Creating A Cleaner Energy Future For the Commonwealth

DOER
Massachusetts Department of Energy Resources

MASSACHUSETTS LEADING BY EXAMPLE PROGRAM
PUBLIC LEADERSHIP, STEWARDSHIP, COMMITTMENT

Solar Canopies at State and Municipal Facilities in MA

Webinar

April 15, 2015

12:00 pm

Leading by Example Team – Dept. of Energy Resources
Taylor Leyden & Francois Attal –*Business Development,* Solaire Generation
Brian Tracey, *Program Development,* PowerOptions

Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the Commonwealth or DOER.

Agenda

Welcome and Introduction	Andrea Hessenius, LBE, DOER
Introduction to Solar Canopies	Francois Attal & Taylor Leyden, Solaire Generation
Solar Canopy Financing	Jillian DiMedio, LBE
Grant Opportunities	Andrea Hessenius, LBE
Canopy Case Study: Bristol Community College	Brian Tracey, PowerOptions
Next Steps	Jillian DiMedio, LBE
Q&A	

Recording and Presentation

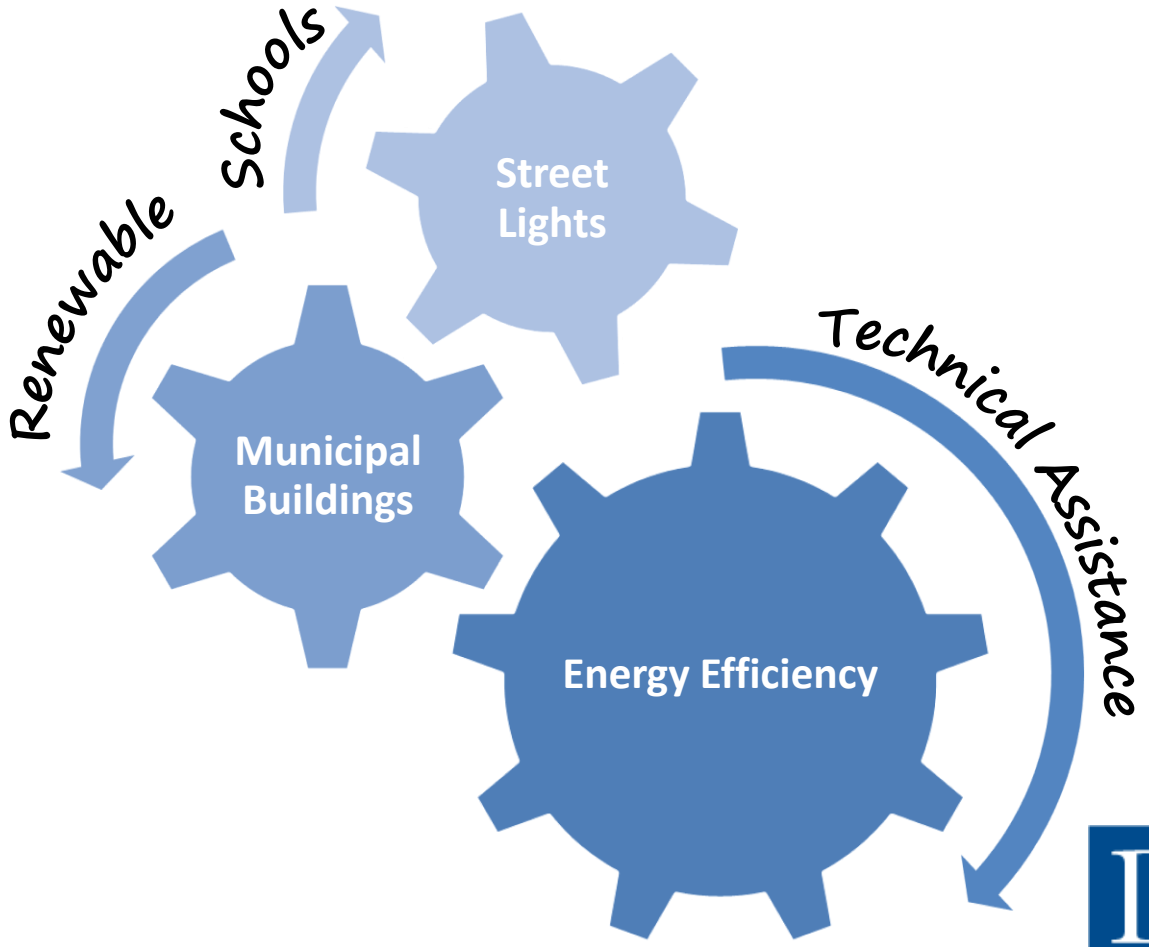
- This webinar is being recorded and will be available on our website in approximately 48 hours at: http://www.mass.gov/eea/energy-utilities-clean-tech/webinars.html
- Click on the camera icon top right of your screen to save any slides for future reference
- Use the Q & A icon on your screen to type in questions
- The slide presentation will also be posted

Poll Question 1

- Who is In the audience today?
  a) State agency
  b) College/University Campus
  c) Municipality
  d) Solar industry/Utility
  e) Other

Green Communities Division

The energy hub for ***all*** Massachusetts cities and towns, not just designated "Green Communities."



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Green Communities Division: Programs & Resources for Municipalities

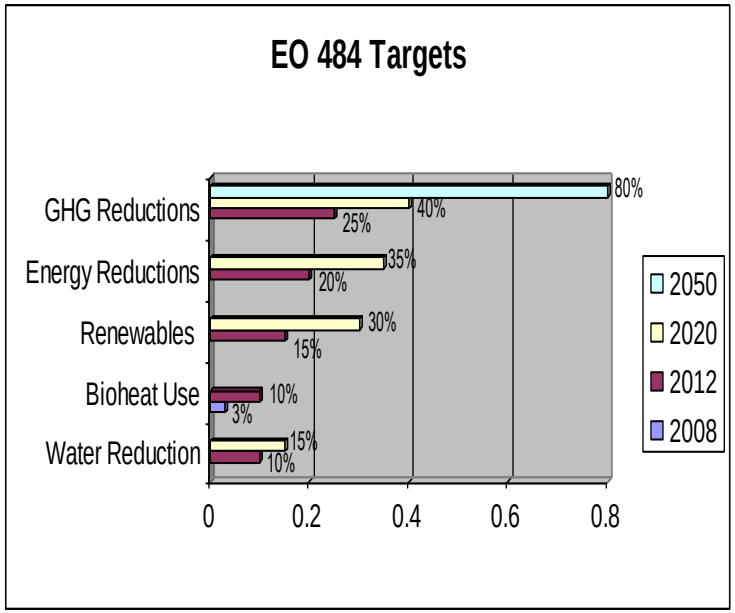
- Green Communities Designation and Grant Program
- MassEnergyInsight energy tracking and analysis tool
- Municipal Energy Efficiency Program
- Energy Management Services Technical Assistance
- Clean Energy Results Program (CERP)
- Mass Municipal Energy Group (MMEG)
- Website filled with tools & resources: www.mass.gov/energy/greencommunities

Executive Order No. 484:

Leading by Example: Clean Energy and Efficient Buildings

Issued April 2007

- Sets short, medium, and long-term goals for state agencies:
  - GHG emission reductions
  - Energy reductions
  - Renewable energy
  - Water conservation
- Requires all new construction to meet Mass. LEED Plus Standard
- Targets large and small facilities, on-going operations, and innovation
- MA State Govt. includes 80 million sq.ft. of buildings, 3,000 light-duty vehicles, 50,000 computers and thousands of gas and electric accounts



- Consume over 1 billion kWh
- Emit over 1 million tons of greenhouse gas emissions

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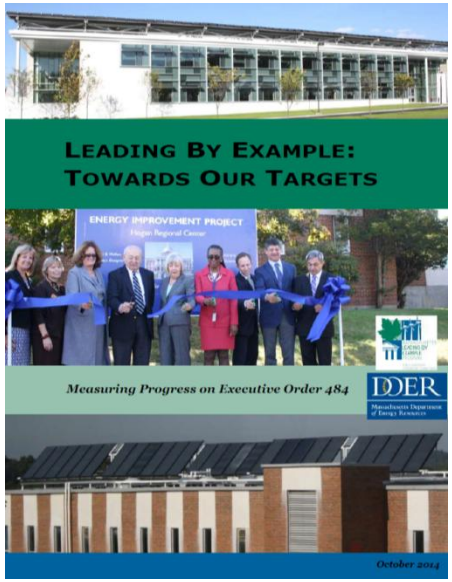
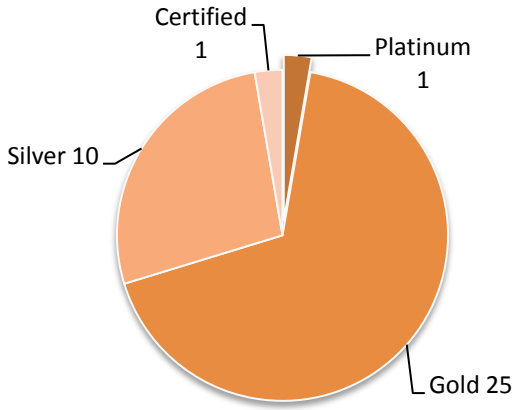
Leading By Example Progress



LBE Progress report released Fall 2014

- Met 25% GHG emission reduction target
- 72% heating oil reduction
- 37 LEED certified buildings

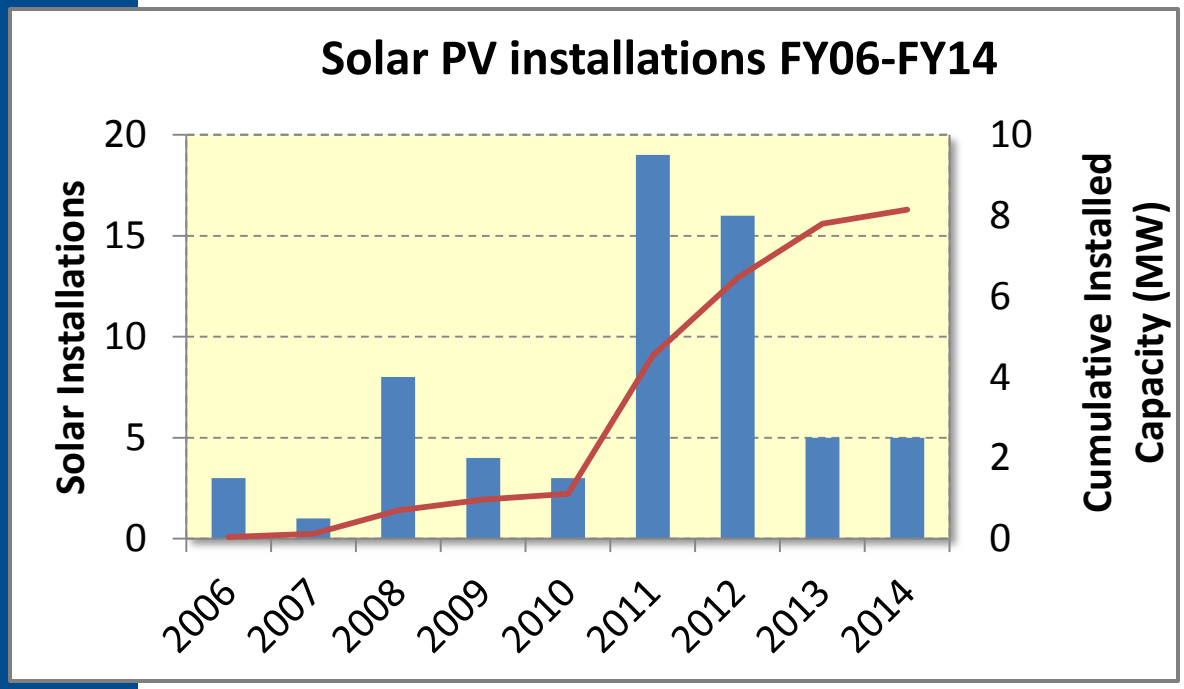
LEED Buildings



Solar Progress at State Facilities

Over 8 MW of solar PV installed at state facilities with an additional 3MW to be online by the end of FY2015

Massasoit Community College



Dept. of Correction - Framingham

Why Solar Canopies in MA?

- Many of the best roof/ground sites have been exhausted
  - In general, 40% of pavement is parking lots
  - Greater potential for large scale systems
- Substantial potential for canopies across portfolio of government-owned parking lots
  - State lots: 4 MW installed at handful of sites
  - Municipal lots: minimal installations
  - Rough estimates suggest > 50 MW possible
- Keep green spaces open for public enjoyment
- Additional Benefits

Poll Question 2

- For public entities on the call, have you previously considered installation of a solar canopy?
  a) Yes
  b) No
  c) Not Sure

Introduction to Solar Carports

SOLAIRE GENERATION®

DESIGN DEVELOP FABRICATE INSTALL

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Introduction to Solar Carports

- SOLAIRE GENERATION
- SOLAR CARPORT INTRODUCTION
- CANOPY TYPES
- SNOW & WATER MANAGEMENT
- CANOPY FEATURES & ENHANCEMENTS

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55 MWp of Aggregate Systems

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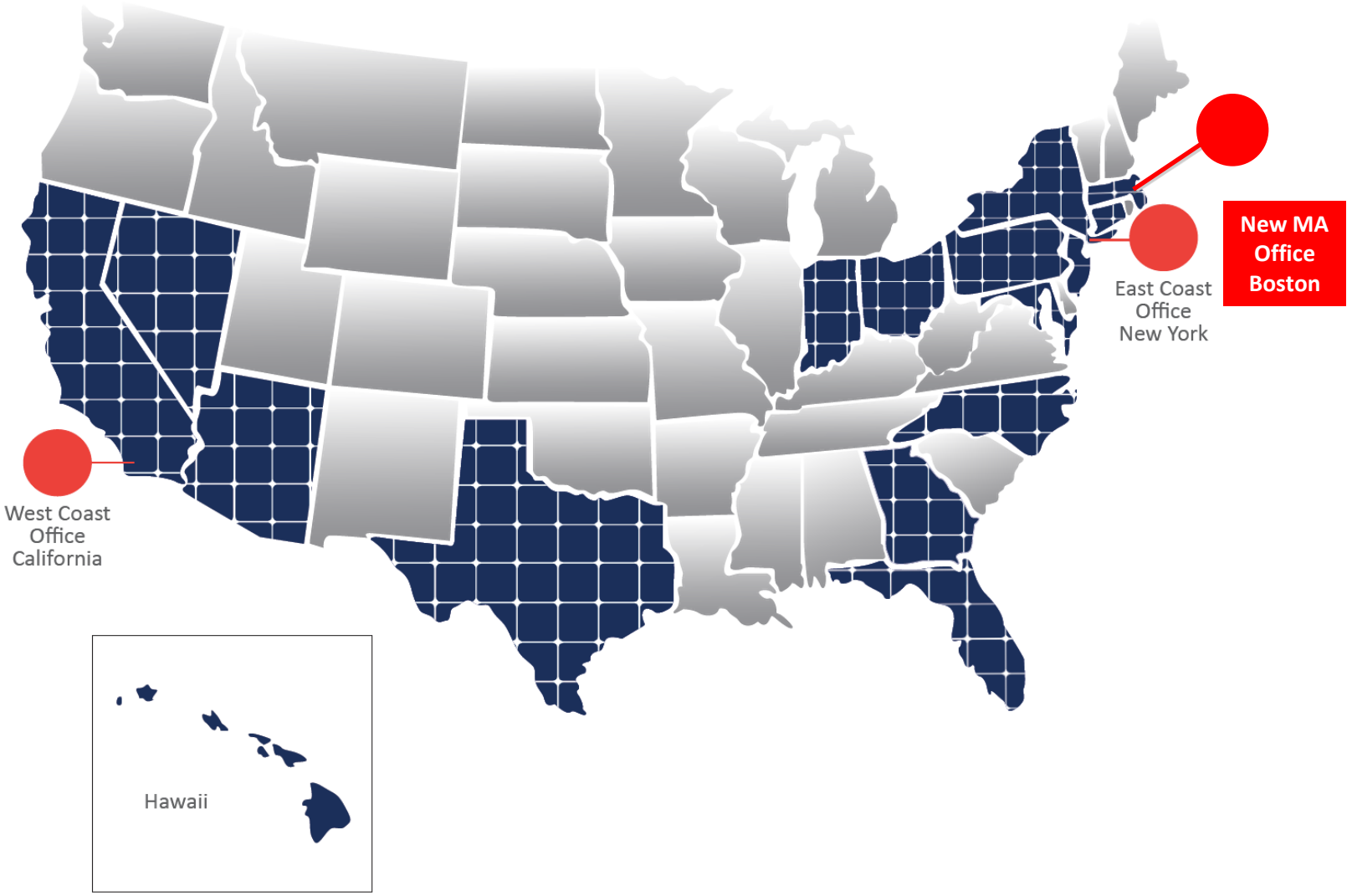

SOLAIRE GENERATION®

Nationwide Presence
New 2015 Office in MA

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Solaire Massachusetts Experience

Built canopies

•Cronig's Market – Martha's Vineyard

•Staples HQ – Framingham

•Oracle Offices – Burlington

•Wyman Properties – Waltham

•Boston Properties – Waltham

•Danversport Marina – Danversport

In contract

•Retail Mall – West Boston

•Woburn Garages

•U Mass Amherst – "Leading by example" recipient

SOLAR CARPORT INTRODUCTION

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Pros of Solar Carports

1.Receive preferential treatment from MA DOER SREC program

2.Transform unused assets into productive power plants

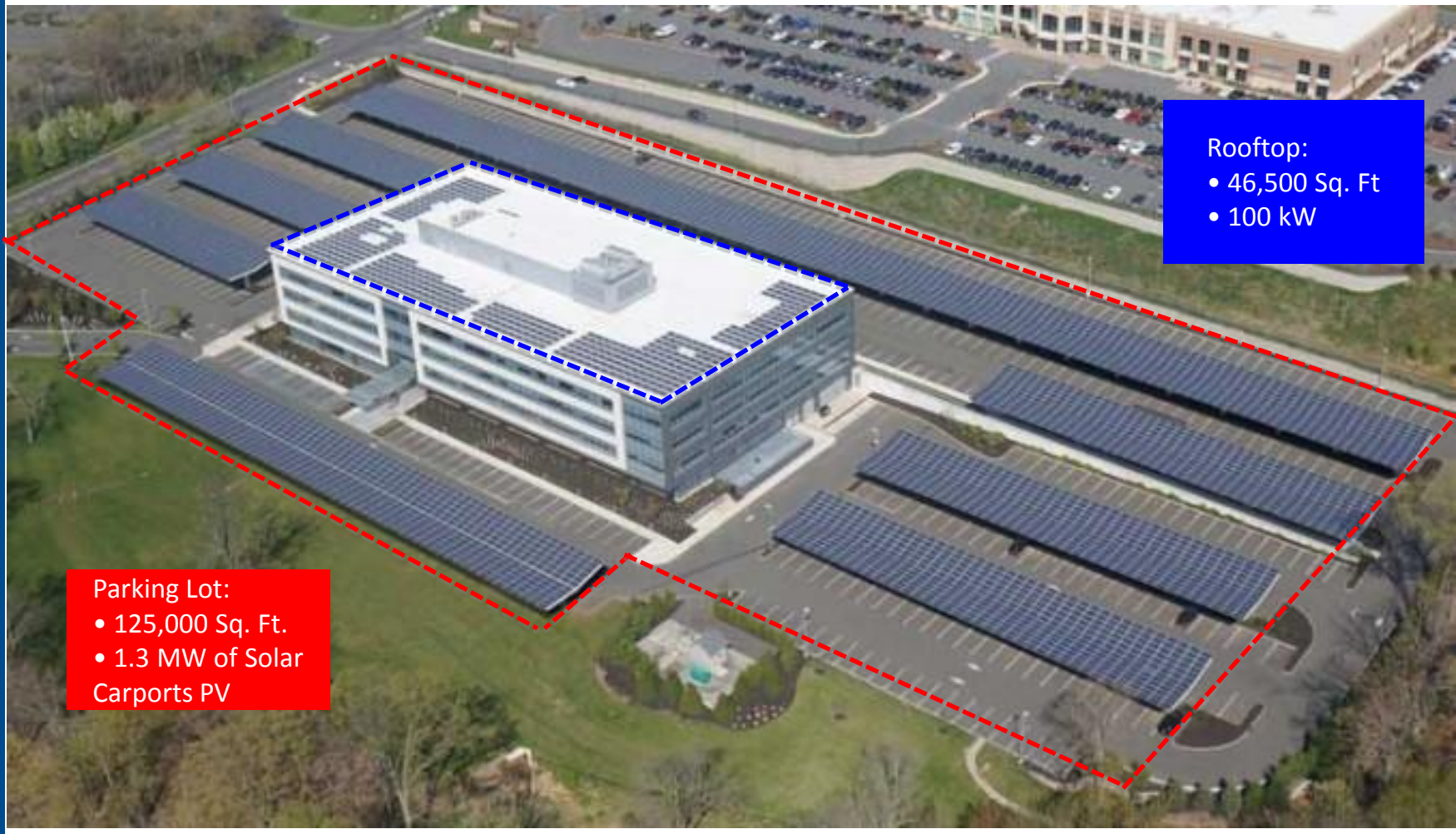
3.Are close to point of consumption versus solar farms which require high interconnection upgrade costs

4.Provide an ideal alternative when roof installations are not feasible due to roof age and load limitations

5.Usually size up to ideal production of buildings nearby – 40 to 50% of electricity consumption

Pros of Solar Carports cont'd

6. Provide secondary benefits
    - Reduce heat island effect
    - Protect individuals from the elements – rain, snow, sun
    - Reduce vehicle consumption during summer time
    - Capture water for gray water reuse (optional)
    - Replace lights with LED fixtures with lower electricity consumption and substantially less light pollution



Huge Onsite Generation Potential

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Good Carport Site

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Good Carport Site

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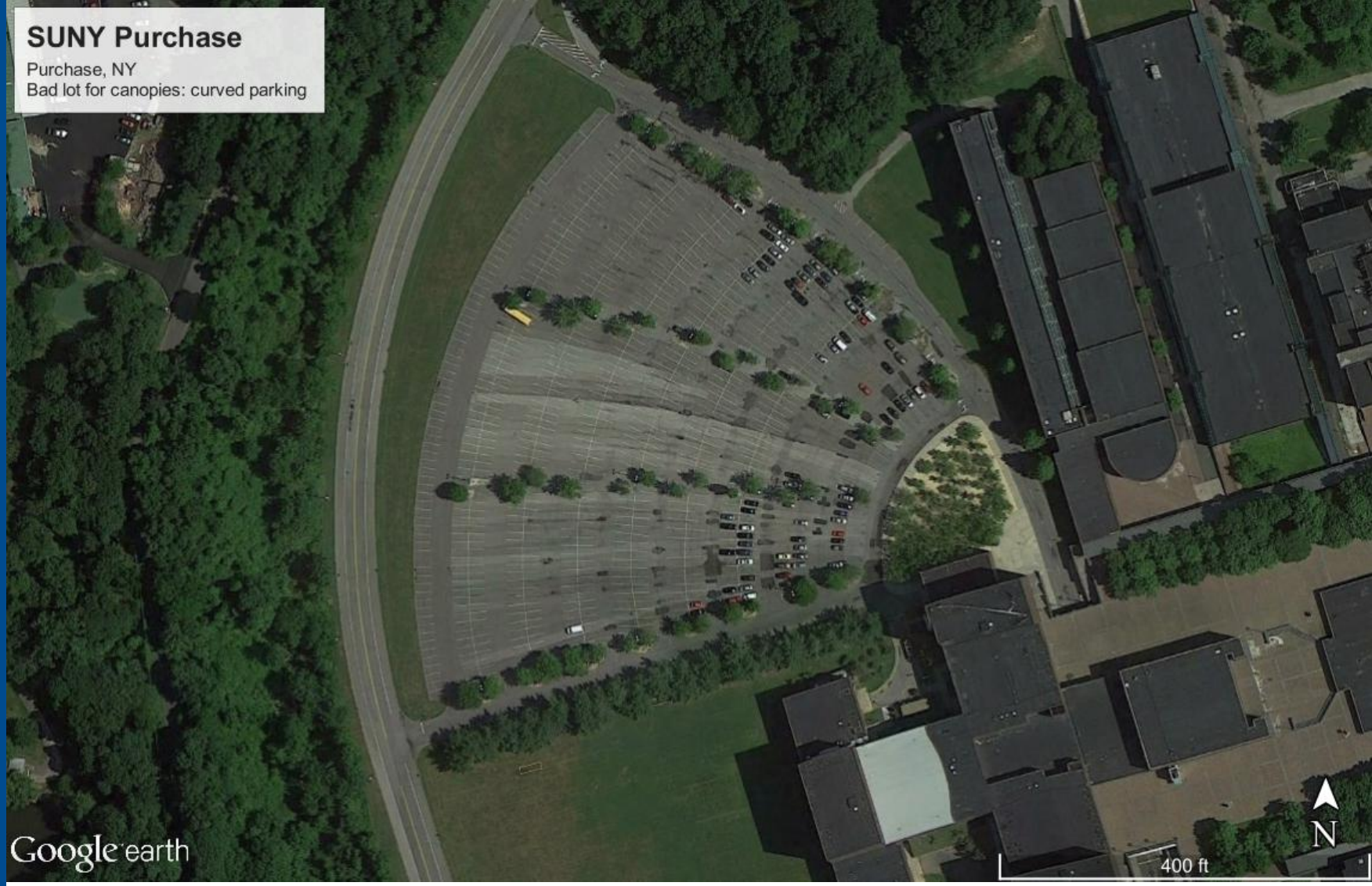

Bad Carport Site 1

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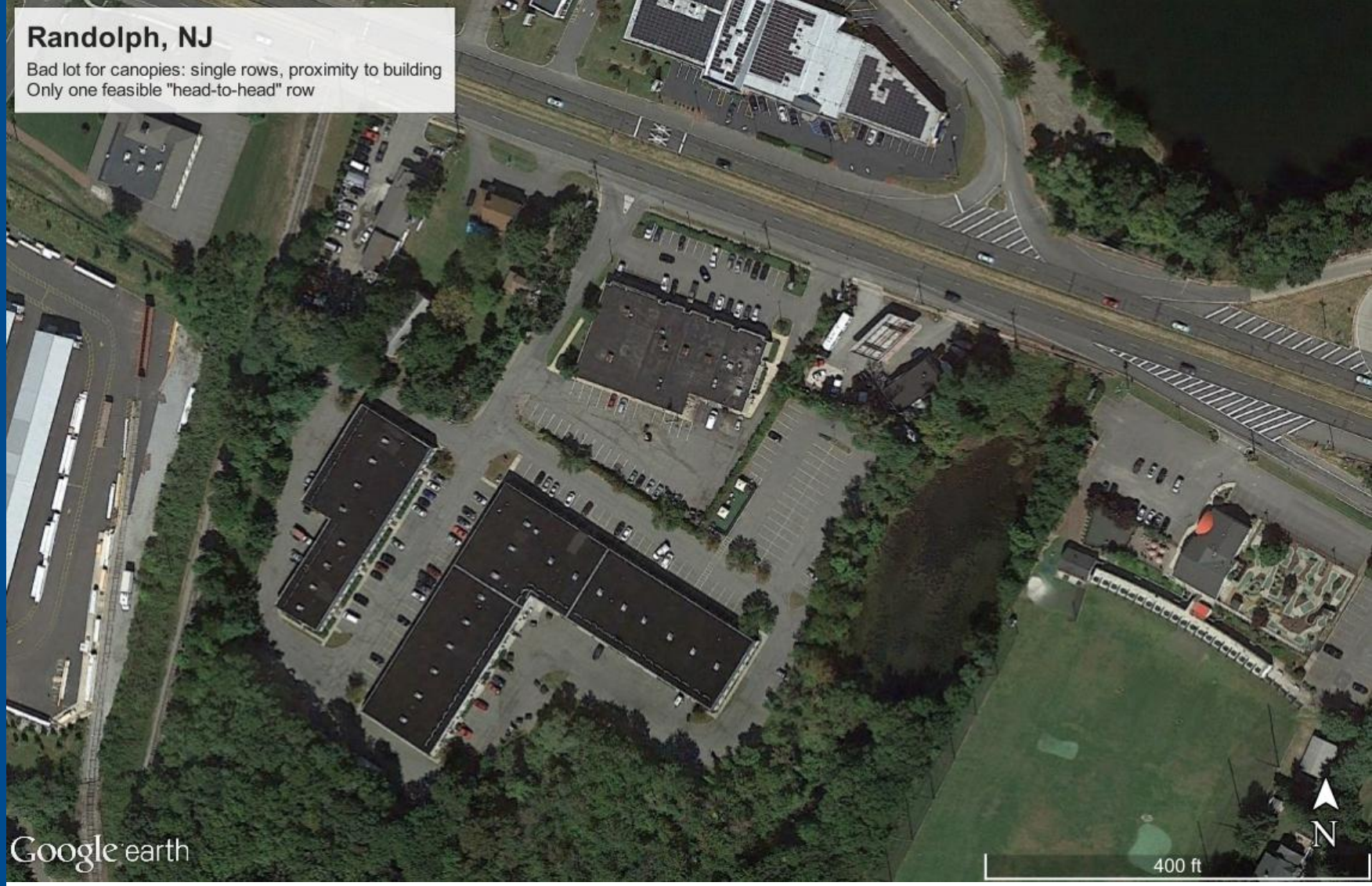

Bad Carport Site 2

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Cons of Solar Carports

1.Real construction projects

2.Require experienced partners who understand construction logistics / phasing / minimal impact and precise coordination between all trades involved in a carport installation: Architects, Electricians, Structural Engineers, Electrical Engineers, Civil Engineers, AHJs, Utility companies….

3.Higher cost of installation versus roof or ground, though mitigated by DOER incentive structures

Must Have Features

1. High Clearance – minimum 11’ and preferably 13’ 6”
2. Concrete piers to protect from vehicle impact
3. Snow Protection – Dual Tilt / Snow Guards
4. Integration of lighting for safety and security
5. Minimum exposures of wires and electrical equipment
6. Engineered by qualified structural engineers and designed by architects who understand the integration of these structures into public spaces
7. Canopy finish that will last for a period of 25 years minimum

Important Optional Features:

- Water Management / Decking / EV Charger Integration / LED Lights

CANOPY TYPES

Solaire 360D – Dual Tilt

Cronig's Market – Martha's Vineyard, MA

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Solaire 360S – Single Tilt

Konterra Realty – Laurel, MD

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Long Span 360

Danversport Yacht Club – Danvers, MA

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Garage Long Span

Staples HQ – Framingham, MA

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Solaire Premium Canopy

NJ Meadowlands Commission

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SNOW MANAGEMENT

Snow Management
Dual Incline

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WATER MANAGEMENT

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CANOPY FEATURES & ENHANCEMENTS

EV Charging

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Integrated LED Lighting

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Battery Storage
Microgrid Creation

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DESIGN DEVELOP FABRICATE INSTALL

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Solar Canopy Financing

Methods for Financing

1. Entity Builds and Owns, Self-finances
2. Entity Builds and Owns, Secures Financing Elsewhere
3. Third Party Ownership: Power Purchase Agreement (PPA)

Method Chosen Depends on:

- Capital funds available
- Appetite for operation and maintenance
- Status of Investment Tax Credit (ITC)
- Timeline

1. Build to Own and Self-Finance

- Finance through own capital budget
- Pay for system up front
- Revenue contributing to project payback comes from:
  - Electricity cost savings
  - Generation of SRECs
    - Each MW generated = 1 SREC (2015-2024)
    - SRECs generate revenue through sale in market
    - 2025+: SRECs expire, entity earns Class I RECs
- Entity responsible for:
  - Routine maintenance
  - Repairs as needed
  - Inverter replacement

SREC Revenue Schedule	
2015	$285
2016	$285
2017	$271
2018	$257
2019	$244
2020	$232
2021	$221
2022	$210
2023	$199
2024	$189
2025+	$40

2. Build to Own and Utilize Outside Financing: CREBs

Clean Renewable Energy Bonds (CREBs)

A form of tax credit bond for qualified renewable energy projects in which some or all of the interest is paid in the form of federal tax credit by U.S. govt., thus reducing interest for the issuer.

- IRS issued new round of allocations in Feb. 2015
- Applications opened March 5; funds allocated on rolling basis
- $600 million (1/3 of total) available to state and municipal governments nationwide
- Estimated 1.5% interest rate
- Bond term varies, but approx. 15-25 years
- Bonds issued by MassDevelopment

- Available to state agencies and municipalities

MassDevelopment

Massachusetts Leading By Example Program
Public Leadership, Stewardship, Committment

Build to Own and Utilize Outside Financing: NEEIP

Non-Building EE Investment Program (NEEIP) (for state agencies only)

A MA general obligation bond, termed a "green bond", created to finance clean energy projects whereby annual savings and/or revenue generated by the project is used to make bond payments.

- Because savings cover payments, debt doesn't affect state's bond rating
- $15 million allocated over 2 years, originally for "non-building" efficiency
- Estimated 3.5% interest rate
- 10, 15, 20 year bond terms
- Annual savings/revenue must be at least 10% > debt service payment
- Some upfront cost may be required

Outdoor Lighting

Tunnel Ventilation

Dam Operations

Subway Operations

Solar Canopy Financing: Third Party Ownership

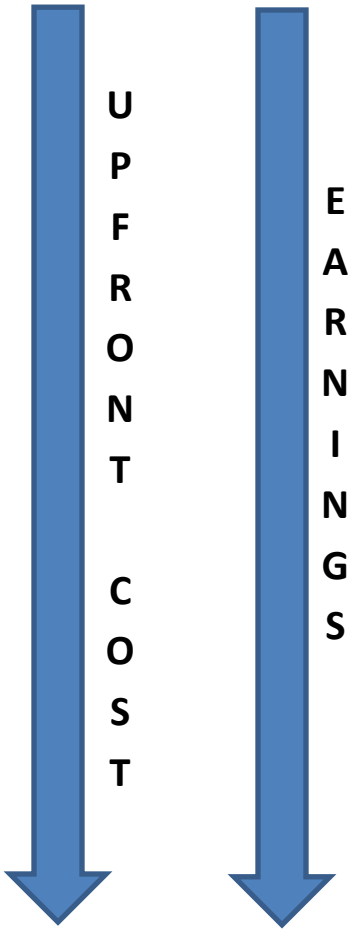
Power Purchase Agreement (PPA)

Contract whereby one party, the project owner, agrees to install, operate and maintain a RE system and the other party, the buyer, agrees to purchase the electricity generated.

- Fixed price per kWh, with or without agreed upon escalator
- Usually 20 year contract
- No O&M responsibilities
- System owner retains SREC revenue

Financing Method Pros & Cons

	Pros	Cons
1. Entity Builds and Owns, Self-finances	• Most cost-effective • 100% of SRECs retained • Minimal cost of borrowing	• Large upfront cost • O&M Responsibilities • Higher risk
2. Entity Builds and Owns, secures financing	• Little to no upfront cost • 100% of SRECs retained	• Debt service payments • O&M responsibilities • Administrative burden • Higher risk
3. Third Party Ownership	• No upfront cost • No O&M responsibilities • Low Risk • Reliable electricity price	• Least cost-effective • No SREC revenue



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Hypothetical Project: Cash Flow Scenarios

Project Assumptions	
Total Project Size	500 kW
Total Project Cost	$1.75 M
Cost per Watt	$3.50
Electricity Rate	$.16/kWh
Electricity Escalation	*2.0%*
PPA Rate	$0.115/kWh

Project Benefits				
	Build to Own			Third Party Ownership
	Self Finance	CREBs	NEEIP	PPA
Upfront Cost to Entity	$1.75 M	$350K (20%)	$350K (20%)	$0
Bond Financing	-	$1.4 M	$1.4 M	-
Bond Rate	-	1.5%	3.5%	-
Net Benefit - Year 1	$257,281	$152,359	$135,726	$26,017
Avg. Net Benefit (20 yrs)	$179,002	$100,310	$87,835	$43,425
20 Year Earnings	**$1.83 M**	**$1.65 M**	**$1.41 M**	**$869K**

Procurement

- For state agencies:
  - Build to own: Competitive procurement
  - 3rd Party Ownership through energy cooperative authorized to act on behalf of public entities
- For municipalities:
  - Build to Own: Competitive procurement
  - 3rd Party Ownership: Competitive procurement or through energy cooperative authorized to act on behalf of public entities

Solar Canopy Grant Opportunities: State Facilities

LBE Solar Canopy Grant

$1.5 million grant opportunity for solar PV at parking lots, garage roofs, and pedestrian walkways on state owned land

- $0.75/watt for state-owned projects (up to $600K/site)
- $0.50/watt for third-party owned projects (up to $500K per site)
- Eligibility:
  - Projects over 200 kW
  - Some onsite consumption
  - Include min. # of EV charging stations
  - All procurement options eligible

http://www.mass.gov/eea/grants-and-tech-assistance/guidance-technical-assistance/agencies-and-divisions/doer/doer-procurements.html

Solar Canopy Grant Opportunities: Municipalities

Owner's Agent Technical Assistance (OATA) Grant

Funding for independent 3rd parties to help municipalities negotiate, develop and manage projects or to perform studies to support the development of clean energy projects

- $12,500 maximum award available
- First come, first served basis
- **Look for PON in May; accepting applications in July**

http://www.mass.gov/eea/grants-and-tech-assistance/guidance-technical-assistance/agencies-and-divisions/doer/doer-procurements.html

PowerOptions
MA Solar Parking Canopy Case Study: Lessons Learned

PowerOptions

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PowerOptions Overview

- Largest Energy Buying Consortium in Massachusetts
- Serve MA nonprofit customers - 500 members
  - All Massachusetts nonprofits and public entities are eligible
- $200 million annual sales of energy supply
  - 1 billion kwh of electricity
    - 220 MW demand
  - 13 million dekatherms of gas
  - 60+ MWs of solar projects under contract
    - 10 MW behind the meter projects
    - 50 MW virtual net metering projects

Our energy solutions

- PowerOptions Electricity -
  - Supplied by Direct Energy Business
  - through 2019
- PowerOptions Natural Gas
  - Supplied by Direct Energy Marketing
  - through 2019
- PowerOptions Solar
  - Supplied by SunEdison
  - On site PPA, serving load behind the meter
  - Offsite PPA for Net metering credits
  - Solar Program PPA for smaller projects, 25-300kW
    - RFQ proposals due May 7, 2015

PowerOptions Competitive solicitation

- All PowerOptions supply programs begin with a competitive procurement process.
- PO Programs are offered on behalf of MA Clean Energy Center, provides procurement exemption for members.
- Leverage of aggregation yields low prices.
- Pre-negotiated best-in-industry contract terms and conditions unique to our aggregation.
- Price methodology locked with Suppliers/Developer for program term – assures on-going competitive pricing.
- Allows members to avoid cost of solicitation and contract negotiation and benefit from PO expertise.

Bristol Community College (BCC)
Project Site

VICINITY MAP

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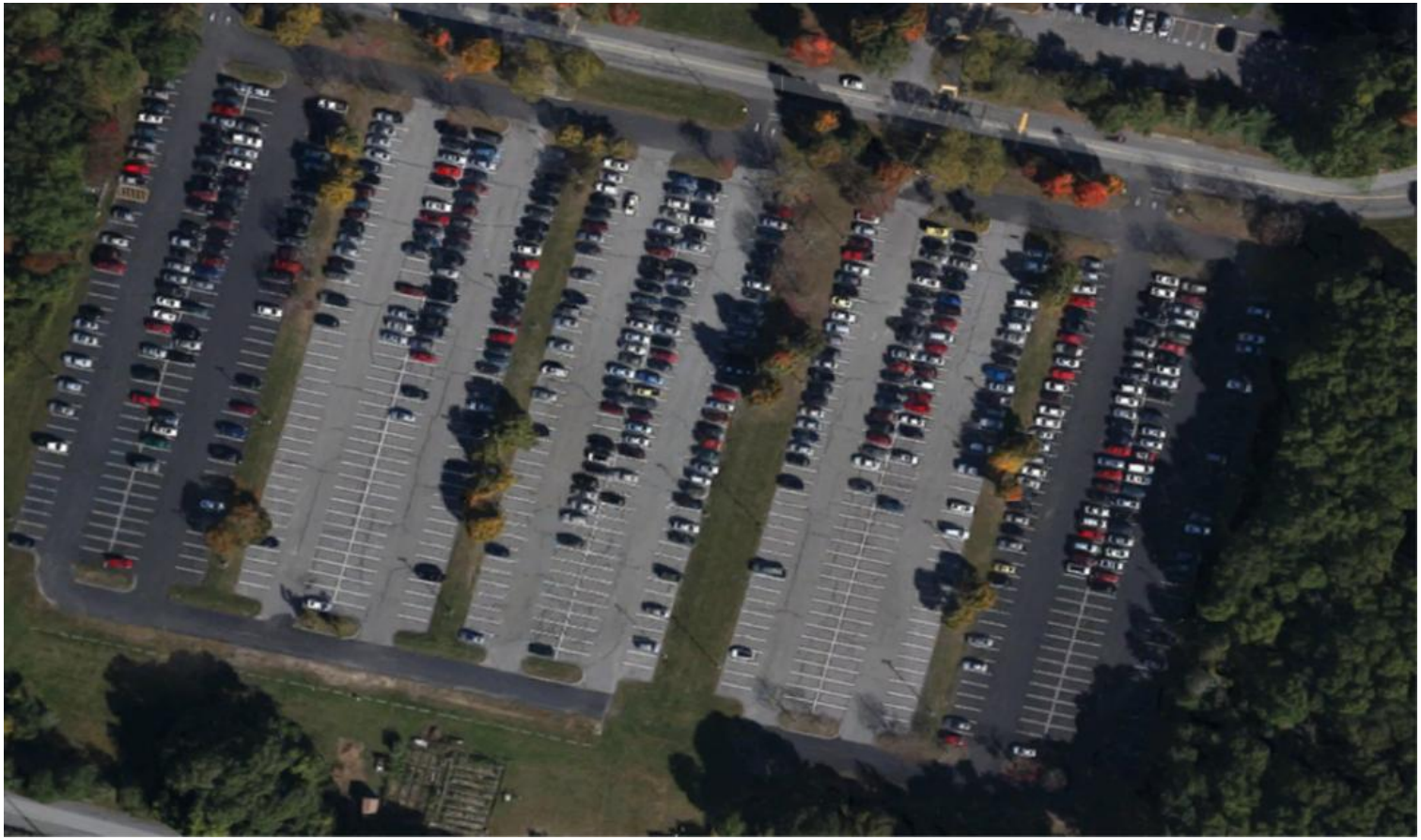
Opportunity: Transform a 800 space / 6 acre parking lot into a Solar PV generator



BCC Canopy Project Timeline

- Key Milestone Dates:
  - Initial PPA Proposal submitted to BCC --- 2012
    - Various designs considered, from 1 to 3 to 5 parking lots
  - PPA Contract & Site License Execution --- 2013
  - NM Cap Allocation Application filed at DPU --- 2014
    - Cap space important due to final project size
    - Initially Waitlisted until legislation passed in July '14
  - Interconnection Approval Granted by NGrid --- 2014
    - 9-12 month process includes NGrid System Impact Studies, Local Network Upgrades
  - Notice to Proceed (NTP) on Construction --- 2014
    - Equipment Procurement, Site Preparation, Contractor mobilization, Material Deliveries, etc.
  - Commercial Operation Date --- Spring 2015

BCC Project Under Construction – Fall 2014

Under Construction – Feb. 2015

Under Construction – March 2015

April 2015 --- almost complete

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20 year Projected Annual Electricity Savings

	Solar PV kWh	Projected Cost without Solar PV	Projected Cost with Solar PV	Projected Savings
2015	3,935,213	$ 584,352	$ 564,676	$ 19,676
2016	3,915,537	$ 593,117	$ 566,492	$ 26,626
2017	3,895,959	$ 602,014	$ 568,404	$ 33,610
2018	3,876,479	$ 611,044	$ 570,413	$ 40,631
2019	3,857,097	$ 620,210	$ 572,522	$ 47,688
2020	3,837,811	$ 629,513	$ 574,732	$ 54,781
2021	3,818,622	$ 638,956	$ 577,044	$ 61,912
2022	3,799,529	$ 648,540	$ 579,459	$ 69,081
2023	3,780,532	$ 658,268	$ 581,980	$ 76,288
2024	3,761,629	$ 668,142	$ 584,608	$ 83,534
2025	3,742,821	$ 678,164	$ 587,345	$ 90,819
2026	3,724,107	$ 688,337	$ 590,192	$ 98,145
2027	3,705,486	$ 698,662	$ 593,151	$ 105,511
2028	3,686,959	$ 709,142	$ 596,224	$ 112,918
2029	3,668,524	$ 719,779	$ 599,412	$ 120,367
2030	3,650,181	$ 730,576	$ 602,718	$ 127,858
2031	3,631,930	$ 741,534	$ 606,142	$ 135,392
2032	3,613,771	$ 752,657	$ 609,688	$ 142,970
2033	3,595,702	$ 763,947	$ 613,356	$ 150,591
2034	3,577,723	$ 775,406	$ 617,149	$ 158,257
				$ 1,756,654
Note: 1.5% utilty rate escalation assumed				

BCC Project Equipment Overview

- Rigid Global provided canopy structures:
  - 8 canopy buildings installed on-site including 4 long span buildings (64’ wing)
  - Structure height -- 11’ to 17’
- System Size – 3.2 MWdc or 2.0 MWac
- 9,676 MEMC modules
- MEMC Modules M330s include:
  - 10 year material warranty/25 year power warranty
  - Module efficiency – 16.9%
- Inverters – 4 x Advanced Energy (AE) 500kw
  - 10 year nationwide warranty

BCC Power Purchase Agreement (PPA) overview

- SunEdison is responsible for project design, financing, construction, and O&M for contract term
- SunEdison owns the project, not BCC
- BCC purchases the electricity generated from the project
- No Upfront Costs with Third-Party PPA structure
- 20 year contract term, industry standard
- BCC used the PO pre-negotiated PPA Contract
  - Guaranteed Performance Provision
  - Fixed PPA price (no escalation) for contract term, valuable price hedge
  - Note PV System reduces Utility demand charges
  - Provider/SunEdison retains Environmental Attributes, SRECs and Federal/State tax incentives
  - Project buy-out options available

Things to know…and Some Advice

- This is heavy construction
  - Schedule shifts are common
  - Various contractors mobilizing/demobilizing on-site
  - Disruptions (noise, parking, traffic)
  - Sun Edison has the risk of change orders etc.
- Put your needs in writing – clearly articulate schedule requirements & water management needs
- Have frequent, weekly meetings with operations team
- Take the long view

In the end…

- 3,500,000+ kWh/year generated
- $1.75 Million in Projected Savings over contract term
- 1,500+ tons/C02/year avoided
- Diversified electricity supply
- Great PR for customer & Educational opportunity

Photo: © BlueWave Capital

We are always here to assist you

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Poll Question 3

- Given what you've learned in this webinar, how likely are you to consider a solar canopy at your facility?
  a) Definitely
  b) Very Likely
  c) Somewhat Likely
  d) Not Sure

Next Steps

For State Facilities:

- Complete LBE Solar Canopy Survey - (over 75 potential lots already)
- Fatal Flaw analysis to narrow sites down to 25
- End of Month: RFQ for DOER-funded feasibility study

For Municipalities:

- Complete similar preliminary analysis to determine best sites
  - Size, shape, shading
- Consider applying for OATA grant to perform more in-depth feasibility study

For Both:

- If decide to move forward - determine which financing method is best
  - For CREBs: Bundle projects for statewide CREBs application through LBE (agencies) or MassDevelopment (munis)
  - Utilize NEEIP when CREBs not available
  - For 3rd Party: Authorized energy cooperative

Resources & Contact Information

Massachusetts Dept. of Energy Resources

www.mass.gov/doer

Leading by Example Program

http://www.mass.gov/eea/leadingbyexample

Green Communities Division

http://www.mass.gov/eea/energy-utilities-clean-tech/green-communities/

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