comments

August 20, 2014



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Deployment Committee of the Clean Energy Finance and Investment Authority

Agenda Item #3

Approval of the Meeting Minutes of May 15, 2014

August 20, 2014



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Deployment Committee of the Clean Energy Finance and Investment Authority

Agenda Item #4

Statutory and Infrastructure Sector Programs

August 20, 2014



Key Questions

Strategic Plan – is the RSIP consistent with the Board approved Comprehensive Plan and Budget for the fiscal year?

Ratepayer Payback – How much clean energy is being produced from the project versus the dollars of ratepayer funds invested?

Terms and Conditions – What are the terms and conditions of the ratepayer payback, if any?

Capital Expended – How much of the ratepayer and other capital that the Green Bank manages is being expended on the project?

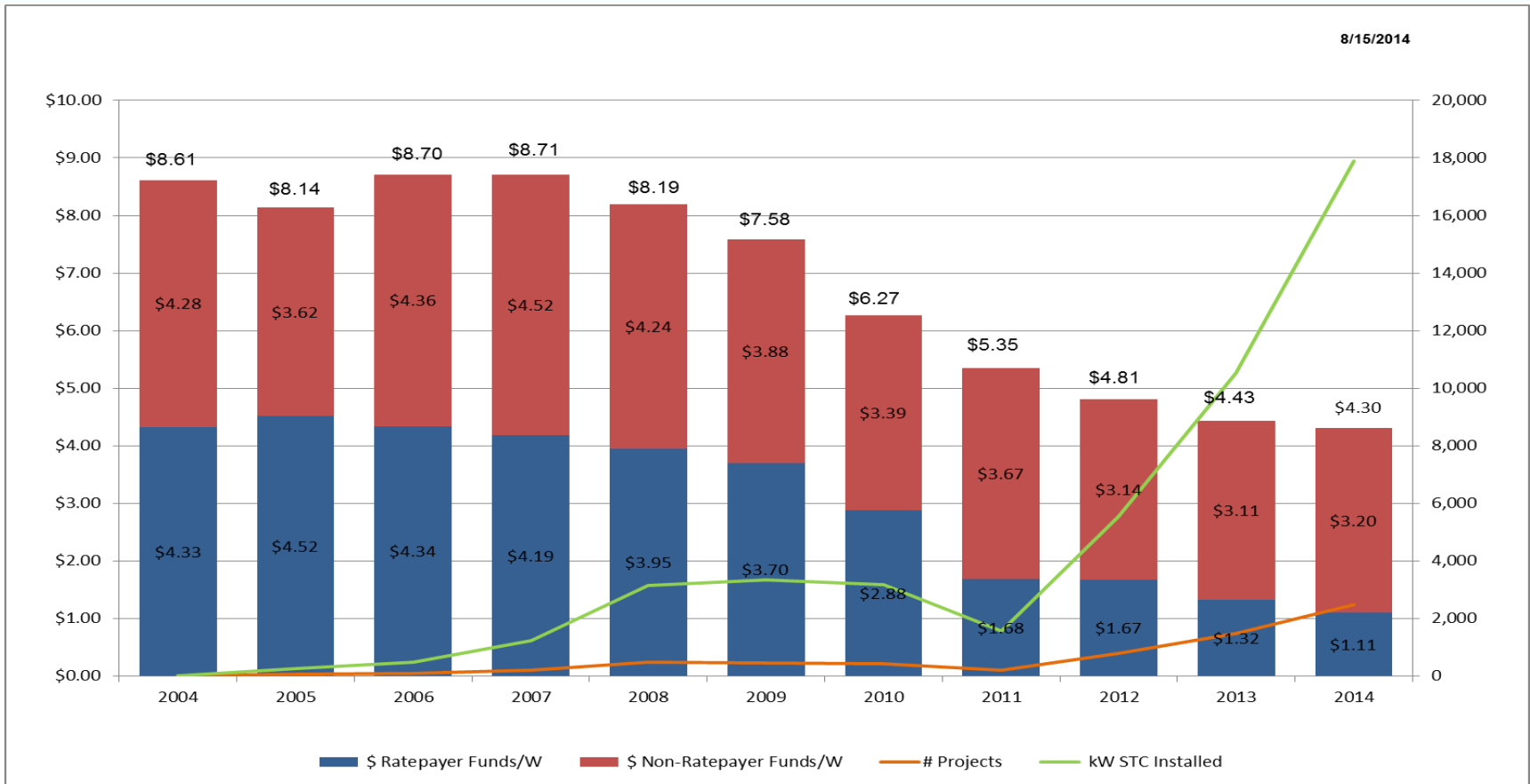
Risk – What is the maximum risk exposure of ratepayer funds for the project?

Target Market – Who are the end-users of the project?

Residential Solar Investment Program Achieved Legislative Minimum Target



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Achieved the legislative minimum target (30 MW) 8 years ahead of schedule (2022) and under budget

Residential Solar Investment Program

Benchmarking Progress of Neighbors



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RSIP Incentive Step	Connecticut	Massachusetts	New Jersey	New York
Installed Cost (\$/W)	\$4.26	\$4.85	\$4.00	\$4.90
State Incentives	\$1.17	\$2.90	\$1.87	\$1.68
Federal Incentives	\$0.93	\$0.59	\$0.64	\$1.17
Net Cost to Consumer	\$2.16	\$1.36	\$1.49	\$2.05
% of Installed Cost	51%	28%	37%	42%

CT is providing consumers less state incentive while delivering the same watts per capita as MA and likely more than NJ and NY

Residential Solar Investment Program

Benchmarking Progress In State



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	Through Step 4 of RSIP	Rounds 1 and 2 of ZREC Actual		
	<u>RSIP</u>	<u>Small</u>	<u>Medium</u>	<u>Large</u>
Clean Energy Deployed (MW _{STC})	33.4	26.5	29.9	29.4
Ratepayer Funds Expended (\$)	\$42,314,916	\$61,657,718	\$62,722,512	\$57,431,170

RSIP is doing more clean energy deployment with less ratepayer resources than any class of the ZREC

Reference

Discount rate used is the rate of inflation or 3% for ZREC present value cost of ratepayer funds expended.

Residential Solar Investment Program

Meeting with Installers



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Internal “deep dive” sessions – next generation of RSIP

Conversations with the industry

National Market Leader – Solar City (30% market share)

Solar Connecticut – Local “Growth” (1-10% market share) and “Small” Installers (<1% market share)

Key Messages

Green Bank is losing money – demand is outpacing incentives

Legislative target of 30 MW has been achieved – there is a GW market out there and subsidies aren’t the answer to scale

We don’t want to “pull the plug” on the market like in years past – we need commitment of the industry to work on a legislative fix for long-term contracts to secure REC revenue over time to offset RSIP expenses

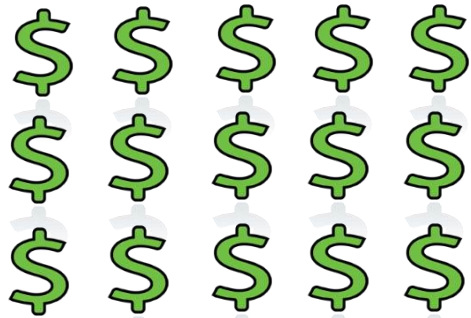
Residential Solar Investment Program Rebates (Version 1.0)



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RPS Market (2014)

\$150,000,000



RSIP

\$10,000,000



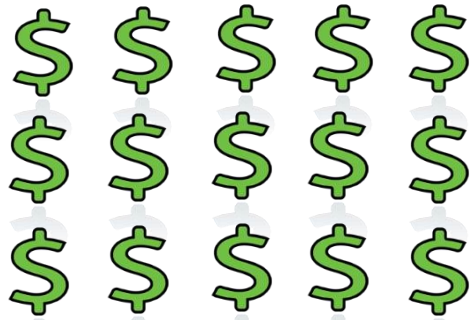
Residential Solar Investment Program RPS Market Intermediary (Version 2.0)



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RPS Market (2014)

\$150,000,000



15-Year Contracts
for Class I RECs
from Residential
Solar in CT

RSIP

\$10,000,000



Residential Solar Investment Program

REC Revenue (\$/W)



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Year	Estimated RECs Produced (MWh)	Estimated Current REC Price (\$)	Estimated Current Present Value REC Revenue (\$/W)	Estimated Future Present Value REC Revenue (\$/W)
0	-	-	-	-
1	1.139	55.33	\$0.061	\$0.055
...
15	1.062	12.50	\$0.009	\$0.034
Total			\$0.390	\$0.658

Residential Solar Investment Program

Step 5 Incentive Expense Proposal



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RSIP Incentive Step	HOPBI-EPBB (\$/W)			PBI (\$/kWh)	
	5 kW	5 to 10 kW	>10 kW	10 kW	>10 kW
Step 1	\$2.450	\$1.250	\$0.00	\$0.300	\$0.000
Step 2	\$2.275	\$1.075	\$0.00	\$0.300	\$0.000
Step 3	\$1.750	\$0.550	\$0.00	\$0.225	\$0.000
Step 4	\$1.250	\$0.750	\$0.00	\$0.180	\$0.000
Step 5 (proposed)	\$0.65		\$0.30	\$0.100	\$0.050

The Step 5 proposed incentive level is equivalent to a present value of a 15-year ZREC of \$50 or \$5 lower than the Class I RPS ACP

Residential Solar Investment Program

Step 5 Recommendation



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“Race to the Rooftop” of 10 MW for Step 5 – no more buckets...open competition for HOPBI and PBI

Move from the rebate model to Class I RPS policy intermediary – facilitate value of the RPS to the customer by monetizing the value of the REC (i.e. equivalent to \$50 ZREC)

HOPBI – \$0.65/W 10 kW; and \$0.30/W > 10 kW

PBI – \$100/MWh 10 kW; and \$50/MWh > 10 kW

Green Bank owns the REC and will sell it to generate REC revenues that offset the RSIP expenses

Residential Solar Investment Program Resolution (Revision)



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(Open the Resolution document and run through revisions...)

Residential Solar Investment Program

Step 6 and Step 7 Discussion



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Establish Step 6 and Step 7 “Race to the Rooftop” of 10 MW each – total of 30 MW for Steps 5 through 7 doubling legislative target – must get policy on long-term REC contracts to continue beyond



Key Questions

Strategic Plan – is the RSIP consistent with the Board approved Comprehensive Plan and Budget for the fiscal year?

As a Statutory Program in the CEFIA comprehensive plan (as required by Section 106 of PA 11-80), the **RSIP is consistent with that plan and the Board approved a budget** in the amount of \$14,400,000 to support HOPBI-EPBB and PBI for FY 2015.

RSIP expended no more than \$1.0 million to date for FY 2015 - \$1.0 million for HOPBI-EPBB and \$0.0 million for PBI





Key Questions

Ratepayer Payback – How much clean energy is being produced from the project versus the dollars of ratepayer funds invested?

RSIP Incentive Step	Numerator (Lifetime kWh)	Denominator (\$ Invested)	Objective Function (kWh / \$1)
Step 1	187,779	\$11,769	16.0
Step 2	187,779	\$9,569	19.6
Step 3	187,779	\$7,119	26.4
Step 4	187,779	\$5,019	37.4
Step 5 (proposed)	187,779	\$1,819	103.2





Terms and Conditions – What are the terms and conditions of the ratepayer payback, if any?

The incentive of \$0.65/W offered under Step 5 for the HOPBI and \$100/MWh for the PBI is paid out after a 30-day performance period or over a 6-year period of time respectively based on system performance.

The Green Bank owns all RECs associated with projects that receive an incentive. It is estimated that \$0.39/W in revenue (in present value terms) will be received from the sale of RECs into the Class I RPS market under current and forecasted conditions – whereas if the Green Bank were to be able to sell its RECs to the utilities through a long-term contract similar to the ZREC program, then \$0.66/W in revenue (in present value terms) could be received. However, a change in public policy during the 2015 legislative session would be required to achieve this result.





Key Questions

Capital Expended – How much of the ratepayer and other capital that CEFIA manages is being expended on the project?

By statute, the Green Bank shall apportion no more than one-third of the total surcharge collected annually, or approximately \$9.2 million for the current fiscal year.

For Step 5, with a “Race to the Rooftop” target of 10 MW and a proposed incentive level of \$0.65/W, then \$6.5 million in incentives would be expended on the program over time (with the HOPBI being paid out within the first year of system installation and the PBI being paid out over six years).





Risk – What is the maximum risk exposure of ratepayer funds for the project?

Despite the \$3.9 million in REC revenue (in present value terms) that staff expects can be realized as a result of the program, staff expects that the maximum risk exposure for the program is \$6.5 million – the estimated value of the incentives provided through Step 5 of the program to achieve the “Race to the Solar Rooftop” target of 10.0 MW. Given the variability of REC pricing, it would be difficult to ascertain the true value that the Green Bank would receive without a forward contract and a fixed price for RECs produced.





Target Market – Who are the end-users of the project?

Per Section 106 of Public Act 11-80, the end-users of the RSIP are residential ratepayers. These ratepayers are interested in either owning (i.e. HOPBI) a solar PV system or paying a reduced or fixed electricity price by leasing (i.e. PBI) a solar PV system.

Nearly 15% of the projects supported in Step 1 through Step 4 are located in distressed communities.





Key Questions

Financial Statements – How is the program investment accounted for on the balance sheet and profit and loss statements?

The **HOPBI** will be reflected on the balance sheet as a reduction to “cash” (current assets) with a corresponding entry on the profit and loss statement under “Operating Expenses” in the relevant ledger account under “Financial Incentives – Grants and Rebates,” which will have the effect of reducing unrestricted net assets. The **PBI** will be reflected as an “Open Commitment” which is recorded in the notes to the financial statements and when paid over six years, the PBI will be reflected on the balance sheet as a reduction to “cash” (current assets) with a corresponding entry on the profit and loss statement under “Operating Expenses” in the relevant ledger account under “Financial Incentives – Grants and Rebates,” and will have the effect of reducing unrestricted net assets.





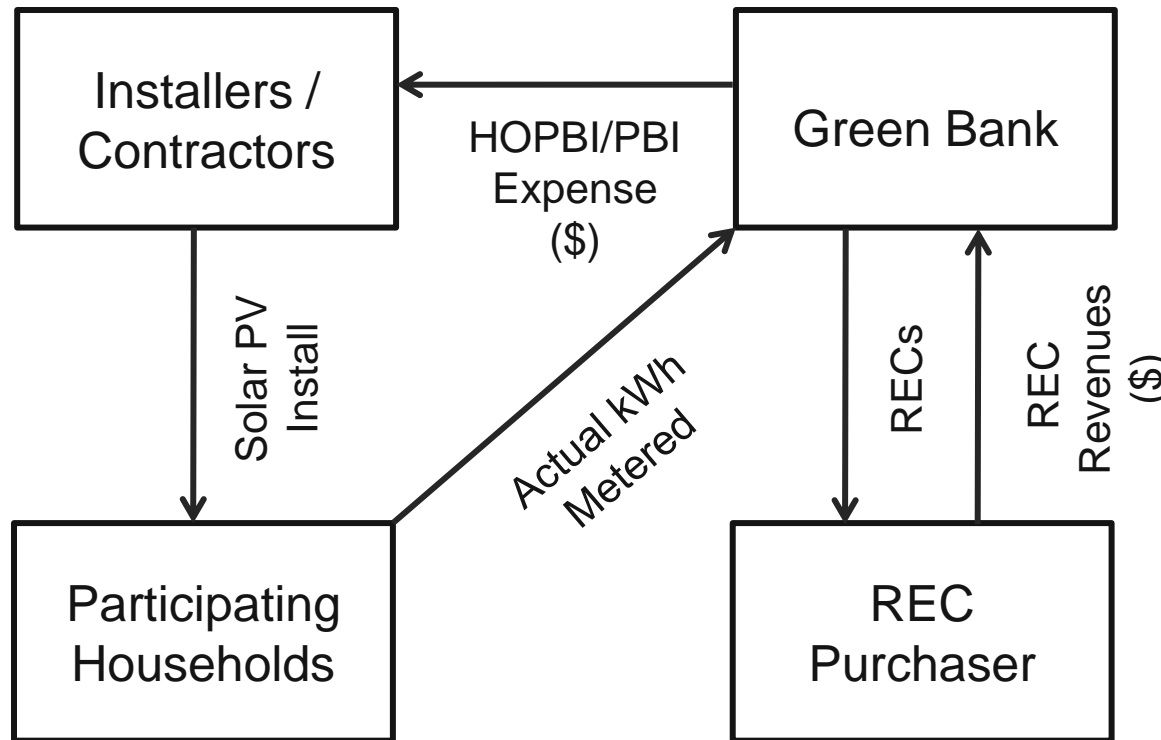
Financial Statements (cont'd) – How is the program investment accounted for on the balance sheet and profit and loss statements?

The **production of RECs** has been accounted for as a reduction of “Rebate Expense” with a corresponding increase to the Non-Current Asset Account: “Investment RECs”. At the time of sale of the RECs, the “Investments – RECs” account is reduced by the carrying value of the RECs sold and the Profit and Loss Statement will recognize a gain or loss to reflect any difference in value between the actual sale price of the RECs and the carrying value of the RECs sold.





Capital Flow Diagram



Residential Solar Investment Program

Key Questions



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Capital Flow Table

Year	HOPBI Expense (\$/W)	Estimated RECs Produced (MWh)	Estimated Current REC Price (\$)	Estimated Current Present Value REC Revenue (\$/W)	Estimated Future Present Value REC Revenue (\$/W)
0	(\$0.650)	-	-	-	-
1	-	1.139	55.33	\$0.061	\$0.055
...	-
15	-	1.062	12.50	\$0.009	\$0.034
Total	(\$0.650)			\$0.390	\$0.658
(Loss) / Profit				(\$0.26)	\$0.008



Residential Solar Investment Program

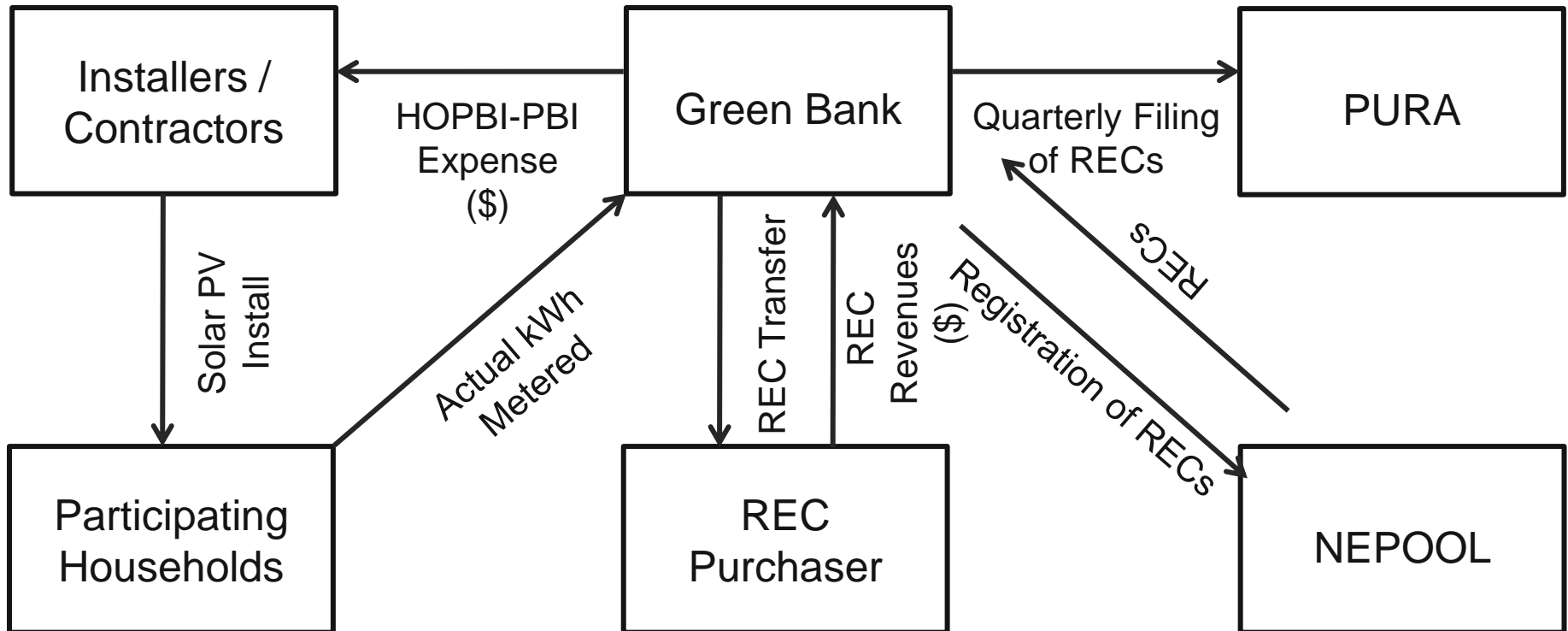
Market to Policy Intermediary



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MARKET

POLICY



Residential Solar Investment Program Incentive Reduction Comparison



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RSIP Incentive Step	HOPBI-EPBB (\$/W)		PBI (\$/kWh)	
	Incentive (\$/W)	% Decrease	Incentive (\$/W)	% Decrease
Step 1	\$1.78	-	\$1.78	-
Step 2	\$1.55	13%	\$1.85	(4%)
Step 3	\$1.15	26%	\$1.43	23%
Step 4	\$0.88	23%	\$1.14	20%
Step 5 (proposed)	\$0.65	26%	\$0.72	37%

Reduced incentives by more than 60% in two years –
to an equivalent ZREC price of \$50/REC in Step 5

Residential Solar Investment Program

Objective Function



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RSIP Incentive Step	Numerator (Lifetime kWh)	Denominator (\$ Invested)	Objective Function (kWh / \$1)
Step 1	187,779	\$11,769	16.0
Step 2	187,779	\$9,569	19.6
Step 3	187,779	\$7,119	26.4
Step 4	187,779	\$5,019	37.4
Step 5 (proposed)	187,779	\$1,819	103.2

Reference

Assumes a 7 kW average sized solar PV system for the HOPBI-EPBB incentive



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Deployment Committee of the Clean Energy Finance and Investment Authority

Agenda Item #5

Residential Sector Programs

August 20, 2014

CT Solar Loan

Update and Preview of BOD Request



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Board of Directors approved \$5 million for program in July 2013

As of August 12, \$4.9 million approved, representing 230 homeowners, \$3.25 million closed, and over \$800,000 funded

Successful pooled asset sale (Feb. 2014) to crowdfunding platform Mosaic, which has sold 100% of initial tranche (~\$125,000) to its investor base

Origination partner Sungage has closed on a new debt capital line, with a federally chartered credit union, that it will begin to access in Q3 or Q4 of 2014

Staff will request full Board approval of expansion of Green Bank warehouse facility (another \$5 million for revolving advances, of which up to \$1 million could be held to term – for a total maximum of \$10 million in revolving advances, \$2 million held to term), as well as new programmatic features, including lengthening loan tenor to 20 years and allowing homeowners to finance battery storage systems along with solar PV

Consistent with FY15 Budget & Comprehensive Plan



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Deployment Committee of the Clean Energy Finance and Investment Authority

Agenda Item #6

Adjourn

August 20, 2014

DEPLOYMENT COMMITTEE OF THE CLEAN ENERGY FINANCE AND INVESTMENT AUTHORITY

Draft Minutes – Regular Meeting
Thursday, May 15, 2014

A regular meeting of the Deployment Committee of the Board of Directors of the **Clean Energy Finance and Investment Authority (“CEFIA”)** was held on May 15, 2014, at the office of CEFIA, 845 Brook Street, Rocky Hill, CT.

1. **Call to Order:** Mr. Hundt, noting the presence of a quorum, called the Deployment Committee meeting to order at 2:03 p.m. Deployment Committee members participating: Bettina Ferguson representing Denise Nappier, State Treasurer (by phone); Reed Hundt (by phone); and Patricia Wrice (by phone).

Staff Attending: Jessica Bailey (by phone), George Bellas, Mackey Dykes, Brian Farnen, Bryan Garcia (by phone), Dale Hedman, Bert Hunter, David Goldberg, Rick Ross, Ali Lieberman, Ben Healy, Will McCalpin, Madeline Priest, Joe Buonannata, Cheryl Samuels and Fiona Stewart.

2. **Public Comments:**

There were no public comments.

3. **Approval of Meeting Minutes:**

The Deployment Committee members were asked to consider the minutes from the Regular March 7, 2014 meeting.

Ms. Ferguson indicated that on **page 9, regarding Colebrook wind 17 lines up from bottom, the sentence starting “finally he indicated” the “if” should be “is”.**

Upon a motion made by Ms. Ferguson, seconded by Ms. Wrice, the Deployment Committee members voted in favor of adopting the minutes from the March 7, 2014 Regular meeting as corrected.

The Deployment Committee members were asked to consider the minutes from the March 14, 2014 Special meeting.

Upon a motion made by Ms. Ferguson, seconded by Ms. Wrice, the Deployment Committee members voted in favor of adopting the minutes from the March 7, 2014 special meeting as presented.

4. Commercial and Industrial Sector Program Recommendations

a. C-PACE Transactions

Mr. Hunter announced that previously, the BOD approved a sell-down of C-PACE transactions. Mr. Bellas informed the group that at 11 AM that morning, \$6,500,000 was received into CEFIA accounts as a result of the closing on the sell-down with Clean Fund. Mr. Goldberg stated that he will be working with Clean Fund and other partners to issue a press release on Monday morning, May 19. Mr. Hunter thanked Jessica Bailey and the CEFIA staff for continuing to generate the transactions. Ms. Bailey mentioned that they are excited to continue to use this model moving forward.

- i. Ms. Bailey spoke to the solar PV Installation at 1200 High Ridge Road, Stamford, CT. It will be the first C-PACE project in Stamford. Ms. Ferguson noted that the second footnote was cut off and asked for clarification. Mr. Healy clarified that the second footnote was explaining Loan to Value.

Upon a motion made by Ms. Ferguson, seconded by Ms. Wrice, the Deployment Committee members voted unanimously in favor of adopting the following resolution regarding C-PACE transaction at 1200 High Ridge Rd, Stamford, CT:

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

WHEREAS, the CEFIA Board of Directors has approved a \$40,000,000 C-PACE construction and term loan program; and

WHEREAS, CEFIA seeks to provide a \$292,986 construction and (potentially) term loan under the C-PACE program to the 1200 High Ridge Company, LLC, the property owner of 1200 High Ridge Road, Stamford, CT (the "Loan"), to finance the construction of specified clean energy measures in line with the State's Comprehensive Energy Strategy and CEFIA's Strategic Plan;

NOW, therefore be it:

RESOLVED, that the President of CEFIA and any other duly authorized officer of CEFIA, is authorized to execute and deliver the Loan in an amount not to be greater than one hundred ten percent of the Loan amount with terms and conditions consistent with the memorandum submitted to the Board of Directors dated May 8, 2013, and as he or she shall deem to be in the interests of CEFIA and the ratepayers no later than 90 days from May 15, 2014;

RESOLVED, that before executing the Loan, the President of CEFIA and any other duly authorized officer of CEFIA shall receive confirmation that the C-PACE

transaction meets the statutory obligations of the Act, including but not limited to the savings to investment ratio and lender consent requirements; and

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

- ii. Regarding Dee Zee Ice in Stonington, CT, Ms. Bailey mentioned that while this project has a loan value of 90% (above CEFIA guidelines of 80%), the cash flow for the business is quite good. She also stated that the lien-to-value value was 30%, within CEFIA guidelines. Mr. Healy explained the loan-to-value is within CEFIA's 80% threshold when considering the other real properties that are part of the mortgage holder's collateral package.

Upon a motion made by Ms. Ferguson, seconded by Ms. Wrice, the Deployment Committee members voted unanimously in favor of adopting the following resolution regarding C-PACE transaction at Dee Zee Ice, Stonington, CT:

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

WHEREAS, the CEFIA Board of Directors has approved a \$40,000,000 C-PACE construction and term loan program;

WHEREAS, CEFIA seeks to provide a \$306,641 construction and (potentially) term loan under the C-PACE program to Dee Zee Ice, LLC, the property owner of 93 Industrial Drive, Southington, CT (the "Loan"), to finance the construction of specified clean energy measures in line with the State's Comprehensive Energy Strategy and CEFIA's Strategic Plan;

NOW, therefore be it:

RESOLVED, that the President of CEFIA and any other duly authorized officer of CEFIA, is authorized to execute and deliver the Loan in an amount not to be greater than one hundred ten percent of the Loan amount with terms and conditions consistent with the memorandum submitted to the Deployment Committee dated May 8, 2014, and as he or she shall deem to be in the interests of CEFIA and the ratepayers no later than 90 days from May 15, 2014;

RESOLVED, that before executing the Loan, the President of CEFIA and any other duly authorized officer of CEFIA shall receive confirmation that the C-PACE

transaction meets the statutory obligations of the Act, including but not limited to the savings to investment ratio and lender consent requirements; and

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

- iii. Ms. Bailey stated that the Cargill Falls Mill project has been in the works since the inception of C-PACE. Mr. Healy explained how it is a redevelopment of an old, continuously used mill site in the town of Putnam. Over \$20,000,000 for redevelopment of the mill buildings into both residential and commercial space is planned. Mr. Healy went on to mention that this project will bring together clean energy, commercial, and multi-family goals into one project, including a portion of the residential development that will be classified as affordable housing (the developers are seeking a CHAMP grant as part of their overall funding plan). Mr. Healy explained that the project developers had met with several members of staff over many months, including Ms. Bailey, Mr. Hunter, Ms. Stevenson and Mr. Ross in order to explore modifications to the developers' plans. He noted that this process has been beneficial, and that a number of suggestions by staff have been accommodated in the proposal being presented to the Deployment Committee, including new hydroelectric generation equipment that would come with manufacturers' warranties, a comprehensive insurance package and other provisions. Mr. Healy further explained that the reason for coming to the Deployment Committee for approval, subject to the conditions set forth in the memorandum circulated to the members of the committee, was to demonstrate to the other potential funders of the project, including private capital, that CEFIA is supportive the development of the project by the underwriting, in principle and subject to various conditions, of the hydroelectric portion of the project. Mr. Healy made clear to the committee that while staff stress-tested the project economics to demonstrate that the C-PACE financing could be repaid without the successful development of the residential and commercial portions of the project, nonetheless CEFIA's funding would not be advanced unless the other portions of the capital stack had expressed a commitment to the project. Mr. Healy also recognized CEFIA staff who worked on this and other C-PACE projects and how this experience has been an opportunity for growth for these staff members.

Upon a motion made by Ms. Ferguson, seconded by Ms. Wrice, the Deployment Committee members voted unanimously in favor of adopting the following resolution regarding C-PACE transaction at Cargill Falls Mill:

WHEREAS, Pursuant to Section 157 of Public Act No. 12-2 of the June 12, 2012 Special Session of the Connecticut General Assembly and as amended (the "Act"), CEFIA is directed to, amongst other things, establish a commercial sustainable energy

program for Connecticut, known as Commercial Property Assessed Clean Energy ("C-PACE");

WHEREAS, the CEFIA Board of Directors has approved a \$40,000,000 C-PACE construction and term loan program; and

WHEREAS, CEFIA seeks to provide a not-to-exceed \$2,250,000 construction and (potentially) term loan under the C-PACE program to Historic Cargill Falls Mill, LLC, the property owner of 58 Pomfret Street, Putnam, CT (the "Loan"), to finance the construction of specified clean energy measures in line with the State's Comprehensive Energy Strategy and CEFIA's Strategic Plan;

NOW, therefore be it:

RESOLVED, that the President of CEFIA and any other duly authorized officer of CEFIA, is authorized to execute and deliver the Loan in an amount not to be greater than one hundred ten percent of the Loan amount with terms and conditions consistent with the memorandum submitted to the Board of Directors dated May 8, 2014, and as he or she shall deem to be in the interests of CEFIA and the ratepayers no later than 360 days from May 15, 2014;

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

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

5. Statutory and Infrastructure Sector Program Recommendations:

a. Southington Anaerobic Digester Project

Mr. Ross highlighted the Turning Earth Anaerobic Digester pilot program in Southington. He noted that the site is close to I-84 which allows for easy on and off for waste hauling. Turning Earth will be able to handle 75,000 tons per year of organic waste. Mr. Ross noted that the proposal before the Deployment Committee is for CEFIA to invest approximately \$4,000,000 as subordinated debt and leverage that investment 5 and a half times with private capital. Mr. Ross explained the technology of this site and how it differs from other technologies. Turning Earth will use Aiken technology and a three step process which results in methane gas to fuel two reciprocating engines, driving generators to produce electricity. The Aiken process then processes the digestate into compost which is used for fertilizer or for "engineered soils" for agricultural purposes. Ms. Ferguson asked if this project is indicative of what they want to build in Southington

and similar to other sites. Mr. Ross explained how the whole process takes place in one bin and does not need to be moved. Ms. Ferguson asked how many bins will be at the new site to which Mr. Ross replied that Turning Earth will have 20 bins.

There was discussion between Ms. Ferguson and Mr. Ross about capacity at this site and wait time for processing. Ms. Ferguson indicated that you do not want too little waste or too much. Mr. Ross agreed to ask Turning Earth about their capacity for taking waste and their plan to communicate to Covanta about capacity and deliveries of waste. Mr. Ross explained that nothing will be sitting out in the open waiting to be processed. Mr. Hedman indicated that there was no “put or pay” contract, but would confirm this and report back to Ms. Ferguson.

Mr. Hundt then asked about the price of the electricity for the project. Mr. Ross stated that the plan is to sell the energy at wholesale back to the utility which, when combined with REC sales, are expected to result in a combined 10 cent per kWh rate. A Power Purchase Agreement is also being considered with the town of Southington as well as possible plans for a microgrid as a BJs superstore is adjacent to the proposed facility.

Mr. Ross went on to explain that the Covanta is currently paying approximately \$62 for tipping fees for hauled waste, and the plan of the developer is to earn a tipping fee from Covanta of approximately \$42, representing a \$20 discount due to the long-term relationship between to the two parties.

Upon a motion made by Ms. Ferguson, seconded by Ms. Wrice, the Deployment Committee members voted unanimously in favor of bringing the request of \$4,000,000 regarding the Southington Anaerobic Digester Project to the full board:

WHEREAS, Turning Earth Central Connecticut, LLC (“TECC”) – Integrated Organic Recycling Facility, a limited liability company wholly-owned by Turning Earth, LLC, has submitted a proposal for an Anaerobic Digestion facility to be located in Southington, CT;

WHEREAS, in early 2013, CEFIA released a rolling Request for Proposals in the third round of solicitations for anaerobic digestion (AD) projects to participate in a statutorily mandated AD Pilot program, an initiative aimed at reducing landfill waste through the recycling of organics, helping to promote sustainable practices and economic prosperity of Connecticut farms and other businesses by using organic waste with on-site anaerobic digestion facilities to generate electricity and heat;

WHEREAS, Turning Earth, LLC submitted the TECC - Integrated Organic Recycling Facility proposal in response to develop, in the Town of Southington, a 1.6 MW AD and cogeneration project and, after a thorough review, was selected as a project that is consistent with the CEFIA Comprehensive Plan and in the best interests of ratepayer and offered a subordinated loan in the amount of \$4,012,984 at a 2 percent interest rate for 10 years, to attract private capital and representing 18 percent of the

overall project's capital expense as well as a preferential interest rate valued by staff at an amount that does not exceed the \$450 per kilowatt limit under Section 103 of PA 11-80;

NOW, therefore be it:

RESOLVED, that the Deployment Committee hereby recommends to the CEFIA Board of Directors the approval of the TECC - Integrated Organic Recycling Facility Project; and

RESOLVED, that the Deployment Committee hereby recommends to the CEFIA Board of Directors that the Board of Directors provide approval for CEFIA to execute definitive loan documentation for a \$4,012,984 subordinated loan with terms and conditions consistent with the memorandum submitted to the Deployment Committee dated May 8, 2014.

6. Other Issues:

- a. Approval Limits – Funding Requests Under \$300,000 and No More in Aggregate of \$500,000

Mr. Hunter reported to the committee that Calvary Temple Christian Center in Bridgeport has been approved for an approximate \$50,000 loan for energy efficiency, Eli Properties in West Haven has been approved for an approximate \$269,000 loan for renewable energy, and AirTemp Mechanical in Southington has been approved for an approximate \$139,000 loan for renewables. He noted that the complete underwriting packages had been circulated to the members of the committee prior to the meeting. The committee members did not have any questions concerning the staff-approved transactions.

- b. Approval Limits Adjustment Recommendation – Funding Requests Under \$300,000 and No More in Aggregate of \$1,500,000

Attorney Farnen highlighted that the CT Clean Energy Fund permitted approval by staff for projects under \$300,000. CEFIA continued this practice but couldn't exceed \$500,000 between Deployment Committee meetings. With C-PACE, CEFIA can reach this limit quickly. As the program gets more settled, and committee meetings have become quarterly instead of monthly, CEFIA has increased standardization with documentation and underwriting, therefore becoming more programmatic with the approval. CEFIA staff would like the aggregate raised from \$500,000 to \$1,500,000.

Mr. Hundt stated that there should be a condition that spending will still be reported out to the committee. Attorney Farnen agreed and stated that these will all be programmatic projects. In response to a question from Ms. Ferguson, Mr. Hunter mentioned that \$1,500,000 was picked based on current project pipeline and in the

context of the size of CEFIA's balance sheet. Attorney Farnen stated how the amount was large enough that this topic should not need to be addressed again by the committee for some time.

Mr. Hundt stated that consideration should be given to the amount of capital that was going to be spent without a Board vote. Given the amount of capital CEFIA has, this \$1,500,000 is a small percentage of that. He then stated that this will allow CEFIA staff to process deals of this magnitude faster and that he felt it was the correct way to go.

Ms. Wrice said that if the committee does not like the direction the staff is proceeding in, then the committee can always put restrictions back later.

Upon a motion made by Ms. Wrice, seconded by Ms. Ferguson, the Deployment Committee members voted unanimously in favor of approving for recommendation to the Board of Directors Limits Adjustment Funding Requests Under \$300,000 and No More in Aggregate of \$1,500,000:

WHEREAS, pursuant to Section 5.3.3 of the CEFIA Bylaws, the CEFIA Deployment Committee has been granted the authority to evaluate and approve funding requests between \$300,000 and \$2,500,000;

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

NOW, therefore be it:

RESOLVED, that the CEFIA Deployment Committee hereby recommends that the Board of Directors adopt a resolution amending the Staff Approval Policy for Projects Under \$300,000 to increase the aggregate amount limit from \$500,000 to \$1,500,000 from the date of the last Deployment Committee meeting.

c. Mr. Garcia update by phone

Mr. Garcia stated that RSIP is at a post 30 MW stage. Currently 80% of the target at 24 MW, eight years ahead of schedule. CEFIA staff is working with Reed Hundt, Jeff Schub on analytics and doing a deep dive. CEFIA staff are meeting with the RSIP team on Friday, May 16, 2014 to look at how to move beyond post-30 MW. The goal is create **more transparency in the market for consumers to unleash the full market potential.**

Mr. Hundt asked to have a future deployment committee meeting where Mr. Garcia can dedicate time to present his analysis of the DG solar market. The whole committee would be interested in seeing this.

7. **Adjournment**: Upon a motion made by Mr. Hundt, seconded by, Ms. Wrice, the Deployment Committee members voted unanimously in favor of adjourning the meeting at 3:05 p.m.

Respectfully submitted,

Reed Hundt, Chairperson of the
Deployment Committee



CLEAN ENERGY FINANCE AND INVESTMENT AUTHORITY

Residential Solar Investment Program

A Statutory Program

Due Diligence Package

August 20, 2014

Document Purpose: This document contains background information and due diligence on the Residential Solar Investment Program and the organizations involved. This information is provided to the Board of Directors for the purposes of reviewing and approving recommendations made by the staff of the Connecticut Green Bank.

In some cases, this package may contain among other things, trade secrets, and commercial or financial information given to the Connecticut Green Bank in confidence and should be excluded under C.G.S. §1-210(b) and §16-245n(D) from any public discourse under the Connecticut Freedom of Information Act. If such information is included in this package, it will be noted as confidential.

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Program Qualification Memo

To: Deployment Committee
From: Dale Hedman (Director of Statutory and Infrastructure Programs) and Bryan Garcia (President and CEO)
Date: August 13, 2014
Re: Residential Solar Investment Program –Step 5

Summary

The staff proposes the following incentive levels for Step 5 of the Residential Solar Investment Program:

1. Race to the Solar Rooftop –The total capacity target for Step 5 is 10.0 MW – by June 30, 2015, whichever comes sooner.
2. Incentive Level – we propose about a 25% reduction of the Step 4 incentive levels to \$0.65/W for systems up to 10 kW for the Homeowner Performance Based Incentive (HOPBI) and \$100/MWh for the Performance Based Incentive (PBI) in Step 5 – both ZREC price equivalents of \$50 or 10% below the ACP for the Class I RPS in Connecticut. For the first time in the RSIP, in order to encourage larger systems to reduce future peak load, for systems over 10 kW, the Green Bank will purchase RECs at a ZREC price equivalent of \$25 – or half of the value of the HOPBI (i.e., \$0.30/W) and PBI (i.e., \$50/MWh). Per Section 106 of PA 11-80, the Green Bank staff will seek DEEP's approval of the schedule of incentives for Step 5.
3. REC Value – as the Green Bank now has a process in place for tracking, registering, and selling renewable energy credits (RECs) as a result of projects receiving incentives through the RSIP, revenues are being generated over time that offset the HOPBI and PBI incentives. Based on the objective function protocol, the present value of RECs produced from 1 kW of residential solar PV is \$0.390/W¹. If a policy were to be established that requires the utilities to purchase RECs from the Green Bank through a long-term contract (i.e., 15 years) at a price no more than the Alternative Compliance Payment (ACP) of the Class I RPS, then the present value of the RECs produced from 1 kW of residential solar PV is \$0.658/W¹. The realization of REC value can generate revenues over time that covers the upfront expenses of the incentive through the RSIP. Our intent is to try and establish a policy in the 2015 legislative session that would achieve this objective.

¹ See: "Ratepayer Payback" later in this memorandum

This incentive structure for Step 5 is designed to maximize the objective function, or to maximize the amount of clean energy deployed per dollar of ratepayer funds invested enabling Connecticut to realize more of the TAM on a sustainable basis (see Table 1).²

Table 1. Objective Functions for the RSIP for Steps 1 through Step 5 for a 7 kW System (EPBB/HOPBI)

Step	Numerator (Lifetime kWh)	Denominator (\$)	Objective Function (kWh / \$1 invested)
1	187,779	\$11,769	16.0
2	187,779	\$9,569	19.6
3	187,779	\$7,119	26.4
4	187,779	\$5,019	37.4
5	187,779	\$1,819	103.2

Between Steps 1 to Step 5 of the RSIP, the Objective Function has improved by 650%, maximizing the amount of clean energy produced per dollar of Green Bank funds invested.

Program Description

On March 2, 2012, CEFIA launched the Residential Solar Investment Program (the "RSIP" or "Program"). Per Section 106 of Public Act 11-80, the 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 a home ownership performance based incentive ("HOPBI", and previously an expected performance-based buydown or "EPBB") and a performance-based incentive ("PBI") for the purchase and/or lease of qualifying PV systems respectively.

Green Bank Incentives

The Program offers performance incentives for households that want to own the system (i.e., HOPBI) and for third-party owned (i.e., PBI) solar photovoltaic systems. The HOPBI is paid out after a 30-day performance period, while the PBI is paid out over 6-years based on performance. Through thirty-months of the Program, the Green Bank has approved nearly 4,500 projects that have deployed or are in the process of deploying approximately 32.0 MW of clean energy (see Table 2). Once all of these projects are installed, the Green Bank will have achieved the minimum legislative target of 30 MW of residential solar PV systems 8 years ahead of schedule. Over 2,100 direct, indirect and induced job-years have been created as a result of Steps 1 through 4 of the RSIP.³

Table 2. Program Data as of August 1, 2014

	EPBB-HOPBI	PBI	Total
# Projects Approved	2,484	2,003	4,487
Installed Capacity (kW)	17.9 MW	14.0 MW	32.0 MW

² Objective Function – Residential Solar Investment Program’s Homeowner Performance Based Incentive (HOPBI) and Performance-Based Incentive (PBI) for Step 5 (August 13, 2014)

³ Connecticut Department of Economic and Community Development has approved of the estimates of jobs created methodology – [click here](#).

Total Incentive Amount	\$22.2 MM	\$18.6 MM	\$40.8 MM
Total Installed Cost	\$75.7 MM	\$65.4 MM	\$141.2 MM
Direct Job-Years Created	447	386	833
Indirect and Induced Job-Years Created	720	621	1,341
Total Job-Years Created	1,167	1,007	2,174
Installed Cost (\$/W)	\$4.22	\$4.66	\$4.41
Incentive (\$/W)	\$1.23	\$1.31	\$1.28
Leverage Ratio	2.4:1.0	2.6:1.0	2.4:1.0

It should be noted that 662 projects, or 15% of the projects, are located in distressed communities as defined by the Connecticut Department of Economic and Community Development.⁴

Projects under the Program have thus far sought approximately \$40.8 million in incentives leveraged by an additional \$100.4 million of private investment.

The data on program performance indicates the following:

PBI Competition – over the past 6 months, we are now seeing more competition from PBI installers – dominating the market at over 75% of the RSIP in Step 4. It should be noted that Solar City, a PBI installer, is the #1 residential solar PV installer in Connecticut with 30% market share and that many independent installers are now able to offer a “third party owned” /PBI product through the CT Solar Lease that was re-introduced in the summer of 2013.

Costs Declining – as competition increases in the market, installed costs are decreasing, declining by 20% in 2011 (\$5.35/W) to 2014 (\$4.28/W). Installed costs for HOPBI/ EPBB installers is currently less (i.e. \$4.03/W) than that of PBI installers (i.e. \$4.61/W) for Step 4. In 2014-2015, as a result of the recent U.S. government tariffs on Chinese imported solar PV panels, the Green Bank does not expect average costs per watt installed to continue to decline, but instead settle between \$3.75 to \$4.25/W. Through the SunShot Initiative and Solarize campaigns, the Green Bank will continue to reduce soft costs (i.e., permitting and customer acquisition) in the Connecticut market.

Customer Demand Increasing – the demand for residential solar PV is increasing as indicated by the number of approved projects and the installed capacity resulting from those projects. Demand has doubled in each of the past two years and is on pace to double again in 2014. In 2012, over \$25 million in installations occurred in Connecticut. As of August 1, 2014, nearly \$68 million in installations have been approved thus far this year, on pace for over \$100 million in installations.

⁴ According to C.G.S. Section 32-9p, a distressed municipality should be based on “high unemployment and poverty, aging housing stock and low or declining rates of growth in job creation, population, and per capita income.” [Click here.](#)

Ratepayer Subsidies Decreasing – the percentage of incentives as a portion of the overall project costs are decreasing. In Step 4, the average incentive is \$1.07/W – \$0.88/W for HOPBI and \$1.14/W for PBI – or 24% of the installed cost. In the proposed Step 5, the average incentive will be \$0.65/W or 15% of the installed cost – a reduction of 25% from the Step 4 average incentive for the HOPBI. Subsidies have decreased for the HOPBI-EPBB and PBI with each step of the RSIP (see Table 3). The proposed Step 5 incentives for the HOPBI and PBI differ in terms of the percentage decrease from Step 4 actuals, but based on historical payments under the PBI, are economically equivalent in the incentive dollars to be awarded.

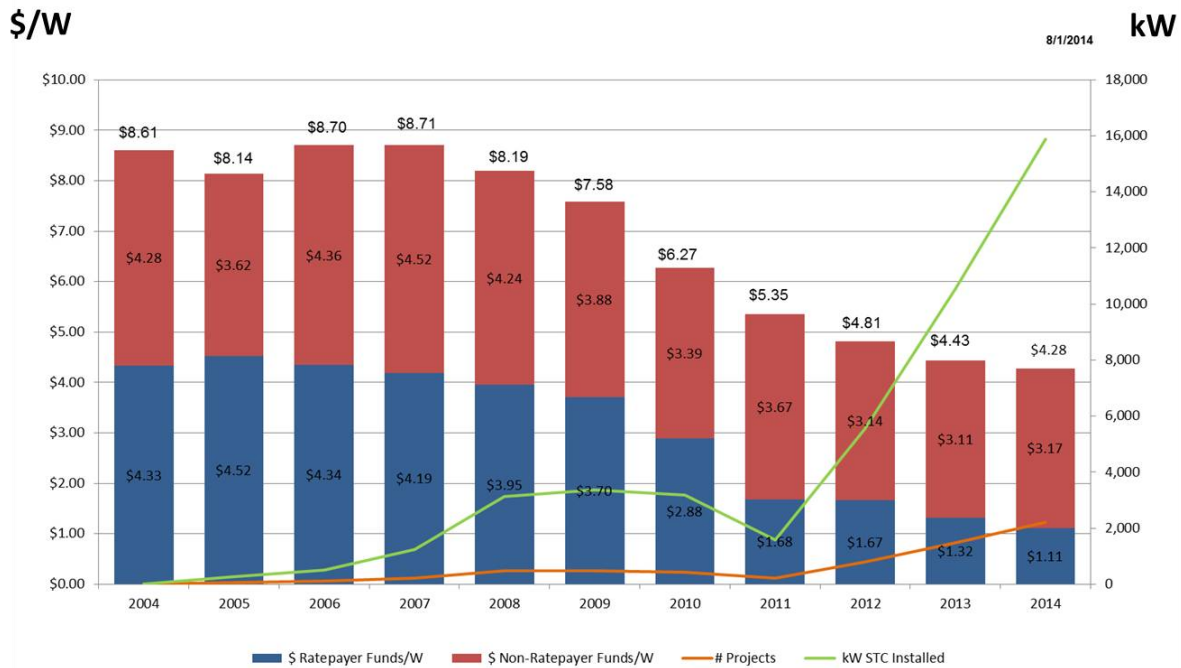
Table 3. Decrease in the RSIP by Step for the HOPBI-EPBB and PBI⁵

Step of the RSIP	HOPBI-EPBB		PBI	
	Incentives (\$/W)	% Incentive Decrease	PBI (\$/W)	Incentive Decrease
Step 1	\$1.78	-	\$1.78	-
Step 2	\$1.55	13%	\$1.85	(4%)
Step 3	\$1.15	26%	\$1.43	23%
Step 4	\$0.88	23%	\$1.14	20%
Step 5	\$0.65	26%	\$0.72	37%

For a graphical picture of the Program’s performance through August 1, 2014 – see Figure 1. The CCEF-supported programs were in effect from 2004 through 2011, while the Green Bank-supported programs began in 2012.

⁵ Based on data from the Market Watch Report of August 1, 2014. It should be noted that the PBI is paid out on performance in \$/MWh produced over a 6-year period, while the EPBB was paid out upfront based on estimated performance in \$/W_{PTC}.

Figure 1. Comparison of Installed Costs, Incentives, Projects and Installed Capacity (2004 through August 1, 2014)



The Green Bank’s goal is to create a robust market for residential solar PV systems in Connecticut that helps the state realize its potential – or total available market as noted in the Comprehensive Plan (FY 2015 through FY 2016).

With these goals in mind, we are proposing the following schedule of incentives for Step 5 – see Table 3:

Table 3. Proposed Schedule of Incentives for Step 5

	EPBB-HOPBI			PBI	
	x 5 kW	10kW x > 5 kW	X>10 kW	x 10 kW	X>10 kW
Current Step 4	\$1.25/W	\$0.75/W	\$0.00/W	\$0.180/kWh	\$0.000/kWh
Proposed Step 5	\$0.65/W		\$0.30/W	\$0.100/kWh	\$0.050/kWh

It should be noted that the incentive levels for the HOPBI and PBI proposed in Step 5 are economically comparable as required by statute.

To support systems greater than 10 kW, and reduce peak load in the state by encouraging the installation of larger systems, the Green Bank will provide approximately half of the proposed Step 5 incentive – i.e., \$0.30/W for the HOPBI and \$50/MWh for the PBI. This is the equivalent value of a \$25 ZREC. Prior to Step 5 there was no incentive available for systems greater than 10 kW.

Benchmarking Incentives

In order to determine if Connecticut is providing relatively greater or lesser levels of incentives to support the residential solar PV market growth while reducing the market’s reliance on incentives in

general, benchmarking the incentive against neighboring states as well as the in-state zero-emissions renewable energy credit (ZREC) program provides some useful observations.

Massachusetts

To provide some context as to how the residential market for solar PV in Connecticut is faring with respect to our neighboring state of Massachusetts, we have provided information on various aspects of our programs.

Incentives being offered to consumers in Connecticut versus Massachusetts varies (see Table 4).

Table 4. State Incentive Comparisons to Consumers per W (\$/W) for Residential Solar PV in Connecticut and Massachusetts (FY14)

State Incentives	Connecticut	Massachusetts
Tax Incentive	-	\$0.16 ⁶
Upfront Rebate	\$1.17	\$0.36 ⁷
SREC	-	\$2.38 ⁸
Total Incentives	\$1.17	\$2.90

Based on the average installed costs of solar PV systems in Connecticut and Massachusetts, the out of pocket costs after state and federal incentives vary greatly – showing a greater reliance on subsidies in Massachusetts than Connecticut (see Table 5).

Table 5. Comparison of Out of Pocket Costs to Consumers per W (\$/W) for Residential Solar PV after State and Federal Incentives in Connecticut and Massachusetts (FY14)

	Connecticut	Massachusetts
Installed Cost	\$4.26	\$4.85
State Incentives	\$1.17	\$2.90
Federal Incentives	\$0.93	\$0.59
Net Cost to Consumer	\$2.16	\$1.36
% of Installed Cost	51%	28%

Massachusetts has installed more than two times the number of residential solar PV systems than Connecticut, but the same on a per capita basis – see Table 6. The average installed costs in Massachusetts are nearly 7% more than they are in Connecticut.

Table 6. Comparison of Residential Solar PV Markets in Connecticut vs. Massachusetts (March 5, 2012 to June 26, 2014)

State	# of Projects	Average System Size (kW)	Total Capacity Installed (kW)	Installation Comparative (W/Capita)	Installed Cost (\$/W)
Connecticut	3,898	7.12	27,770	7.7	\$4.41

⁶ \$1,000 state tax credit

⁷ Upfront rebate provided by the MassCEC

⁸ Present value of 10-year SREC with \$285 per REC starting price, declining over time according to 10-year forward schedule per MA RPS Solar Carve-Out II

Massachusetts	8,047	6.31	50,815	7.6	\$4.71
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For installers that are doing business in both Connecticut and Massachusetts, and that have completed more than 20 projects in each state, the following is a breakdown of their installed costs – see Table 7.

Table 7. Average Installed Cost (\$/W) of Projects for Contractors Doing Business in Connecticut and Massachusetts

Installer	Connecticut	Massachusetts	Installed Cost Variance	% Variance (Less)/More
Astrum Solar	\$3.73	\$4.02	(\$0.29)	(7.8%)
Next Step Living	\$6.31	\$5.71	\$0.60	9.5%
Real Goods Solar	\$4.08	\$4.26	(\$0.18)	(4.4%)
Roof Diagnostics	\$4.03	\$4.52	(\$0.49)	(12.2%)
Solar City	\$4.92	\$5.04	(\$0.12)	(2.4%)
Sungevity	\$4.64	\$4.86	(\$0.22)	(4.7%)
Sunlight Solar Energy	\$4.26	\$4.79	(\$0.53)	(12.4%)
Trinity Solar	\$4.13	\$3.98	\$0.15	3.6%

Average installed costs in Connecticut are lower than they are in Massachusetts and for those installers doing business in both states, Connecticut installed costs are lower for most of them.

New Jersey and New York

To provide some context as to how the residential market for solar PV in Connecticut is faring with respect to New Jersey and New York, we have benchmarked incentives being offered to consumers in Connecticut versus New Jersey and New York (see Table 8) and the out of pocket costs after state and federal incentives (see Table 9).

Table 8. State Incentive Comparisons to Consumers per W (\$/W) for Residential Solar PV in Connecticut, New Jersey and New York (FY14)

State Incentives	Connecticut	New Jersey	New York
Tax Incentive	-	-	\$0.68 ⁹
Upfront Rebate	\$1.17	-	\$1.00 ¹⁰
SREC	-	\$1.87 ¹¹	-
Total Incentives	\$1.17	\$1.87	\$1.68

Table 9. Comparison of Out of Pocket Costs to Consumers per W (\$/W) for Residential Solar PV after State and Federal Incentives in Connecticut, New Jersey, and New York (FY14)

	Connecticut	New Jersey	New York
Installed Cost	\$4.26	\$4.00	\$4.90
State Incentives	\$1.17	\$1.87	\$1.68
Federal Incentives	\$0.93	\$0.64	\$1.17
Net Cost to Consumer	\$2.16	\$1.49	\$2.05

⁹ State tax credit of 25% of net system cost after state and federal incentives, capped at \$5,000

¹⁰ Upfront rebate provided by NYSEERDA

¹¹ Present value of 15-year SREC with \$182 per REC starting price and estimated 4% price decline over time, comparable to annual rate of decline for MA SREC

% of Installed Cost	51%	37%	42%
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Zero-Emissions Renewable Energy Credits (ZREC) in Connecticut

To provide some context as to how the residential market for solar PV in Connecticut is faring with respect to the commercial and industrial market for solar PV incentives in Connecticut through the ZREC, we have provided nominal and present value comparisons (see Tables 10 and 11) for small (i.e. 100 kW), medium (i.e. 100kW < X 250kW), and large (i.e. 250kW < X 1,000kW) ZREC projects.

Table 10. Comparison of RSIP Steps 1 through 4 vs. ZREC Rounds 1 and 2 – Nominal Analysis

	RSIP	Small	Medium	Large
Clean Energy Produced (MWh)	550,353	608,735	685,574	804,636
Ratepayer Funds Expended (\$)	\$42,314,916	\$77,259,767	\$78,593,999	\$71,963,721
Objective Function (kWh / \$1 Expended)	13.01	7.88	8.72	11.18
Objective Function (\$ / 1 kWh Produced)	\$0.077	\$0.127	\$0.115	\$0.089
Clean Energy Deployed (MW _{STC})	33.4	26.5	29.9	29.4

Table 11. Comparison of RSIP Steps 1 through 4 vs. ZREC Rounds 1 and 2 – ZREC Present Value Analysis at a 3% Discount Rate

	RSIP	Small	Medium	Large
Clean Energy Produced (MWh)	550,353	608,735	685,574	804,636
Ratepayer Funds Expended (\$)	\$42,314,916	\$61,657,718	\$62,722,512	\$57,431,170
Objective Function (kWh / \$1 Expended)	13.01	9.87	10.93	14.01
Objective Function (\$ / 1 kWh Produced)	\$0.077	\$0.101	\$0.091	\$0.071
Clean Energy Deployed (MW _{STC})	33.4	26.5	29.9	29.4

In comparison to the small and medium projects under the ZREC, the RSIP is doing more deployment at a faster pace and with fewer ratepayer resources on both a nominal and present value basis, and is similarly outpacing the large projects under the ZREC on a nominal basis.

Strategic Plan

Is the program proposed, consistent with the Board approved Comprehensive Plan and Budget for the fiscal year?

The Residential Solar Investment Program proposal is consistent with the Board approved Comprehensive Plan for FY 2015 through FY 2016 and the Budget for FY 2015.

The Program is a statutory requirement pursuant to Section 106 of Public Act 11-80.

Ratepayer Payback

How much clean energy is being produced (i.e. kWh over the projects lifetime) from the program versus the dollars of ratepayer funds invested?

The Program proposes a “Race to the Solar Rooftop” target of 10.0 MW for Step 5. At an average forecasted incentive of \$0.65/W, \$6.5 million of ratepayer capital will be used as incentives to support the deployment of 10.0 MW of solar PV.

The following is a breakdown of the objective function for the RSIP for Steps 1 through the proposed Step 5 (see Table 12).

Table 12. Objective Functions for the RSIP for Steps 1 through Step 5 for a 7 kW System (EPBB/HOPBI)

Step	Numerator (Lifetime kWh)	Denominator (\$)	Objective Function (kWh / \$1 invested)
1	187,779	\$11,769	16.0
2	187,779	\$9,569	19.6
3	187,779	\$7,119	26.4
4	187,779	\$5,019	37.4
5	187,779	\$1,819	103.2

Renewable Energy Credits (RECs)

In return for providing the incentive in Step 5, CEFIA owns the renewable energy credits (RECs) produced by the systems. Per the Objective Function Protocol, the REC valuation methodology estimates the nominal and present value (assuming a 3% discount rate) of RECs created through the RSIP (see Table 13).

Table 13. Present Value of RECs per W of Installed Residential Solar PV

Year	Estimated RECs Produced (1kw) (MWh)	Estimated REC Price (\$)	Estimated REC Revenue (Real) (\$/W)
1	1.139	55.33	0.061
2	1.133	48.57	0.052
3	1.127	45.30	0.047
4	1.122	42.17	0.042
5	1.116	35.26	0.034
6	1.111	25.00	0.023
7	1.105	25.00	0.022
8	1.100	25.00	0.022
9	1.094	25.00	0.021
10	1.089	25.00	0.020
11	1.083	12.50	0.010
12	1.078	12.50	0.009
13	1.072	12.50	0.009
14	1.067	12.50	0.009
15	1.062	12.50	0.009
Total			\$0.390

Between the incentive proposed in Step 5 of \$0.65/W and the present value of the RECs received of \$0.39/W, the RSIP in Step 5 is at a level where 60% of the cost of the incentive can be recovered.

If the Green Bank were to be able to sell RECs produced through the RSIP in a long-term (i.e., 15-years) contract at a price not to exceed the ACP of the Class I RPS (i.e., \$55), then the present value of RECs per

W of installed solar PV would be \$0.658/W (see Table 14) – or \$0.008/W in revenues more than the \$0.650/W in expenses to support Step 5 of the RSIP. Our intent is to try and establish a policy in the 2015 legislative session that would achieve this objective.

Table 14. Present Value of RECs per W of Installed Residential Solar PV Assuming a 15-Year Contract at \$50 REC Price

Year	Estimated RECs Produced (1kw) (MWh)	Estimated REC Price (\$)	Estimated REC Revenue (Real) (\$/W)
1	1.139	50.00	0.055
2	1.133	50.00	0.053
3	1.127	50.00	0.052
4	1.122	50.00	0.050
5	1.116	50.00	0.048
6	1.111	50.00	0.047
7	1.105	50.00	0.045
8	1.100	50.00	0.043
9	1.094	50.00	0.042
10	1.089	50.00	0.040
11	1.083	50.00	0.039
12	1.078	50.00	0.038
13	1.072	50.00	0.037
14	1.067	50.00	0.035
15	1.062	50.00	0.034
Total			\$0.658

Terms and Conditions

What are the terms and conditions of ratepayer payback, if any?

The incentive of \$0.65/W offered under Step 5 for the HOPBI and \$100/MWh for the PBI is paid out after a 30-day performance period or over a 6-year period of time respectively based on system performance.

The Green Bank owns all RECs associated with projects that receive an incentive. It is estimated that \$0.39/W in revenue (in present value terms) will be received from the sale of RECs into the Class I RPS market under current and forecasted conditions – whereas if the Green Bank were to be able to sell its RECs to the utilities through a long-term contract similar to the ZREC program, then \$0.66/W in revenue (in present value terms) could be received. However, a change in public policy during the 2015 legislative session would be required to achieve this result.

Capital Expended

How much of the ratepayer and other capital that CEFIA manages is being expended on the program?

By statute, CEFIA shall apportion no more than one-third of the total surcharge collected annually, or approximately \$9.2 million for the current fiscal year. For Step 5, with a "Race to the Rooftop" target of 10 MW and a proposed incentive level of \$0.65/W, then \$6.5 million in incentives would be expended

on the program over time (with the HOPBI being paid out within the first year of system installation and the PBI being paid out over six years).

Risk

What is the maximum risk exposure of ratepayer funds for the program?

Despite the \$3.9 million in REC revenue (in present value terms) that staff expects can be realized as a result of the program, staff expects that the maximum risk exposure for the program is \$6.5 million – the estimated value of the incentives provided through Step 5 of the program to achieve the “Race to the Solar Rooftop” target of 10.0 MW. Given the variability of REC pricing, it would be difficult to ascertain the true value that the Green Bank would receive without a forward contract and a fixed price for RECs produced.

Financial Statements

How will the various program investment transactions be accounted for or disclosed on the Green Bank's financial statements?

HOPBI and PBI Financial Incentives – Expense

The funding support for the RSIP would be in the form of a HOPBI or PBI. When funds are disbursed by the Green Bank to payout the HOPBI or PBI earned to the system owner, these disbursement transactions will be reflected on the Green Bank's balance sheet as a reduction to “Cash” (current assets) with a corresponding entry on the profit and loss statement under “Operating Expenses” in the relevant ledger account under “Financial Incentives – HOPBI and PBI,” which will have the effect of reducing unrestricted net assets. The HOPBI will be earned over a 30-day period and be paid out in full once earned while the PBI will be earned over a six-year period and be paid out over this six year period on a quarterly basis. For those HOPBI and PBI incentives which have not been paid out in full at the end of the Green Bank's fiscal year, the balance remaining to be paid out will be disclosed in a footnote to the audited financial statements as a future commitment against the Green Bank's unrestricted net assets.

HOPBI Working Capital Loans

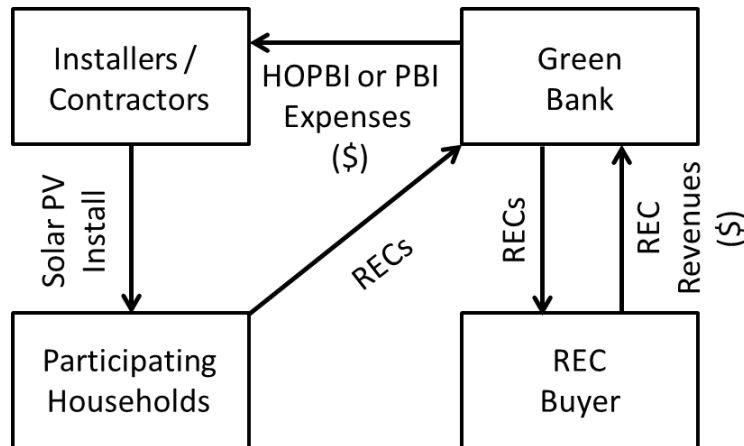
When the Green Bank disburses funds to a PV contractor (contractor) under the HOPBI working capital loan facility, the transaction will be recorded as a reduction to “Cash” and an increase to “Receivable-HOPBI Working Capital Loans” (current asset). When the HOBPI financial incentive is earned by the system owner it will be paid out to the contractor (having been assigned by the homeowner to the contractor at the time of system purchase). The Green Bank will then apply the funds paid to the contractor to the contractor's outstanding working capital loan balance and record the transaction as a reduction of the “Receivable –HOPBI Working Capital Loans” account and an increase to the Green Bank's operating “Cash” account.

REC Transactions – Revenue

When a sale of RECs generated by these residential systems is consummated, the Green Bank will record the transaction as “Revenue – Residential RECs” on the profit and loss statement and record a corresponding entry on the balance sheet under “Receivables – Residential RECs”. Once the Green Bank receives payment from the buyer, the “Receivable – Residential RECs” will be reduced and the Green Bank's operating “Cash” will be increased. A footnote to the Green Bank's financial statements will

disclose the anticipated future revenue stream for residential RECs the Green Bank expects will be generated and sold under this program.

Capital Flow Diagram



Target Market

Who are the end-users of the program?

The Green Bank worked with Geostellar¹² 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 15 and 16).

Table 15. 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%
Technically Viable Rooftops (TAM)	659,312	0.52%
Economically Viable Rooftops	506,714	0.68%

Table 16. 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

¹² www.geostellar.com

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.

Green Bank Role, Financial Assistance & Selection/Award Process

The Green Bank’s role is to administer the statutory program. Financial assistance being offered through the program is based on general program guidelines developed by staff and a schedule of incentives approved by the Department of Energy and Environmental Protection.

Program Partners

The program partners are the more than 70 qualified solar contractors that support the installation of rooftop solar PV systems for residential ratepayers.¹³

Risks and Mitigation Strategies

Risk: Proposed incentives for Step 5 are too high and they generate more installations than we had anticipated in FY 2015 with a target of 10.0 MW by June 30, 2015.

Mitigation Strategy: Staff will closely monitor the applications submitted and approved to the program during Step 5. If applications significantly exceed what is expected, staff will propose a Step 6 incentive to the Board to decrease the incentive levels further prior to the end of the fiscal year.

Risk: Proposed incentives for Step 5 are too low and demand significant slows down and alternative sources of incentives are sought (i.e., higher incentive small ZREC).

Mitigation Strategy: Staff will inform DEEP of this concern so as to prevent the ZREC policy from adversely affecting the sustainable market development of the RSIP by continuing to transition the market reliance away from subsidies and towards low-cost and long-term financing that can both reduce Connecticut’s Class I RPS compliance costs on all ratepayers while supporting in-state generation.

Operating Procedures

The Residential Solar Investment Program follows the “Programmatic Selection and Award” aspects of the Green Bank’s Operating Procedures for financial assistance in the form of grants, loans or loan guarantees, debt, or equity investments.

¹³ <http://www.energizect.com/residents/programs/residential-solar-investment-program>

Resolutions

WHEREAS, Section 106 of Public Act 11-80 "An Act Concerning the Establishment of the Department of Energy and Environmental Protection and Planning for Connecticut's Energy Future" (the "Act") requires the Connecticut Green Bank (Green Bank") to design and implement a Residential Solar Photovoltaic ("PV") Investment Program ("Program Plan") that results in a minimum of thirty (30) megawatts of new residential PV installation in Connecticut before December 31, 2022;

WHEREAS, as of August 1, 2014, the Program Plan has thus far resulted in approximately thirty-two (32.0) megawatts of new residential PV installation application approvals in Connecticut; and

WHEREAS, pursuant to Section 106 of the Act, the Green Bank has prepared a Program Plan and a declining incentive block schedule ("Schedule") that offer direct financial incentives, in the form of homeowner performance-based incentives ("HOPBI") or performance-based incentives ("PBI"), for the purchase or lease of qualifying residential solar photovoltaic systems, respectively.

NOW, therefore be it:

RESOLVED, that the Green Bank Deployment Committee (Deployment Committee) hereby recommends to the Green Bank Board of Directors (the "Board") the approval of the Schedule of Incentives as set forth in Table 3 of the Due Diligence Package dated August 20, 2014 to achieve 10.0 MW of solar PV deployment;

RESOLVED, that the Deployment Committee hereby recommends that the Board direct staff that at the point where 6.0 MWs of committed capacity is reached during Step 5 of the Schedule, or earlier if staff deems it appropriate, to release a report that makes a recommendation to the Deployment Committee on the Step 6 and beyond for capacity allocation and incentive levels; and

RESOLVED, that the Deployment Committee hereby recommends that the Board adopt a resolution stating that by (a) the point of the Step 5 incentive where 8.0 MW of committed capacity is reached for either the PBI or the HOPBI models or (b) June 30, 2015 whichever comes first, the Board will approve a Step 6 capacity allocation and incentive level to ensure the sustained and orderly deployment of the residential solar market in Connecticut.

Program Implementation Plan

Human Resources

Statutory and Infrastructure Programs – will lead in administering the program and collecting information on each project

Residential Programs – will track leases and loans for each project to track ratepayer payback

Administration – will support the analysis of the data being collected to track the overall performance of the program

Financial Resources

1. Incentives up to 10.0 MW for Step 5 at \$0.65/W or \$6.5 million;
2. Lease and Loan Programs – see separate due diligence packages

Metrics, Targets, Measurement, Verification & Reporting

Metrics:

- Amount of clean energy produced per dollar of ratepayer funds at risk
- Ratio of private to public capital leveraged and ratio of grants versus financing programs
- Annual clean energy generation
- Total amount of investment

Targets:

- Attract nearly \$40 million of non-ratepayer capital through the achievement of a leverage ratio of 1:5
- Deploy 10.0 MW of Class I renewable sources in Connecticut
- Produce 11,400 MWh of Class I renewable sources per year for 20-years
- Reduce soft costs

CEFIA will collect data on the following (the Market Watch Report will continue to report the performance of the program on a weekly basis), but not be limited to:

- Installed capacity
- # of projects
- Installed costs
- Actual clean energy produced
- Benefits achieved including environmental (i.e. emissions avoided) and economic development (i.e. jobs created)



CLEAN ENERGY
FINANCE AND INVESTMENT AUTHORITY

Memo

To: Connecticut Green Bank Board of Directors

From: Bryan Garcia, President and CEO, and Mackey Dykes, Chief of Staff

CC: Dale Hedman, Director of Statutory and Infrastructure Programs, and Kerry O'Neill, Director of Residential Programs

Date: August 13, 2014

Re: Objective Function – Residential Solar Investment Program's Homeowner Performance Based Incentives (HOPBI) and Performance-Based Incentives (PBI) for Step 5

Per Section 106 of Public Act 11-80, 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 homeowner performance based incentives (HOPBI) and performance based incentives (PBI) for the purchase and/or lease of qualifying PV systems.

The Objective Function for the RSIP is on average 112.7 kWh per \$1 of green bank funds invested for a 7 kW system (see Table 1). This is calculated based on an assumed 7kW system.¹

Table 1. Objective Function for a Typical 7-kW Installation from Step 5 of the RSIP without Program, Administrative, and Servicing Costs

Program	First Year of the Measure(s)		Lifetime of the Measure(s)	
	kWh / \$1 Invested	MMBtu / \$1 Invested	kWh / \$1 Invested	MMBtu / \$1 Invested
HOPBI	4.4	0.0149	103.2	0.3522
PBI	5.2	0.0155	122.3	0.3663

In comparison, a larger 17 kW system has an Objective Function for the RSIP on average of 386.0 kWh per \$1 of green bank funds invested – demonstrating that the larger the system size installed, the greater the Objective Function.

Numerator

The amount of clean energy generated in the first year for a 7 kW residential solar PV installation assuming a capacity factor of 13% is 7,972 kWh – with a degradation of 0.5% producing 187,779

¹ Assumed capacity factor is 13% and install cost is \$4.00/w. Prior versions of this calculation have assumed a design efficiency of 77.5% and calculated the EPBB/HOPBI off of the system PTC. The calculation has been adjusted to determine EPBB/HOPBI amount based on the system STC of 7 or 17 kw.

kWh over the 25-year life of the system – or producing 27 MMBtu in its first year and 641 MMBtu over the lifetime.² A 17 kW system produces 456,034 kWh and 1,556 MMBtu over its lifetime.

These figures represent the numerators for the first year and lifetime for both the HOPBI and PBI calculations. The amount of generation associated with a standard system size does not vary based on the type of incentive, so the generation figure in the numerator is the same for the HOPBI and PBI calculations.

Denominator

The green bank funds invested (i.e. incentive, credit enhancements, and amount of financing) and received (i.e. REC revenue) to support a typical project through the RSIP include (see Table 2):

Table 2. Denominator of the Objective Function for a Typical 7-kW Installation from Step 5 of the RSIP

Funds Invested³	HOPBI	PBI
Incentive	\$4,550	\$4,267
Credit Enhancement	\$0	\$0
Amount of Financing	\$0	\$0
REC Revenue	\$2,731	\$2,731
Total	\$1,819	\$1,536

The HOPBI incentive figure is calculated based on the Step 5 RSIP incentive levels. Current incentives are \$0.65/W up to 10kW and \$0.30/W above 10 kW. An assumed 7kW STC system draws a HOPBI incentive of \$4,550, while a 17 kW system draws a HOPBI incentive of \$8,600.

The PBI calculation is different, because the PBI is paid out over 6 years and requires converting future payments into present value. This system will produce 47,236 kWh over its first 6 years (including degradation), which, at \$0.100/kWh for up to 10kw (and \$0.500/kWh above 10 kW), earns a nominal incentive of \$4,724. Discounted at 3%, the real value of the incentive is \$4,267.

REC revenue is calculated based on an assumed 15-year of value. Beyond a 15-year horizon, it is unreasonable to assume any REC value due to market and policy uncertainty. The first 5 years of REC value is based on the current value of a 5-year REC strip using the latest pricing data collected by the green bank from REC brokers. The REC value from years 6 through 10 are calculated based on the assumption that the broker-provided price for year 6 will remain constant throughout the five year period. The price for years 11 through 15 are assumed to equal 50% of the year 6 price. A 7 kW system will generate 115.48 RECs over 15 years, which are nominally worth \$3,222 based on broker-provided REC prices and the method described above. Discounted at 3%, these RECs are worth \$2,731 in real terms.⁴

² Initial CEFIA review has found that on average residential solar PV systems are producing more electricity than was expected. This data is still under review, and if this positive “realization rate” is confirmed, it would necessitate the increase of the figures in the numerator of the OF. See CEFIA RSIP Evaluation Program Recommendations, Cadmus Group, May 2014, based on analysis of RSIP Locus monitoring data as compared to energy generation estimates in PowerClerk, normalized against typical meteorological year data accessed from NREL, http://rredc.nrel.gov/solar/old_data/hsrdb/1991-2005/tmy3/.

³ Note – for tracking purposes, the program, administrative, and servicing costs per project are being tracked, but not currently included in the Objective Function (Version 1.0). A per project program, administrative, and servicing cost takes into account the budget for the program and divides it by the number of target projects. See the Objective Function Protocol (Version 1.0) for more details.

⁴ This does not include brokerage fees, which are typically 2-3% of the value of the transaction.

Objective Function

In sum, the denominator of the Objective Function for the HOPBI is \$1,819 in its first year and over its lifetime – while the denominator for the PBI is \$1,536 in its first year and over its lifetime.⁵ This produces a lifetime Objective Function for the HOPBI of $187,779 / \$1,819 = 103.2$ kWh/\$ and a lifetime Objective Function for the PBI of $187,779 / \$1,536 = 122.3$ kWh/\$.

In comparison to prior steps of the RSIP, Step 5 delivers more clean energy per dollar of green bank funds invested (see Table 3).

Table 3. Objective Functions for the RSIP for Steps 1 through Step 5 for a 7 kW System (EPBB/HOPBI)

Step	Numerator (Lifetime kWh)	Denominator (\$)	Objective Function (kWh / \$1 invested)
1	187,779	\$11,769	16.0
2	187,779	\$9,569	19.6
3	187,779	\$7,119	26.4
4	187,779	\$5,019	37.4
5	187,779	\$1,819	103.2

If the Connecticut Green Bank were able to sell the RECs generated from the systems it supports through long-term contracts (i.e., 15 years) at a fixed price per REC (i.e., \$50) to the utilities to support compliance towards the Class I RPS, then the Objective Function for the RSIP would change (see Table 4).

Table 4. Objective Functions for the RSIP for Steps 1 through Step 5 for a 7 kW System and Assuming a Long-Term REC Contract (EPBB/HOPBI)

Step	Numerator (Lifetime kWh)	Denominator (\$)	Objective Function (kWh / \$1 invested)
1	187,779	\$9,892	19.0
2	187,779	\$7,692	24.4
3	187,779	\$5,242	35.8
4	187,779	\$3,142	59.8
5	187,779	-\$58	-3,242.5

The negative denominator and objective function in Step 5 indicates that with a 15-year REC contract at \$50 per REC, the RSIP program would become self-sustaining. The Green Bank would be able to generate revenues under this incentive structure that exceeds expenses over time, expanding its ability to support the growth of the residential solar PV market and put revenues towards new investments.

⁵ First year and lifetime denominators are the same because all lifetime expenses and revenues are calculated in present value terms and are realized at the date of project creation.