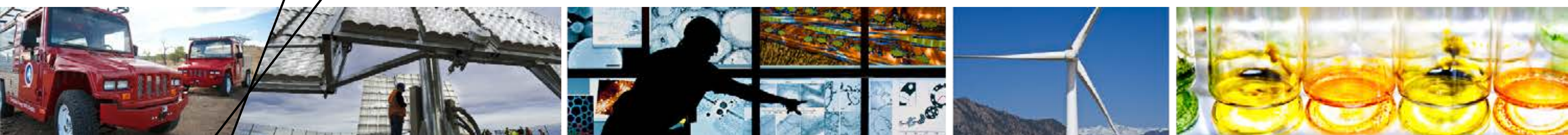
Distributed Generation Interconnection Collaborative (DGIC)



"Highlights of SunShot Projects: Interconnection as Part of a Strategic Resource Planning Process"

Virginia Lacy and Mark Dyson with RMI Electricity Practice and Alison Kling with Con Edison

September 24, 2014

Speakers

Virgina Lacy
Principal
RMI Electricity Practice

Mark Dyson
Senior Associate
RMI Electricity Practice

Alison Kling
Distributed Generation Specialist
Con Edison

Kristen Ardani
Solar Analyst
National Renewable Energy Laboratory
(DGIC moderator)

REGULATORY TOOLS & PROCESSES FOR DISTRIBUTION PLANNING

A POTENTIAL eLAB INITIATIVE

RMI. Creating a clean, prosperous, and secure energy future.™

eLab
Electricity Innovation Lab
ROCKY MOUNTAIN INSTITUTE

Rocky Mountain Institute®

ABOUT RMI AND ELAB

Rocky Mountain Institute works across industries on challenging energy issues to drive the efficient and restorative use of resources with market-based approaches

e-Lab brings together leading electricity sector actors to solve regulatory, business, and economic barriers to the economic deployment of distributed resources

ABOUT THIS WORK

- Identified increasing need to provide clearer insights to regulators, utilities, customers, and developers about the system-level technical and economic effects of increasing adoption of distributed energy resources [DER].
  - How will DER (lead currently by PV) help or hinder distribution system operations?
  - Where are the best areas for deployment?
  - How will the new resources affect the operations of the rest of the system?
  - What are the long-term effects on planned investments?
  - What is the effect on retail rates?
  - What's the economic impact on customers?

- Through eLab and RMI project work, RMI is investigating opportunities to address gap
  - DOE SunShot funded EDGE tool and related work
  - eLab Regulatory Tools work

OBJECTIVES

1. Characterize best practices for the creation & review of Distribution Resource Plans [DRPs], including analysis tools and linkages between model silos
2. Identify relevant stakeholder concerns, and availability of software and data used to model and address them
   - Create detailed gap analysis
3. Identify a process framework for regulators, utilities, and third parties to ensure least-cost outcomes that meet policy goals

This Webinar:

– Present initial survey results and synthesis, with goal to receive feedback on hypotheses, approach, and proposed work product.

CURRENT PROCESSES & FUTURE NEEDS

Current process (e.g. California)

- Utilities submit rate cases detailing planned distribution network expenditures in various FERC budget categories
    - Variety of modeling tools are used in simulating system behavior and upgrade needs
- Regulatory staff & interveners review planned investments
    - Availability of input data and modeling tools for review is inconsistent
- Based on evaluation & comments, regulators must approve and/or modify requested budgets

Future needs

- Distribution system planning should be linked explicitly to policy goals (e.g. DER adoption levels)
- Advanced capabilities of DERs (e.g. inverters, storage) should be modeled to capture their value to the system
- Regulators should have increased technical capability to vet DRPs
    - Requires access to models and necessary data to ensure that utility DRPs meet above criteria
- This may require a new breed of integrated model to evaluate DRPs in a consistent framework

COMMON THEMES: REGULATORY PROCESSES

Hawaii –

- Focus on **alleviating issues** with existing, high PV penetration
- Emphasis on incorporating **advanced capabilities** of DERs

California –

- Focus on lowering interconnection costs by finding **optimal locations**

New York –

- Focus on **defining markets** for DER development and services
- Acknowledge interaction with NYISO and **bulk power interplay**

Common themes –

- New rules for distribution planning are rooted in **public policy goals**
  - e.g. DER adoption levels
- Emphasis on **safety and reliability** of system and possible DER value
- Driving goal is **lower net costs** for ratepayers through adoption of cost-effective technologies
  - e.g. Defer traditional capital projects via DER adoption
- Acknowledge need for new **rate structures** to effectively incentivize customers with various DERs

CASE STUDIES: NETWORK PLANNING WITH DER

Several utility planning processes have examined isolated cases where DER adoption may offset transmission and distribution infrastructure investment.

Bonneville Power Administration

- In 1990s, risk of voltage collapse due to long transmission corridor to Puget Sound area
- BPA invested in capacitors, local generation, and efficiency programs to mitigate risk without new lines

Consolidated Edison (NY)

- As part of load forecasting, takes into account impact of geography-specific efficiency programs
- Con Ed estimates it has reduced required capital investment by $1B over its 10-year investment horizon

Green Mountain Power (VT)

- Planned expansion of a ski resort would increase load by 15 MW
- A combination of load management and utility-sponsored efficiency were used to avoid transmission upgrades

- These and other examples showcase an approach to planning that considers DERs in a least-cost analysis framework
- The lessons learned can be applied to contemporary efforts at integrated distribution system planning

Source: Regulatory Assistance Project, "US Experience with Efficiency As a Transmission and Distribution System Resource," 2012

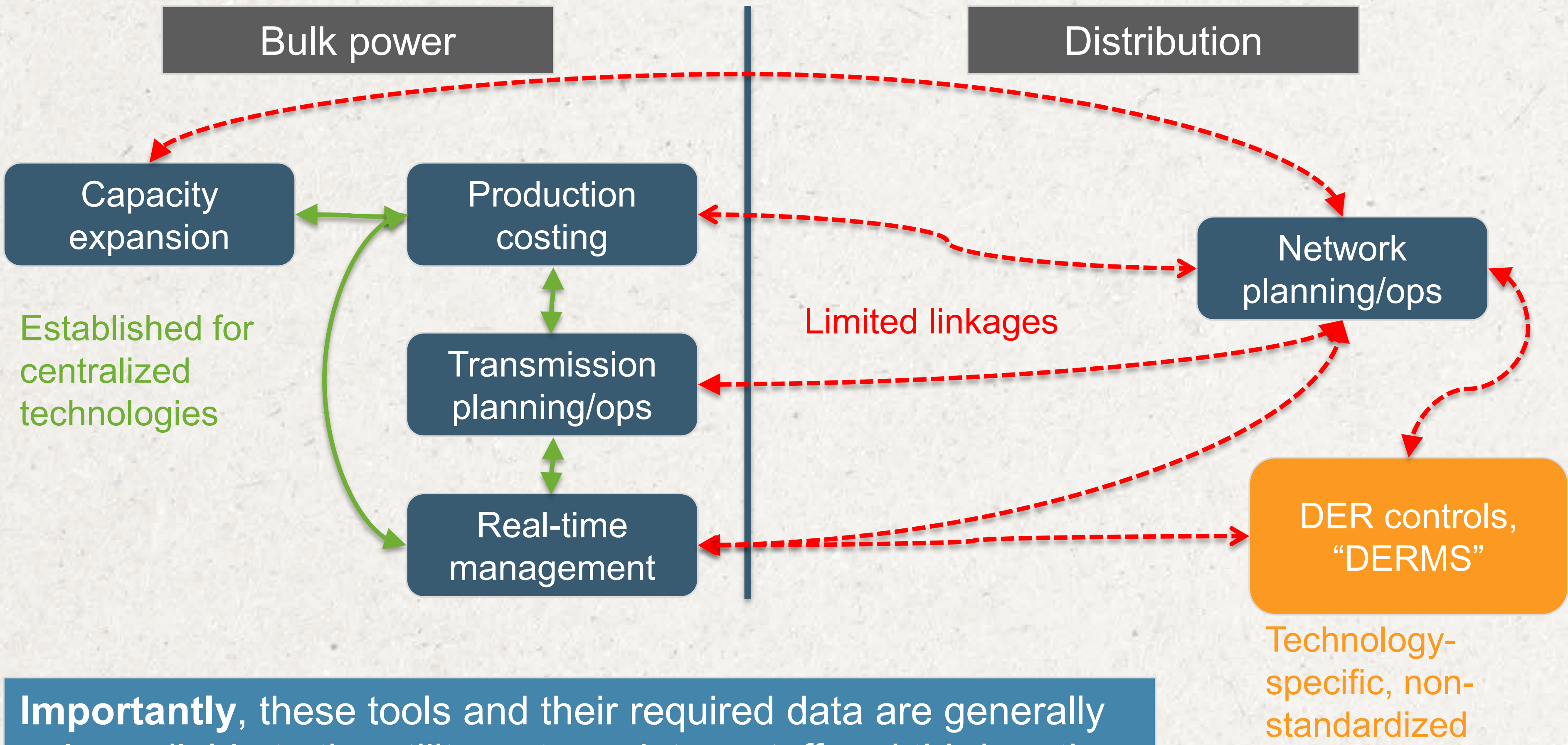
TOOLS RELEVANT TO DISTRIBUTION PLANNING

Model type	Examples	Key outputs	Modeling need for DRP	Current capabilities
Capacity expansion	Strategist	Bulk power capacity	Options for DERs to reduce bulk capacity needs	−
Production cost	Plexos	Generator costs & transmission use	Interaction of aggregated DERs with bulk power commitment & dispatch	−
Transmission planning	GE PSLF	Steady-state power flows & dynamic results	Impact of aggregated DERs on transmission-level power flows and contingency response	−
Distribution planning	SynerGEE	Power flow and equipment use	Impact of DERs on equipment use, safety, and dynamic conditions	+
Real-time management models		Pricing and contingency metrics	Interaction of DERs with real-time markets and dispatch logic	−
DER operations	BlueFin	DER schedules, customer metrics	Interaction of DER fleets with network & grid equipment	−

Source: Adapted from Navigant Consulting / Energy Storage Alliance, 2014, "Survey of Models and Tools for the Stationary Energy Storage Industry"

MODELING TOOLS: GAP ANALYSIS

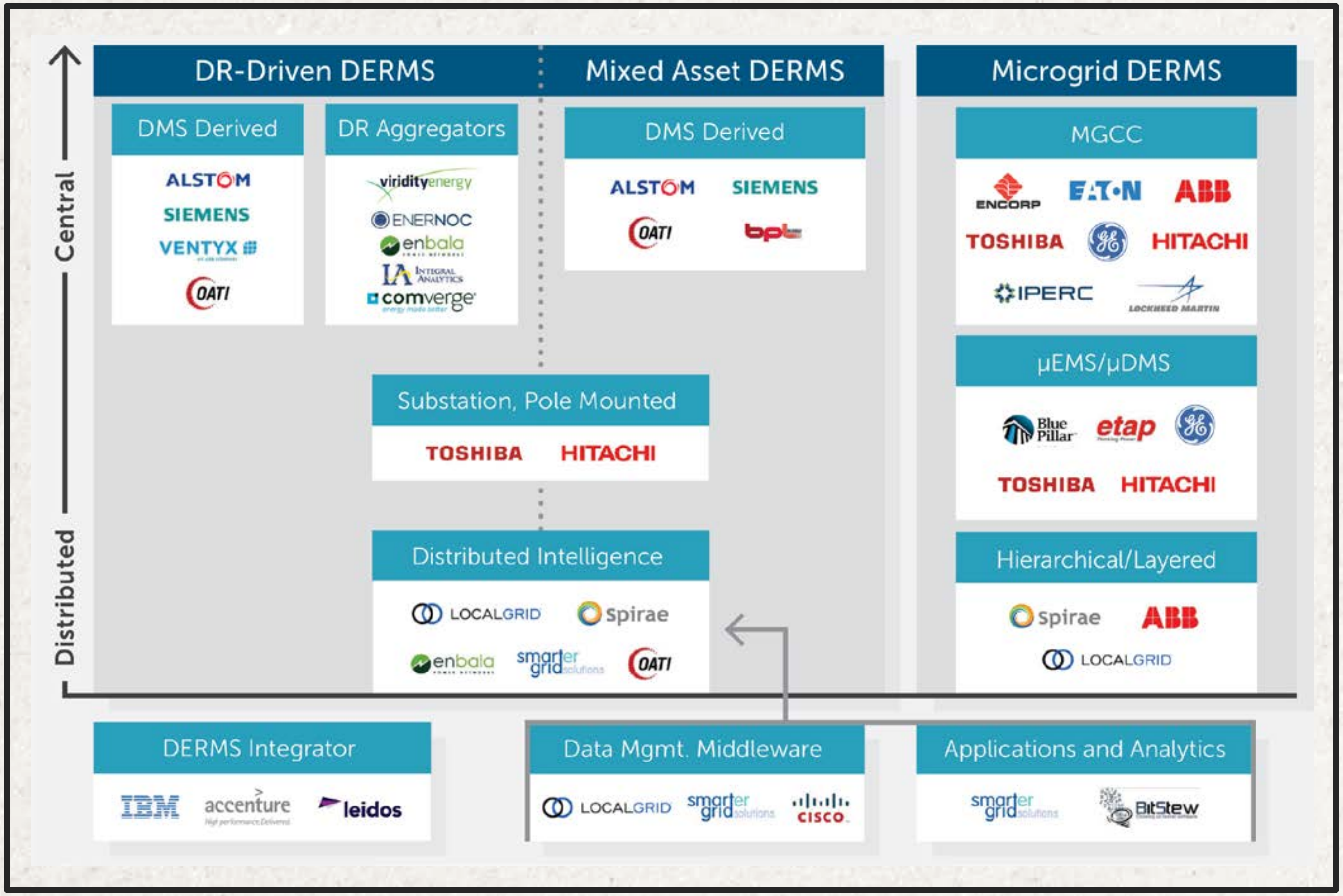
Utility planning processes tend to be split between transmission- and distribution- level analysis. Integrated DRP modeling requires an explicit link between these silos.



Importantly, these tools and their required data are generally only available to the utility, not regulatory staff and third parties

MODELING TOOLS: "DERMS" SOLUTIONS?

DER Management Systems (DERMS) make up a rapidly-growing category of tools for monitoring and managing distribution systems and connected DERs.



Several issues are important in determine use in creating/evaluating DRPs:

- Level of interface with ISO-level modeling
- Capability of DERMS as a planning tool
- Data requirements & accessibility

Source: Greentech Media Research, "Distributed Energy Resource Management Systems 2014" (pre-publication brochure)

PROPOSED FRAMEWORK: REGULATORY PROCESS

Regulators should ensure that DRP requirements allow stakeholder vetting and support policy goals

Utilities need better, integrated models to fully address DRP requirements

Regulators will evaluate whether the filed DRP addresses stakeholder concerns and meets policy goals

DRP requirements

DRP creation

DRP review

DRP approval

Stakeholder review, e.g.:

- ISO: bulk power impacts
- PV industry: interconnection
- DER vendors: compatibility
- Ratepayers: system cost

Stakeholders need access to the same models and data used to create the DRP – or at least a subset – to vet utility plan outcomes and advise regulatory staff on adequacy of the DRP in meeting goals.

For results driven by proprietary tools unavailable to third parties, methodology should be transparent.

ELAB PROPOSED PRODUCTS

- eLab is in a unique position to convene the key stakeholders in these ongoing processes (regulators, utility staff, DER industry, ISOs, software vendors, etc.) in order to gain insight into emerging best practices in creating and evaluating DRPs.
- eLab has convening power and influence at a national as well as regional or state scale; this leads to a choice of the best way to leverage our network for greatest impact:

"Breadth-first" synthesis

- Focus on synthesizing common experiences and best practices from ongoing processes in leading states
- Partner with DER developers, software vendors, and a selection of regulator and utility staff to arrive at broadly-applicable framework and best practices
- Sets the stage for a deep dive project

"Depth-first" working group

- Focus on detailed gap analysis and process building for a specific state
- Partner with key regulatory and utility staff, as well as local stakeholders, to arrive at actionable recommendations for the state in question
- Lends detailed insight to a more broadly-applicable synthesis

Rocky Mountain Institute®

We welcome your questions & comments

mdyson@rmi.org | vlacy@rmi.org

Improving the Customer Experience: Residential Interconnection

NREL
Distributed Generation Interconnection Collaborative

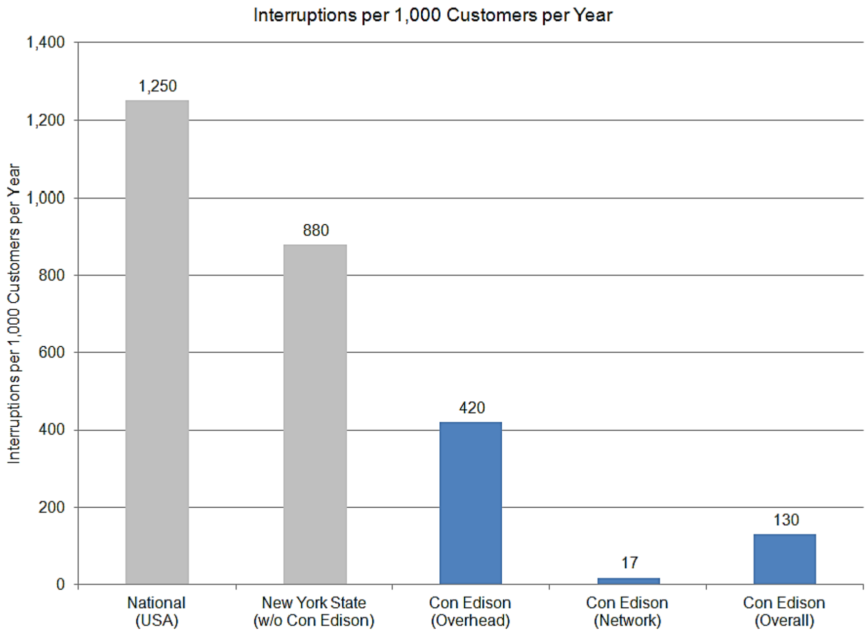
September 24, 2014

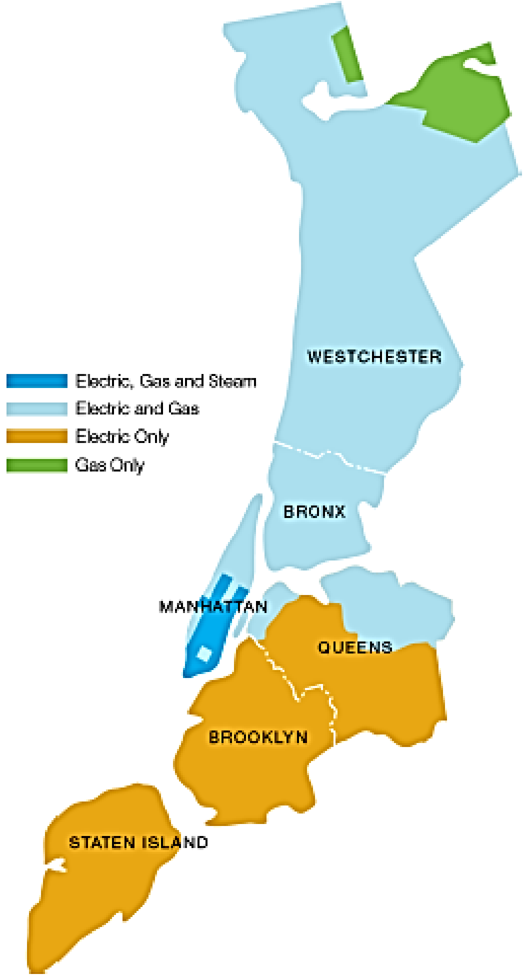
Con Edison

Alison Kling
Specialist, Distributed Generation Group

Con Edison

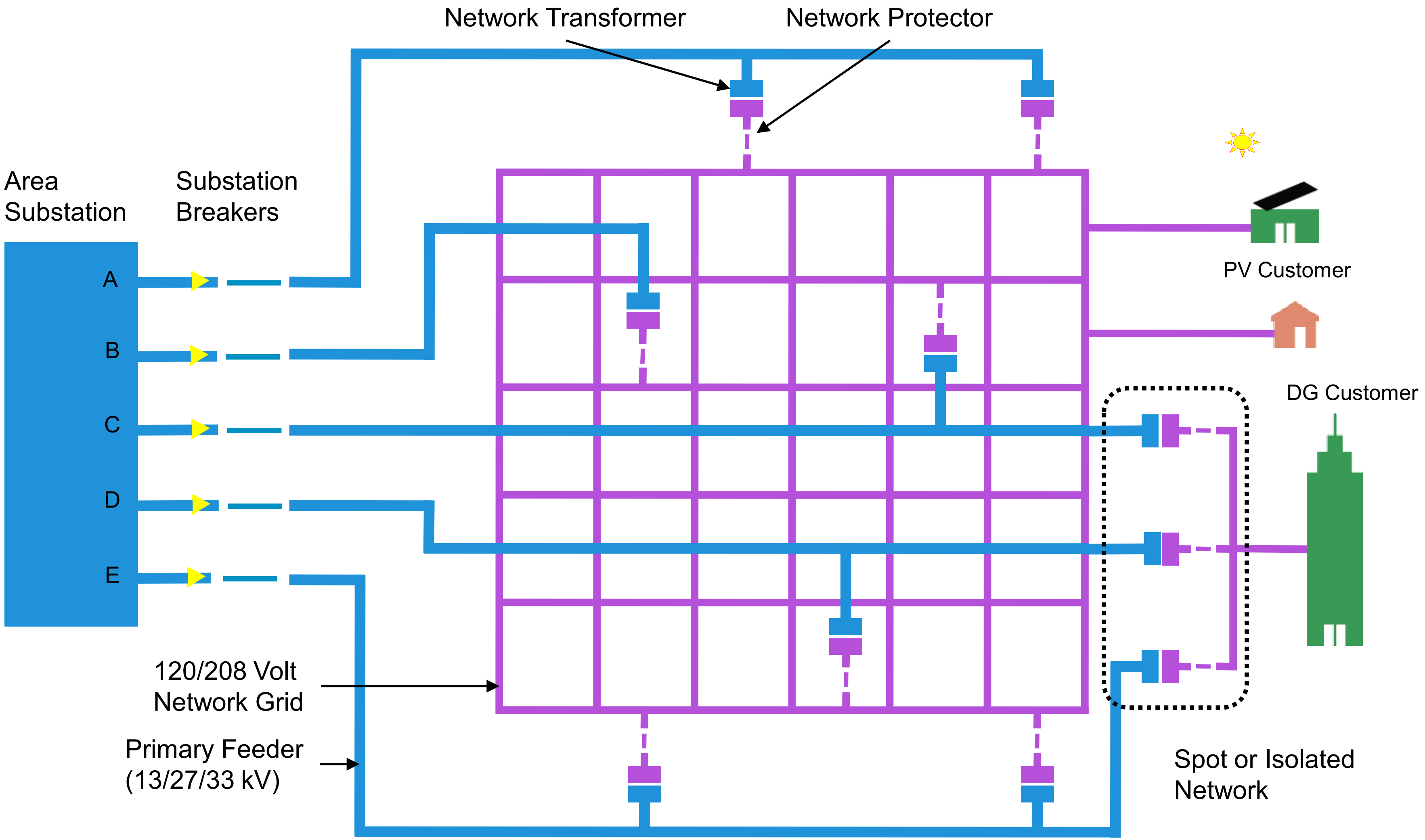
	Customers	Infrastructure	Service Territory
Electric	3.3 million (2.4 Network)	One of the world's largest UG systems	All 5 boroughs and Westchester County
Gas	1.1 million	4,333 miles of gas mains and services	3 out of the 5 boroughs and Westchester County
Steam	1,760	World's largest district steam system	Manhattan below 96th Street



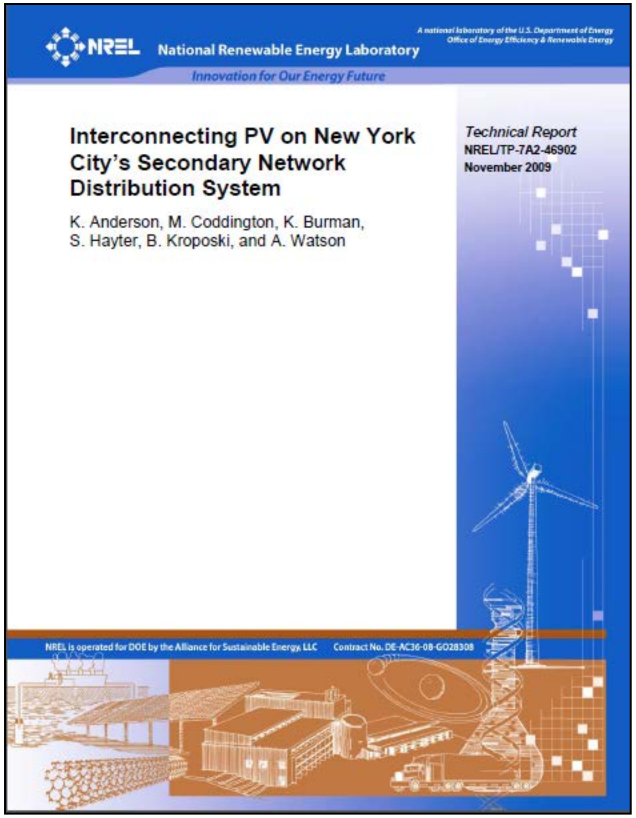


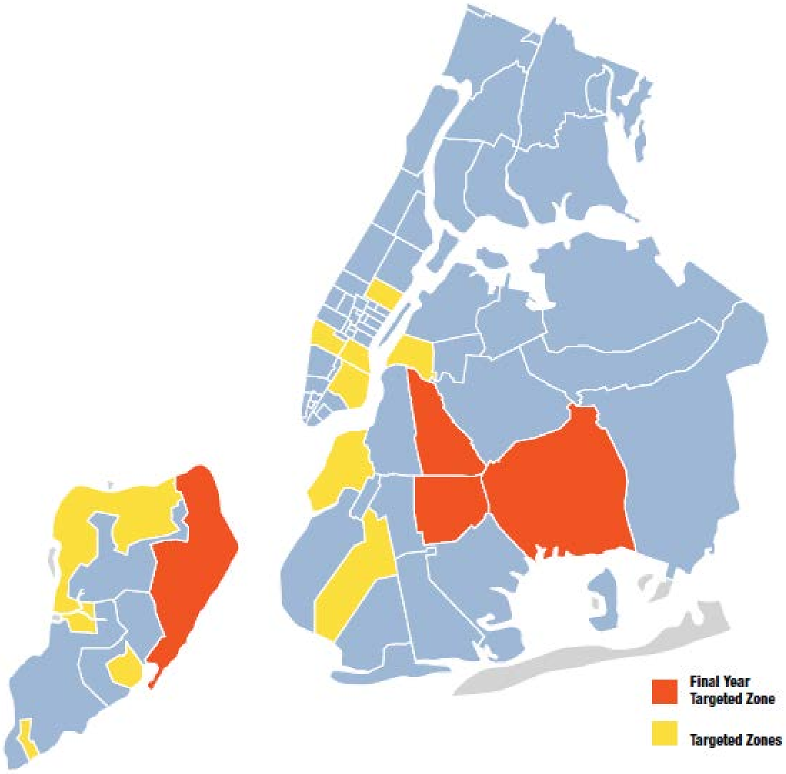
conEdison

Typical Network Grid



Interconnection in a network system





2009 NREL report on technical impacts of PV

"Solar Empowerment Zones": daytime peaking networks with extra incentives for solar PV

Current and expected PV (Q2 2014)

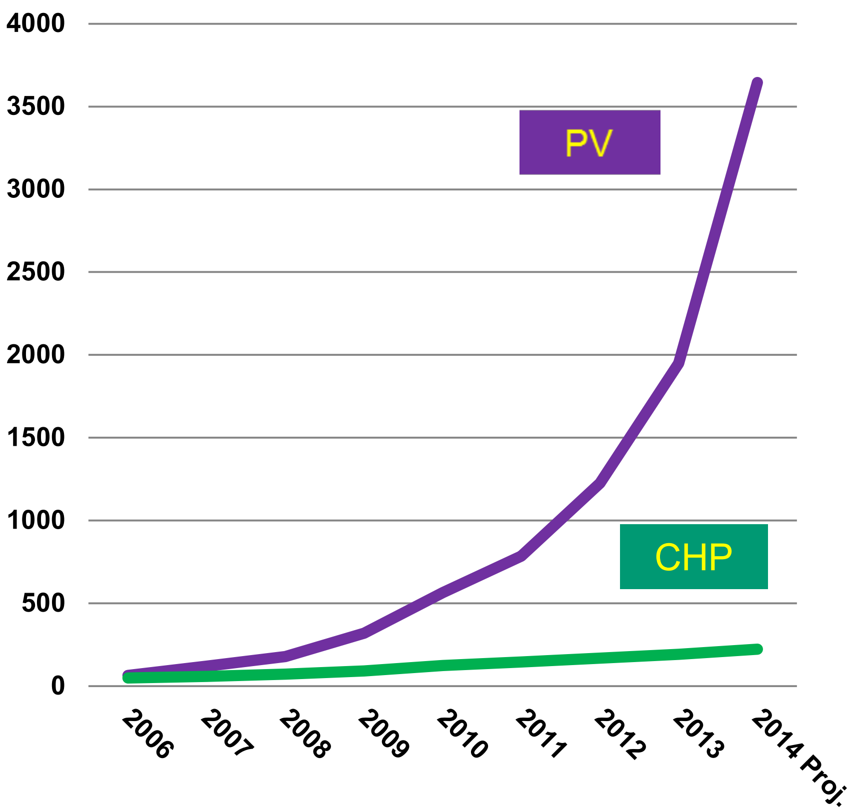
- Added 1300 customers & 16MW in just over 2 quarters
- Bronx - Jetro Cash & Carry 1.6MW PV with SCADA
- Staten Island
  - 825 residential installs
  - More than an order of magnitude residential jump
  - Doubled commercial capacity with only 9 installs
- Residential still growing after 2013 year end rush
- On pace to nearly double capacity

PV Installed	Commercial		Residential		Totals (includes all types)	
Region	Installs	kW	Installs	kW	Total Installs	Total kW
BK	132	6,134	189	931	332	7,545
BX	77	5,478	52	311	132	5,905
M	65	1,575	36	229	109	2,037
Q	197	8,027	254	1,472	458	9,837
SI	40	1,975	902	6,873	943	8,884
W	115	6,327	832	5,550	963	12,405
Totals	**626**	**29,516**	**2,265**	**15,366**	**2,937**	**46,613**

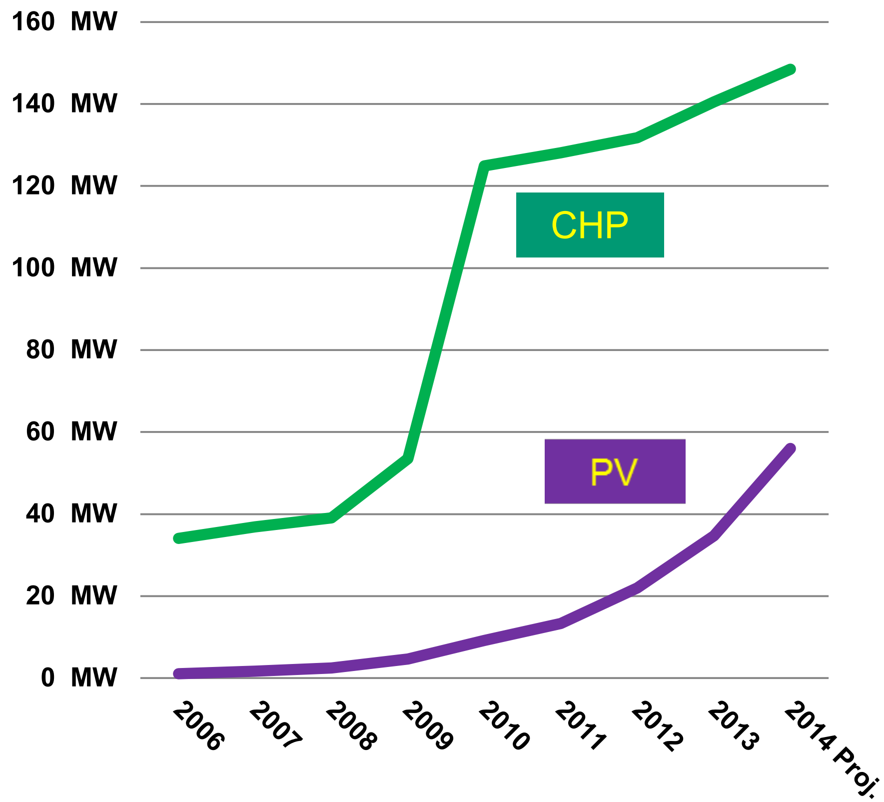
PV In Queue	Commercial		Residential		Totals (includes all types)	
Region	Cases	kW	Cases	kW	Total Cases	Total kW
BK	39	4,455	66	331	112	5,129
BX	41	6,478	36	251	80	7,509
M	4	78	5	17	13	323
Q	31	5,461	115	1,720	146	7,182
SI	12	2,351	478	3.329	492	6,879
W	48	7,132	226	1,882	274	9,015
Totals	**175**	**25,955**	**926**	**7,530**	**1117**	**36,037**

Technology Trends

Total Customers by Technology



Total Installed Capacity

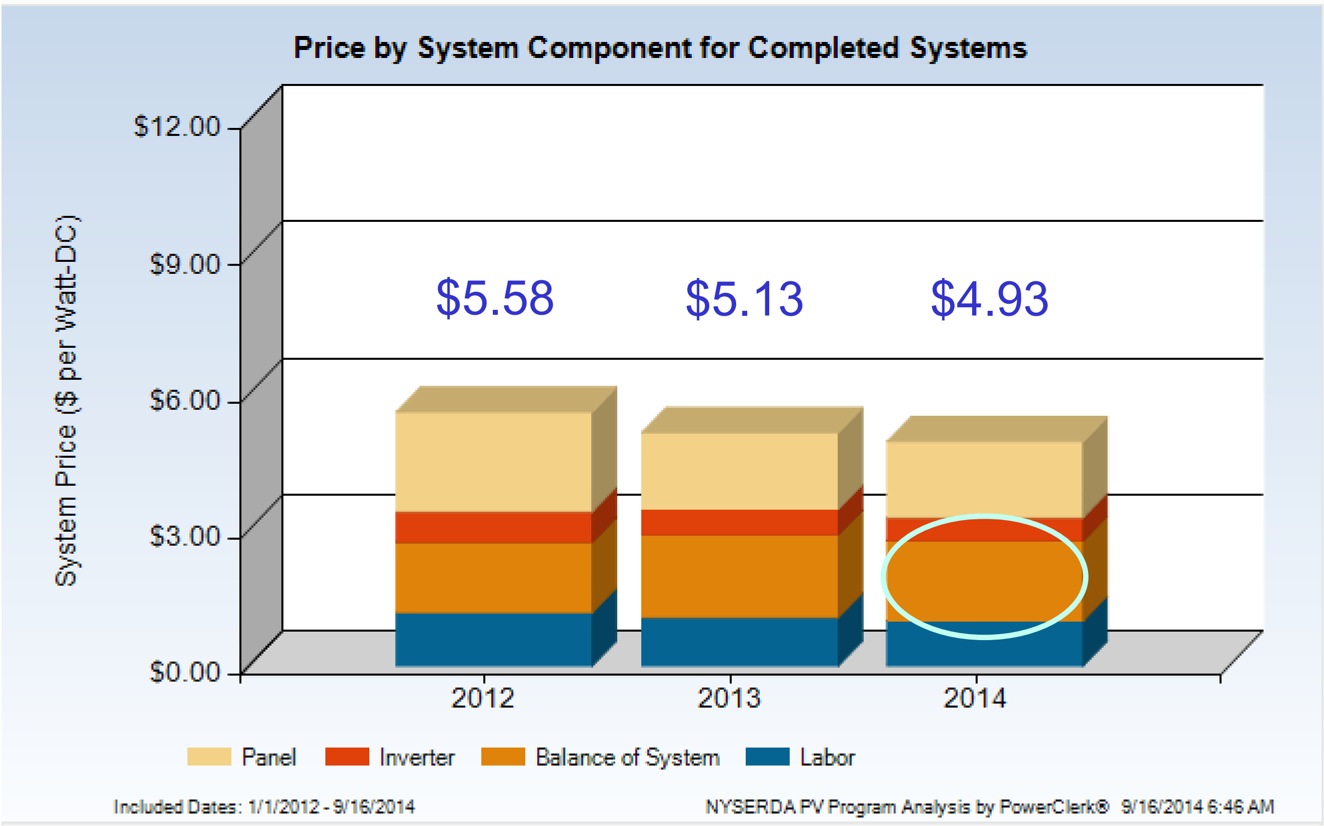


Drivers for residential growth

- NY-Sun: $1 Billion for solar in New York State
- 14MW in residential applications to new state rebate program since January
- Significant increase in marketing efforts by third-party solar providers
- Statewide permit for systems under 12kW (Westchester)

- Number of residential systems more than doubled 2012-2013
- 76% of systems after 2011 under 12kW

Residential costs are dropping, but "balance of system" has stayed constant



Cost components for residential PV, 2012-2014 (NYSERDA)

Goal: reduce PV interconnection costs/time for Con Edison customers

Rooftop Solar Challenge: Partnership with New York City Mayor's Office & City University of New York

"Fast-Track" Interconnection Concept

Concept

- Pre-qualified installers
- Established criteria for eligible systems
- Adapt existing online interconnection system
- Same-day approvals
- Audits/spot-checks as needed

Implementation

- Proven experience in our service territory
- 12kW and under; roof mounted; standard 3-line
- Automated approvals via Project Center
- Require upload and confirmation of all system details before submittal
- Spot-checks for quality assurance

Project Status and Considerations
Target launch: 1Q 2015

Where We Are

- Have criteria for installers and systems
- Draft screens for Project Center
- Discussing 3-line with engineering
- Reviewing necessary updates to project management systems

Issues to Consider

- Universal applicability of 3-line (e.g., building departments)
- Resources for audits/spot-checks
- Quality control
- Installer beta-test before launch

Large-scale PV

Smart grid pilot for large-scale PV on isolated networks

Upcoming NYSERDA MW block program for systems above 200kW

"Grid Ready Solar" project with CUNY, NREL, and NYSERDA to provide pre-screening of technical issues for buildings with large-scale PV potential

Case Study:
Jetro Cash & Carry – Bronx, NY

System

Roof space can support 1.6MW solar installation. (2MVA)

Weekend loading can support less than 450KW solar installation.

Three lightly loaded 2500KVA Transformers, 13kV to 277/480V in an Isolated Network.

Solution

Export Limit of up to 50% Transformer Rating equals 3MVA max.

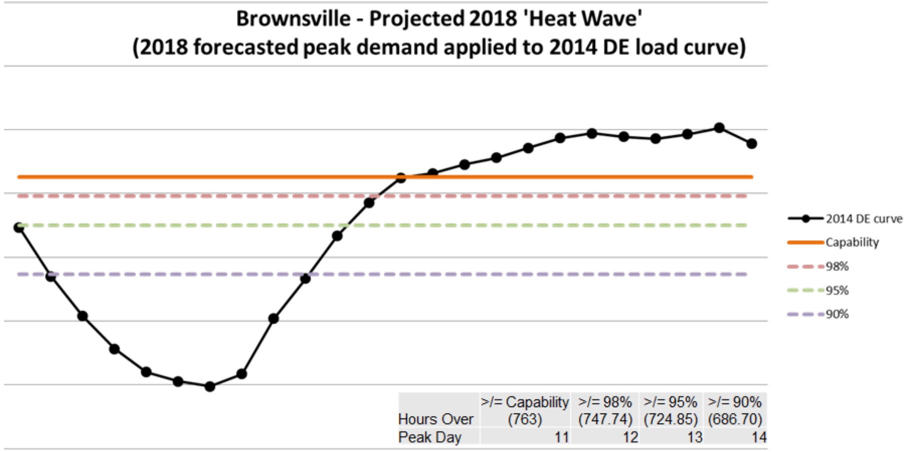
Anti-Islanding Protection prevents overpowering any transformer by tripping one inverter at a time.

Up to 1MVA support to Central Bronx 13kV Network.

Looking ahead

- Reforming the Energy Vision (REV) Proceedings
- Resiliency Efforts & Microgrids
- Indian Point Demand Management Program
- Brownsville Load Reduction

Load Reduction Profile



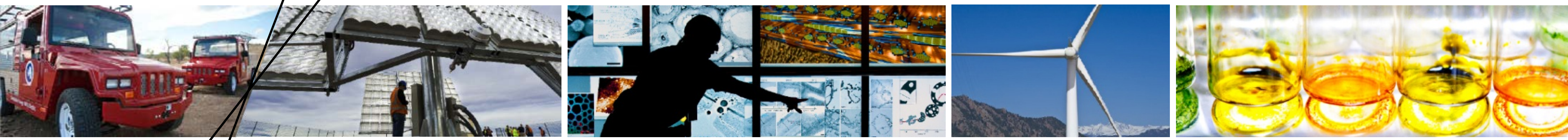
QUESTIONS?

Alison Kling klinga@coned.com

NREL
NATIONAL RENEWABLE ENERGY LABORATORY

Western Area Power Administration

SunShot
U.S. Department of Energy



Thank you!

http://www.nrel.gov/tech_deployment/dgic.html