Clean Energy States Alliance Webinar

Solar Maps as Tools for Advancing Solar Energy

Hosted by Warren Leon, Executive Director, CESA

March 5, 2014



Housekeeping



All participants are in "Listen-Only" mode. Select "Use Mic & Speakers" to avoid toll charges and use your computer's VOIP capabilities. Or select "Use Telephone" and enter your PIN onto your phone key pad.

Submit your questions at any time by typing in the Question Box and hitting Send.

This webinar is being recorded.

You will find a recording of this webinar, as well as all previous CESA webcasts, archived on the CESA website at

http://www.cleanenergystates.org/webinars/



About CESA

Clean Energy States Alliance (CESA) is a national nonprofit organization working to implement smart clean energy policies, programs, technology innovation, and financing tools, primarily at the state level. At its core, CESA is a national network of public agencies that are individually and collectively working to advance clean energy.



Today's Guest Speakers

Tria Case, University Director of Sustainability at the City University of New York

Emil King, Policy Analyst in the Energy Administration at the District of Columbia Department of the Environment







The NYC Solar Map

City University of New York America's Largest Urban University 24 Academic Institutions | 500,000 Students Tria Case, Esq., University Director of Sustainability



Sustainable CUNY

America's Largest Urban University 24 Academic Institutions | 500,000 Students



Modeling a CUNY transformation Building the tools to move cleantech in to NYC and beyond Building commercialization platforms



NYC Solar 2006



Building the Foundation of Change in NY

U.S. Department of Energy

- 2013 SunShot Rooftop Solar Challenge II NYS, NYC
- 2012 NYSolar Smart Phase 1 a NYS, NYC
- 2011 SunShot Rooftop Solar Challenge I *NYC*
- 2010 ARRA 'Special Projects' NYC
- 2007 Solar America City *NYC*
- 2006 Million Solar Roof NYC



Generating more than electricity









Sustainable CUNY

Solar Plan Implementation





NYC SOLAR MAP

Zoom to Borough

Find Address

Go Select Building Clear Selection

Draw Solar

NYC SOLAR MAP

 Showcases existing installations

TOOLS

- LiDAR based PV potential for every rooftop in NYC
- Marketing tool for industry , ie customer acquisition
- Planning tool for utility
- Calculator





Installation



Description	Brooklyn Greenroof Solar	
Property Type	Residential	
Installer	AeonSolar	
Size	7.4 kW	
Installation Date	October 2009	
Annual Output	8,000 kWh	
Live Solar Data	N/A	

Testimonial

The owners wanted to do something to lower their carbon footprint and to be an example of environmental stewardship in their community.

METHOD



- Create a 3-D model of New York City
 - LiDAR for creating a Digital Surface Model (DSM)
- Run a model to calculate solar insolation
- Calibrate model
 - Typical Meteorologic Year (Central Park)
 - Pyronameter (Hunter College Weather Station)
 - Other solar sites
- Develop Custom Web Map

The NYC Solar Map was built in the C.A.R.S.I. Center at CUNY's Hunter College under the direction of Professor Sean Ahearn

LiDAR (Light Detection And Ranging)

LiDAR Operating Principles

LIDAR (light detection and ranging) is mapping technology through which a laser is fired at the ground from an airplane to measure distance to the ground. LIDAR was developed as a fast and effective method to gather digital elevation model (DBM) data. With state-of-the-art LIDAR sensors, and many thousands of square miles of data successfully acquired and processed. Sanborn sets the highest standard of accuracy and reliability for LIDAR technology.





LIDAR Data Created a Digital Elevation Model for New York City





Radiation data was layered on top of LIDAR



Solar Model Calibration

Model parameters were adjusted, and output was corrected, to match an average of TMY3 and Redbook data, which results in a slight discrepancy from TMY3. TMY3 is a 'typical meteorological year' based on 30 years of observations in Central park. Model results are for flat unshaded areas within Manhattan:



Panel Tilt and Azimuth Angle Adjustment

This plot shows the estimated yearly output for a 1kW system in NYC based on the tilt and azimuth angles of the panels, from the NREL PVWatts system. Solar potential is the product of the monthly estimated output from PVWatts, the usable area, and the shading derate factor, which is the ration of modeled radiation (using LiDAR) to reference radiation for a flat unshaded surface.



Key Functionalities

D





Annual electricity bill savings up to: **\$44,151**. You can install up to **183.93** kilowatts of solar here. Reduce your annual carbon emissions by up to **162,880 lbs/yr**. That's the same as planting **435 trees**!

Note: estimates only, actual values may vary. Click here to learn how this building's solar potential was estimated.

Get Site Details >

PV Potential for Every Rooftop





Cost Estimates - Incentives, payback



Calculator Output

Cost*

System Size	45.38 kW-DC
Total System Cost, Before Incentives 🗉	\$272,280
Cost After All Incentives and Taxes 🗉	\$38,800

Financial Metrics

Payback Period 🗉	5 yrs
Net Present Value	\$15,953
Internal Rate of Return	12%
Levelized Cost of Electricity w/Incentives 🗉	0.16 \$/kWh

Electricity Bill Savings

Energy Production	46,642 kWh/yr
Savings 🗉	\$9,795/yr

Environmental Impact

CO2 Emissions Reductions 🗉	32,113 lbs/yr
Trees Planted Equivalent	86 trees

*Note: A solar lease or power purchase agreement can reduce your upfront cost to zero! Ask your installer for details.

Cumulative Net Cash Flow



Incentives

NYSERDA/LIPA Incentives 🔢	\$68,070
Federal Tax Credit 🔟	\$81,684
NY State Tax Credit 🗉	\$ 0
NYC Property Tax Abatement 🗉	\$40,842
MACRS + 50% Bonus Depreciation in Year 1 🔢	\$81,003

Steps for Installing Solar in NYC

ilding

GO TO MAP 🕨

ility | ate (\$

00 🚽

rray orientation 🗉	s
ost (\$/Watt-DC) 🗉	6.00

"Draw a System" Feature



NYC SOLAR MAP O Find an Zoom to Borough Go Selection Building an Area Summary Annual electricity bill savings up to: \$252,365. You can install up to 4,602.37 kilowatts of solar here. Reduce your annual carbon emissions by up to 931,011 lbs/yr. That's the same as planting 2,484 trees! Note: All results are estimates and may change depending on building-specific information. Enter your information by clicking below. Get Site Details >

NYC

22

20

18

16

2

Solar Market Growth



Economic **Development**

1MW in NYC in 2007 represented \$8,330,000

The growth to 22.4 MW by November of 2013 represents \$162.6 Million



U.S./ NYS/ NYC Annual Growth





Tria Case University Director of Sustainability tria.case@mail.cuny.edu

NYSOLAR SMART

★ ★ ★ SUSTAIN ABILITY

Expanding Solar Access: Solar Potential Modeling & Mapping in the District of Columbia

March 5, 2014









- 1. Energy Sustainability in DC
- 2. Primary Solar Policy Drivers
- 3. Solar Mapping Overview and Details

1st in per capita ENERGY STAR rated buildings (US EPA) 1st in per capita LEED certified projects among large cities (US Green Building Council)

1st among US communities in citywide green power usage (US EPA)

1st in solar density among states

capitol hill

ar tour & fair

Solar

(Green Source Magazine)

Solar panels at Lutheran Church of the Reformation Credit: DDOE-Energy

Solar Policy Drivers

Numerous Legislative Supports:

- Renewable Portfolio Standards Act
- Green Building Act
- Clean and Affordable Energy Act
- Sustainable DC Act
- Distributed Generation Amendment Act
- Community Renewables Energy Act



Vision for a Sustainable DC



In just one generation—20 years—the District of Columbia will be the healthiest, greenest, and most livable city in the United States.

An international destination for people and investment, the District will be a model of innovative policies and practices that improve quality of life and economic opportunity.

We will demonstrate how enhancing our natural and built environments, investing in a diverse clean economy, and reducing disparities among residents can create an educated, equitable and prosperous society.



Sustainable DC Plan Structure

- > 32 Goals, 31 Targets, 143 Actions
- 4 Challenges, 7 Solutions



CHALLENGES	SOLUTIONS
	•Built Environment
 Jobs and the Economy 	•Energy
•Health and Wellness	•Food
	•Nature
 Equity and Diversity 	 Transportation
 Climate and Environment 	•Waste
	•Water

Highlight: Energy

* * * SUSTAIN ABILITY

Goal : Increase the proportion of energy sourced from clean and renewable supplies

Target: By 2032, increase the use of renewable energy to make up 50% of the District's energy supply

Actions:

- ID opportunities for neighborhood scale renewable energy systems (ST)
- Build 1,000 new renewable energy projects (MT)
- Introduce legislation to reduce fuel-based power use (LT)

Highlight: Built Environment

Goal : Ensure highest standard of green building design for new construction

Target: By 2032, meet net-zero energy use standards in all new construction projects.

Actions:

- Adopt latest green building code for all new construction/major renovations (ST)
- Update Green Building Act to require higher level of LEED certification (MT)
- Require all new buildings to be net-zero or netpositive (LT)

RPS Annual Increase

* * * SUSTAIN ABILITY
DC

Year	Tier 1	Tier 2	Solar
2011	4%	2.5%	0.40%
2012	5%	2.5%	0.50%
2013	6.5%	2.5%	0.50%
2014	8%	2.5%	0.60%
2015	9.5%	2.5%	0.70%
2016	11.5%	2%	0.825%
2017	13.5%	1.5%	0.98%
2018	15.5%	1%	1.15%
2019	17.5%	0.5%	1.35%
2020	20%	0%	1.58%
2021	20%	0%	1.85%
2022	20%	0%	2.175%
2023	20%	0%	2.50%

Source: DC Public Service Commission

DC RPS – Solar Carve Out

976 solar PV and 65 solar thermal systems <u>within</u> the District eligible for the RPS program Additional 2,239 solar energy systems <u>outside</u> of the District are eligible Total reported capacity of~29.6 MVV, of which ~10.3 MVV is located within the District. Current SREC price ~\$480 (Flett Exchange,

2/3/14)



Source: DC Public Service Commission

Citywide Photovoltaic Distribution

SUSTAIN ABILITY



Mapping Project Goals

SUSTAIN ABILITY

- Support Mayor Gray's Sustainable DC goals
- Comprehensively map the District's PV installations
- Provide a resource to analyze citywide solar potential on a lot-by-lot basis
- Showcase Solar System where national energy policy is debated and created
- Demonstrate viability of community action driven by a powerful and engaging information tool
- Accelerate deployment and adoption of other open energy mapping and analysis tools elsewhere

Project Planning

Areas for Consideration

Sponsor's Customization



- Logos, program content, installed PV system info, optional inputs, installer info
- Local Intelligence
 - Financial incentives (installation, generation), restrictions by building type, system installed prices
- Launch and Outreach
 - Press materials, social media plan
- Administrative
 - Contractual agreements, payment terms

Partner Roles

Mapdwell

- Developed solar potential data as delivered and visualized through Solar System
- Developed cost/benefit analysis modules

District of Columbia

Provided underlying input datasets, content, and imagery

*As of February 1, 2013



Washington DC, USA

Sample Statistics

Total Potential 2,669 GWh/year High Yield PV Capacity 2.693 GW Total Listed Systems 4.279 MW Number of Buildings 156,195 Average Footprint 1,418 sqft High Potential Area 6.5 sqmi Total City Area 68.34 sqmi Population 632.323

Input Data Sets

LIDAR 2008 by DC GIS Aerial Imageny May 2008 by DC GIS Building Footprints 1999 updated in 2005, 2008 and 2010 by EarthData International, Inc.

About

Map Stats



High Yield PV Capacity - 2.693 GW Total PV Production Potential - 2,669 GWh/yr Total Listed Systems – 6.97 MW Number of Buildings - 156,195 Average Footprint - 1,418 sq ft High Potential Area - 6.5 sq mi Total City Area - 68.34 sq mi Population - 632,323

Selected Map Features









C in en mapdwell.com/asiarystem/dc



Contact Information

Emil King

Policy Analyst, Energy Administration District Department of the Environment

Phone: 202-870-7248 Email: <u>emil.king@dc.gov</u>

ddoe.dc.gov green.dc.gov





Today's Guest Speakers

Tria Case, University Director of Sustainability at the City University of New York, <u>tria.case@cuny.edu</u>

Emil King, Policy Analyst in the Energy Administration at the District of Columbia Department of the Environment, <u>emil.king@dc.gov</u>







Thank you for attending our webinar

Warren Leon CESA Executive Director wleon@cleanegroup.org

Find us online:

www.cleanenergystates.org

facebook.com/cleanenergystates

@CESA_news on Twitter

