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NEW YORK STATE OF OPPORTUNITY. | Climate Smart Communities

Solar Power on Landfills: Case Studies and Lessons Learned

This webinar will begin shortly

March 10, 2016

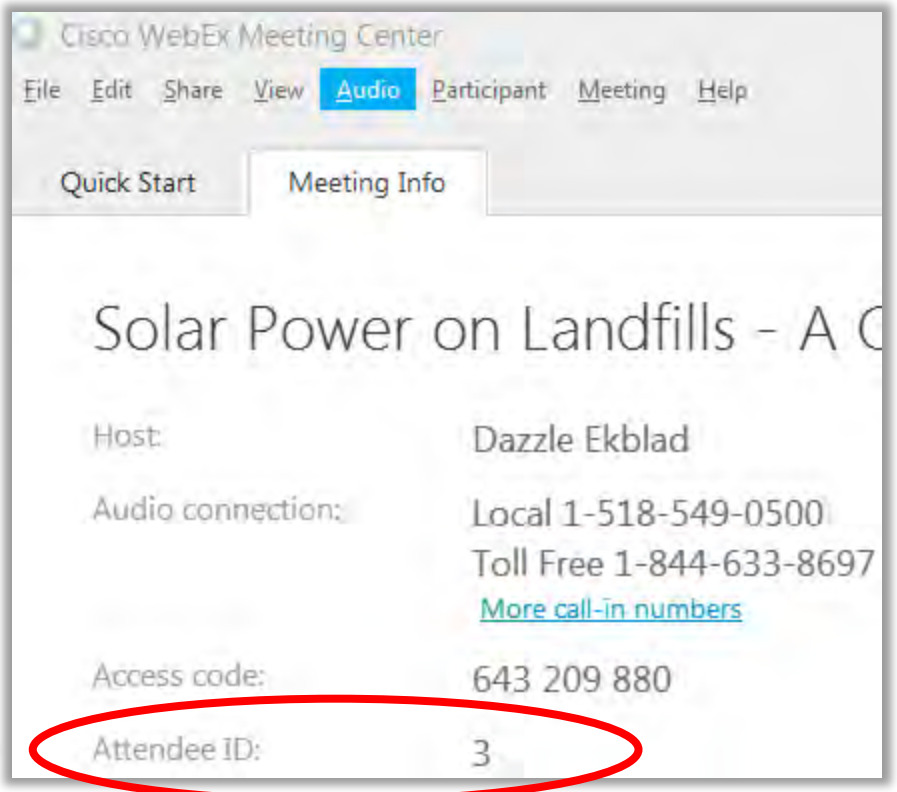
Welcome!

Today's topic: *Solar Power on Landfills*

Connect to the audio with your phone using

<u>your unique attendee ID</u>

which is available on the "*Meeting Info*" tab:



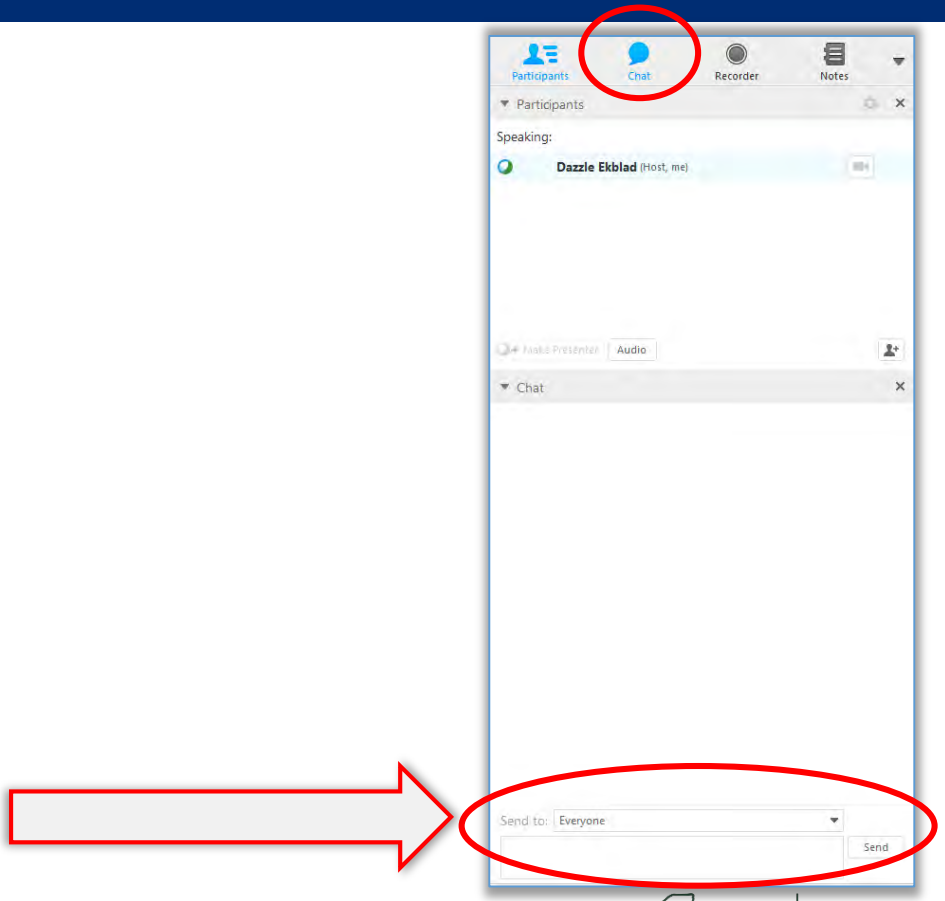
Welcome!

Today's topic:

Solar Power on Landfills

Questions?

Use WebEx chat function



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Agenda

I. **Introduction & Announcements** - ***Dazzle Ekblad***, NYSDEC

II. **Solar Power & Maintenance of Closed Landfills** - ***Dazzle Ekblad***

III. **Resources for Solar Power on Landfills** – ***Maureen Leddy***, *NYSERDA*

IV. **Case Study: Clarkstown Landfill Solar Field** – ***Supervisor George Hoehmann***, *Town of Clarkstown NY*

V. **Q & A** - ***Dazzle Ekblad***

Announcements

- Fri. March 18: **Central NY Community Solar Forum**, Syracuse, NY
- Thurs. March 31, **North Country Community Distributed Generation Summit**, Tupper Lake, NY
- Thurs. April 14 10:30am: Climate Smart Communities Webinar – **Comprehensive Plans with Sustainability Elements**
- June 13-15: **Clean Energy Economy Conference**, Utica, NY

CSC Certification

- Revised CSC Certification Workbook available by emailing climatechange@dec.ny.gov
- Today's webinar relates to these actions:
  - **# 4.3** – Conduct feasibility studies for renewable energy installations (5 points)
  - **# 4.6** – Install solar technology on public property (9 points)
  - **# 4.7** – Serve as host site for renewable energy installation and enter into a long-term service contract or power purchase agreement (9 points)

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Solar Power and the Maintenance of Closed Landfills

Dazzle Ekblad, NYSDEC

Solar Power on Closed Landfills

- DEC's primary areas of concern:
  - Protection and maintenance of final cover
  - Protection of landfill gas system

➢ **DEC guidance is currently under development**

Solar Power on Closed Landfills

- Part 360 solid waste mgmt. permit not required in NYS
  - Requires modification to Closure Plan & Post-Closure Care Manual and review of plans by DEC
  - For example: ECL 360-2.15(k) Post-closure operation and maintenance (k)(9): "…Use of the property shall not disturb the integrity of the final cover, liners, or any other components of the containment system, or the function of the monitoring or environmental control systems …"

Solar Power on Closed Landfills

Preferred method:

- Surface placement of conduit and cell foundations
- Rather than subsurface placement
- Design that can accommodate settling, if needed

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Solar Power on Closed Landfills

Preferred method:
Surface placement of conduit and cell foundations

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Solar Power on Closed Landfills

Minimize added weight

- Only low ground pressure vehicles for construction and maintenance
  - 5 to 10 psi per axle

Solar Power on Closed Landfills

Stormwater impacts:

- SPDES as necessary
- Properly designed access roads
- Ensure no rutting or erosion of cover soils
  - E.g., at drip edge of panels

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Solar Power on Closed Landfills

Stormwater & erosion:

- Precipitation + Equipment = Damage

Any other problems here?

- Stakes

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Solar Power on Closed Landfills

Maintain healthy cover vegetation

- Consider shade-tolerant, low-growing plants under panels
- Mowing & maintenance

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Solar Power on Closed Landfills

Inverter/Transformer Location:

- Preferred off-cover
- If on cover, proper foundation to distribute load

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Solar Power on Closed Landfills

Landfill Gas System

- Appropriate separation of vents from equipment

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Guidelines for Solar Power on Closed Landfills

- Place conduit/foundations on surface (vs. subsurface)
- Use low ground pressure vehicles
- Prevent stormwater impacts like erosion and rutting of cover
- Maintain healthy cover vegetation
- Place inverter/transformer off-cover (vs. on-cover)
- Separate solar power from landfill gas vents/collection wells

Conclusion: Solar Power on Closed Landfills

- **DEC is supportive of this re-use**
  - DEC staff have experience with these projects
- **Stay tuned for publication of further guidance by DEC**
  - Will be a Materials Mgmt. Division Program Policy

Resources for Solar Power on Closed Landfills

Maureen Leddy, NYSERDA

NY Sun Initiative

Maureen.Leddy@nyserda.ny.gov

March 10, 2016

NYSERDA

- A nationally recognized leader in the development, commercialization, and implementation of advanced energy technologies
- A public benefit corporation helping New York State meet its goals to:
  - Reduce energy consumption and increase energy efficiency
  - Create a clean energy economy
  - Grow diverse, renewable energy supplies
  - Protect the environment
  - Provide experienced leadership in planning and policy

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Clean Energy Fund (CEF)

- 10-year, $5 billion funding commitment
- Reshapes New York's energy efficiency, renewable energy and energy innovation programs
- Reduces cost of clean energy
- Accelerates adoption of energy efficiency to reduce load
- Increases renewable energy to meet demand
- Mobilizes private investment in clean energy

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Reforming the Energy Vision (REV)

Governor Cuomo's strategy to build a clean, resilient and affordable energy system for all new Yorkers

NY Sun Initiative

- Governor Cuomo's $1 Billion initiative to achieve over 3GW of customer-sited solar installations 2014-2023
- Protect the environment and lower energy costs by improving the efficiency and reliability of the electric grid, through solar energy.
- Significantly expand deployment of solar capacity throughout the State
- Transform New York's solar industry to a sustainable, subsidy-free sector; attract private investment; create jobs

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NY-Sun Focus Areas

- Incentives for solar installation
  - MW Block Program
- “Soft cost” reduction efforts
- Assistance to local governments
- Customer education

www.ny-sun.ny.gov

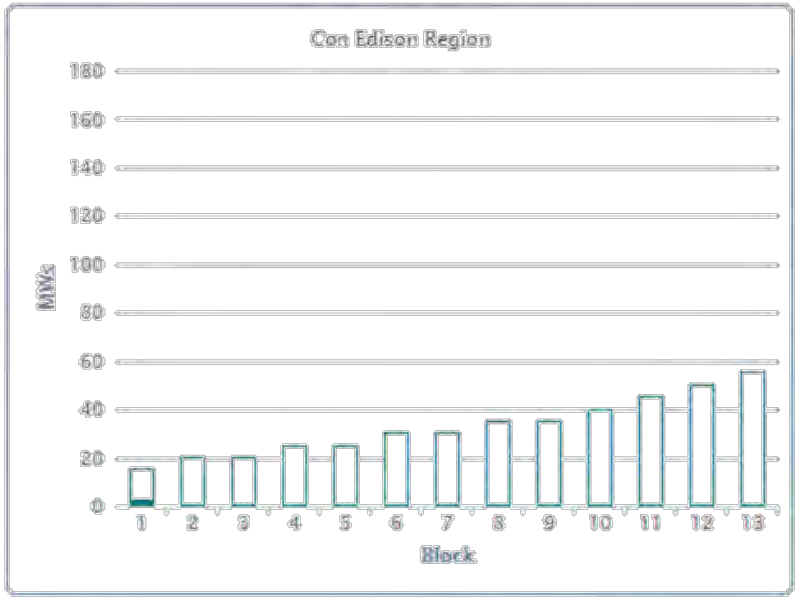
MW Block Program Structure

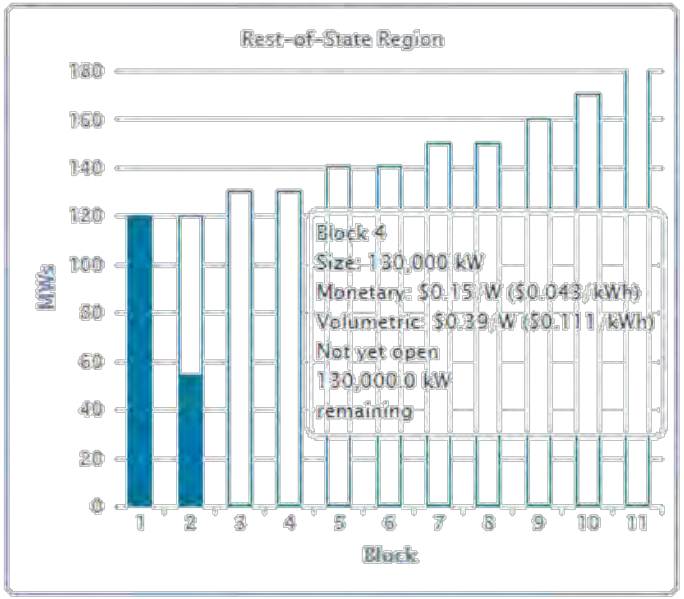
- MW targets to specific regions of the state; breaks those MW targets into blocks to which incentives are assigned
- Incentives awarded based on block in effect at time of application submission
- When a block is fully subscribed, it will close, and the next opens with a decreased incentive
- MW Block Dashboard: tracks real-time information on block status, including incentive level and capacity

Commercial/Industrial Dashboard

Commercial / Industrial

Refresh





Submitted Available

Hold the cursor over a column in any chart to get the block details.

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Commercial/Industrial MW Block (>200kW)

- Performance based incentives
  - Initial incentive payment at commercial operation (25%)
  - Three annual incentive payments based on production
- 20% multiplier on base incentive for utility strategic locations
- Add up to $50,000 for integrating energy storage
- Add up to $50,000 for integrating energy efficiency
- System size limited to one host meter per application

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Large PV on Landfills

Completed projects:

Clarkstown Landfill, 2014, 2.3 MW

Williamson Landfill, 2014, 1.5 MW

Patterson Landfill, 2015, 1 MW

Plus 19 sites under development
Average size 2 MW

1 MW = appx 6 acres
1 MW = appx 1,174,000 kWh/yr

Patterson Landfill Phase 1 - 1MW

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Options for Landfill Development

Remote Net Metering

Direct Ownership
- Loans
- Cash Sale

Third Party Ownership
- Lease
- Power Purchase Agreement

Shared Solar Ownership
- Community Distributed Generation

Town of Williamson Landfill 1.5 MW

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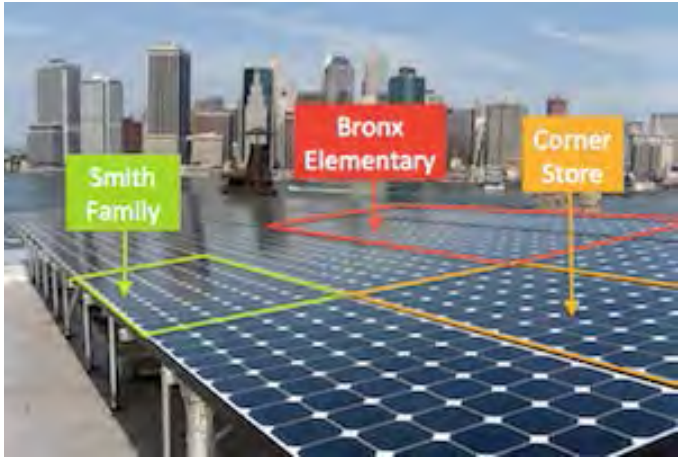
Community Distributed Generation

- Shared Solar
  - Project Sponsor organizes a membership, members contract for a portion of the energy from the array that shows up as kWh credits on their utility bills
- Minimum of ten members
- No long term commitment
- Increases access to solar to those that can't do rooftop
- No more than 40% of the output can go to large electric consumers (>25 kW demand)



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Resources

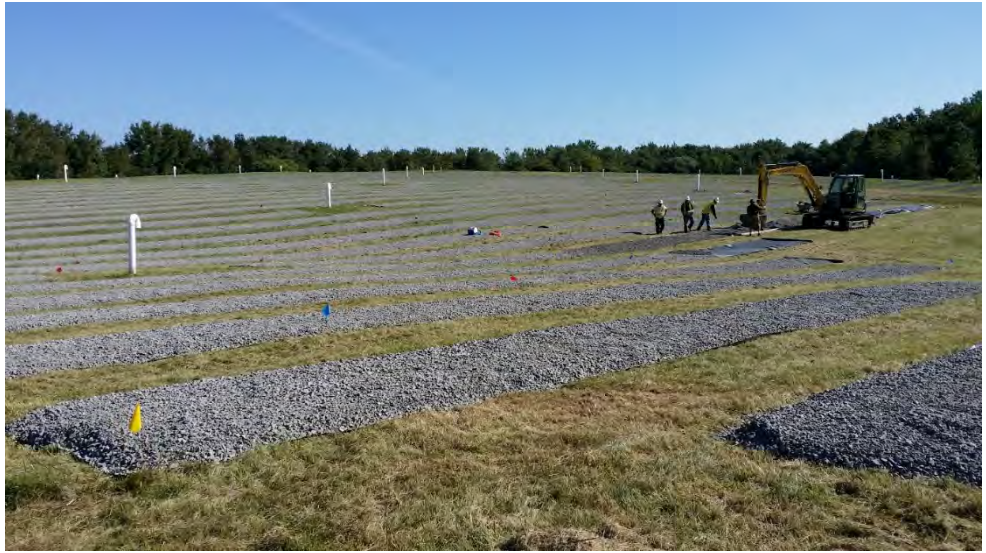
EPA RE-Powering America's Land
- Solar Screening Studies
- Mapping Tools

https://www.epa.gov/re-powering

PV Trainers Network
- Ask the expert
- Procurement Toolkit

https://training.ny-sun.ny.gov/

More on CDG: http://ny-sun.ny.gov/-/media/NYSun/files/Contractor%20Resources/Community-Distributed-Generation-Project-Developers.pdf



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Clarkstown Landfill Solar Field

George Hoehmann, Clarkstown

New York State Department of Environmental Conservation
Climate Smart Communities Webinar

March 10, 2016

THE CLARKSTOWN LANDFILL SOLAR FIELD

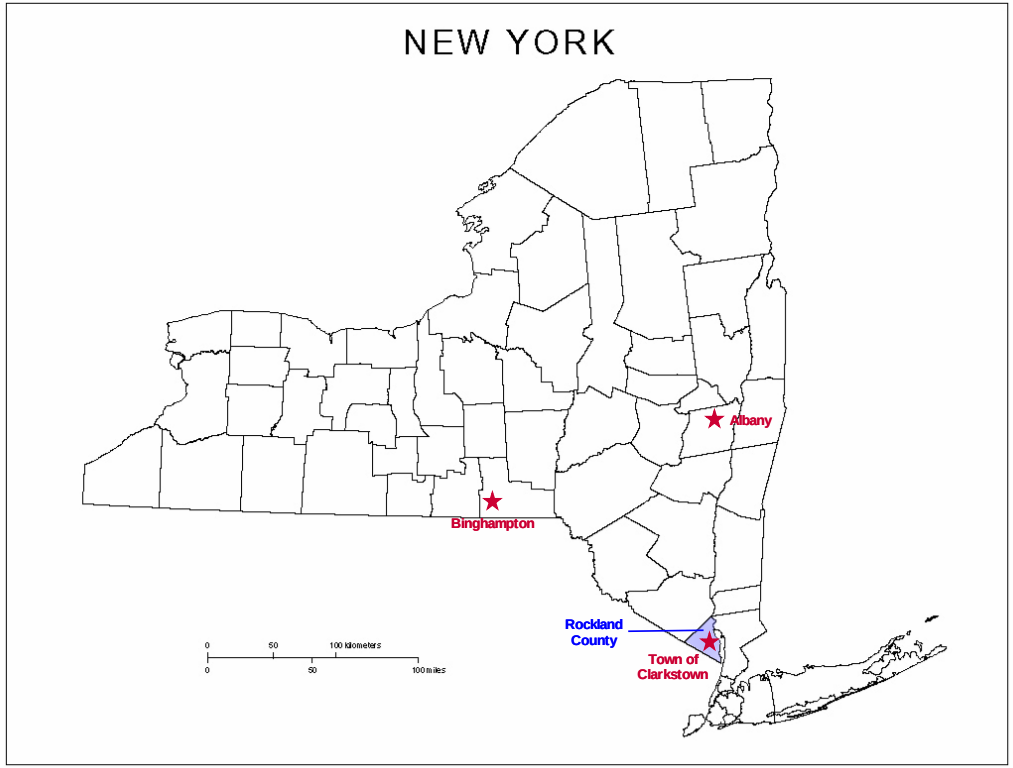
Presented By:

George Hoehmann, Supervisor

Town of Clarkstown

SUMMARY OF PRESENTATION

- Green Energy Program Initiatives
- Project Facts
- Development Incentives
- Town Closed/Capped Landfill
- Project Facts
- Development Incentives
- Power Purchase Agreement
- Landfill Complex Site Operations
- Project Initial Steps
- Project Issues
- Construction Issues
- Operational Issues
- Financial Analysis
- Lessons Learned



TOWN OF CLARKSTOWN

GREEN ENERGY PROGRAM INITIATIVES

- **Town of Clarkstown**
  - Purchasing/Projects
    - Hybrid and fuel efficient vehicles
    - Town Building retrofitted with energy saving devices
    - O&R LED pilot lights
    - Energy efficient lighting on Main Street
    - Purchase of street light system from O&R
    - Microgrid potential for Police Department, Town Hall along with County
  - Policies
    - ICLEI
    - Mayors Climate Protection Agreement
    - Open Space Program
    - NYS Energy Star Building Codes
    - Tree Preservation Law
    - Award winning Comprehensive Plan – Based on Environmental Impact Statement

WHAT DOES ONE DO WITH A CAPPED CLOSED LANDFILL?

- In 2009, then Councilman Hoehmann, proposed the idea of a solar field on the landfill
- Development of Town Evaluation Committee
  - Started in 2009
  - Finance/Planning/Environmental Control/ Engineer/Town Board Member
  - Pilot Study Potential
- Feasibility Study conducted – demonstrated potential, but fiscally did not work
- Remote net Metering and NYSERDA PON allowed for the concept to move forward
- No money out of pocket and resulting savings over 20 years

PROJECT FACTS:

- 1st MW Scale Municipal Photovoltaic (PV) Array System in New York State
- Public/Private Partnership Project
- Landfill Closed/Capped (1997)
- Landfill:
  - 161 Acre Property
  - 76 Acres Capped with 16 Acre Plateau at Top
- Solar Field:
  - 13 Acres on Capped Area
  - 2.364 MW
  - 376 Racks
  - 1,128 Ballasts
  - 8,744 Solar Panels – Canadian Solar, Inc.
- Zero Development Cost to Town
- Project Power Use Savings = $4.6 million over 30 years

DEVELOPMENT INCENTIVES:

- New York State Incentive Program
  - Governor Cuomo – Sun Initiative Program
  - NYSERDA – Pon 2156/2484
- Remote Net Metering Policy approved by PSC made project possible
- Federal Investment Tax Credits
  - 30% through 2016
  - Accelerated Depreciation

POWER PURCHASE AGREEMENT:

- 20 Year Contract Period (executed 12/18/2012)
- Exhibits
  - Installation Drawings
  - Site Description
- Lease Agreements
- Operation and Maintenance Details
- Non-Refundable Development Fee ($100,000)
- Utility Interconnection Fee Allocation
- System Acceptance Testing
- Termination Conditions
- Defaults/Remedies
- Service Fee/Purchase Price Schedule
- End Use Options

LANDFILL COMPLEX SITE OPERATIONS:

- Developer chosen - OnForce Solar Inc., Bronx, New York
- Consulting services - H2M Architects & Engineers,
- Interconnection Agreement - Randolph Horner
- Installed on active operational site
  - 800 TPD MSW Transfer Station
  - Leaf Composting Facility
  - Concrete/Asphalt Recycling
  - Mulch/Brush Chipping
  - Landfill Methane Gas Collection System
  - Community Aerodrome Operations
  - RCSWMA facility

PROJECT INITIAL STEPS:

- **Feasibility Study**
  - Prepared 2011
  - Existing energy use at Site/Town
  - Siting/Technologies
  - Utility Interconnection
  - Regulatory Agency Concerns
  - Funding Sources
  - Development Options
    - Traditional P&S/Town Funded
    - Private/Public Partnership
  - Financial Projections

- **Request for Proposal Process**
  - Initial Solicitation (May 2012)
  - Review/Negotiation (Summer 2012)

PROJECT ISSUES:

- **Utility Consideration**
  (Orange/Rockland Utilities)
  - Utility Interconnection
  - Remote Net Metering
  - SCADA monitoring requirements
  - Energy provider versus Consumer
  - CESIR Study Cost/Preparation

- **Regulatory Agency Concerns**
  - NYSDEC – Albany/New Paltz
    - Integrity of capped landfill
    - Maintain access to existing operations
    - Ongoing O&M operation
    - Methane gas collection system
    - Installation Work Plan approval (November 27, 2013)

CONSTRUCTION ISSUES:

- Access to site over landfill cap drainage swales
- Staging area locations
- Access along landfill perimeter road
- Utility coordination
- Utility service to site
- Following approved Installation Work Plan
- Layout of site on landfill
- Use of pre cast/poured in place concrete ballasts
- Stripping of existing cap cover material
- Use of recycled crushed glass for ballast base
- Concrete delivery for ballast
- Installation of racking system

CONSTRUCTION ISSUES (Continued):

- Installation of solar panels (Union Issues)
- Installation of electrical feed/wiring system
- Inverter location/delivery
- Switchgear installation/elevation
- Trenching/cover damage

- **Startup/Testing**
  - Acceptance
  - Approval

OPERATIONAL ISSUES:

- Power surges
- Wind toppling panels (just happened this month)
- Vegetation growing beneath panels
- Maintenance - cleaning panels, cutting grass, repairs, monitoring

FINANCIAL ANALYSIS:

- Initial service fee
- Escalator costs
- Determining existing electric use rate
  - $0.09611/KWH usage + delivery (2013)
- Estimate of solar panel production loss
- Useful life of solar panels – 30 years
- End use of solar panel field – What are the options?

CLARKSTOWN LANDFILL SOLAR PROJECT
PROJECTED ESTIMATED COST SAVINGS(1)

YR(2)	PAY RATE(3) $/KWH	PRODUCTION RATE(4) KWH/YR AC	TOWN COST TO DEV $/YR	PAY RATE(5) TO O&R $/KWH	PAY RATE(6) TO O&R $/KWH	SAVINGS TO TOWN(5) $/YR	SAVINGS TO TOWN(6) $/YR
1	0.083	2,493,838	206,988	.09611	.09611	239,683	239,683
5	0.093	2,444,334	227,323	.105	.108	256,655	263,988
10	0.108	2,383,833	257,454	.122	.132	290,828	314,666
15	0.126	2,324,830	292,929	.141	.160	327,801	371,973
20	0.146	2,267,288	331,024	.164	.195	371,835	442,121
25	--	2,049,449	--	.190	.237	389,395	485,719
30	--	1,949,005	--	.220	.289	428,781	563,262

NOTES:

(1) Based upon CLKT/OnForce PPA dated December 18, 2012.

(2) Assume Year One starts January 1, 2015.

(3) Initial Town pay rate to OnForce (See Page 27 of PPA) includes 3%/year escalator.

(4) Initial electrical production (See Page 22 of PPA) and includes 0.5%/year production loss years 2 through 20, 2%/year loss years 21 through 25, 1%/year loss years 26 through 30.

(5) Initial utility rate of $0.07764/KWH (usage)+ $0.01847/KWH (delivery) provided by Rob Berdy, Town Purchasing to July 1, 2016. Includes 3%/year utility escalator assumed.

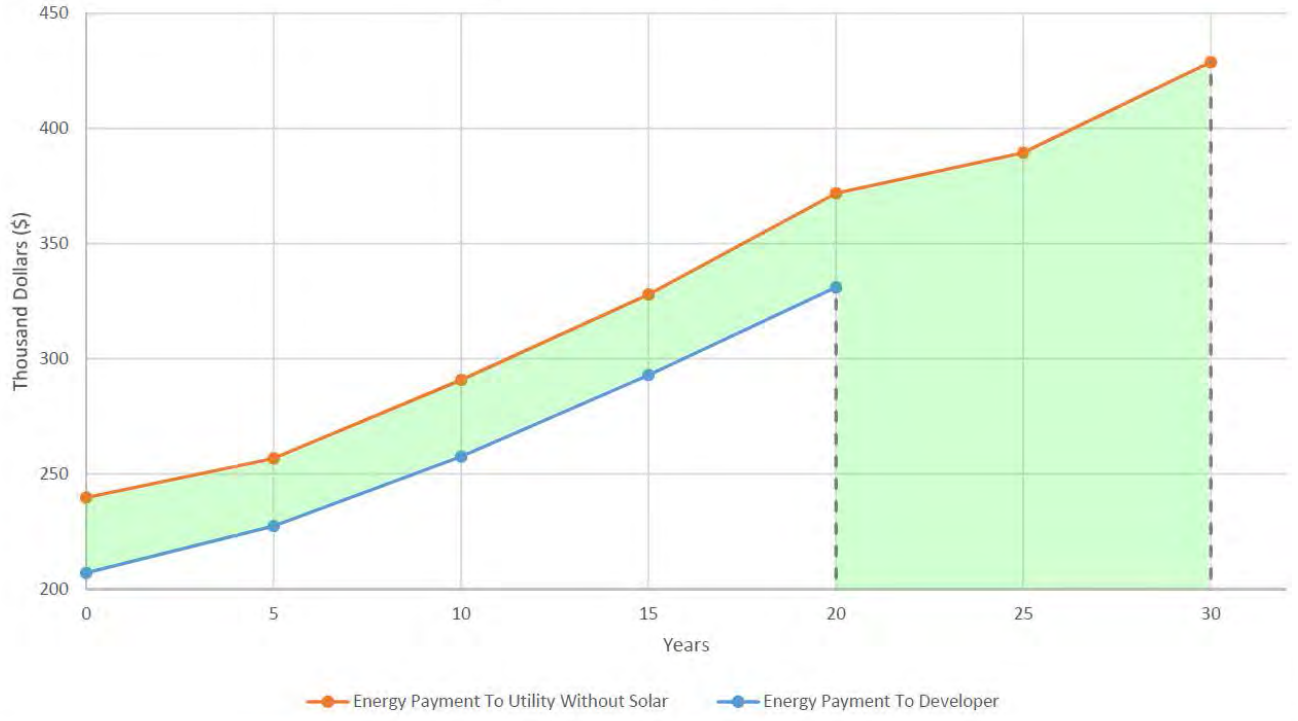
(6) Same as Note (5) except assumes 4%/year utility escalator.

CLARKSTOWN LANDFILL SOLAR PROJECT
PROJECTED ESTIMATED COST SAVINGS

YR	TOWN COST TO DEVELOP	TOWN SAVINGS FROM UTILITY		NET SAVINGS	
		WITH 3% ESC	WITH 4% ESC	WITH 3% ESC	WITH 4% ESC
1-20	$5,276,447	$5,940,196	$6,512,427	$663,749	$1,235,980
21-25	--	$1,912,654	$2,340,372	$2,576,403	$3,576,352
26-30	--	$2,067,130	$2,658,887	$4,643,533	$6,235,239

- $50,000 savings first year

CLARKSTOWN LANDFILL SOLAR PROJECT
PROJECTED ESTIMATED COST SAVINGS



LESSONS LEARNED:

- Have realistic expectations about the ability and experience of the utility company
- Have a clear understanding of the Interconnection Agreement with the utility company
  - Our utility company had not dealt with this before
- Assign a Project Manager from the municipality – especially after construction
- Verify that utility will allow credit for electricity produced to be applied to more than one account
  - Our utility company initially only allowed credit to a limited number of bills
- Ensure capability of the utility to verify what is produced
  - Our utility company only has one staff person to conduct this process through meters resulting in significant lag time
    - As a result, the Town received several shutoff notices
    - Some utility companies have automatized processes, ours does not – be aware

LESSONS LEARNED:

- Understand that company that builds the solar installation may sell
  - Our company sold to a company in Utah under a separate LLC.
- Evaluate the use bonding instead of Power Purchase Agreement
  - We are saving, but the debt service on a bond is more attractive
- Have an emergency operations plan in place to manage the solar field
- Verify who has the Maintenance Contract
- Know what is covered and what is not
- Have a breakdown of each agency’s responsibilities

LESSONS LEARNED:

- It is good to be first, but it has its drawbacks
  - You have the benefit of learning from us to have even better projects
- If I had it all to do over again, I would, with some changes
- We will proceed with more solar projects and our experience will improve these projects in the future.

QUESTIONS?

George Hoehmann, Supervisor – g.hoehmann@clarkstown.org

Climate Smart Communities Webinar

Thanks for joining us!

Website for webinar slides and recordings:

http://www.dec.ny.gov/energy/84359.html

Contact Email: Dazzle Ekblad

dazzle.ekblad@dec.ny.gov

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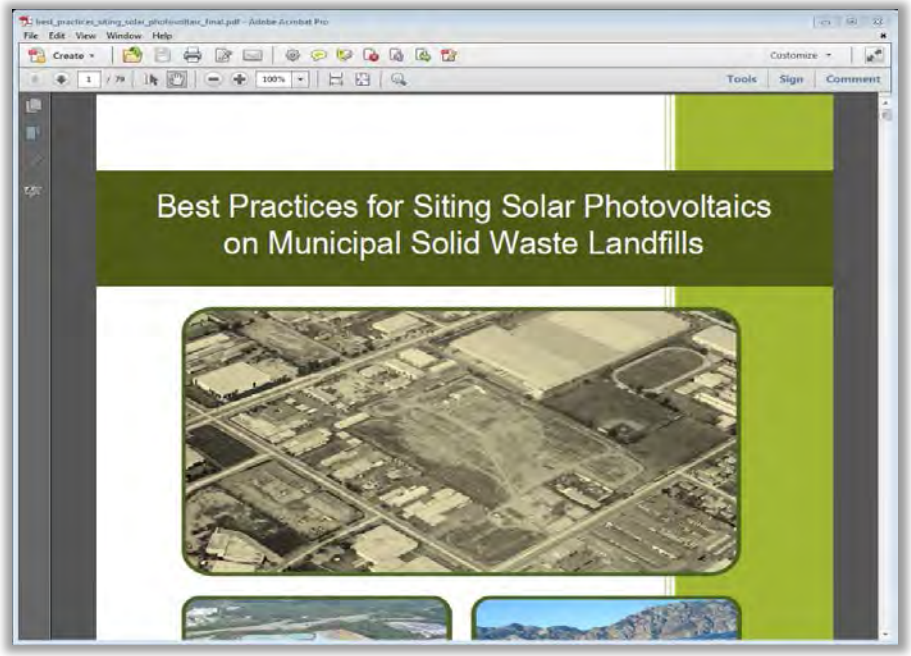
Additional Resources from US EPA



- Best Practices Guide
- Contacts at EPA Region 2, who are supportive of landfill solar projects & offer screening assessments
  - Fernando Rosado (EPA, NYC) Rosado.Fernando@epa.gov 212-637-4346
  - Vince Pitruzzello (consultant) Vince.Pitruzzello@gmail.com 914-606-0103

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