

Interoperability of Demand Response Resources in NY

DOE and NYSERDA are providing financial support for this project

PRESENTATION

to

**2009 INTERNATIONAL MICRO-GRID SYMPOSIUM
San Diego, CA**

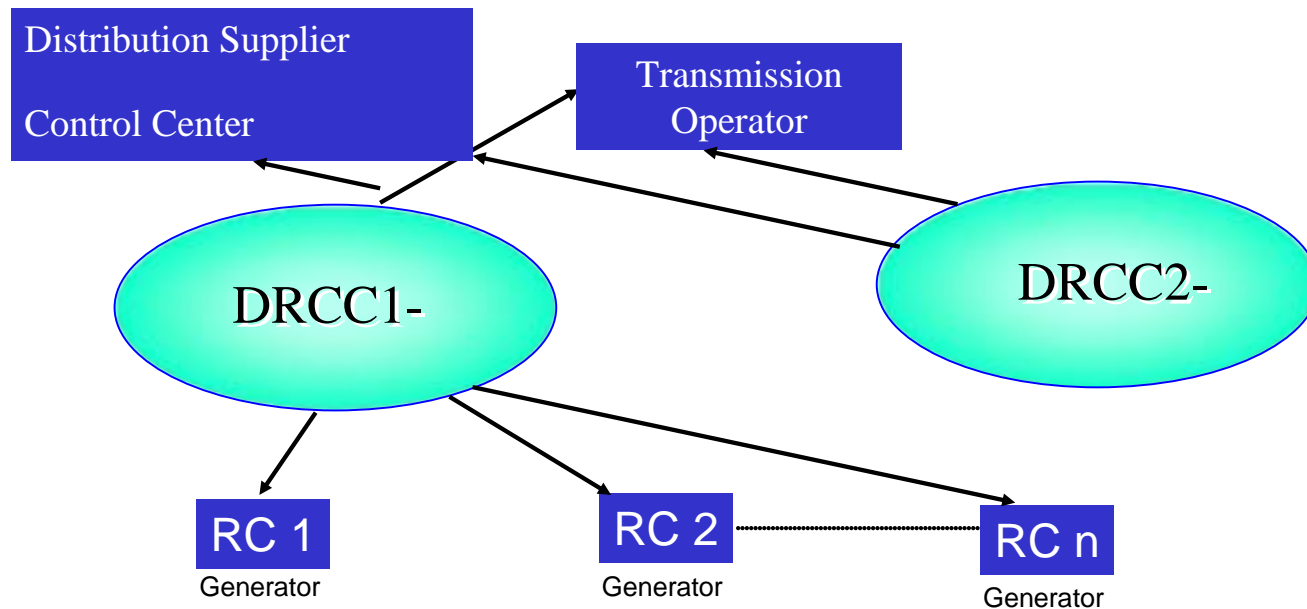
September 18, 2009

Presentation Summary

- Project Scope/Goals
- Project Participants and Funding
- Project Schedule
- Deliverables
- Major Findings to Date
- Current Status

Project Scope/Goals

- Develop better methods for integrating distributed demand response resources to enhance the reliability of Transmission & Distribution systems
 - The project will utilize a demand response command center to aggregate multiple DR resources at retail electric customer sites to supply critical services, under tariff-based and market-based programs, to the electric distribution company and to the regional transmission operator.



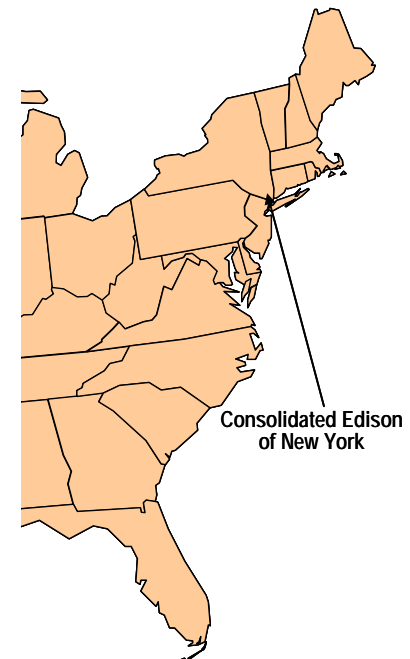
Project Participants and Funding

- **Participants**

- Consolidated Edison of New York: Electric Delivery Company & Transmission Operator
- Innoventive Power: Project Management and Demand Response Service Provider
- Verizon: Retail Electric Customer & Demand Response Resource Owner
- Infotility: Interoperability Software Developer

- **Funding**

- Department of Energy (DOE) - \$6.8 million
- Verizon, Innoventive et al - \$6 million
- New York State Energy R&D Administration (NYSERDA) - \$1 million



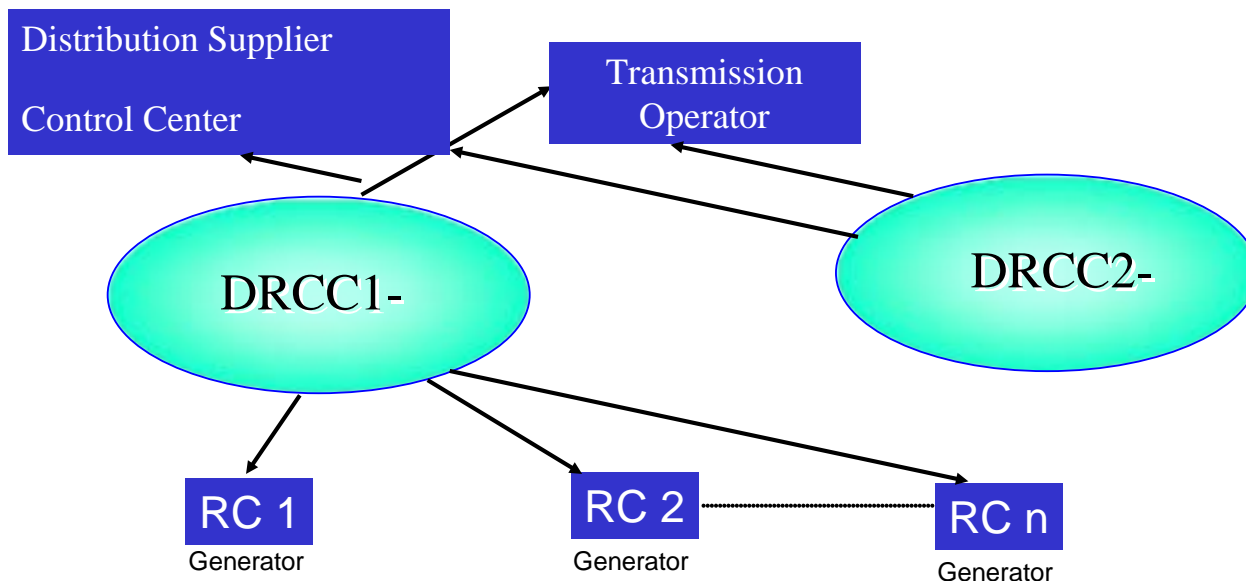
Project Schedule

- **Phase 1** – Gather Data & Study Feasibility: October 1, 2008 – September 30, 2009
 - Develop Interconnection Plans
 - Design Interoperability Approach for DR supply of ancillary services
 - Evaluate Fuel Cell & Wind Facility Integration
- **Phase 2** – Design & Construct: October 1, 2009 – June 30, 2010
 - Design/Install remote monitoring/control equipment/software, interconnection equipment, wind turbine, load reduction systems, fuel cell.
- **Phase 3** – Operate, Measure & Report: October 1, 2010 – September 30, 2011

Project Schedule

- Phase 1 – Gather Data & Study Feasibility:

- 30 sites selected -
- Operational and load profiles developed
- Protocols for communication between transmission operator, distribution company and Demand Response Service Provider in progress



Deliverables

- Computer models & cost benefit analysis show:
 - Demand Response Resources can participate in NYISO capacity programs, Con Edison distribution load relief program and NYISO Demand Side Ancillary Services such as 10 Minute Synchronous Reserve, 30 Minute Reserve and Regulation.
 - Sustainability established
 - Revenues will provide 3 – 24 month payback for new control equipment.
 - Remote monitoring reduces labor, allowing ICAP/SCR participation, with 2-hour activation feasible for some buildings.
 - ICAP/SCR and DLRP support T&D reliability
 - Ancillary Services are year-round programs supporting grid stability.

Results

The table illustrates the load components of a typical Verizon facility.

- DC and chiller loads can supply ancillary services - 10 min. response
- Emergency generators can supply capacity services - 2 hr response

Load Component	Peak Day Demand Load (kW)
1. DC Equipment	260
2. Comfort Zone Chillers	N/A
3. Critical Zone chillers	426
4. Air Handlers	75
5. Ventilation	1
6. Lighting	39
7. Peak Load	849

Economic Benefits

- Estimated potential annual incomes illustrate the values which result in rapid paybacks of the monitoring and control equipment.

Site	ICAP /DLRP	Annual Income (\$/Year)				NPV (\$)	IRR	Payback (Months)
		10-min Spinning						
		24 x 7	6-18hrs x 7	24 x 5	6-18hrs x 5			
1	\$23,085	\$17,446	\$13,652	\$12,457	\$9,896	\$290,289	57%	21.7
2	\$46,050	\$29,759	\$23,366	\$21,285	\$16,959	\$603,209	81%	15.2
3	\$65,037	\$42,738	\$33,537	\$30,551	\$24,327	\$907,142	116%	10.5
4	\$72,846	\$43,581	\$34,162	\$31,156	\$24,796	\$982,818	116%	10.5
5	\$26,166	\$18,312	\$14,355	\$13,074	\$10,402	\$308,954	49%	25.7
6	\$24,054	\$17,522	\$13,690	\$12,512	\$9,924	\$283,404	47%	26.9
7	\$39,777	\$27,896	\$21,870	\$19,955	\$15,876	\$521,309	68%	18.1
8	\$34,983	\$25,597	\$20,032	\$18,283	\$14,257	\$459,320	65%	19
9	\$29,190	\$17,001	\$13,311	\$11,920	\$9,492	\$343,418	65%	19
10	\$125,123	\$82,467	\$64,766	\$58,086	\$46,389	\$1,860,505	237%	5.1

Benefits of Interconnection

- Value of DR resources can be dramatically enhanced by interconnection using rapid response technology.
- **By interconnecting existing telecom facilities to operate in parallel with the Con Edison distribution network, Verizon can increase their participation in the ICAP market by 17 MW relative to the 22 MW of participation among the buildings participating in this project. This would benefit both Verizon (the retail customer) and Con Edison (the delivery company).**
- **By installing closed-transition switches in designated participating facilities, the ability to supply capacity (ICAP) can be increased by 5.5 MW (a significant increase from the population of buildings, relative to the 22 MW of capacity, which are part of the 30-buildings participating in this project and are registered to supply ICAP).**

Economic Benefits - Continued

Studies examining design of DR income-supported reliability interconnections has been completed;

- An interconnection to allow 20% injected power into a primary distribution feeder plus closed transition switching was evaluated.
 - Estimated interconnection cost, about \$300k
 - Estimated annual income about \$300k.
- Facility normally uses commercial power with capability to
 - Support the grid by taking load off-line
 - Injecting power to alleviate system problems
 - Allow grid-independent operation.

Deliverables - Continued

CHP (combined heat & power) Fuel Cell Plant Study

- 8,000 hours/yr operation at design capacity
- 4-year payback.
- Waste heat recovery,
- Avoided delivery system losses plus better efficiency.
- Carbon footprint reduced: >1,000 tons/MW-yr.

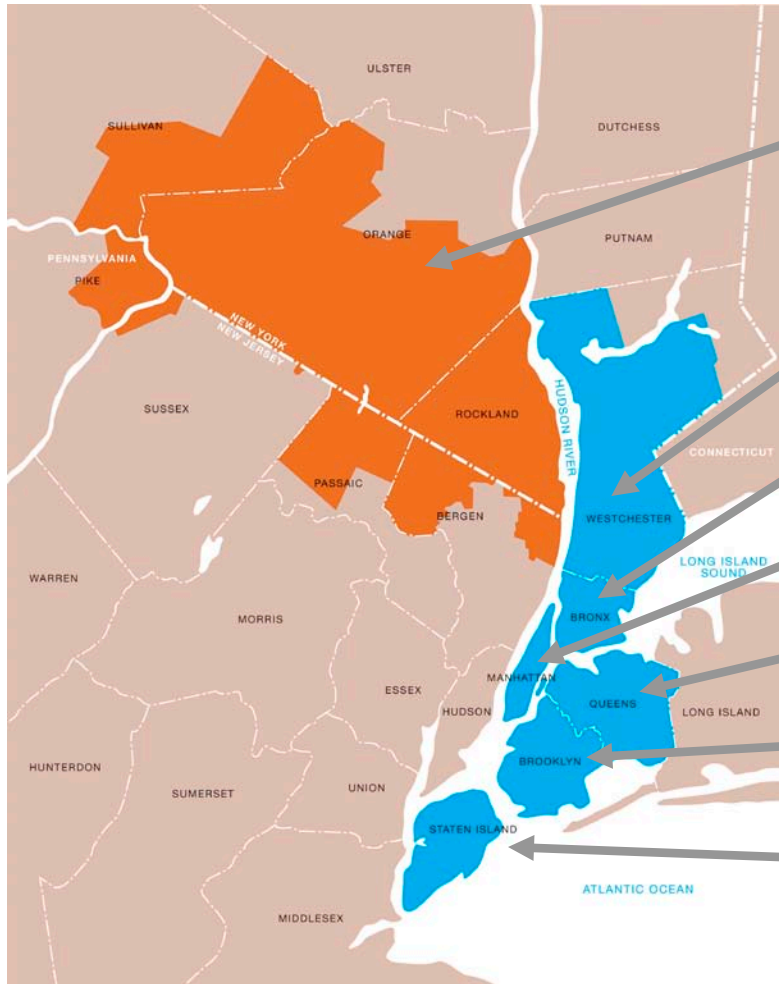
Planned Pilot – DR Network De-Loading

- The Con Edison low voltage distribution network
 - Improves network reliability.
 - Provides highly reliable service
 - Includes sophisticated tools to forecast compromising events
- Allows operators to mitigate problems of high stress in local load pockets.
- Year 2 demonstration of new operator command and control interfaces.

Major Findings of Phase 1 Feasibility Studies: System Benefits

- **DR resources in 30 facilities support grid reliability and lower CO₂ emissions by**
 - Supplying spinning reserves (shutting down chillers/rectifiers, replacing Rankine Cycle Plants).
 - Adding closed-transition switching equipment, adding reliability support (ICAP);
 - Installing paralleling switchgear supports reliability, enabling power injection into distribution network; and
 - Remotely activating on-site DG resources can provide load relief to distribution networks and help to mitigate network emergencies.

Resources in 30 Facilities Support Grid Reliability



- 1 - Orange
- 1 - Westchester
- 2 - The Bronx
- 10 - Manhattan
- 8 - Queens
- 6 - Brooklyn
- 2 - Staten Island

Project Advances Micro-Grid Technology

This project demonstrates the ability to aggregate multiple DR resources, which then will enhance the ability to supply power utilizing the existing delivery infrastructure, while enhancing power system reliability and lowering costs.

Questions ?