845 Brook Street, Rocky Hill, CT 06067
T 860.563.0015
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CONNECTICUT
GREEN BANK

September 22, 2016

Dear Connecticut Green Bank Deployment Committee:

We have a regular meeting of the Deployment Committee scheduled for Thursday, September 29, 2016 from 9:00 to 11:00 a.m. in the Colonel Albert Pope Board Room of the Connecticut Green Bank at 845 Brook Street, Rocky Hill, CT 06067.

On the agenda we have the following items:

- **Consent Agenda** – We have several items, including the meeting minutes for February 9, 2016, projects under $300,000 and no more in aggregate than $1,000,000, and an approval of a contingency increase for a C-PACE transaction (Hartford – 900 Asylum Avenue) to finance additional HVAC and lighting work on the property.

- **Infrastructure Sector Programs** – we would like to provide you an update on the progress we are making with respect to the Residential Solar Investment Program (RSIP). We are nearly halfway towards our 300 MW public policy goal. We would like to get your support for Steps 11 through 13 (i.e., an additional 30 MW each step) for the EPBB and PBI, including the continuation of the low to moderate income incentive. We would also like to get your feedback on a pilot concept that we are working on which would foster the sustained orderly development of the solar PV industry, build increased collaboration with the utilities on energy efficiency, and support the state's climate change efforts through the promotion of electric vehicles and renewable thermal technologies fueled by solar PV.

- **BeFree Hearing** – After multiple documented violations of program rules, the Green Bank terminated BeFree Green Energy from the RSIP program on August 15, 2016. BeFree is appealing this decision to the Deployment Committee. BeFree brings this appeal to rebut these documented violations and complaints.

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

We look forward to seeing you next week.

Sincerely,

Bryan Garcia
President and CEO

AGENDA

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

Thursday, September 29, 2016
09:00am – 11:00am

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

1. Call to order

2. Public Comments – 5 minutes

3. Consent Agenda* – 5 minutes

    a. Approval of Regular Meeting Minutes for February 9, 2016*
    b. Under $300,000 and No More in Aggregate than $1,000,000*
    c. Approval of Contingency Increase of C-PACE Transaction*
        i. Hartford – 900 Asylum Ave

4. Infrastructure Sector Program Updates and Recommendations – 30 minutes

    a. Residential Solar Investment Program – Steps 11 through 13

5. BeFree Appeal – 75 minutes

6. Other Business – 5 minutes

7. Adjourn

*Denotes item requiring Committee action

Join the meeting online at https://global.gotomeeting.com/join/598241293

Or call in using your telephone:
Dial (872) 240-3412
Access Code: 598-241-293

Next Regular Meeting: Friday, November 18, 2016 from 3:00-4:00 p.m.
Colonel Albert Pope Board Room at the

Connecticut Green Bank, 845 Brook Street, Rocky Hill, CT

RESOLUTIONS

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

Thursday, September 29, 2016
09:00am – 11:00am

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

1. Call to order

2. Public Comments – 5 minutes

3. Consent Agenda* – 5 minutes

   a. Approval of Regular Meeting Minutes for February 9, 2016*

   Resolution #1

   Motion to approve the minutes of the February 9, 2016 Regular Meeting of the Deployment Committee of the Connecticut Green Bank.

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

   c. Approval of Contingency Increase of C-PACE Transaction*

      i. Hartford – 900 Asylum Ave

   Resolution #2

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

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

   WHEREAS, the Green Bank seeks to provide a $704,535 construction and (potentially) term loan under the C-PACE program to HARC, Inc., the building owner of 900 Asylum Ave, Hartford, Connecticut (the "Loan"), to finance the construction of

specified clean energy measures in line with the State's Comprehensive Energy Strategy and the Green Bank's Strategic Plan; and

WHEREAS, the Green Bank may also provide a short-term unsecured loan (the "Feasibility Study Loan") from a portion of the Loan amount, to finance the feasibility study or energy audit required by the Act, and such Feasibility Study Loan would become part of the Loan and be repaid to the Green Bank upon the execution of the Loan documents.

NOW, therefore be it:

RESOLVED, that the President of the Green Bank and any duly authorized officer of the Green Bank is authorized to execute and deliver the Loan in an amount not to be greater than one hundred ten percent of the Loan amount with terms and conditions consistent with the memorandum submitted to the Deployment Committee dated September 20, 2016, and as he or she shall deem to be in the interests of the Green Bank and the ratepayers no later than 120 days from the date of authorization by the Deployment Committee;

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

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

4. Infrastructure Sector Program Updates and Recommendations* – 30 minutes

a. Residential Solar Investment Program – Steps 11 through 13*

Resolution #3

WHEREAS, Public Act 15-194 "An Act Concerning the Encouragement of Local Economic Development and Access to Residential Renewable Energy" (the "Act") requires the Connecticut Green Bank ("Green Bank") to design and implement a Residential Solar Photovoltaic ("PV") Investment Program ("Program") that results in no more than three-hundred (300) megawatts of new residential PV installation in Connecticut before December 31, 2022 and creates a Solar Home Renewable Energy Credit ("SHREC") requiring the electric distribution companies to purchase through 15-year contracts the Renewable Energy Credits ("RECs");

WHEREAS, as of September 2, 2016, the Program has thus far resulted in nearly one-hundred and fifty megawatts of new residential PV installation application approvals and completions in Connecticut;

WHEREAS, pursuant to Conn. Gen Stat. 16-245a, a renewable portfolio standard was established that requires that Connecticut Electric Suppliers and

Electric Distribution Company Wholesale Suppliers obtain a minimum percentage of their retail load by using renewable energy;

WHEREAS, real-time revenue quality meters are included as part of solar PV systems being installed through the Program that determine the amount of clean energy production from such systems as well as the associated RECs which, in accordance with Public Act 15-194 will be sold to the Electric Distribution Companies through a master purchase agreement entered into between the Green Bank, Eversource Energy, and United Illuminating, and approved by the Public Utility Regulatory Authority;

WHEREAS, pursuant to the Act, the Green Bank has prepared a declining incentive block schedule ("Schedule") that offers direct financial incentives, in the form of the expected performance based buy down ("EPBB") and performance-based incentives ("PBI"), for the purchase or lease of qualifying residential solar photovoltaic systems, respectively, fosters the sustained orderly development of a state-based solar industry, and sets program requirements for participants, including standards for deployment of energy efficient equipment as a condition for receiving incentive funding;

WHEREAS, pursuant to the Act, to address willingness to pay discrepancies between communities, the Green Bank will continue to provide additional incentive dollars to improve the deployment of residential solar PV in low to moderate income communities.

WHEREAS, pursuant to Section 16-245(d)(2) of the Connecticut General Statutes, a Joint Committee of the Energy Conservation Management Board and the Connecticut Green Bank was established to "examine opportunities to coordinate the programs and activities" contained in their respective plans (i.e., Conservation and Load Management Plan and Comprehensive Plan);

WHEREAS, the Global Warming Solutions Act of 2008 requires Connecticut to reduce its greenhouse gas emissions by 80 percent from 2001 levels by 2050, all the while transportation and the thermal heating and cooling of buildings representing the largest emitting sectors;

WHEREAS, residential solar PV can provide cleaner, cheaper, and more reliable sources of energy that enable distributed energy resource and fuel for renewable thermal technologies and electric vehicles while creating jobs and supporting local economic development;

NOW, therefore be it:

RESOLVED, that the Deployment Committee recommends that the Board approves of the Schedule of Incentives as set forth in Tables 5 and 6 of the memo dated September 22, 2016 to achieve 90.0 MW of solar PV deployment over FY and CY 2017 – 30.0 MW from Step 11, 30.0 MW from Step 12, and 30.0 from Step 13.

RESOLVED, that the Deployment Committee requests that the staff explore in collaboration with the Department of Energy and Environmental Protection and the utility administrators of the Conservation and Load Management Fund through the Joint Committee, how energy efficiency programs (e.g., HES) and incentives, as well

as distributed energy resources, renewable thermal technologies (e.g., air source heat pumps and ground source heat pumps) and electric vehicles fueled by solar PV can potentially be incorporated into a special EPBB and/or PBI incentive through the RSIP.

5. BeFree Appeal* – 75 minutes

Resolution #4

RESOLUTION TO [*Select One:* DENY / GRANT / GRANT IN PART AND DENY IN PART] APPEAL

WHEREAS, following an investigation, the Connecticut Green Bank determined that BeFree Green Energy LLC ("BeFree") violated the provisions of Section 4.11 of the Green Bank Eligible Contractor and System Owner RFQ (the "RFQ"); and

WHEREAS, pursuant to Section 4.11 of the RFQ, the Connecticut Green Bank imposed sanctions against BeFree; and

WHEREAS, the findings of Connecticut Green Bank and resultant sanctions are set forth in letters to BeFree dated February 29, 2016 and August 15, 2016; and

WHEREAS, BeFree has appealed the sanctions of Connecticut Green Bank to the Connecticut Green Bank Deployment Committee (the "Committee"); and

WHEREAS, the Committee heard BeFree's appeal at its September __, 2016 meeting.

NOW, THEREFORE, BE IT RESOLVED that:

OPTION ONE (DENYING APPEAL):

The appeal of BeFree Green Energy LLC is denied. The findings of Connecticut Green Bank and resultant sanctions against BeFree are affirmed, and shall stand as forth in the August 15, 2016 letter from the Connecticut Green Bank to BeFree.

OPTION TWO (APPEAL GRANTED):

The appeal of BeFree Green Energy LLC is granted. The findings of Connecticut Green Bank and resultant sanctions against BeFree, which are set forth in the August 15, 2016 letter from the Connecticut Green Bank to BeFree, are hereby vacated.

OPTION THREE (MODIFYING):

The appeal of BeFree Green Energy LLC is denied in part and granted in part. The findings of Connecticut Green Bank and resultant sanctions against BeFree, which are set forth in the August 15, 2016 letter from the Connecticut Green Bank to BeFree, shall be modified to include the following additions and/or substitutions.

As to the factual findings, the Committee finds as follows:_____
_____
_____.

As to the applicable sanctions, the Committee modifies the sanctions against BeFree as follows:
_____
_____
_____.

6. Other Business – 5 minutes

7. Adjourn

*Denotes item requiring Committee action

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CONNECTICUT
GREEN BANK

Deployment Committee

September 29, 2016

Deployment Committee

Agenda Item #1

Call to Order

Deployment Committee

Agenda Item #2

Public Comments

Deployment Committee

Agenda Item #3

Consent Agenda

Consent Agenda
Resolutions 1 through 2

- **Meeting Minutes** – approval of meeting minutes of February 9, 2016.

- **C-PACE Project Increase** – expansion of prior BOD approved project from $480,000 to $705,000 to include additional HVAC and lighting improvements.

- **Under $300,000 and No More in Aggregate than $1,000,000** – memo to update Deployment Committee on transactions reviewed and approved by staff and clearing the queue for future transactions consistent with Comp Plan and Budget.

Consent Agenda
No More in Aggregate than $1,000,000

Project Name	Comprehensive Plan	Amount	Type
909 Newfield Street (Middletown)	C-PACE – solar PV	$61,429	Benefit Assess.
390 Amity Road (Woodbridge)	C-PACE – solar PV	$287,732	Benefit Assess.
801 Windham Road (Windham)	C-PACE – solar PV	$101,599	Benefit Assess.
477 CT Boulevard (East Hartford)	C-PACE – EE	$264,562	Benefit Assess.
170 Broad Street (New London)	C-PACE – EE	$172,718	Benefit Assess.
Total		**$976,842**	

Approximately $975,000 in loans

Deployment Committee

Agenda Item #4

Infrastructure Sector

RSIP Progress to Date
Overview

- **Demand** – approved nearly 150 MW to date – halfway to the legislative target of 300 MW

- **Installed Costs** – reduced by over 35% since 2011 (from $5.35/W to $3.45/W)*

- **Incentive** – reduced by over 80% since 2011 (from $\$1.79/W_{STC}$ to $\$0.32/W_{STC}$)

- **Impact** – supporting the production of nearly 3.5 million MWh over the life of the projects, reducing 3.6 billion pounds of CO_2 emissions, and creating nearly 3,700 direct and 6,000 indirect and induced job years

REFERENCES

Note – installed costs exclude Solar City.

RSIP Progress to Date
Low to Moderate Income

Income Level (AMI)	Projects per 1,000 People		Installed Capacity per Capita	
	FY 2012 to FY 2016	CY 2015 and 2016	FY 2012 to FY 2016	CY 2015 and 2016
Less than 60%	1.5	1.1	8.2	9.4
60-80%	4.1	2.7	24.9	27.8
80-100%	5.4	3.4	36.7	39.5
100-120%	7.1	4.4	51.9	54.6
More than 120%	7.5	3.8	58.3	61.3
Total	**5.4**	**3.5**	**41.1**	**41.5**

Making **steady progress** expanding the market for solar PV in low to moderate income households

Proposed Steps 11 through 13 Schedule of Incentives

RSIP Incentive Step	EPBB ($/W)			PBI ($/kWh)		LMI-PBI ($/kWh)	
	≤5 kW	5 to 10 kW	>10 kW	≤10 kW	>10 kW	≤10 kW	>10 kW
Step 10	$0.487		$0.400	$0.039	$0.039	$0.110	$0.110
Step 11	**$0.487**			**$0.039**		**$0.110**	**$0.055**
Step 12	**$0.463**			**$0.035**		**TBD**	**TBD**
Step 13	**$0.463**			**$0.035**		**TBD**	**TBD**

Maintain RSIP at Step 10 levels for Step 11, and then **reduce by 5% for EPBB and 10% for PBI** to maintain economically comparable in Step 12 and maintain through Step 13; maintain LMI-PBI through Step 11 and adjust if necessary

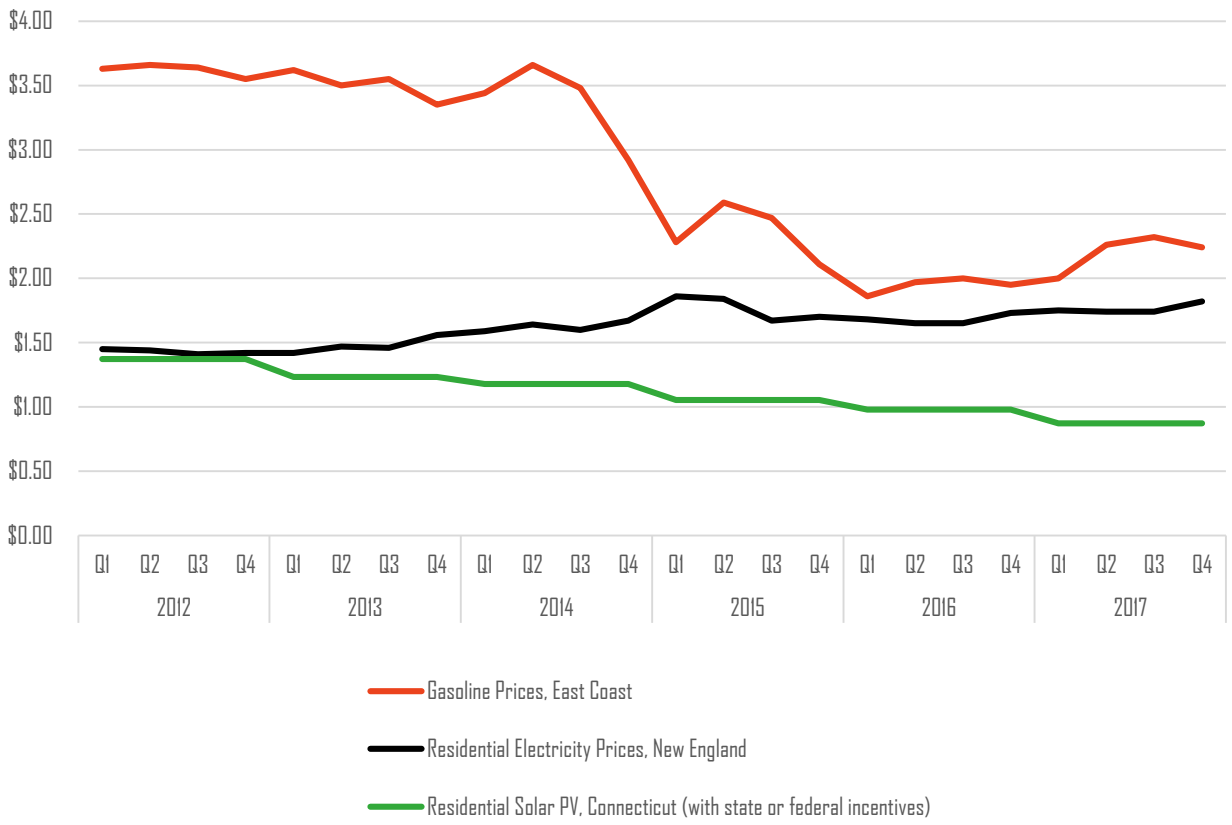
RSIP Partnership with Utilities DERs, EVs, and RTTs

- **Sustained Orderly Development** – "provide incentives that decline over time and will foster the sustained, orderly development of a state-based solar industry". SOD is a concept (not defined in statute) that describes a condition in which stable and reliable schedule of orders can be maintained in the marketplace.

- **Collaboration with Utilities** – through the efforts of the Joint Committee, and as reflected in the Comprehensive Plan, working to incorporate HES program track and supporting more efficient space and water heating will drive "deeper" and more comprehensive energy savings

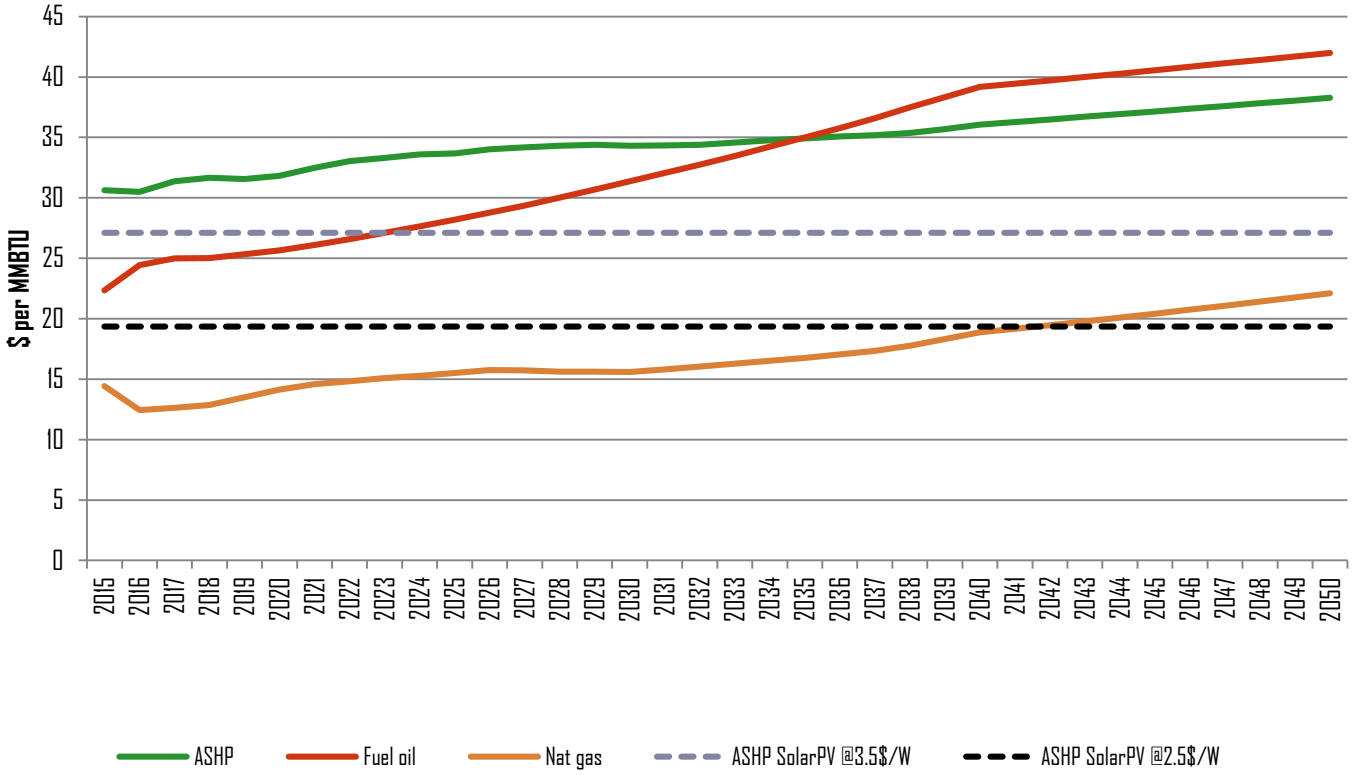
- **Transportation, Renewable Thermal Technology (RTT), and Distributed Energy Resources (DER)** – represent the largest GHG emitting sectors in Connecticut (i.e., transportation and heating and cooling) and provide an opportunity to address climate resilience and grid reliability (i.e., battery storage)

RSIP Innovation
Transportation Fuel Costs



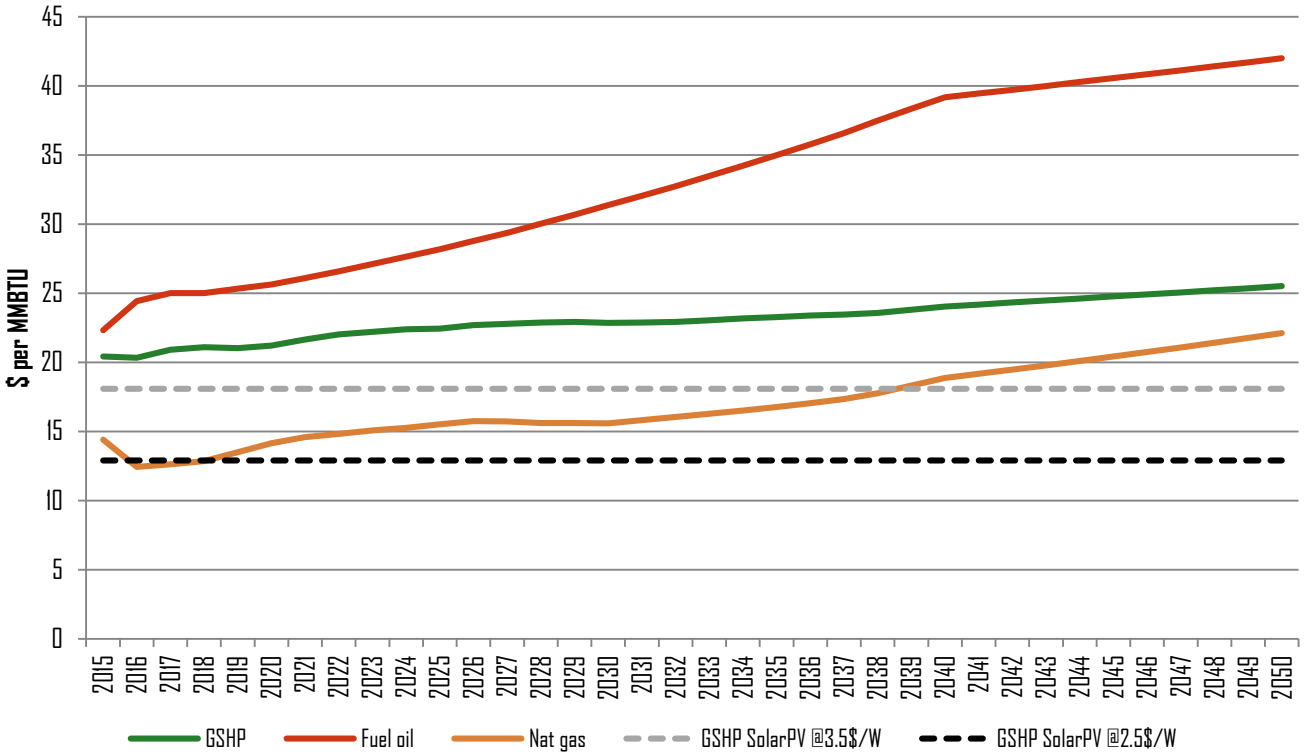
<u>EVs fueled by solar PV</u> provide "cleaner and cheaper" source of energy **<u>than gasoline and electricity</u>**

RSIP Innovation
RTT Fuel Costs (ASHP)



<u>ASHP powered by solar PV</u> provide “cleaner and cheaper” sources of energy **<u>than electricity and fuel oil</u>**

RSIP Innovation
RTT Fuel Costs (GSHP)



GSHP powered by solar PV provide "cleaner and cheaper" sources of energy **than electricity, fuel oil, and natural gas**

Recommendation
RSIP Steps 11 through 13

- **Race to the Rooftop** – 30 MW blocks for Steps 11 through 13, with continuation of LMI-PBI to encourage more solar PV deployment in low-to-moderate income households

- **Schedule of Incentives** – non-LMI for EPBB and PBI for Steps 11 through 13 and LMI PBI for Steps 11 through 13

- **Explore Pilot with DEEP and Utilities** – determine opportunity to create a special track(s) for energy efficiency, renewable thermal technologies, and alternative fuel vehicles:
  - ❖Require Home Energy Solutions Upfront
  - ❖Provide additional incentives for RTT, AFV, or other DER (e.g., battery storage)

Deployment Committee

Agenda Item #5

BeFree Appeal

CONNECTICUT
GREEN BANK

Misconduct hearing

BeFree Green Energy LLC

September 2016

Rebuttal Summary

The Program violations are:

(1) the submission of fraudulent equipment packing slips for payment on 66 projects, all of which resulted in the issuance of HOPBI working capital loans,

(2) failure to follow required contractor processes for the CT Solar Lease,

(3) failure to follow required contractor processes for Smart-E Loans,

(4) failure to follow required contractor processes for the Solarize Connecticut Program,

(5) excessive complaints from BeFree customers, and

(6) numerous complaints from officials from the towns of Haddam and Killingworth, who participated in the Solarize Program

Fraudulent Packing Slips

Summary of Violation

RSIP Program Guidelines:

Green Bank at its sole discretion, can suspend or terminate an Eligible Contractor for any of the the following actions:

4.11.9 Submission of falsified documents or unauthorized signatures to the Program

4.11.8 Failure to meet requirements and standards for other relevant Green Bank programs including, but not limited to:

a. Solarize Connecticut[SM]

b. CT Solar Lease

d. Smart-E Loan

Fraudulent Packing Slips

Background

EPBB RSIP Incentive (2012-2014)

- Paid incentive to contractor on delivery to the installation site or to a contractor's warehouse
- Net metering issue closed this incentive down from 2014-2015

HOPBI RSIP Incentive (2014-2015)

- HOPBI created to address net metering issue
- Paid incentive to contractor after inspection and meeting production goal

HOPBI Working Capital Loan (2014-2015)

- Optional loan created to pay contractors the value of the HOPBI when equipment was delivered to the installation site
- Not an incentive payment, this was a loan to help contractors impacted by legislative change
- Loan was "closed out" when project passed Green Bank inspection and met production goal. HOPBI incentive covered loan amount per-project by design.

Fraudulent Packing Slips

Timeline and Detail of Violation

- 9/11/14 - 5/15/15 BeFree certified on 66 separate HOPBI Equipment Delivery Certification and Loan Draw Down forms that equipment was delivered to the installation address.
- BeFree also certified on their own packing slips that equipment had been “delivered to the site”
- Green Bank inspections uncovered that the equipment installed differed from that on the HOPBI application.
- Not in dispute that equipment was not on site when certification was made
- Beginning late spring 2015, BeFree began to submit change orders for some of these projects.
- BeFree submitted fraudulent materials in order to be paid HOPBI Loans.

Fraudulent Packing Slips

Supporting Evidence

1. RSIP RFQ

2. HOPBI Working Capital Loan Agreement

3. HOPBI Equipment Delivery Certification and Loan Draw Down Form

4. Equipment Packing Slips and Change Orders

Fraudulent Packing Slips

Impact of Violation

- If loan is provided for equipment not on site and project does not go forward, there is no HOPBI RSIP incentive to pay off the short term unsecured loan
- Certifying to equipment that was actually not on site – happened with one other contractor, who is currently under investigation with State police for theft of $70,000 for exactly the behavior we were trying to avoid.
- Submission of fraudulent materials is explicitly forbidden in the RSIP RFQ
- This behavior is contrary to the statements certified by BeFree in HOPBI Loan materials
- The Green Bank staff spent an inordinate amount of time processing change orders because of BeFree's disregard for the HOPBI Loan process

Fraudulent Packing Slips

Conclusion

- Green Bank's HOPBI webinar and process guide instructions are clear
- Pattern of willful disregard for process or complete gross negligence
- BeFree has not proven that the Green Bank instructed contractors to use HOPBI Loans this way
- Only one other contractor used HOPBI Loans this way – others "got it"
- **HOPBI Loan request form and "certification statement" is unmistakably clear**

Failure to Follow SL2 Process

Christophe Beauchamp, Killingworth, CT

Issue 1: BeFree installed solar modules that differed from those which the customer contracted to receive in their signed work order (08/07/14) and executed lease agreement (02/17/2015)

– Although BeFree states that the customer received something of higher quality, the customer did not contract for the panels provided

– BeFree also miscalculated the site efficiency of the overall system, resulting in a much higher estimated kWh production than what is feasible.

- **CGB** confirmed an expected first-year production **decrease from 11,296 kWh to 9,990 kWh**

Failure to Follow SL2 Process

Christophe Beauchamp, Killingworth, CT

Issue 2: BeFree contacted the customer 3 weeks after installation in August 2015 to sign an updated work order.

– Customer cannot be forced to contract for a different system –

- **BeFree** maintains the position that they can change equipment so long as the equipment is approved by Solarize CT – this is true, however:

- **CT Solar Lease** require the customer sign a new work order and execute new lease documentation whenever system related changes occur *prior to installation*.

- Signing a new lease statutorily affords the customer the right to a new (3) day rescission period, during which they have the option to cancel their lease.

Failure to Follow SL2 Process

Christophe Beauchamp, Killingworth, CT

Issue 3: BeFree maintains the position that the customer's only issue is with the manner in which rain falls off of the solar modules onto his lawn. The customer advised that the modules overhang his gutters in some areas, causing flooding.

- In an email to CGB Staff on 12/12/2015: **BeFree** stated: *"His entire roof is covered with panels and it fit his roof perfectly without any overhangs."*
- **CGB** Inspector, Richard Dziadul, was dispatched to evaluate the site on 01/22/16 and provided a photo clearly showing modules overhanging the gutter.
- In response to an email from CGB notifying BeFree that the customer would like his system removed, on 03/02/16 BeFree reiterated "*At no point does the panel overhang the gutter"* and provided the second photo, showing a direct view of the home.

Failure to Follow SL2 Process

Christophe Beauchamp, Killingworth, CT

Issue 4: BeFree charged Mr. Beauchamp $1,145.00 for Professional Engineering Services related to roof reinforcements, without advising or seeking approval from Solarize CT Program Administrators; in violation of their contract to participate in the Solarize Haddam-Killingworth campaign

- **Customer** stated that BeFree did not go onto his roof or into his attic during their initial site visit. After expressing concern to BeFree about the soundness of his roof to support the solar equipment, BeFree and an engineer visited the home and recommended the installation of roof reinforcements.
- Per Attachment B (“Pricing Proposal”) of BeFree’s response to the Contractor RFP for Solarize Haddam-Killingworth, dated 03/26/2014, and accepted by municipalities and CGB, BeFree noted that no extra fee would be assessed for roof reinforcements.
- Per regulations of Solarize CT, any adder not included in a contractor’s Attachment B is subject to prior written approval from the Solarize CT Program Administrators
- BeFree did not request approval for the Professional Engineering fee nor did they notify Solarize CT Program Administrators / CGB Staff of this charge after it occurred.
- CT Solar Lease 2, LLC reimbursed customer for $1,145 on 05/04/2016

Failure to Follow SL2 Process

Christophe Beauchamp, Killingworth, CT

Open Items:

- The non-energized system remains on the customer's home, approximately 1 year after installation; however, BeFree will not be authorized to remove it by CGB until:

  – **Cancellation of Bill of Sale.** BeFree must execute a cancellation of the Bill of Sale for this project, reversing the sale of the solar equipment from BeFree to CEFIA Holdings, LLC, dated 02/25/2015

  – **Refund of Tranche A Payment**. BeFree must refund CEFIA Holdings, LLC a Tranche A payment of $15,370.00 (50% of the project cost) made to BeFree on 3/24/2015.

  – **Refund of Engineering/Roof Reinforcement Charge**. BeFree must refund CT Solar Lease 2, LLC $1,145.00 ($495 for engineering services and $650 for materials and labor) for a professional engineering and roof reinforcement fees that should not have been charged to the customer, per BeFree's contract with the Solarize Haddam-Killingworth campaign.

Bottom Line: Issue unresolved / System Still on Roof / BeFree never admitted any culpability / Failure to Follow-Process Led to these Problems

Failure to Follow SL2 Process

Robert Brown, Killingworth, CT

AFC First (CT Solar Lease administrator) first notified Green Bank of this project issue on 5/15/2015, stating that the panels installed for his CT Solar Lease system were changed from those in his signed contract without prior notification nor his approval or authorization.

- **Issue 1:** BeFree installed solar modules that differed from those which the customer agreed to receive in their signed work order (dated 08/11/14), which was also included in their executed lease agreement (dated 11/10/2014)
  - **Green Bank** confirmed an expected first-year production decrease from 7,800 kWh to 7,595 kWh
- **Issue 2:** BeFree had the customer sign a revised work order the day the system was installed in May 2015
  - **BeFree** maintains the position that they can change equipment so long as the equipment is approved by Solarize CT – this is true, however:
  - **Green Bank** requires the customer sign a new work order and execute new lease documentation whenever system related changes occur.
    - Signing a new lease statutorily affords the customer the right to a new (3) day rescission period, during which they can cancel their lease. Installers may not proceed with installation until they receive notice to proceed from AFC First that the customer has indeed signed the new lease and the 3-day rescission period has passed.

- This system was removed from the customer's roof on 10/8/15

Non-Compliance with Smart-E Guidelines

Summary of Issue

- BeFree and their subcontractor were not pulling municipal permits for ductless heat pumps (sold with solar PV)
  - Per Energize CT Smart-E contractor compliance, a letter was issued
    - *"Failure to ensure that all employees and subcontractors are properly licensed according to Connecticut State law and adhere to the requirements of the program"*

- The Green Bank notified BeFree of the issue and requested they provide information on projects including heat pumps and their permit status on January 12, 2015
  - A partial response was received from BeFree – a full response to the Green Bank inquiry was never obtained

- March 5, 2015 – A follow up letter was issued to BeFree stating that their response was incomplete and that they would therefore be placed on probation for the Energize CT Smart-E Loan

Solarize CT Process

Background Haddam Killingworth

- Selected as installer for Solarize Haddam/Killingworth campaign
- Selected based on bid including preferred pricing for standard equipment and additional costs for adders (ground mount, upgrades, etc.).
- Expected to meet all RSIP and Green Bank financing requirements, as well as additional Solarize requirements set forth in Solarize CT RFP
- Excessive complaints from customers and town officials:
  - Poor communication
  - Missed Appointments
  - Contract violations
  - Work completed without permits
  - Violations of Solarize CT program requirements

Solarize CT Process

Background Haddam Killingworth

- Pricing and equipment must be consistent with the approved bid and may not include additional costs outside of this scope:
  - Excessive customers charged after their contracts were signed
  - Customers charged additional fees which were not permitted under approved Solarize Haddam/Killingworth pricing and were explicitly stated by BeFree as being no charge
  - Numerous customers were unaware the panels installed on their homes had been swapped from their contracted panel
- Customers reported poor communication, missed appointments, and dissatisfaction with customer service, some instances resulting in reports to the AG and media
- Municipal and utility officials confirmed that applications for permits and interconnections were inaccurate or complete
- Municipal officials confirmed inspection failures, late and missed inspection appointments, and battery backup systems without the proper building or electrical permits

Customer Service Complaints

Background

Customers Cited

- Beauchamp
- Brown
- Devlin
- Dove
- Geist
- Petrie
- Pudim
- Rosenbower
- Schemmerling
- van der Swaagh

Recurring Themes

- Panel swaps
- Poor communication
- Disorganization
- Combativeness
- Unauthorized charges
- Installation delays
- Poor installation and design quality
- No call / no show

Town and Utility Complaints

Background

4.11.3 Failure to comply with current State and local laws and ordinances pertinent to building, electrical and solar photovoltaic installations, including but not limited to:

a) Obtaining proper permits for solar photovoltaic installations

c) Following … municipal building code(s) and ordinance(s).

4.11.6 Consistent inspection failures, including, but not limited to:

a) Municipal inspections

b) Utility inspections

4.11.7 Failure to submit or respond to requests for information, including but not limited to

b) Project documentation or information

e) Permits or interconnection applications

Town and Utility Complaints

Haddam and Killingworth

- *Town of Killingworth*: Letter from First Selectwoman Catherine Iino when requested to comment on experience(s) with Solarize. Excerpts below:
  - *"Several of our residents considered themselves to have been misled when they shown when they were enrolled. Although there is some language about changing the panels, the residents believed they were getting inferior installations"*
  - *"I had numerous reports of charges being added after the initial contract was signed. Some of these were in the thousands of dollars. In many instances, customers either paid or agreed to split the cost with BeFree in order to avoid prolonged arguments"*
  - *3-page letter concludes with "In sum, for Haddam and Killingworth, the Solarize program should have been a point of pride; instead it has been an embarrassment."*
- *Town of Haddam*: Former First Selectwoman Melissa Schlag email:
  - *Thursday August 13, 2015 email excerpt to Bob Wall (CGB) regarding Solarize concerns: "As you know, I have been extremely patient with BeFree and have been their biggest ally in Haddam, trying to smooth problems and concerns. But things have changed and I expect more from a contractor that has had an incredible opportunity in our town. Myself, our building inspector as well as our entire land use department takes their jobs very seriously and continuously looks out for our residents. Let us know if you have any words of wisdom on how to correct our issues,…"*

Town and Utility Complaints

Haddam and Killingworth

- *Town of Killingworth*: E-mail excerpts from town building official Jerry Russ

(describing Michael Dove project) “This project took over 2 years to resolve, and the process with the owners of BeFree Solar was very arduous. **The denial of wrong doing, then charging the customer in excess of their original contract**, and many other issues.”

“We have had nearly 100 applications come to our office by BeFree Solar, and **most of them have been incorrect or incomplete**.”

“…our experience working with them in the Zoning, Wetlands, Building and Health departments has been a **D-** across the board.”

“Not to mention that **all the extra work** our offices had to do, and the **hand holding** with respect to Killingworth’s and the State’s codes, as well as having the building fees capped, leaves a sour taste in the mouth of many of us here in the town offices.”

“I know I have discussed our frustration in the past with you, but I feel sending this note now, after the program is nearly closed, is just information I needed to share.”

Town and Utility Complaints

Eversource Energy

- BeFree has failed to provide battery backup (i.e., energy storage) information to Eversource in cases where this technology is being installed with solar PV, even after being informed by Eversource numerous times that this information is required based on the PURA approved utility interconnection guidelines.
- The utilities need documentation on battery backup systems to ensure that these systems are installed properly and are configured not to back-feed electricity into the grid during a power outage. **This is a matter of extreme importance to the safety of utility workers and the public.**
- In addition, Eversource collects information on energy storage systems to better understand their impact on the grid, in the interest of all stakeholders in the energy industry, especially electric ratepayers.
- BeFree continues to argue to Eversource that this is not a requirement and still has outstanding battery system information that has not been provided.
- An Eversource manager also noted that his staff have brought to his attention numerous times the frustration of having to work with BeFree and have requested not to be assigned to their projects.

Summary of Findings

Fraudulent equipment packing slips for payment on 66 RSIP projects undisputed

Failure to follow required contractor processes for the CT Solar Lease, Smart-E Loans, and the Solarize Connecticut Program,

Complaints from BeFree customers, negative media coverage, officials from the towns of Haddam and Killingworth, utility concerns, DCP concerns.

DCP, OCC and other stakeholders are relying on us to weed out the bad actors

BeFree is an outlier - four year formal and informal remedial process and they have yet to take responsibility for their mistakes or acknowledge that they have been noncompliant with the RSIP Contractor RFQ

Deployment Committee

Agenda Item #6

Other Business

Deployment Committee

Agenda Item #7

Adjourn

Deployment Committee of the
Connecticut Green Bank

845 Brook Street
Rocky Hill, CT 06067
Tuesday, February 9, 2016
3:00-4:00 p.m.

A special meeting of the Deployment Committee of the Board of Directors of the Connecticut Green Bank was held on February 9, 2016 at the office of the Green Bank, 845 Brook Street, Rocky Hill, CT.

1. **Call to order**

   Bryan Garcia Called the meeting to order at 3:02 pm. Deployment Committee members participating: Reed Hundt (by phone), Matt Ranelli (by phone) and Bettina Ferguson (by phone).

   Staff Attending: Bryan Garcia, Bert Hunter, Genevieve Sherman (by phone), Mackey Dykes, Cheryl Samuels, George Bellas, Nick Zuba (by phone), Jane Murphy, and Ben Healey (by phone).

2. **Public Comments**

   There were no public comments.

3. **Consent Agenda**

   a. **Approval of Regular Meeting Minutes for November 20, 2015**

      Upon a motion made by Reed Hundt, and seconded by Bettina Ferguson, the Committee voted unanimously to approve the Meeting Minutes from November 20, 2015.

   Resolution #1

   Motion to approve the minutes of the Board of Directors Meeting for October 16, 2015

4. **Commercial and Industrial Sector Program Updates and Recommendations**

   Genevieve Sherman discussed two transactions that had been previously approved. She explained that they were coming to the Committee late because of the interconnection agreement with Eversource. She explained the interconnection process and how they required an upgrade to the utility infrastructure. She explained that they had increased the size of the solar PV system.

   a. Approval of Contingency Increase of C-PACE Transactions

      i. Hartford – 77 Leibert Road

         Genevieve Sherman explained that this transaction has increased to $550,000. She explained that the SIR had dropped slightly, but it is still positive. She

explained that it remains within the standard underwriting criteria. She explained that the mortgage is in the process of being paid off. She explained that the numbers assume the mortgage is fully cleared.

Matt Ranelli questioned the fact that there was not going to be any energy efficiency. Genevieve Sherman explained that the property owners are just focused on solar PV technology.

Matt Ranelli questioned the new language with Hannon Armstrong. He questioned if the expectation of placing the term loan with Hannon was just formal language. Genevieve Sherman explained that it is just because this project is older. It seemed much easier to close out on financing using the existing financing agreement with the Green Bank. She explained that Hannon has not yet approved this. She also explained that future underwriting goes to Hannon first. Bert Hunter explained that Hannon did a back test on all transactions that had been approved to date. He explained that each transaction has qualified under standard, expedited, or exception criteria. He explained that not one single transaction did not pass their criteria.

Matt Ranelli questioned if there can be a condition added on the owner providing proof that the mortgage has been paid off. Genevieve Sherman explained that yes, there would be no objection to that.

Resolution #2

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"), the Connecticut Green Bank (Green Bank) is directed to, amongst other things, establish a commercial sustainable energy program for Connecticut, known as Commercial Property Assessed Clean Energy ("C-PACE");

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

WHEREAS, the Green Bank seeks to provide $551,167 construction and (potentially) term loan under the C-PACE program to VAG Development, LLC, the property owner of 77 Leibert Road, Hartford, CT (the "Loan"), to finance the construction of specified clean energy measures in line with the State's Comprehensive Energy Strategy and the Green Bank's Strategic Plan; and

WHEREAS, the Green Bank may also provide a short-term unsecured loan (the "Feasibility Study Loan") from a portion of the Loan amount, to finance the feasibility study or energy audit required by the C-PACE authorizing statute, and such Feasibility Study Loan would become part of the Loan and be repaid to the Green Bank upon the execution of the Loan documents.

NOW, therefore be it:

RESOLVED, that the President of the Green Bank and any other duly authorized officer of the Green Bank, is authorized to execute and deliver the Loan and, if applicable, a Feasibility Study Loan in a total 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 February 2, 2016, and as he or she shall deem to be in the interests of the Green Bank and the ratepayers no later than 120 days from February 9, 2016;

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

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

ii. Hartford – 133 Leibert Road

Genevieve Sherman explained that the loan has increased to just under $430,000. She explained that the solar PV system has been doubled in size. She explained that the LTV is under 80% and debt service is healthy as well, and falls within the standard underwriting criteria.

Resolution #3

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"), the Connecticut Green Bank (Green Bank) is directed to, amongst other things, establish a commercial sustainable energy program for Connecticut, known as Commercial Property Assessed Clean Energy ("C-PACE");

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

WHEREAS, the Green Bank seeks to provide $429,095 construction and (potentially) term loan under the C-PACE program to Auto Corner, LLC, the property owner of 133 Leibert Road, Hartford, CT (the "Loan"), to finance the construction of specified clean energy measures in line with the State's Comprehensive Energy Strategy and the Green Bank's Strategic Plan; and

WHEREAS, the Green Bank may also provide a short-term unsecured loan (the "Feasibility Study Loan") from a portion of the Loan amount, to finance the feasibility study or energy audit required by the C-PACE authorizing statute, and such Feasibility Study Loan would become part of the Loan and be repaid to the Green Bank upon the execution of the Loan documents.

NOW, therefore be it:

RESOLVED, that the President of the Green Bank and any other duly authorized officer of the Green Bank, is authorized to execute and deliver the Loan and, if applicable, a Feasibility Study Loan in a total 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 February 2, 2016, and as he or she shall deem to be in the interests of the Green Bank and the ratepayers no later than 120 days from February 9, 2016;

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

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

Upon a motion made by Bettina Ferguson, and seconded by Matt Ranelli, the Committee voted unanimously to approve Resolutions two and three.

5. Other Business

Genevieve Sherman discussed SIR and provided the definition. She explained that there are specific costs with certain renewable energies. She explained that with solar the inverter needs to be replaced after ten years. She explained that there is a similar situation with fuel cells after ten years, even though they have a 20 year life.

Genevieve Sherman advised that they have looked at all projects that have been closed in the last three years. She explained that the average savings to investment ratio has consistently been 1.3.

She explained that they did find that the SIR is dependent upon the property owner's stance. She explained that the projects fall within two buckets. One being when the owner prioritizes cash flow, which means a high SIR and when capital improvements are the focus there is a low SIR. She explained that there really is no clear trend. She advised that bundling of measures is pretty common and necessary to realize deep energy savings.

Reed Hundt questioned if there should be a minimum savings to investment ratio that is comfortably above 1. Genevieve Sherman explained that the Green Bank is trying to deploy clean energy, but also to do so in a way that does not

compromise the financial health of the underlying property. If the Green Bank only cared about deploying clean energy, there would be no SIR requirement at all, since the cost for a property to go 'zero-carbon' for example, are currently very high and would not be supported through energy savings over a 20 year period. So the mandatory SIR of 1 or greater provides a simple check to ensure that C-PACE financing is not used in such a way that financially encumbers the property from the perspective of cash flow. Furthermore, because the SIR is a simple metric for evaluating financial risk, it is not the only metric used to approve a transaction, but one of many. Reed Hundt asked if they all agreed that one is their minimum. Bert Hunter advised that per statute it is.

Matt Ranelli explained that there are two other factors that concern him. He asked if there was an evaluation as to how the projects are performing against the expected savings. The other concern is that for certain transactions, in the out years of the 20 year agreement that the savings are less than the payment. Genevieve Sherman explained that they are collecting data on the energy consumption of the projects that the Green Bank is financing. She explained that they're seeing the majority of projects performing well, but that there are a couple that are not. She explained that that doesn't mean that the energy improvements are not working, because there could be changes in the use of those properties that increase energy consumption, but that just from a measurement perspective the projects look very good.

Genevieve Sherman discussed the negative cash flow in the out years for certain transactions, particularly solar. She explained that the revenue streams for solar are less lucrative than they used to be. She explained that the utility tariffs for commercial businesses changed in 2015. She also explained that the net metering benefit for commercial customers has gone down as well. She explained that they are starting to see that over the last five years of projects they are seeing consecutive years of negative cash flow. She explained that Bert Hunter and his team have been working on a sculpted amortization to change the schedule by which principal and interest are repaid to have a higher overall payment in the early years.

Bert Hunter explained that the key benefit other than keeping the savings in excess of the debt service requirement is that in doing the sculpted amortization it brings in the weighted average life to a shorter term than would be on our standard mortgage repayment profile. He explained that since the Green Bank is charged for the cost of funds based on the weighted average life of the transaction, shorter term transactions will price at a lower rate. He explained that they are also able to pass along the reduction in interest rate to the property owner. He explained that it's a win all around. He also explained that they intend to create a tool to work with property owners to show this. Genevieve Sherman explained that the plan is to offer this under the Hannon facility. It will not be a requirement, but an option. She explained that they feel this is a really great option.

Bettina Ferguson questioned why it will be going out 25 years. Genevieve Sherman explained that after discussions with the Hannon facility they are okay with 25 year financing terms, only with technologies with useful life that extends over 25 years. Bryan Garcia explained that the team is open to ideas that may work.

Matt Ranelli questioned if they should make this a requirement instead of a choice. Bert Hunter explained that they are looking at the portfolio of transactions to see what the extent of negativity is in the out year transactions. He explained that they are still in the process of assessing that and that they are not ready to decide one way or the other. Genevieve Sherman explained they need to figure out how to manage the risks in the earlier years where there is better clarity into the market parameters that cause risk.

5. Other Business

6. Adjourn

Upon a motion made by Matt Ranelli, and seconded by Bettina Ferguson, the meeting was adjourned at 3:58 p.m.

Respectfully Submitted,

Reed Hundt, Chairperson

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CONNECTICUT GREEN BANK

Memo

To: Board of Directors of the Connecticut Green Bank – Deployment Committee of the Connecticut Green Bank

From: Bryan Garcia (President and CEO)

Date: September 29, 2016

Re: Approval of Funding Requests below $300,000 – Update

At the July 18, 2014 Board of Directors (BOD) meeting of the Connecticut Green Bank ("Green Bank") it was resolved that the BOD approves the authorization of Green Bank staff to evaluate and approve funding requests less than $300,000 which are pursuant to an established formal approval process requiring the signature of a Green Bank officer, consistent with the Comprehensive Plan, approved within Green Bank's fiscal budget and in an aggregate amount not to exceed $1,000,000 from the date of the last Deployment Committee meeting. This memo provides an update on funding requests below $300,000 that were evaluated and approved. During this period, 5 projects were evaluated and approved for funding in an aggregate amount of approximately $976,841.80. If members of the board would be interested in the internal documentation of the review and approval process Green Bank staff and officers go through, then please request it.

Project Name:	**Lewis R. and Maureen C. Labbadia - 909 Newfield Street, Middletown**
Amount:	**$61,429 +/- 10%**
Comprehensive Plan:	**CPACE**

Description

The 9,442 square foot office building at 909 Newfield Street, Middletown CT – originally constructed in 1981– comprises the Labbadia Property (the "Property"). Owners, Lewis and Maureen Labbadia acquired the property in 1992. The Property houses the Labbadia & Carroccia Chiropractic Offices, of which Lewis Labbadia is a primary practioner.

The proposed investment is a C-PACE transaction under which the Connecticut Green Bank ("Green Bank") would provide construction financing (at a per annum 5.0% interest rate) and a 20-year term loan commitment (at a per annum 6% interest rate), in the amount of $61,429

to support a 16.8 kW Solar PV Renewable Energy System. The Green Bank intends to sell its investment to HA C-PACE LLC, a C-PACE facility established by Hannon Armstrong and the Green Bank. The Green Bank, as a subordinated lender to HA C-PACE LLC, would ultimately be responsible for 10% of the financing, amounting to $6,142. The remaining 90% would be funded by Hannon Armstrong. Notwithstanding the foregoing, the Green Bank may advance above its 10% portion during the construction period for logistical ease, and any funding in excess of this 10% will be repaid by a subsequent senior advance.

The **LiTV inclusive of all C-PACE liens for this property is 6.3%**. There is an outstanding mortgage associated with the property, bringing the **LTV to 31.1%**. Given the low LiTV and LTV, the proposed investment qualifies as an expedited underwriting per HA C-PACE LLC guidelines.

Furthermore, from a financial perspective, staff has confidence that the Labbadia Property has sufficient cash flow and balance sheet to service the C-PACE Benefit Assessment. Staff examined the financials of the Property and found it to be in good health. The Property has sizable debt service requirements in the next two years as it finishes paying off a $550,000 mortgage that closed in 2003 (current outstanding balance of $102,838). However, this outstanding balance can be refinanced if necessary, ameliorating any DSCR pressure. **Across the 10-year financing term, the average Debt Service Coverage Ratio ("DSCR") is 2.08x**.

Taking all of these factors into consideration, along with an SIR of 1.72x, staff recommends the project for approval, pursuant to the Project Approval Form for projects under $300,000.

Project Name: **JCC of Greater New Haven - 360 Amity Road, Woodbridge**

Amount: **$287,732 +/- 10%**

Comprehensive Plan: **CPACE**

Description

The 118,494 square foot building at 360 Amity Road in Woodbridge, CT – originally constructed in 1993 with an additional building added in 1998 – comprises the Jewish Federation and the Jewish Community Center of Greater New Haven (together, the "JCC"). The JCC acquired the property in 1990.

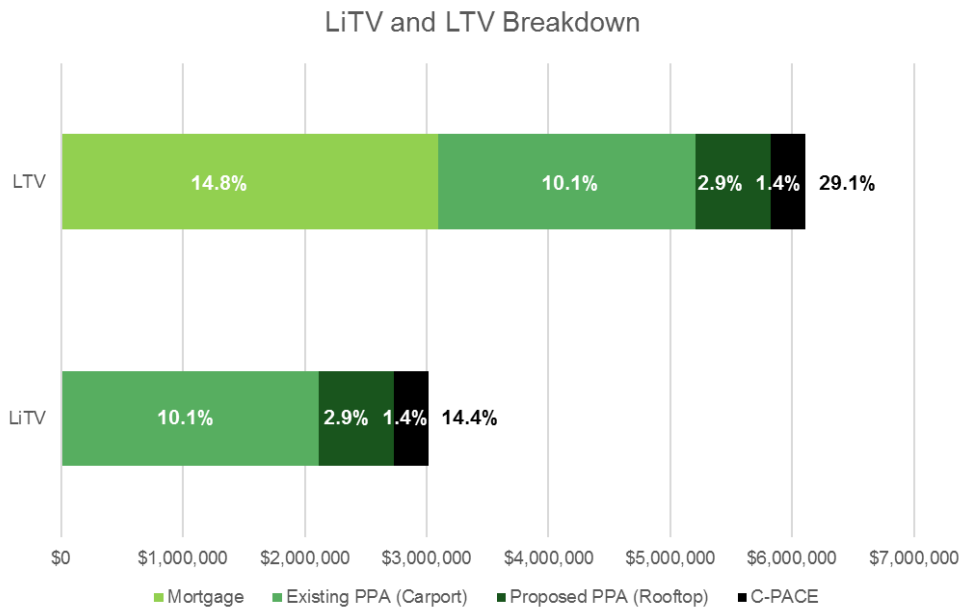
The proposed investment is a C-PACE transaction under which the Connecticut Green Bank ("Green Bank") would provide construction financing (at a per annum 5.0% interest rate) and a 20-year term loan commitment (at a per annum 6% interest rate), in the amount of $287,732 to support roof repairs to allow for the installation of a third-party owned 269 kW Solar PV Renewable Energy System (to be financed by CT Solar Lease 2 LLC ("SL2") or a subsequent Connecticut Green Bank backed solar lease vehicle, and secured by a distinct C-PACE Benefit Assessment Lien). The Green Bank intends to sell its investment to HA C-PACE LLC, a C-PACE facility established by Hannon Armstrong and the Green Bank. The Green Bank, as a subordinated lender to HA C-PACE LLC, would ultimately be responsible for 10% of the financing, amounting to $28,773. The remaining 90% would be funded by Hannon Armstrong. Notwithstanding the foregoing, the Green Bank may advance above its

10% portion during the construction period for logistical ease, and any funding in excess of this 10% will be repaid by a subsequent senior advance.

The property has a 750 kW solar photovoltaic carport system already in place that was previously financed under a Power Purchase Agreement ("PPA") with SL2, which system was placed in service in the summer of 2015 and has performed to spec to date:

The JCC views its investments in solar PV as part of an energy cost hedging strategy (rather than purely about realizing upfront savings), and the previous PPA was priced such that the PPA rate was set at a slight discount to the JCC's current utility electric charges with the expectation of realizing increasing savings over time. Similarly, with respect to the proposed project, for which the solar will also be financed via a PPA, the PPA savings associated with the new 269 kW PV system will pay for the financing costs associated with the roof upgrade at an approximately 1:1 ratio over the project's early years, with greater savings accruing to the JCC as utility electricity costs increase going forward.

The original PPA closed in early 2015 and is secured by a C-PACE benefit assessment lien of $2,111,575 on the property. With the addition of this investment of $287,732 and of the new solar system estimated at $615,000, the **LiTV inclusive of all C-PACE liens for this property becomes 14.4%**. There is an outstanding mortgage associated with the property, bringing the **LTV to 29.1%**. Given the low LiTV and LTV, the proposed investment qualifies as an expedited underwriting per HA C-PACE LLC guidelines.



	Previously	2015	2016
Outstanding Mortgage	$3,228,064	$3,228,064	$3,097,006
Existing PPA (Carport)		$2,204,743	$2,111,575
Proposed PPA (Rooftop)			$615,000
C-PACE			$287,732
Mortgage Repayments		$131,058	$139,739
PPA Repayments		$93,168	$94,556
C-PACE Repayments			$25,242
LiTV	0.0%	10.6%	14.4%
LTV	15.5%	26.1%	29.1%

Furthermore, from a financial perspective, staff has confidence that the JCC has sufficient cash flow and balance sheet to service the C-PACE Benefit Assessment. Staff examined the financials of the JCC and found it to be in good health. The JCC has significant outstanding debt repayments in 2017 ($1.3M) and 2019 ($1.6M) as a result of balloon payments associated with a mortgage and term loan, respectively. However, staff expects that these debt obligations can be readily refinanced. In addition, the JCC has current investments of more than twice the amount necessary to cover these payments in the event the JCC chooses not to refinance. **Across the 20-year financing term, the average Debt Service Coverage Ratio ("DSCR") for the mortgage, PPA and C-PACE Assessment is 1.35x the projected Change in Net Assets and Energy Savings**.

Taking all of these factors into consideration, along with an SIR of 1.34x, staff recommends the project for approval, pursuant to the Project Approval Form for projects under $300,000.

Project Name: **Miller Brothers Moving - 801 Windham Road, Windham**

Amount: **$101,599 +/- 10%**

Comprehensive Plan: **CPACE**

Description

The property at 801 Windham Road, South Windham, CT is a 24,500 square foot commercial warehouse building (the "Property") that is owner-occupied by Miller Brothers Moving & Storage, Inc. ("Miller Brothers Moving & Storage Inc." or the "Company"), a family-owned storage and moving service company operating in Connecticut since 1929.

The proposed investment is a C-PACE transaction under which the Connecticut Green Bank (the "Green Bank") would provide construction financing (at a per annum 5.0% interest rate) and a 10-year term loan commitment (at a per annum 5.0% interest rate), in the amount of $101,599 to support a 27 kW Solar PV Renewable Energy System. The Green Bank intends to sell its investment to HA C-PACE LLC, a C-PACE facility established by Hannon Armstrong and the Green Bank. The Green Bank, as a subordinated lender to HA C-PACE LLC, would ultimately be responsible for 10% of the financing, amounting to $10,160. The remaining 90% would be funded by Hannon Armstrong. Notwithstanding the foregoing, the Green Bank may advance above its 10% portion during the construction period for logistical ease, and any funding in excess of this 10% will be repaid by a subsequent senior advance.

The project's SIR over the useful life of measures is 1.47 and is expected to generate total gross savings of $191,099 over the effective useful life. With a total investment of $101,599, the LiTV and LTV for this property is 13.8%. In addition, although the Property has no outstanding mortgage, there is Line of Credit ("LOC") secured on property for the value of $90,000. This LOC is currently undrawn. **Were the Company to fully draw on this facility, the LiTV and LTV would be 26.1%.** For purposes of this underwriting, it is assumed that the LOC is drawn up to the full amount, and therefore the transaction qualifies as a **full underwriting** per HA C-PACE LLC guidelines.

Furthermore, from a financial perspective, staff has confidence the operating company has sufficient cash flow to service the C-PACE Benefit Assessment. Staff examined the financials of Miller Brothers Moving & Storage, the operating company, and found it to be in good health. The average DSCR over the term of the financing is 7.42x.

Taking all of these factors into consideration staff recommends the project for approval, pursuant to the Project Approval Form for projects under $300,000.

Project Name: **Nguyen & Cai Group LLC - 477 Connecticut Boulevard**

Amount: **$264,562 +/- 10%**

Comprehensive Plan: **CPACE**

Description

The property at 477 Connecticut Boulevard, East Hartford, CT is a 44,000 square foot commercial building (the "Property") that is owned by Nguyen & Cai Group LLC ("Nguyen &

Cai Group LLC" or the "Company"). The Nguyen & Cai Group LLC is an S-Corporation wholly owned by Tuyen D Nguyen, who also owns the dental practice located in the building called Kasimer Kowalski, DMD. The Property also houses the Dr. Cai Eyecare Center, which is the optometry/optical care business of Mr. Nguyen's wife (she is the sole 100% owner). In addition to the above businesses, the Property leases out space for commercial use by third parties.

The proposed investment is a C-PACE transaction under which the Connecticut Green Bank (the "Green Bank") would provide construction financing (at a per annum 5.0% interest rate) and a 10-year term loan commitment (at a per annum 5.0% interest rate), in the amount of $264,562 to support an Energy Efficiency Upgrade project. The Green Bank intends to sell its investment to HA C-PACE LLC, a C-PACE facility established by Hannon Armstrong and the Green Bank. The Green Bank, as a subordinated lender to HA C-PACE LLC, would ultimately be responsible for 10% of the financing, amounting to $26,456. The remaining 90% would be funded by Hannon Armstrong. Notwithstanding the foregoing, the Green Bank may advance above its 10% portion during the construction period for logistical ease, and any funding in excess of this 10% will be repaid by a subsequent senior advance.

The project's SIR over the useful life of measures is 1.02 and is expected to generate total gross savings of $347,678 over the effective useful life. With a total investment of $264,562, the LiTV and LTV for this property is 17.45% and 79.4% respectively. In addition, the Property has outstanding mortgage of **$939,672** (initially $1,200,000) at 3.53% interest rate with 5 year term. **Since the current balance is $939,672 and the maturity date is 6/1/2017, it is assumed in the cash flow projections that the client will refinance the mortgage in 2017.** This transaction qualifies as a **full underwriting** per HA C-PACE LLC guidelines.

The mortgage note by Peoples Bank on the property is guaranteed by the dental practice. Since the dental practice is an S Corporation, the mortgage obligations are passed through and reflected in the tax returns of Tuyen D Nguyen (see Financial Statement section below).

Furthermore, from a financial perspective, staff has confidence the Nguyen & Cai Group LLC has sufficient cash flow (rent paid by tenants) to service the C-PACE Benefit Assessment. The Property's occupancy rate on a square foot basis is above 75%. Since the rent revenue of the property is reflected in personal tax return of Tuyen D Nguyen, staff examined the financials of Tuyen D Nguyen and found it to be in good health. The average DSCR over the term of the financing is 1.37x.

Taking all of these factors into consideration staff recommends the project for approval, pursuant to the Project Approval Form for projects under $300,000.

Project Name: **Sheffield Pharmaceuticals, 170 Broad Street - New London**

Amount: **$172,718 +/-10%**

Comprehensive Plan: **CPACE**

Description

The property at 170 Broad Street, New London, Connecticut consists of a light industrial / manufacturing building owned, occupied, and operated by Sheffield Pharmaceuticals ("Sheffield"), a manufacturer of over-the-counter beauty and dental hygiene products. The

proposed investment is a C-PACE transaction under which the Connecticut Green Bank ("Green Bank") would provide construction financing (at a per annum 5.0% interest rate) and a 10-year term loan commitment at an effective per annum 5.07% interest rate, in the amount of $172,718 to support the installation of a boiler upgrade and replacement.

The contractor for the project will be NORESCO, an accredited Energy Service Company and Energy Service Provider, in tandem with Connecticut Boiler Repair & Manufacturing Co., a leading boiler repair and service company. An initial investment of $160,718 for the same purpose was approved on June 18, 2015, and a benefit assessment lien for that amount was placed on the property at 170 Broad Street in July 2015 in anticipation of the C-PACE transaction. Since initial approval, the total project cost has increased by $12,000 due to Sheffield choosing a boiler that is not eligible for a utility incentive that was previously envisioned in the technical review and underwriting process. Thus, the updated total investment amounts to $172,718, but because $159,722.11 of the original $160,718 investment has already been disbursed, this revised C-PACE Project Qualification Memo is considering only an additional $12,995.89 of capital required to complete the project.

The $12,000 project cost increase falls within the acceptable 10% contingency for cost overruns found in the C-PACE agreement, but because several new financial considerations have emerged since the original underwriting of the project Green Bank staff thought it prudent to reassess the project qualifications. Furthermore, Green Bank intends to hold the loan to maturity, as opposed to housing it within the HA-CPACE facility, resulting in additional $156,646 of ratepayer funds at risk across the 10-year financing term[1].

Line of Credit

In addition to the property at 170 Broad Street, Sheffield owns a manufacturing facility, an office building, a warehouse, and a newly acquired 136,000 square foot fulfillment center located at 9 Wisconsin Ave in Norwich, CT. There is a line of credit totaling $6,000,000 that is secured by the entirety of the Sheffield properties, and which is also subject to certain financial covenants related to asset eligibility requirements (specifically trade receivables and inventory). Green Bank staff understands this line of credit to be part of normal business operations, and analyzes the maximum limit of the line of credit in relation to an appropriate borrowing base to determine its impact on the underwriting analysis. Given the line of credit's subjugation to the current assets base, and with the maximum limit of the line of credit at 46.9% of total current assets, staff believes that an LTV exclusive of the line of credit is an appropriate metric by which to underwrite the transaction.

Refinancing

Since the original investment approval, Sheffield has entered into a debt financing agreement with a 3rd party capital provider for $4,250,000 to finance new equipment as part of its restructuring efforts and to refinance an existing mortgage. The new debt facility is secured by assets that are not related to the Green Bank's security interest, and therefore will have

[1] Green Bank would have retained 10% of the original $160,718 loan placed in the HA-CPACE facility ($16,072) vs. holding the updated $172,718 loan to maturity.

no impact on Green Bank's LiTV and LTV calculations. On June 30, 2016 Sheffield completed a sale-leaseback of the newly acquired 9 Wisconsin Ave property, generating net proceeds of $5,000,000, which will in turn be used to refinance the 3rd party debt financing, and which will result in monthly lease payments of $39,967 for the site (which have been factored into the underwriting considerations below). Staff believes this refinancing to be in line with the company's turnaround strategy and capital-raising ambitions (as discussed below).

Going Concern

Audited financials for Sheffield for the calendar year ended December 31, 2015 were produced on June 14, 2016, and the Independent Auditors' Report stated that Sheffield's ability to continue as a going concern will depend largely on its ability to secure financing for its turnaround strategy of transitioning from selling low-cost and low-margin commoditized products to more luxury, higher-margin products. Green Bank staff believes that between its own investment, the recent 3rd party refinancing, and the completed sale-leaseback transaction, Sheffield will be able to implement its turnaround strategy.

Litigation Liability

Sheffield currently faces a potential fine of up to $1,000,000, levied by the Environmental Protection Agency (EPA), due to the failure to obtain a permit for certain wastewater discharges. No environmental damage was recorded in association with the fine, and the company can pay the fee in annual installments over a six-year period beginning in 2017. Due to the permitting nature of the offense, and the expectation of its settlement over time, Green Bank staff does not believe the EPA fine will impede Sheffield's operations.

Underwriting Considerations

Given the size of the transaction, staff proposes an expedited underwriting review. With a total investment of $172,718, the **LiTV[2] for this property would be 6.2%**, well within the <20% figure that multiple private capital providers have suggested to staff is an acceptable threshold for purchasing C-PACE projects. In addition, although the property does have an outstanding mortgage, the **LTV[2] is 46.2%**, well below Green Bank guidelines of 80%. **Finally, the AATV (annual assessment-to-value), a new metric that Green Bank staff has recently begun to consider as a result of conversations with private capital providers, is at 0.79%, well below the 2.5% threshold the market has communicated to us**. Furthermore, from a financial perspective, staff has confidence that the property has sufficient cash flow, coverage, and asset value to service the C-PACE Benefit Assessment. **Using 2016 pro forma financials, based on 2016 Q2 YTD actuals which present an indicative view of the go-forward operating results that can be expected from Sheffield's turnaround strategy, the average Debt Service Coverage Ratio ("DSCR") for the mortgage at 170 Broad Street, the C-PACE Assessment, and all other corporate-related financings (EPA Settlement charges, Line of Credit interest payments, monthly rental charges on the Sale-Leaseback for the property at 9 Wisconsin Ave, and additional Notes Payable as per 2015 audited financials) is 1.72x**

[2] LiTV and LTV calculations are based on the property, and subsequent property value, associated with the benefit assessment lien placed on 170 Broad Street.

against EBITDA and Energy Savings Staff still feels very comfortable with the robust nature of the debt coverage; 2016 Pro Forma EBITDA could be reduced by 35.0% and the company would still maintain a DSCR at or above 1.00xacross the financing term.

Taking all of these factors into consideration, along with an SIR of2.82, staff recommends the project for approval, pursuant to the Project Approval Form for projects under $300,000.

HARC, Inc: A C-PACE Project in Hartford, CT

Address	900 Asylum Ave, Hartford, CT 06105			
Owner	HARC, Inc.			
Proposed Project Description	LED Lighting and HVAC upgrades			
Proposed C-PACE Assessment	~~$704,535~~$479,810			
Assessment Term (*years*)	~~17~~16			
Term Remaining (*months*)	Pending Construction Completion			
Annual Interest Rate	5.~~76~~%			
Annual C-PACE Assessment	~~$67,603~~$44,444			
Savings-to-Investment Ratio	1.~~05~~03			
Average Debt-Service Coverage Ratio	[redacted]			
Loan-to-Value Ratio	[redacted]			
Projected Energy Savings (*mmBTU)*		RE[~~2~~]	EE	Total
	Per year	~~270~~	~~1,114~~2,032	~~1,384~~2,032
	Over ~~Term~~EUL	~~4,775~~	~~26,609~~33,328	~~31,384~~33,328
Estimated Cost Savings	Per year ($)	~~1,170~~	~~45,188~~67,681	~~46,358~~67,681
	Over ~~Term~~ EUL ($)	~~19,900~~	~~768,184~~1,109,974	1,109,974 ~~788,084~~
Objective Function	~~65.4~~47.3 kBTU per ratepayer dollar at risk			
Location	City of Hartford			
Type of Building	Office			
Year of Build	1977			
Building Size (*total sf*)	99,604 sf.			
Year Acquired by Current Owner	1995			
Appraised Value	[redacted]			
Status of Mortgage Lender Consent	[redacted]			
Est. Date of Construction Completion	Pending closing			
Current Status	Pending Deployment Committee Approval			
Energy Contractors	[redacted]			
Additional Comments	[redacted]			

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CONNECTICUT GREEN BANK

Memo

To: Board of Directors of the Connecticut Green Bank

From: Bryan Garcia, Dale Hedman and Kerry O'Neill

Date: September 29, 2016

Re: Residential Solar Investment Program – Steps 11 through 13 Recommendations

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Background

On March 2, 2012, the Connecticut Green Bank launched the Residential Solar Investment Program ("RSIP"). Per Section 106 of Public Act 11-80 (as amended and now codified at Connecticut General Statute Sec. 16-245ff), the RSIP requires that a minimum of 300 MW of new residential solar PV be installed in Connecticut on or before December 31, 2022, at a reasonable payback to the customer all the while developing a sustainable market for contractors. The RSIP provides to residential customers, via solar PV contractors, direct financial incentives in the form of a one-time expected performance-based buy-down ("EPBB") or a 6-year performance-based incentive ("PBI") for the purchase and/or lease of qualifying PV systems respectively. The success of the RSIP over its first three years resulted in an improvement to the policy in the 2015 legislative session – with subsequent technical fixes in the 2016 legislative session. As a result of the leadership of Governor Malloy, Public Act 15-194 "An Act Concerning the Encouragement of Local Economic Development and Access to Residential Renewable Energy" was passed with bipartisan support.

To date, through the RSIP, we have approved and completed nearly 150 megawatts of projects – approximately 50 percent of the public policy target – while reducing the level of subsidies by over 80 percent since 2012 through ten steps – see Table 1. About 30 percent (or 43 MW) of the installations are homeownership through the EPBB.

Table 1. Installed Capacity by Step for Approved, In Progress, and Completed Projects (as of September 16, 2016)

RSIP Incentive Step	Approved (kW)	Completed (kW)	Total (kW)	Average Incentive ($/W$_{STC}$)
1	0	1,381	1,381	$1.789
2	0	5,992	5,992	$1.629
3	59	13,117	13,175	$1.229
4	433	19,157	19,590	$1.031
5	642	12,961	13,603	$0.745
6	1,090	11,383	12,472	$0.513
7	1,606	17,857	19,463	$0.399
8	7,630	21,863	29,493	$0.366
9	23,643	7,325	30,967	$0.328

10	1,543	14	1,556	$0.320
Total	**36,644**	**111,049**	**147,693**	**$0.637**

About 54 MW of solar PV deployment were the results of Steps 1 through 5, while about 94 MW of solar PV deployment are the results of Steps 6 through Step 10 (current).[1] We have successfully petitioned PURA to aggregate the 54 MW of projects from Steps 1 through 5 enabling the Connecticut Green Bank to sell RECs on the spot and future market. We are currently in the process of working with PURA and the utilities on the 15-year master purchase agreement for the Solar Home Renewable Energy Credits (SHRECS). The investment of over $625 million in residential solar PV in Connecticut through the RSIP to date has created 9,628 job-years (i.e., 3,689 direct, and 5,939 indirect and induced) and will reduce over 1.8 $MTCO_2$ emissions over the 25-year life of the projects.

Of the over 19,350 projects approved under the RSIP, in recent years, the Connecticut Green Bank has made progress with respect to installed capacity of residential solar PV by income – see Tables 2 and 3.

Table 2. Statewide Residential Solar PV Deployment by Income Level and Census Tract (FY 2012 through FY 2016)

Income Level (AMI)	**# of Census Tracts**	**Tract Population**	**# of Projects**	**Projects per 1,000 People**	**Installed Capacity** (kW_{STC})	**Installed Capacity per Capita** (W/Capita)
<60%	166	725,662	1,110	1.5	6,827	8.2
60-80%	118	507,031	2,064	4.1	14,114	24.9
80-100%	137	596,408	3,249	5.4	23,575	36.7
100-120%	160	723,314	5,148	7.1	39,513	51.9
>120%	246	1,007,209	7,564	7.5	61,777	58.3
N/A	-	-	231	-	1,886	-
Total	**827**	**3,559,624**	**19,366**	**5.4**	**147,693**	**41.1**

Table 3. Statewide Residential Solar PV Deployment by Income Level and Census Tract (CY 2015 and 2016)

Income Level (AMI)	**# of Census Tracts**	**Tract Population**	**# of Projects**	**Projects per 1,000 People**	**Installed Capacity** (kW)	**Installed Capacity per Capita**
<60%	166	725,662	776	1.1	4,764	9.4
60-80%	118	507,031	1,378	2.7	9,589	27.8
80-100%	137	596,408	2,016	3.4	14,913	39.5
100-120%	160	723,314	3,183	4.4	25,024	54.6
>120%	246	1,007,209	3,857	3.8	32,764	61.3
N/A	-	-	1,204	-	9,656	-
Total	**827**	**3,559,624**	**12,414**	**3.5**	**96,711**	**41.5**

While a gap still exists between penetration rates of residential solar projects in lower income census tracts vs. those in higher census tracts, that gap has decreased over the last two years. In December 2014 we presented to the Board of Directors a market analysis of solar deployment conducted with the Connecticut Center for Economic Analysis at UCONN[2] that

[1] Section 106 of PA 11-80 applies to Steps 1 through 5, while PA 15-194 applies to Steps 6 through 10 and beyond – or projects approved after January 1, 2015.

[2] The market analysis memo is available here

showed that solar deployment penetration in census tracts at <60% AMI was 1/10th what it was in tracts at >80% AMI, and for tracts at 60-80% AMI it was 1/4th of what it was in tracts >80% AMI. For solar project deployed in CY 2015 and 2016 penetration of tracts at <60% AMI was 1/4th what it was for tracts at >80% AMI, and for tracts at 60-80% AMI it was 7/10th what it was for tracts at >80% AMI. This improvement is attributable to the following:

1) the Green Bank conducted customer segmentation analysis that identified a unique segment that is lower income and older (dubbed "Prudent Yankees") that was already going solar and we educated the installer market about the opportunity to further penetrate this segment;
2) the Green Bank has repeatedly communicated to the installer market that consumer incomes and credit quality don't correlate, and that lower income homeowners are good prospective customers;
3) we issued a solar financing RFP in early 2015 that specifically called out the LMI customer segment as an area of focus for us (the PosiGen partnership came through this RFP); and
4) we created an LMI tiered PBI incentive that launched in August 2015. Since to date only PosiGen is taking advantage of the LMI-PBI and their activity does not fully explain the improvement in solar deployment in lower income tracts, we can conclude that the broader messages we've been communicating to the installer market around the customer acquisition opportunities in this market segment have been heard.

With respect to the estimated RSIP incentive at an equivalent 15-year price that we had estimated for Steps 8 through 10, [3] we were between the best to expected case scenarios – see Table 4.

Table 4. Estimated Case vs. Actual for RSIP Incentive at Equivalent 15-Year Price ($/REC)

RSIP Step	Best Case	Expected Case	Worst Case	Actual
Step 8	$22.30	$25.03	$33.03	$24.02[4]
Step 9	$18.90	$22.08	$31.51	$22.14[5]
Step 10[6]	$16.10	$19.63	$30.09	TBD

Based on these tentative results, the Connecticut Green Bank staff believes that the RSIP incentive at an equivalent 15-year price from Steps 8 through 10 will be on average about $22, which in comparison to the spot market REC price for Class I resources of $40 and the ZREC price for commercial projects (i.e., between $50-$75), demonstrates that the Connecticut Green Bank is successfully transitioning the residential solar PV market reliance away from the RSIP incentive.

RSIP Proposed Schedule of Incentives for Steps 11 through 13

The staff proposes the following incentive for Steps 11 through 13 of the RSIP:

[3] For estimates, see "Residential Solar Investment Program – Steps 8 through 10 Recommendations" memo of July 10, 2015 – click here (p. 5)
[4] For Step 8, EPBB was 17%, PBI was 83%, and LMI PBI was 0%
[5] For Step 9, EPBB was 19%, PBI was 77%, and LMI PBI was 4%
[6] Step 10 is only 1.6 MW of 30.0 MW "race to the rooftop," therefore data is not accurate to report. Thus far, EPBB represents 20%, PBI 70%, and LMI PBI 10%.

- **Race to the Solar Rooftop** – The total capacity target for Step 11 is 30.0 MW, Step 12 is 30.0 MW, and Step 113 is 30.0 MW. The FY 2017 Comprehensive Plan identifies a target between 48.5 to 64.6 MW through the RSIP.

- **Launch Date** – Step 11 will begin at the conclusion of Step 10.

- **Incentive Level** – we are proposing additional incentive levels by steps, including continuation of the LMI PBI (i.e., below 100% AMI), as well as special consideration for a Home Energy Solutions Energy Efficiency (HESEE) tiered incentive in collaboration with the utility administrators of the Conservation and Load Management Fund – see incentive descriptions below.

Non-LMI Incentives

In order to continue to differentiate the incentive levels for the EPBB and PBI (see Table 5) given the legislative guidance of comparable economic incentives as well as national best practice incentive levels,[7] we are proposing the following incentive levels:

- **EPBB** – for Step 11, the EPBB will be $487/kW. For Steps 12 and 13 the EPBB will decline by about 5% to $463/kW.

- **PBI** – for Step 11, the PBI will be $39/REC. For Steps 12 and 13 the PBI will decline by about 10% to $35/MWh.

Table 5. Schedule of Incentives for Steps 11 through 13 for Non-LMI Households

RSIP Incentive Step	EPBB ($/W)			PBI ($/kWh)	
	≤5 kW	5 to 10 kW	>10kW	≤10 kW	>10 kW
1	$2.450	$1.250	$0.000	$0.300	$0.000
2	$2.275	$1.075	$0.000	$0.300	$0.000
3	$1.750	$0.550	$0.000	$0.225	$0.000
4	$1.250	$0.750	$0.000	$0.180	$0.000
5	$0.800		$0.400	$0.125	$0.060
6	$0.675		$0.400	$0.080	$0.060
7	$0.540		$0.400	$0.064	$0.060
8	$0.540		$0.400	$0.054	
9	$0.513		$0.400	$0.046	
10	$0.487		$0.400	$0.039	
11	$0.487			$0.039	
12	$0.463			$0.035	
13	$0.463			$0.035	

The incentive level for the EPBB is roughly $0.01/kWh more than the PBI over a 15-year period – per the statute, making the incentive levels more economically comparable.

[7] "A Survey of State and Local PV Program Response to Financial Innovation and Disparate Federal Tax Treatment in the Residential PV Sector" by Mark Bolinger and Edward Holt in LBNL-181290 (June 2015).

LMI Incentives

Given the continuing priority of expanding solar PV in Connecticut into the low to moderate income market segments (i.e., Solar for All), and to attempt to ensure that the 300 MW policy target provides an opportunity to reach all household income levels in the state, we are proposing the following schedule of incentives for the LMI-PBI to continue the progress we are making (see Table 6).

Table 6. Schedule of Incentives for Steps 11 through 13 for LMI Households

RSIP Incentive Step	LMI-PBI ($/kWh)	
	≤10 kW	>10 kW
8	$0.110	$0.055
9	$0.110	$0.055
10	$0.110	$0.055
11	$0.110	$0.055
12	TBD	TBD
13	TBD	TBD

The LMI-PBI incentive levels are two to three times more than the non-LMI market incentives.

Home Energy Solutions and Energy Efficiency (HESEE) – Utility Partnership

The residential solar PV market in Connecticut is nearly 4 GW, or 660,000 households.[8] The successful implementation of the 300 MW RSIP policy will deliver nearly 10 percent of the economic potential for solar PV in Connecticut. The long-term success of the residential solar PV market in Connecticut depends not only on the regulatory certainty of the state's net metering policy or equivalent (e.g., value of solar, "cost effective" distributed energy resources, etc.), but also upon progress being made in the following areas:

1. Fostering the sustained orderly development of a state-based industry;
2. Successfully collaborating with the electric distribution companies administering the Conservation and Load Management Fund; and
3. Integrating "cost-effective" solar PV as a zero-emission stable fuel source with Distributed Energy Resources (e.g., energy efficiency, demand response, storage) and then for renewable thermal technologies for home heating and cooling and electric vehicles for transportation.

The Comprehensive Plan of the Connecticut Green Bank acknowledges the importance of working collaboratively with the utility administrators of the Conservation and Load Management Fund.[9] Whether it is the HES program, Home Energy Score, or supporting more efficient space and water heating in our homes, driving comprehensive and deeper savings by reinforcing the connection between solar PV and energy efficiency presents a unique collaboration opportunity for the Connecticut Green Bank to work with the utility administrators of the Conservation and Load Management Fund. The goals of the Joint Committee would be supported through improved linkages between our programs.[10]

[8] FY 2017 and FY 2018 Comprehensive Plan of the Connecticut Green Bank (p. 41)
[9] Ibid (p. 11, 38-39, 50-51)
[10] FY 2017 and FY 2018 Comprehensive Plan of the Connecticut Green Bank (p. 51)

The RSIP policy allows the Connecticut Green Bank to establish program guidelines and requirements for systems and program participants including "standards for deployment of energy efficient equipment or building practices as a condition for receiving incentive funding". By working in collaboration with the utility administrators of the Conservation and Load Management Fund, we are proposing to collaborate on incorporating upfront a Home Energy Solutions (HES) assessment (including a Home Energy Score) that in combination with the RSIP incentive and solar PV deployment will encourage households to install "deeper" energy efficiency and other clean energy measures (i.e., renewable thermal technologies (RTT), electric vehicles (EV), storage, etc.).

HESEE – Pilot Proposal

The staff of the Connecticut Green Bank is proposing to investigate a multi-tiered Home Energy Solutions Energy Efficiency (HESEE) track for the RSIP with DEEP and the EDCs that would require the HES assessment be conducted first – before sizing the solar PV system – and then providing multiple tiers of additional incentives to those who install additional "cost-effective" DER measures (i.e., energy efficiency, demand response, storage, etc.), install RTT, or purchase an EV. The incentive schedule would be designed as a multi-tiered structure – see Table 7.

Table 7. Schedule of Incentives for Energy Efficiency and Solar PV Partnership

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

This would be a pilot program designed in collaboration with the Department of Energy and Environmental Protection and the electric distribution companies who administer the Conservation and Load Management Fund. The pilot would further foster the sustained orderly development of the solar PV industry in Connecticut, increase the collaboration between the Connecticut Green Bank and the utility administrators of the Conservation and Load Management Fund, and serve as a market catalyst for storage, and zero-emission home heating and cooling equipment and electric vehicles that is "cleaner, cheaper, and more reliable while creating jobs and supporting local economic development".

SHREC

A SHREC is a Connecticut Class 1 REC sold to Connecticut's EDCs (Eversource and AVANGRID) under a 15-year fixed price contract established under a Master Purchase Agreement. The value of the SHREC is inclusive of not only the incentives offered under the RSIP, but it also includes the administrative costs of the program to the Connecticut Green Bank (as well as the Electric Distribution Companies) and the anticipated securitization costs (or estimated investment returns) from investors willing to provide the Green Bank with upfront capital to support the program. This memo provides the value of the incentives offered through the RSIP only – and does not include administrative costs nor securitization costs.

RSIP Incentive

For each step of the RSIP, depending upon the percentage of incentives accessed – through non-LMI, LMI, and HESEE – an estimated equivalent 15-year REC price can be determined (see Table 8). This means that the incentive provided by the Connecticut Green Bank through the RSIP is equivalent to a 15-year stream of payments (i.e., $/kWh) based on the performance of a solar PV system.

Table 8. Estimate of the Nominal Value of the RSIP Incentive Over a 15-Year Period ($/kWh)

RSIP Incentive Step	Non-LMI		LMI	HESEE	
	EPBB	PBI	PBI	EPBB (Tiers)	PBI (Tiers)
11	$0.0293	$0.0161	$0.0450	TBD	TBD
12	$0.0278	$0.0145	TBD	TBD	TBD
13	$0.0278	$0.0145	TBD	TBD	TBD

A worst case (i.e., solar PV only), and expected case and best case (i.e., including LMI, EE, DER, RTT, EV) scenarios were analyzed to determine the range of value that the RSIP incentive is likely to be over a 15-year period – between [$X] to [$Y] as part of the overall SHREC price – see Table 9.

Table 9. Estimated Best to Worst Case of the RSIP Incentive at Equivalent 15-Year Price ($/REC)

RSIP Incentive Step	Best Case[11]	Expected Case[12]	Worst Case[13]
11	$16.1	TBD	TBD
12	$14.5	TBD	TBD
13	$14.5	TBD	TBD

Resolution

WHEREAS, Public Act 15-194 "An Act Concerning the Encouragement of Local Economic Development and Access to Residential Renewable Energy" (the "Act") requires the Connecticut Green Bank ("Green Bank") to design and implement a Residential Solar Photovoltaic ("PV") Investment Program ("Program") that results in no more than three-hundred (300) megawatts of new residential PV installation in Connecticut before December 31, 2022 and creates a Solar Home Renewable Energy Credit ("SHREC") requiring the electric distribution companies to purchase through 15-year contracts the Renewable Energy Credits ("RECs");

WHEREAS, as of September 2, 2016, the Program has thus far resulted in nearly one-hundred and fifty megawatts of new residential PV installation application approvals and completions in Connecticut;

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[11] Assumes 90 MW Non-LMI PBI

[12] Assumes [X] MW Non-LMI PBI and [X] EPBB, [X] LMI PBI, and [X] HESEE EPBB and [X] HESEE PBI

[13] Assumes [X] MW Non-LMI PBI and [X] EPBB, [X] LMI PBI, and [X] HESEE EPBB and [X] HESEE PBI

WHEREAS, pursuant to Conn. Gen Stat. 16-245a, a renewable portfolio standard was established that requires that Connecticut Electric Suppliers and Electric Distribution Company Wholesale Suppliers obtain a minimum percentage of their retail load by using renewable energy;

WHEREAS, real-time revenue quality meters are included as part of solar PV systems being installed through the Program that determine the amount of clean energy production from such systems as well as the associated RECs which, in accordance with Public Act 15-194 will be sold to the Electric Distribution Companies through a master purchase agreement entered into between the Green Bank, Eversource Energy, and United Illuminating, and approved by the Public Utility Regulatory Authority;

WHEREAS, pursuant to the Act, the Green Bank has prepared a declining incentive block schedule ("Schedule") that offers direct financial incentives, in the form of the expected performance based buy down ("EPBB") and performance-based incentives ("PBI"), for the purchase or lease of qualifying residential solar photovoltaic systems, respectively, fosters the sustained orderly development of a state-based solar industry, and sets program requirements for participants, including standards for deployment of energy efficient equipment as a condition for receiving incentive funding;

WHEREAS, pursuant to the Act, to address willingness to pay discrepancies between communities, the Green Bank will continue to provide additional incentive dollars to improve the deployment of residential solar PV in low to moderate income communities.

WHEREAS, pursuant to Section 16-245(d)(2) of the Connecticut General Statutes, a Joint Committee of the Energy Conservation Management Board and the Connecticut Green Bank was established to "examine opportunities to coordinate the programs and activities" contained in their respective plans (i.e., Conservation and Load Management Plan and Comprehensive Plan);

WHEREAS, the Global Warming Solutions Act of 2008 requires Connecticut to reduce its greenhouse gas emissions by 80 percent from 2001 levels by 2050, all the while transportation and the thermal heating and cooling of buildings representing the largest emitting sectors;

WHEREAS, residential solar PV can provide cleaner, cheaper, and more reliable sources of energy that enable distributed energy resource and fuel for renewable thermal technologies and electric vehicles while creating jobs and supporting local economic development;

NOW, therefore be it:

RESOLVED, that the Deployment Committee recommends that the Board approves of the Schedule of Incentives as set forth in Tables 5 and 6 of the memo dated September 22, 2016 to achieve 90.0 MW of solar PV deployment over FY and CY 2017 – 30.0 MW from Step 11, 30.0 MW from Step 12, and 30.0 from Step 13.

RESOLVED, that the Deployment Committee requests that the staff explore in collaboration with the Department of Energy and Environmental Protection and the utility administrators of the Conservation and Load Management Fund through the Joint Committee, how energy efficiency programs (e.g., HES) and incentives, as well as distributed energy resources, renewable thermal technologies (e.g., air source heat pumps and ground source heat

pumps) and electric vehicles fueled by solar PV can potentially be incorporated into a special EPBB and/or PBI incentive through the RSIP.

Solar and energy efficiency need to work together like peanut butter and jelly

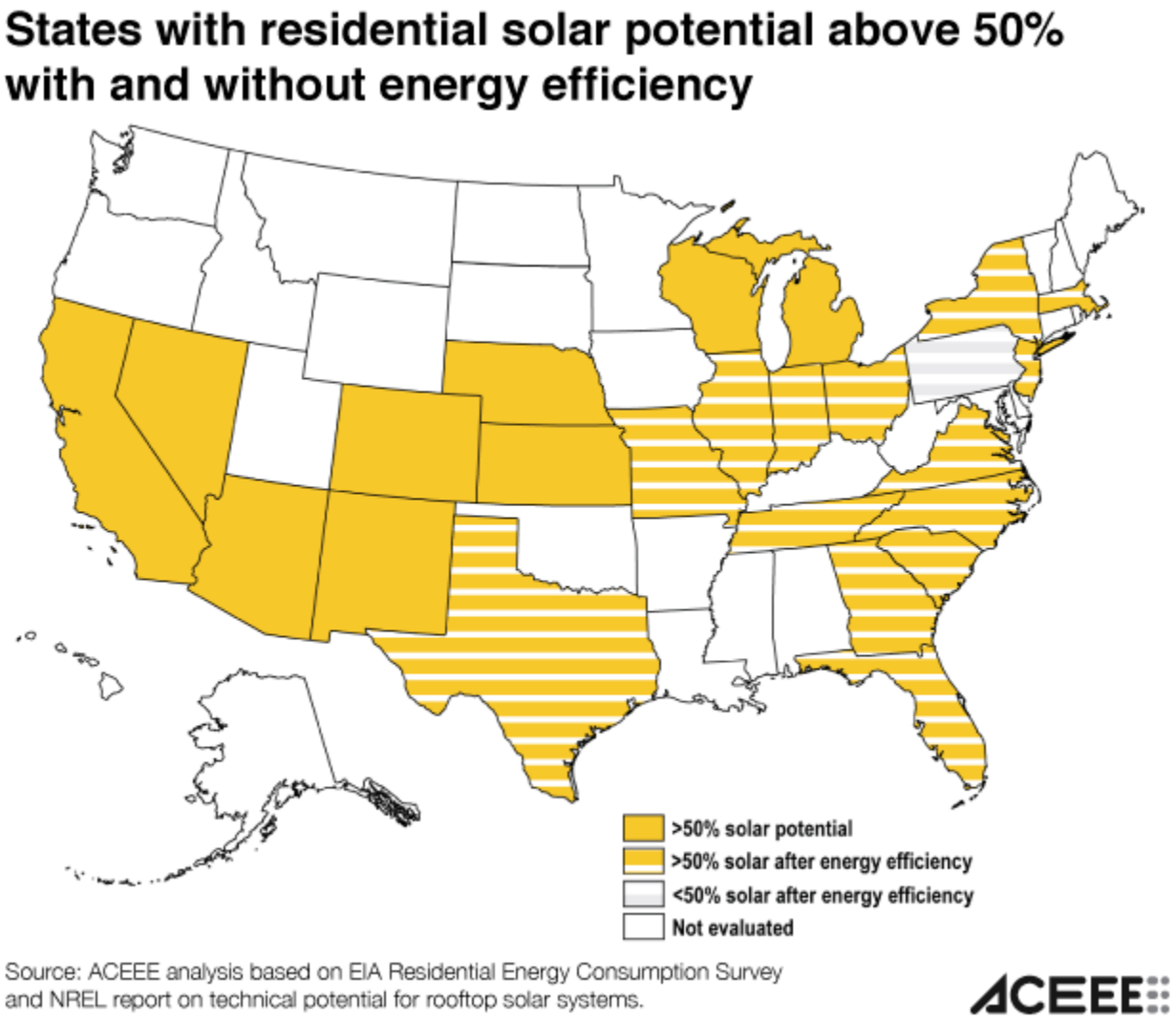
Energy efficiency and solar advocates have on occasion butted heads over which option should be implemented in homes and buildings *first* and how much should be installed before the other is considered. Here at ACEEE we believe that, like market solutions vs. energy efficiency programs, this is a false choice. Both are valuable and can, and should, work together as an integrated solution to create cleaner and cheaper energy. While energy efficiency is just as clean as solar when it comes to emissions, efficiency by itself can't produce energy for customers looking for a clean energy option, and solar without energy efficiency can't reach the full extent of its potential.

However, in recent years, some solar companies and some consumers have been employing a solar-first strategy in the residential sector—installing solar systems without paying much attention to energy efficiency. This strategy has been spurred in part by substantial solar tax credits, net-metering rules in place in most states, and the availability of solar financing that reduces or even eliminates the initial purchase price, replacing the up-front cost with monthly payments that extend over many years.

Despite these incentives, it still generally makes sense to implement as much efficiency as possible when installing generation. To look more closely at this issue, we conducted two illustrative analyses. The first compares the cost per kWh produced or saved from solar and energy efficiency when done individually or together. The second compares solar technical potential and residential electricity use, with and without efficiency. We find that when efficiency and solar are implemented in tandem, costs are lower, and solar can meet a larger share of residential loads.

Cost per kWh

For this comparison, we looked at the average cost per kWh produced from a typical solar system today, the average cost per kWh from residential energy efficiency, and the cost per kWh when efficiency and solar are done together. Our results are summarized in the table below. A solar system costs about 17-23 cents per kWh produced (the low-end estimate is based on very sunny Las Vegas, the high-end on Washington, DC). Energy efficiency costs less—about 8 cents per kWh. But when solar and efficiency are combined, the cost is 3-6 cents less per kWh than solar alone. Energy efficiency has a lower cost, and it also reduces the size and cost of the needed solar system. PB&J (solar and efficiency) is less expensive than PB (solar) alone.



This analysis ignores the federal 30% solar tax credit and also ignores utility incentives that are commonly available for energy efficiency measures. If tax credits and incentives are included, the overall result is still generally the same—a combined approach is less expensive per kWh than solar alone. This is just a simple analysis for typical measures and hence is only useful as a rough approximation.

Solar production relative to residential electricity use

For this analysis, we compared estimates of the technical potential for rooftop solar systems in each state (as estimated in a GIS-based analysis by the National Renewable Energy Laboratory) with residential electricity use (from the most recent EIA Residential Energy Consumption Survey or RECS). We looked for states where the solar technical potential in the residential sector was at least 50% of current residential consumption, or of residential consumption if energy efficiency were to reduce consumption by an average of 30%.

Our analysis only covers 24 states, as those are the states with detailed data in RECS at the single- or two-state level. Results of our analysis are shown in the map below. With efficiency, 23 out of the 24 states could hit the 50% solar threshold, including six reaching 75% solar (California, Colorado, Kansas, Nebraska, New Mexico, and Nevada). Without energy efficiency, only nine of the 24 states could meet at least half of the residential load with rooftop solar. Only in two states (California and Colorado) does solar potential exceed 75% of residential consumption. In other words, solar can meet a much larger proportion of residential loads if efficiency is included.

Cost per kWh of solar, energy efficiency, and the two combined

Item	Cost	kWh saved	Life (years)	Cost/kWh
Solar	$18,500		20	
Washington, DC		6451		$0.23
Las Vegas		8795		0.17
Energy efficiency	$2,943	3414	15.7	$0.08
Combined	$15,893			
Washington, DC		7930	18.1	$0.17
Las Vegas		9571	18.5	0.14

Source: ACEEE analysis based on the following assumptions and sources:

- Base solar system has a peak output of 5 kW; cost is $3.70/kW (both from Energy Sage).
- Solar kWh production from National Renewable Energy Laboratories' PVWatts Calculator using default assumptions.
- Energy efficiency costs and lifetime derived from ACEEE's New Horizons for Energy Efficiency study (new central AC with quality installation plus electric share of weatherization). Savings are about 30% of average kWh/home from EIA.
- Combined assumes that solar system downsized 30% due to energy efficiency, reducing both cost and production. Life is weighted average based on kWh savings.

ACEEE

This analysis doesn't include potential growth in electric loads such as from increased use of electric vehicles, or conversion of gas and oil space- and water-heating systems to heat pumps. Details of our analysis, including a case where all gas and oil space-heating systems are converted to heat pumps can be found here. In this alternative case, only two states meet the 50% threshold without efficiency, while 12 states meet the threshold with efficiency.

As with our first analysis, this is a rough analysis that assumes all of the solar potential is achieved and that all homes implement energy efficiency. Also, this simple analysis ignores the fact that some homes can produce more solar power than they use while other homes are not suitable for solar, such as those heavily shaded by trees or that do not face south. This analysis should be considered a yardstick and not a definitive analysis.

Conclusion

Energy efficiency will generally be less expensive per kWh than solar. And by lowering consumption, energy efficiency will stretch the available rooftop solar resource farther, allowing solar to serve a higher percent of residential consumption while also allowing a smaller and less expensive solar system. These are two simple analyses but they make a clear case that jelly (efficiency) is needed to help peanut butter (solar) do its best.

DONALD W. AITKEN

Sustained Orderly Development of the Solar Electric Technologies

For utilities to accomplish least-cost planning over the long run, they must participate more aggressively in the commercialization of solar electric technologies in the short run.

Two years ago, during the preparation of California's "Electricity Report '90", analytical calculations by the California Energy Commission (CEC) staff suggested that by about the end of this decade it would be cost-effective for California utilities to start acquiring electricity from renewable solar-derived resources, possibly amounting to several thousand megawatts. The two driving assumptions in this mathematical determination are anticipated decreases in the costs of the renewable electric energy resources complemented by expected increases in the costs of competing technologies.

Signs that the renewable electric energy industries are making dramatic advancements are abundant. For example, only a year after the adoption of the 1990 California Electricity Report, the article by Randall Swisher in the May/June, 1991, issue of SOLAR TODAY proclaimed "Wind Energy Comes of Age". A second article, by Frederick Morse and Roberto Vigotti on "Photovoltaic Utility Applications", noted that "...niche markets for photovoltaic systems currently exist in the electric utility sector that are cost-effective *at today's photovoltaic energy costs and today's utility economics."* [Emphasis added.] And a third article, by Michael Lotker and David Kearney, in that same SOLAR TODAY issue, described "Solar Thermal Electric Performance and Prospects", suggesting that "Generating electricity from the sun proves to be a practical, environmentally sound option... "

But serious conflicts emerge from these circumstances. For example, what good is it to have major utility-scale solar electric technologies that are "practical, cost-effective options" now, and equally major "reserves" of wind and radiant solar energy, when the utilities think they do not need to purchase the energy outputs for another 8-10 years? And when the utilities *are* ready to start large-scale acquisitions of electricity produced by the renewable resource technologies, will there be any industries around to fill the orders? How will they have sustained themselves in the interim? How will the costs have been reduced to the favorable levels anticipated by the utility mathematical models, prior to major multi-megawatt commitments by the utilities?

What is missing from all of this is a clear sense of awareness, by those who will have a stake in the successful development of a solar electric power market, that they all have a responsibility to help bring about those benefits.

Deteriorating Opportunities

Only six months after Lotker's and Kearney's optimistic description of the Luz "success", the company shocked the solar world by filing for bankruptcy. (This is described in Newton Becker's article on "The Demise of Luz: A Case Study" in the January/February 1992 issue of SOLAR TODAY). And while the present photovoltaic industries are able to find markets for all product manufactured today, the U.S. utilities are hardly beating paths to their doors. Nor are many following the pioneering lead of California's Pacific Gas and Electric Company (PG&E) in analyzing their complete systems to find those niche markets that are cost-effective at today's costs.

Only the wind-electric industry appears to be financially healthy, although America's great midwestern wind sites remain unexploited. The multi-billion dollar U.S. potential of this electric energy resource—with an already remarkable record of reliability—remains virtually untapped by overly timid U.S. utilities.

This situation deteriorates with each passing year. The 30 percent reduction in the price of natural gas since 1990 now causes all utility mathematical models to come out with the same result—buy gas. And, in that same article about Luz in the May/June 1991 issue of SOLAR TODAY, Lotker and Kearney sadly noted that "The conditions that led to the development of solar energy technology...are not present now. It would be extremely difficult for a

new company to enter this field and succeed." They then prophetically concluded that "Energy policy at the state and federal levels must recognize the benefits that these technologies offer and enact meaningful incentives towards their sustained use and development."

"Sustained Orderly Development" of Solar Electric Technologies

The California-based Coalition for Energy Efficiency and Renewable Technologies (CEERT) first put forth the idea of developing policy in support of the "sustained orderly development" of renewable electric energy technologies during CEC hearings in 1990. Simply expressed, the concept describes a condition in which a growing and stable market is identified by orders that are placed on a reliable schedule. The orders increase as previous deliveries and engineering and field experience lead to further reductions in costs. In addition, the reliability of these orders can be projected many years into the future, on the basis of long-term contracts, to minimize market risks and investor exposure.

Figure 1, "Reducing the Price of Renewable Energy" (derived from helpful insights by Hal Harvey, Executive Director of the Energy Foundation), reveals schematically various stages and features that drive the sustained orderly development of renewable electric technologies. (A tip of my hat here in gratitude to Kim Robinson of the Energy Foundation for her expert help in preparing these illustrations.)

Figure 1 suggests that early scientific research demonstrates the viability of the technological idea, and leads to the development of the design for a marketable device. The engineering that follows develops a practical version of the device and the associated manufacturing processes that can enable it to be marketed at a price that may just touch the upper bounds of present market opportunities (here shown as "Peakload Utility Costs"). Early market sales lead to both manufacturing and field experience that further lowers the price and increases market confidence. And, if the technology has proven itself in cost, reliability, lifetime, adaptability to utility infrastructure and acceptable operations and maintenance (O&M) experience, it is positioned for multi-megawatt purchases at an ever-increasing scale. But those multi-megawatt acquisitions must be forthcoming!

Also shown in Figure 1 is the suggestion that the multi-megawatt acquisitions may be justified at an earlier date, as utility and regulatory economic modeling begin to expose the "true" (societal) cost of electricity. Such environmental valuation will certainly become the critical driver in bridging from small-scale to large-scale multi-megawatt utility acquisitions as the costs of renewable technologies approach those of competing conventional resources.

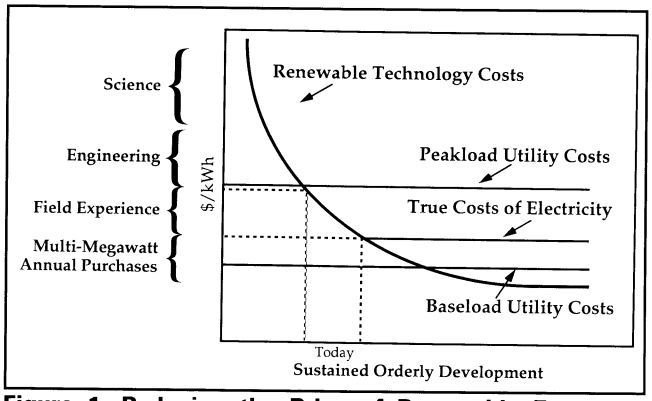


Figure 1: Reducing the Price of Renewable Energy. A schematic presentation of the various stages contributing to the "Sustained Orderly Development" of a renewable electric technology. Relative widths of brackets are hypothetical, for illustrative purposes only.

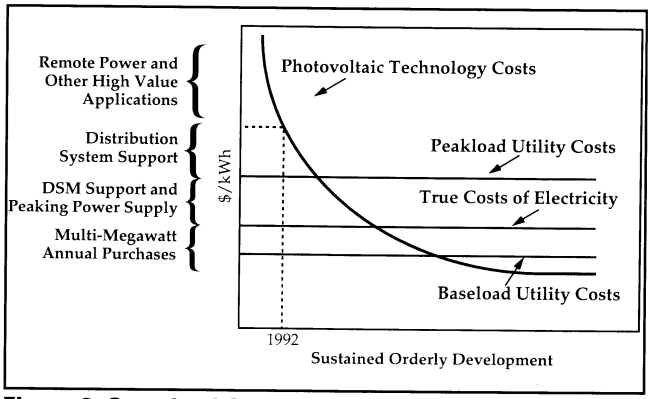


Figure 2: Sustained Orderly Development Showing Utility Market Drivers in the PV Industry. The same as Figure 1, with the left axis brackets relabeled to suggest the actual market "drivers" that can pull the PV industry through the process of "Sustained Orderly Development". In this case the relative widths and positions of the brackets conform approximately to actual PV and utility costs.

Figure 2 shows specifically identifiable market sectors of the photovoltaic industry that can be utilized to "pull" this technology through the various stages of commercialization. Figure 2 is a partial restatement of the well known P.V. market "diffusion" model, but here shown with reasonably accurate relationships between the approximate market driver costs and utility costs, and as a more explicitly time-sequenced series of activities.

Historical "Sustained Orderly Development" Lessons

I am not presenting the cost-reducing and market-preparation power of the sustained orderly development concept as a hypothetical notion. Two very important historical examples have shown the way, and reveal policy pitfalls that must be overcome. These are presented in Figures 3 and 4.

The remarkable experience in the wind-electric industry is shown schematically in Figure 3. The rapid early decline in costs—due to increased industry experience and the switch to a more cost-efficient technology (100 kW turbines)—is evident. The dramatic early cost reductions are replaced by systematic continuing reductions in costs resulting from increased field experience and from decreased installation, balance-of-system (BOS) and O&M costs.

Figure 4 demonstrates a comparable history, but without the wind-electric industry's happy ending. The benefits of the subsidized jump-starting of the parabolic trough solar thermal-electric industry are evident, followed by more reductions in cost resulting from company experience and from the change to a more cost-effective technology. The next quan-

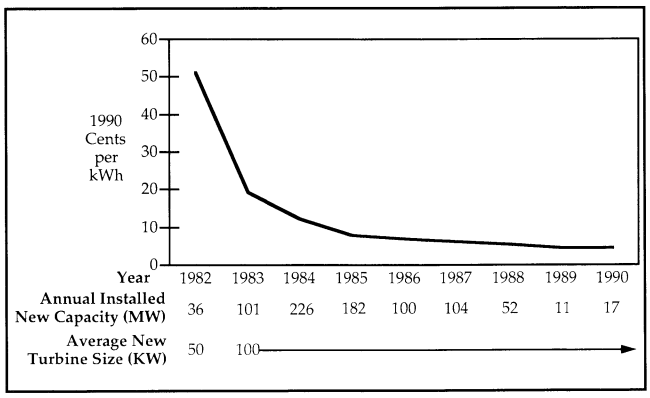


Figure 3: Sustained Orderly Development in the Wind-Electric Industry. (New Turbines in Altamont Pass, California Levelized Cost of Power) A remarkably successful example of "Sustained Orderly Development", jump-started by incentives and then completed by annual new utility power contracts at multi-megawatt levels. Wind-electric production now competes with utility bulk power costs using conventional economic analysis.

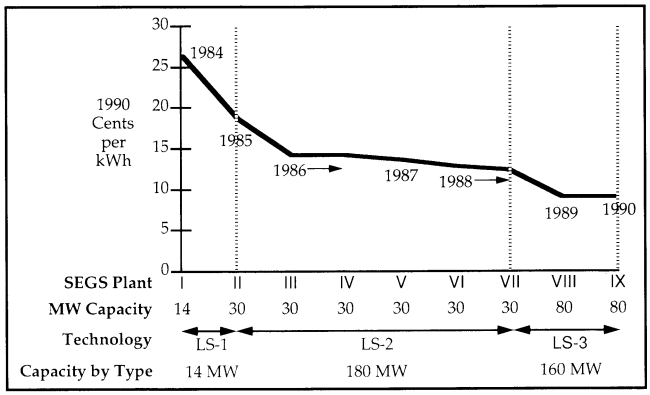


Figure 4: Sustained Orderly Development in the Solar Thermal-Electric Industry. (Parabolic Trough Technology in California—Levelized Cost of Power from SEGS [LUZ]) What might have been another successful example of "Sustained Orderly Development", triggered by incentives and then driven by annual new multi-megawatt utility contracts. The attained costs were well below the peakload power costs for utilities, but insurmountable institutional barriers caused an unfortunate bankruptcy.

tum reduction in costs resulted from another change in technology, while a fourth cost-reducing major technical innovation (the direct steam model) was in design for application in the early 1990's.

In the case of this technology, however, costs could not fall as low as those experienced by the wind-electric industry. And unfortunately, as Michael Lotker observed in his fine report to the Department of Energy, "Barriers to Commercialization of Large-Scale Solar Electricity: Lessons Learned from the LUZ Experience". *"The company and its investors never saw the anticipated long-term increase in energy prices or valuation of environmental benefits that would add value to the SEGS plant concept."* [Emphasis added.]

Market Push and Pull

Showing that it is in the near-term *and* long-term economic self interest for the utilities to acquire energy from the solar electric resources doesn't actually cause them to do it. Indeed, there is a well-known resistance to just such actions in most of the nation's utilities, supported by regulatory modeling that leaves the benefits of the renewables mathematically invisible. *But there is no market "pull" if there are no buyers.*

Thus the "push" from regulators and legislators is still warranted, along with a supportive understanding and participation by consumer and ratepayer advocacy groups, just to give the renewable technologies a fair chance against the major financial and institutional barriers they face. But unless actual market forces are harnessed in a way that can support the sustained orderly development of the solar electric technologies, no amount of governmental incentives will do the job.

Sustained orderly development does not imply that orders should be placed for unworthy technologies, nor that they should not also stand on their own correctly-defined economic merits. Figure 2 demonstrates utility market "drivers" *now* in place, for example, for the PV industry, but they remain ineffective if unexploited! Consequently, sustained orderly development requires a number of supporting behaviors from utilities, regulators, consumers, consumer and ratepayer advocates, legislators, government agencies, and investors.

Manufacturers also bear a responsibility to orient toward early serious market applications. They must be able to prove their products with performance, rather than promises, allowing an honest competitive shake-down and weeding-out of the industry. *The most beneficial and cost-effective technologies will emerge but only as a result of real world multi-megawatt utility scale experience.*

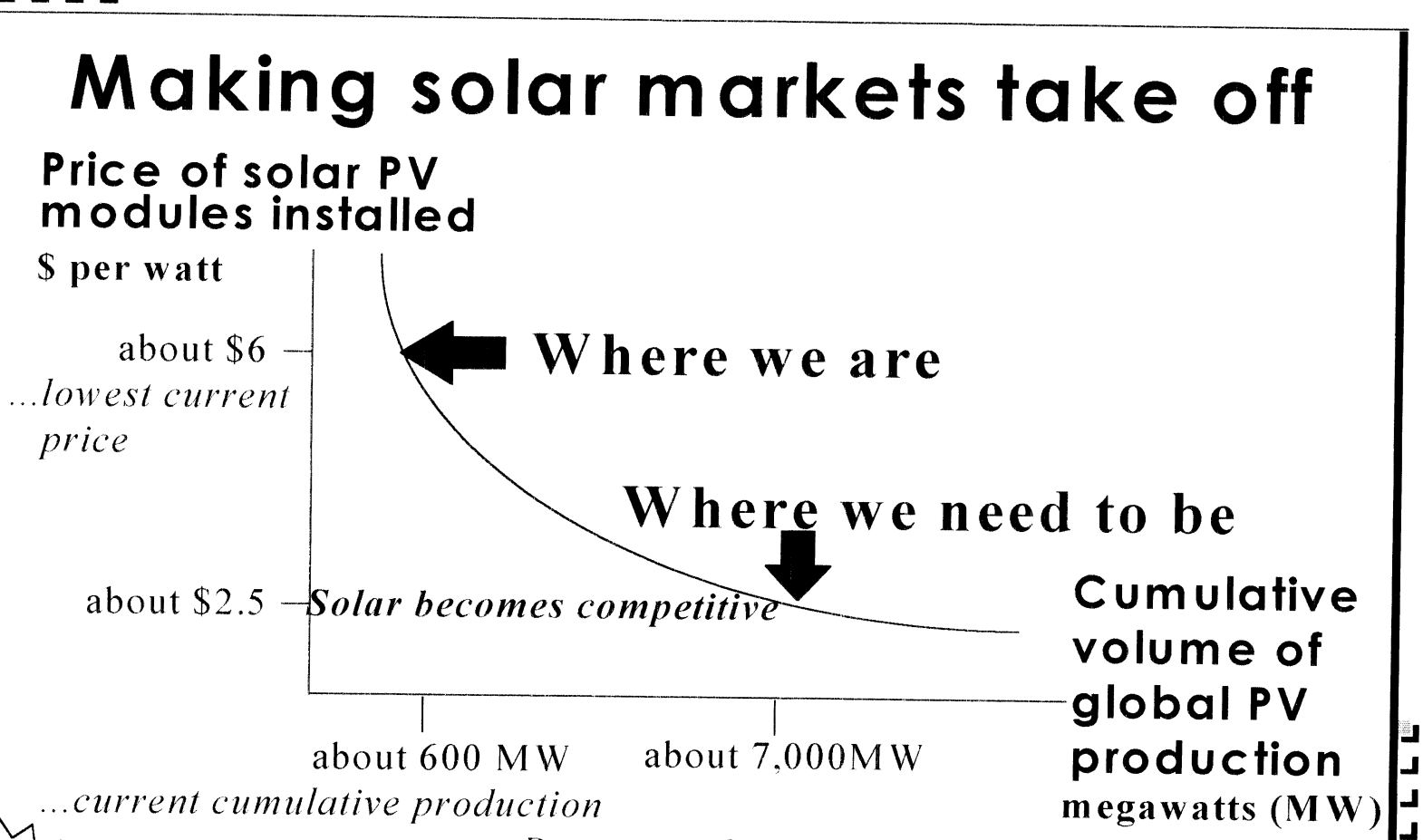
Conclusion

The recent history of the wind-electric industry has shown that sustained orderly development can work spectacularly. Unfortunately, the experience of the parabolic trough solar thermal-electric industry also shows that formidable economic and institutional barriers still exist. Renewables' toehold in today's utility market is tenuous, but not because of any inherent flaws in the renewable electric power-producing technologies.

The recent pioneering study, "America's Energy Choices: Investing in a Strong Economy and a Clean Environment" (see the article by Michael Brower and Alden Meyer in the March/April, 1992 issue of SOLAR TODAY) suggests that very significant economic and environmental benefits will accrue from steering our national energy strategy onto a path that allows a vigorous market commitment simultaneously to both energy efficiency and renewable energy resources. A commitment by the nation's electric utilities to the early deployment of the solar electric power technologies would dramatically advance this scenario. What is needed now is leadership and vision. ✪

Donald W. Aitken is a Senior Energy Analyst with the Union of Concerned Scientists, Adjunct Professor at the Frank Lloyd Wright School of Architecture and Chair of the American Solar Energy Society. This article is excerpted from a paper that he will give at the 1992 ASES conference.

Making solar markets take off



Data sources: Sacramento Municipal Utility District (SMUD)
PV Energy Systems Inc., US Utility PV Group

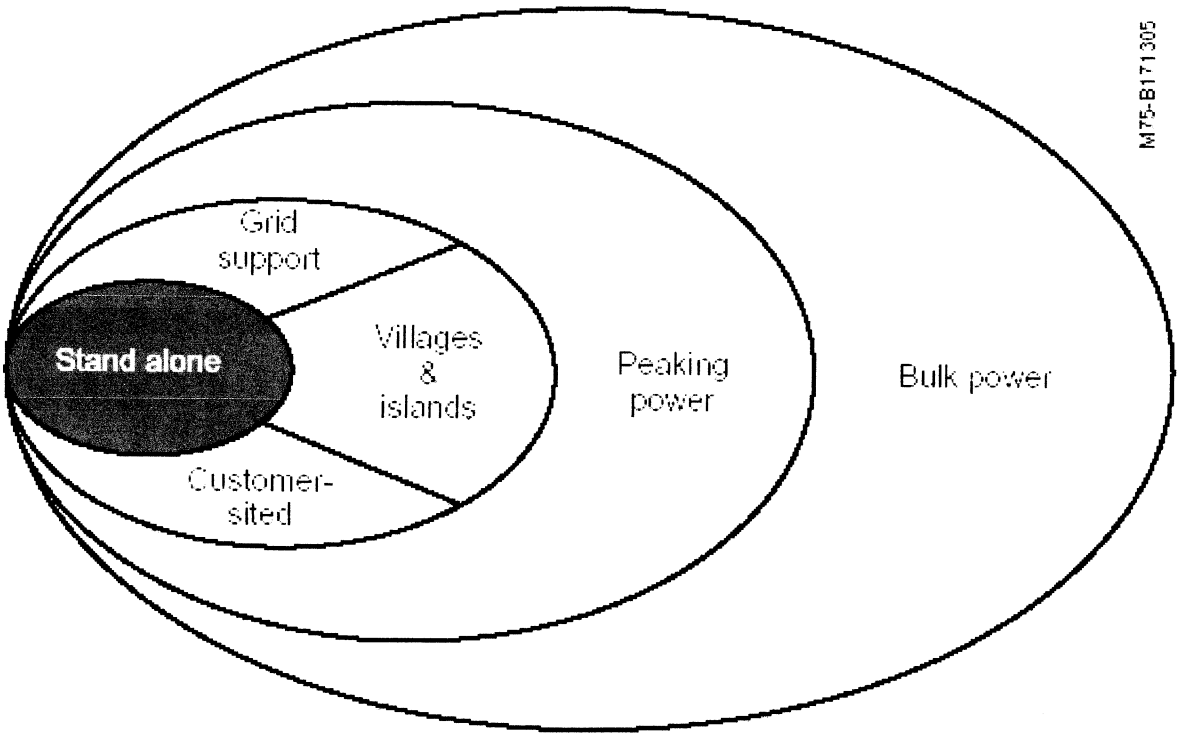
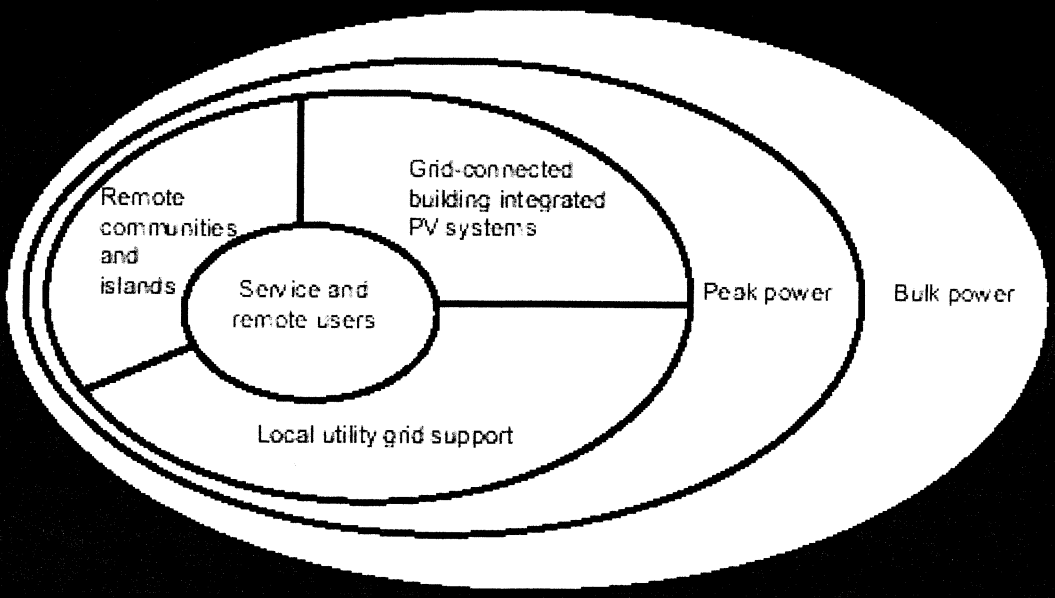


Figure 10. The diffusion model for utility PV.

The PVPS diffusion model

The Taormina egg



CONNECTICUT GREEN BANK

Misconduct hearing

BeFree Green Energy LLC

September 2016

Rebuttal Summary

The Program violations are:

(1) the submission of fraudulent equipment packing slips for payment on 66 projects, all of which resulted in the issuance of HOPBI working capital loans,

(2) failure to follow required contractor processes for the CT Solar Lease,

(3) failure to follow required contractor processes for Smart-E Loans,

(4) failure to follow required contractor processes for the Solarize Connecticut Program,

(5) excessive complaints from BeFree customers, and

(6) numerous complaints from officials from the towns of Haddam and Killingworth, who participated in the Solarize Program

Fraudulent Packing Slips

Summary of Violation

RSIP Program Guidelines:

Green Bank at its sole discretion, can suspend or terminate an Eligible Contractor for any of the the following actions:

4.11.9 Submission of falsified documents or unauthorized signatures to the Program

4.11.8 Failure to meet requirements and standards for other relevant Green Bank programs including, but not limited to:

a. Solarize Connecticut[SM]

b. CT Solar Lease

d. Smart-E Loan

Fraudulent Packing Slips

Background

EPBB RSIP Incentive (2012-2014)

- Paid incentive to contractor on delivery to the installation site or to a contractor's warehouse
- Net metering issue closed this incentive down from 2014-2015

HOPBI RSIP Incentive (2014-2015)

- HOPBI created to address net metering issue
- Paid incentive to contractor after inspection and meeting production goal

HOPBI Working Capital Loan (2014-2015)

- Optional loan created to pay contractors the value of the HOPBI when equipment was delivered to the installation site
- Not an incentive payment, this was a loan to help contractors impacted by legislative change
- Loan was "closed out" when project passed Green Bank inspection and met production goal. HOPBI incentive covered loan amount per-project by design.

Fraudulent Packing Slips

Timeline and Detail of Violation

- 9/11/14 - 5/15/15 BeFree certified on 66 separate HOPBI Equipment Delivery Certification and Loan Draw Down forms that equipment was delivered to the installation address.
- BeFree also certified on their own packing slips that equipment had been “delivered to the site”
- Green Bank inspections uncovered that the equipment installed differed from that on the HOPBI application.
- Not in dispute that equipment was not on site when certification was made
- Beginning late spring 2015, BeFree began to submit change orders for some of these projects.
- BeFree submitted fraudulent materials in order to be paid HOPBI Loans.

Fraudulent Packing Slips

Supporting Evidence

1. RSIP RFQ

2. HOPBI Working Capital Loan Agreement

3. HOPBI Equipment Delivery Certification and Loan Draw Down Form

4. Equipment Packing Slips and Change Orders

Fraudulent Packing Slips

Impact of Violation

- If loan is provided for equipment not on site and project does not go forward, there is no HOPBI RSIP incentive to pay off the short term unsecured loan

- Certifying to equipment that was actually not on site – happened with one other contractor, who is currently under investigation with State police for theft of $70,000 for exactly the behavior we were trying to avoid.

- Submission of fraudulent materials is explicitly forbidden in the RSIP RFQ

- This behavior is contrary to the statements certified by BeFree in HOPBI Loan materials

- The Green Bank staff spent an inordinate amount of time processing change orders because of BeFree's disregard for the HOPBI Loan process

Fraudulent Packing Slips

Conclusion

- Green Bank's HOPBI webinar and process guide instructions are clear
- Pattern of willful disregard for process or complete gross negligence
- BeFree has not proven that the Green Bank instructed contractors to use HOPBI Loans this way
- Only one other contractor used HOPBI Loans this way – others "got it"
- **HOPBI Loan request form and "certification statement" is unmistakably clear**

Failure to Follow SL2 Process

Christophe Beauchamp, Killingworth, CT

Issue 1: BeFree installed solar modules that differed from those which the customer contracted to receive in their signed work order (08/07/14) and executed lease agreement (02/17/2015)

– Although BeFree states that the customer received something of higher quality, the customer did not contract for the panels provided

– BeFree also miscalculated the site efficiency of the overall system, resulting in a much higher estimated kWh production than what is feasible.

- **CGB** confirmed an expected first-year production **decrease from 11,296 kWh to 9,990 kWh**

Failure to Follow SL2 Process

Christophe Beauchamp, Killingworth, CT

Issue 2: BeFree contacted the customer 3 weeks after installation in August 2015 to sign an updated work order.

– Customer cannot be forced to contract for a different system –

- **BeFree** maintains the position that they can change equipment so long as the equipment is approved by Solarize CT – this is true, however:

- **CT Solar Lease** require the customer sign a new work order and execute new lease documentation whenever system related changes occur *prior to installation*.

- Signing a new lease statutorily affords the customer the right to a new (3) day rescission period, during which they have the option to cancel their lease.

Failure to Follow SL2 Process

Christophe Beauchamp, Killingworth, CT

Issue 3: BeFree maintains the position that the customer's only issue is with the manner in which rain falls off of the solar modules onto his lawn. The customer advised that the modules overhang his gutters in some areas, causing flooding.

- In an email to CGB Staff on 12/12/2015: **BeFree** stated: *"His entire roof is covered with panels and it fit his roof perfectly without any overhangs."*
- **CGB** Inspector, Richard Dziadul, was dispatched to evaluate the site on 01/22/16 and provided a photo clearly showing modules overhanging the gutter.
- In response to an email from CGB notifying BeFree that the customer would like his system removed, on 03/02/16 BeFree reiterated "*At no point does the panel overhang the gutter"* and provided the second photo, showing a direct view of the home.

Failure to Follow SL2 Process

Christophe Beauchamp, Killingworth, CT

Issue 4: BeFree charged Mr. Beauchamp $1,145.00 for Professional Engineering Services related to roof reinforcements, without advising or seeking approval from Solarize CT Program Administrators; in violation of their contract to participate in the Solarize Haddam-Killingworth campaign

- **Customer** stated that BeFree did not go onto his roof or into his attic during their initial site visit. After expressing concern to BeFree about the soundness of his roof to support the solar equipment, BeFree and an engineer visited the home and recommended the installation of roof reinforcements.
- Per Attachment B (“Pricing Proposal”) of BeFree’s response to the Contractor RFP for Solarize Haddam-Killingworth, dated 03/26/2014, and accepted by municipalities and CGB, BeFree noted that no extra fee would be assessed for roof reinforcements.
- Per regulations of Solarize CT, any adder not included in a contractor’s Attachment B is subject to prior written approval from the Solarize CT Program Administrators
- BeFree did not request approval for the Professional Engineering fee nor did they notify Solarize CT Program Administrators / CGB Staff of this charge after it occurred.
- CT Solar Lease 2, LLC reimbursed customer for $1,145 on 05/04/2016

Failure to Follow SL2 Process

Christophe Beauchamp, Killingworth, CT

Open Items:

- The non-energized system remains on the customer's home, approximately 1 year after installation; however, BeFree will not be authorized to remove it by CGB until:

  – **Cancellation of Bill of Sale.** BeFree must execute a cancellation of the Bill of Sale for this project, reversing the sale of the solar equipment from BeFree to CEFIA Holdings, LLC, dated 02/25/2015

  – **Refund of Tranche A Payment**. BeFree must refund CEFIA Holdings, LLC a Tranche A payment of $15,370.00 (50% of the project cost) made to BeFree on 3/24/2015.

  – **Refund of Engineering/Roof Reinforcement Charge**. BeFree must refund CT Solar Lease 2, LLC $1,145.00 ($495 for engineering services and $650 for materials and labor) for a professional engineering and roof reinforcement fees that should not have been charged to the customer, per BeFree's contract with the Solarize Haddam-Killingworth campaign.

Bottom Line: Issue unresolved / System Still on Roof / BeFree never admitted any culpability / Failure to Follow-Process Led to these Problems

Failure to Follow SL2 Process

Robert Brown, Killingworth, CT

AFC First (CT Solar Lease administrator) first notified Green Bank of this project issue on 5/15/2015, stating that the panels installed for his CT Solar Lease system were changed from those in his signed contract without prior notification nor his approval or authorization.

- **Issue 1:** BeFree installed solar modules that differed from those which the customer agreed to receive in their signed work order (dated 08/11/14), which was also included in their executed lease agreement (dated 11/10/2014)
  - **Green Bank** confirmed an expected first-year production decrease from 7,800 kWh to 7,595 kWh
- **Issue 2:** BeFree had the customer sign a revised work order the day the system was installed in May 2015
  - **BeFree** maintains the position that they can change equipment so long as the equipment is approved by Solarize CT – this is true, however:
  - **Green Bank** requires the customer sign a new work order and execute new lease documentation whenever system related changes occur.
    - Signing a new lease statutorily affords the customer the right to a new (3) day rescission period, during which they can cancel their lease. Installers may not proceed with installation until they receive notice to proceed from AFC First that the customer has indeed signed the new lease and the 3-day rescission period has passed.

- This system was removed from the customer's roof on 10/8/15

Non-Compliance with Smart-E Guidelines

Summary of Issue

- BeFree and their subcontractor were not pulling municipal permits for ductless heat pumps (sold with solar PV)
  - Per Energize CT Smart-E contractor compliance, a letter was issued
    - *"Failure to ensure that all employees and subcontractors are properly licensed according to Connecticut State law and adhere to the requirements of the program"*

- The Green Bank notified BeFree of the issue and requested they provide information on projects including heat pumps and their permit status on January 12, 2015
  - A partial response was received from BeFree – a full response to the Green Bank inquiry was never obtained

- March 5, 2015 – A follow up letter was issued to BeFree stating that their response was incomplete and that they would therefore be placed on probation for the Energize CT Smart-E Loan

Solarize CT Process

Background Haddam Killingworth

- Selected as installer for Solarize Haddam/Killingworth campaign
- Selected based on bid including preferred pricing for standard equipment and additional costs for adders (ground mount, upgrades, etc.).
- Expected to meet all RSIP and Green Bank financing requirements, as well as additional Solarize requirements set forth in Solarize CT RFP
- Excessive complaints from customers and town officials:
  - Poor communication
  - Missed Appointments
  - Contract violations
  - Work completed without permits
  - Violations of Solarize CT program requirements

Solarize CT Process

Background Haddam Killingworth

- Pricing and equipment must be consistent with the approved bid and may not include additional costs outside of this scope:
  - Excessive customers charged after their contracts were signed
  - Customers charged additional fees which were not permitted under approved Solarize Haddam/Killingworth pricing and were explicitly stated by BeFree as being no charge
  - Numerous customers were unaware the panels installed on their homes had been swapped from their contracted panel
- Customers reported poor communication, missed appointments, and dissatisfaction with customer service, some instances resulting in reports to the AG and media
- Municipal and utility officials confirmed that applications for permits and interconnections were inaccurate or complete
- Municipal officials confirmed inspection failures, late and missed inspection appointments, and battery backup systems without the proper building or electrical permits

Customer Service Complaints

Background

Customers Cited

- Beauchamp
- Brown
- Devlin
- Dove
- Geist
- Petrie
- Pudim
- Rosenbower
- Schemmerling
- van der Swaagh

Recurring Themes

- Panel swaps
- Poor communication
- Disorganization
- Combativeness
- Unauthorized charges
- Installation delays
- Poor installation and design quality
- No call / no show

Town and Utility Complaints

Background

4.11.3 Failure to comply with current State and local laws and ordinances pertinent to building, electrical and solar photovoltaic installations, including but not limited to:

a) Obtaining proper permits for solar photovoltaic installations

c) Following … municipal building code(s) and ordinance(s).

4.11.6 Consistent inspection failures, including, but not limited to:

a) Municipal inspections

b) Utility inspections

4.11.7 Failure to submit or respond to requests for information, including but not limited to

b) Project documentation or information

e) Permits or interconnection applications

Town and Utility Complaints

Haddam and Killingworth

- *Town of Killingworth*: Letter from First Selectwoman Catherine Iino when requested to comment on experience(s) with Solarize. Excerpts below:
  - *"Several of our residents considered themselves to have been misled when they shown when they were enrolled. Although there is some language about changing the panels, the residents believed they were getting inferior installations"*
  - *"I had numerous reports of charges being added after the initial contract was signed. Some of these were in the thousands of dollars. In many instances, customers either paid or agreed to split the cost with BeFree in order to avoid prolonged arguments"*
  - *3-page letter concludes with "In sum, for Haddam and Killingworth, the Solarize program should have been a point of pride; instead it has been an embarrassment."*
- *Town of Haddam*: Former First Selectwoman Melissa Schlag email:
  - *Thursday August 13, 2015 email excerpt to Bob Wall (CGB) regarding Solarize concerns: "As you know, I have been extremely patient with BeFree and have been their biggest ally in Haddam, trying to smooth problems and concerns. But things have changed and I expect more from a contractor that has had an incredible opportunity in our town. Myself, our building inspector as well as our entire land use department takes their jobs very seriously and continuously looks out for our residents. Let us know if you have any words of wisdom on how to correct our issues,…"*

Town and Utility Complaints

Haddam and Killingworth

- *Town of Killingworth*: E-mail excerpts from town building official Jerry Russ

(describing Michael Dove project) “This project took over 2 years to resolve, and the process with the owners of BeFree Solar was very arduous. **The denial of wrong doing, then charging the customer in excess of their original contract**, and many other issues.”

“We have had nearly 100 applications come to our office by BeFree Solar, and **most of them have been incorrect or incomplete**.”

“…our experience working with them in the Zoning, Wetlands, Building and Health departments has been a **D-** across the board.”

“Not to mention that **all the extra work** our offices had to do, and the **hand holding** with respect to Killingworth’s and the State’s codes, as well as having the building fees capped, leaves a sour taste in the mouth of many of us here in the town offices.”

“I know I have discussed our frustration in the past with you, but I feel sending this note now, after the program is nearly closed, is just information I needed to share.”

Town and Utility Complaints

Eversource Energy

- BeFree has failed to provide battery backup (i.e., energy storage) information to Eversource in cases where this technology is being installed with solar PV, even after being informed by Eversource numerous times that this information is required based on the PURA approved utility interconnection guidelines.
- The utilities need documentation on battery backup systems to ensure that these systems are installed properly and are configured not to back-feed electricity into the grid during a power outage. **This is a matter of extreme importance to the safety of utility workers and the public.**
- In addition, Eversource collects information on energy storage systems to better understand their impact on the grid, in the interest of all stakeholders in the energy industry, especially electric ratepayers.
- BeFree continues to argue to Eversource that this is not a requirement and still has outstanding battery system information that has not been provided.
- An Eversource manager also noted that his staff have brought to his attention numerous times the frustration of having to work with BeFree and have requested not to be assigned to their projects.

Summary of Findings

Fraudulent equipment packing slips for payment on 66 RSIP projects undisputed

Failure to follow required contractor processes for the CT Solar Lease, Smart-E Loans, and the Solarize Connecticut Program,

Complaints from BeFree customers, negative media coverage, officials from the towns of Haddam and Killingworth, utility concerns, DCP concerns.

DCP, OCC and other stakeholders are relying on us to weed out the bad actors

BeFree is an outlier - four year formal and informal remedial process and they have yet to take responsibility for their mistakes or acknowledge that they have been noncompliant with the RSIP Contractor RFQ