

# DR, DG and Storage

Comments To **NYISO Symposium**  
**The Future Is Now: Energy**  
Efficiency, Demand Response and  
Advanced Metering  
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# DR, DG and Storage - Outline

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# Who are we and what do we do?

- E3 LLC (1989)
  - Providers of Strategic Services at the Exponential Interface of Energy, Environment and Economics.
- Joint Supporters (1990)
  - Voluntary Association of users, providers, and mobilizers of demand resources, including EE, DR, DG, CHP (including micro-CHP) active in policy settings on occasion. Facilitated by E3 LLC.

# What have we done lately? (April-June 2007)

- June 18, 2007 NYPSC approves Rider U
  - adopting modifications proposed by Joint Supporters creating Network Based Demand Response Program for Con Edison (effect July 1, 2007) - stems from Long Island City 2006 event
- April - June: Residential micro-CHP Opportunities
  - Multiple Jurisdictions Move to Facilitate micro-CHP
- April 2007 Clients Climate Energy, LLC and ECR International (Utica, NY) go Commercial in North America
  - E3 LLC aids market opening for residential micro-CHP system combining ECR furnace and ultra-durable, ultra-quiet, ultra-clean Honda generator.

# What have we done lately? (Jan-March 2007)

- Targeted Demand Response Program [pending FERC approval]
  - Negotiated sub-zone voluntary targeted demand response program for Zone J (NYISO) (Feb - March)
- Forward Capacity Market (FCM) for ISO-NE [FERC approved]
  - Negotiated final revisions of design and approval (Feb) by ISO-NE committees,
  - FCM includes DG, EE, aggregation of resources ok from the smallest size, meter on generator ok for M&V, seasonal resources can participate.
- Analysis of Connecticut DG and EG Monetary Grant Programs and capacity bid programs for Grid Capacity Relief
  - Analysis prepared for Rhode Island DG Work Group Report to Legislature. (Jan 2007) - Report on line at MD PSC.
- [http://webapp.psc.state.md.us/Intranet/CaseNum/NewIndex3\\_VOpenFile.cfm?filepath=%5C%5CColdfusion%5CEWorkingGroups%5CDRDG%5CDistributed%20Generation%5CRhode%20Island%20DG%20Study%202-1-07.doc](http://webapp.psc.state.md.us/Intranet/CaseNum/NewIndex3_VOpenFile.cfm?filepath=%5C%5CColdfusion%5CEWorkingGroups%5CDRDG%5CDistributed%20Generation%5CRhode%20Island%20DG%20Study%202-1-07.doc).

# What have we done lately? (2005-2006 - CT)

- Negotiated Design of CT Energy Independence Act of 2005 programs, including CHP Portfolio Standard, EE, DG and EG Monetary Grant Programs and capacity bid programs for Grid Capacity Relief (Sept 2005-June 2006)
  - By June 2007 343 MW awards sought in 156 applications to DPUC
  - 223 MW awarded to level of \$90 M. All participate in ISO-NE capacity market as demand resources.
  - In first six months, as per E Cubed analysis, DG awards averaging \$470/kW leveraged an average total investment of \$2300/kW. EG awards averaging \$230/kW leveraged total investments of \$650/kW.
  - E Cubed clients won three of first twenty awards.
  - CHP Portfolio Standard targets 6% of load by EE and DG by 2010. (revised in recent legislation).

# What have we done lately?

## (2004-2006 - NY)

- Negotiated Con Edison Base Rate Case (for 2005-2008) on key measures benefiting distributed resources
  - \$1 B plus transmission and distribution infrastructure improvements (among other purposes) to advance the potential utilization of distributed resources, including DG, EE, and DR. (DG friendly website at Con Edison).
  - Fault Current Study and Accelerated Breaker Replacement Program (from 19 in 1999 to over 100 in 2006 out of 600 in 58 networks.)
  - Negotiated goal of meeting load growth of 650 MW by demand resources, including SBC programs, and 300 MW of Demand Resource Programs in the territory.
- Negotiated Design of 300 MW Demand Resource Programs in Con Edison Territory (\$250 M allowed)
  - System Wide Program 150 MW NYSERDA (EE/DR/DG)- Targeted Program 150 MW Con Edison (EE/DG) - incentives to utility for all kW achieved by either.
- NYSERDA Study with Distributed Utility Associates on Electricity Storage Opportunities in NYS, especially NYC. (pub May 2007)

# What's next? (2007-2008 - NY)

- **Negotiate Energy Efficiency Portfolio Standard (EEPS) Proceeding (15% improvement by 2015)** - DG, DR, Storage are second order priorities. What about greater recognition for CHP Savings and Peak Shaving Benefits? Interface of DR with EE & DG? Role of residential micro-CHP?
- **Negotiate/litigate New Con Edison Base Rate Case begun May 2007 (for 2008-2011 period - decision by March 2008 - negotiations over next five months)**
  - How does Proposal comport with NYISO Planning? Role of load resources? Further transmission and distribution infrastructure improvements (post Long Island City blackout) - How can DG/DR/EE contribute?
  - Advanced Metering Proposed for 2.5 million accounts. Interface with NYISO programs? How can AMI interface with DR?
  - Mandatory Hourly Pricing for additional 2000 accounts (above 500 kW)
  - 500 MW demand resource proposal for EE & DG. What about DR?
  - How does 15% EEPS objective (circa 1600 MW by 2015) compare with Con Ed proposal for 500 MW by 2016?
  - How does proposed Demand side program interface with NYSERDA responsibilities? Carry over from 2005-2008 rate plan? Going forward?
- **Negotiate other initiatives in regulatory and RTO situations.**

# What are New Demand Resource Opportunities for NY? (2007-2008 - NY) (1)

- **Promote the aggregation of benefits.**
  - Generators aggregate multiple benefit streams -
  - So should demand resources be able to aggregate benefit streams.
  - Composite aggregation should be facilitated for capacity, ancillary services and other benefit streams.
  - See NYSERDA Storage Study identifying optional benefit streams for storage systems - would apply to other resources.
- **Promote Ancillary Services involving Demand Resources**
  - Wide array of DR resources, including controls and communication.
  - Specifically DG and storage, e.g. commercial and industrial scale DG/CHP, residential micro-CHP and plug-in hybrid vehicles.
- **Allow Clean DG to perform in the economic markets as other DR resources can.**
- **Create Alternate Energy Sector at the NYISO, encompassing Demand Response, DG, EE and other Demand Resources with voting rights, manuals, etc.**

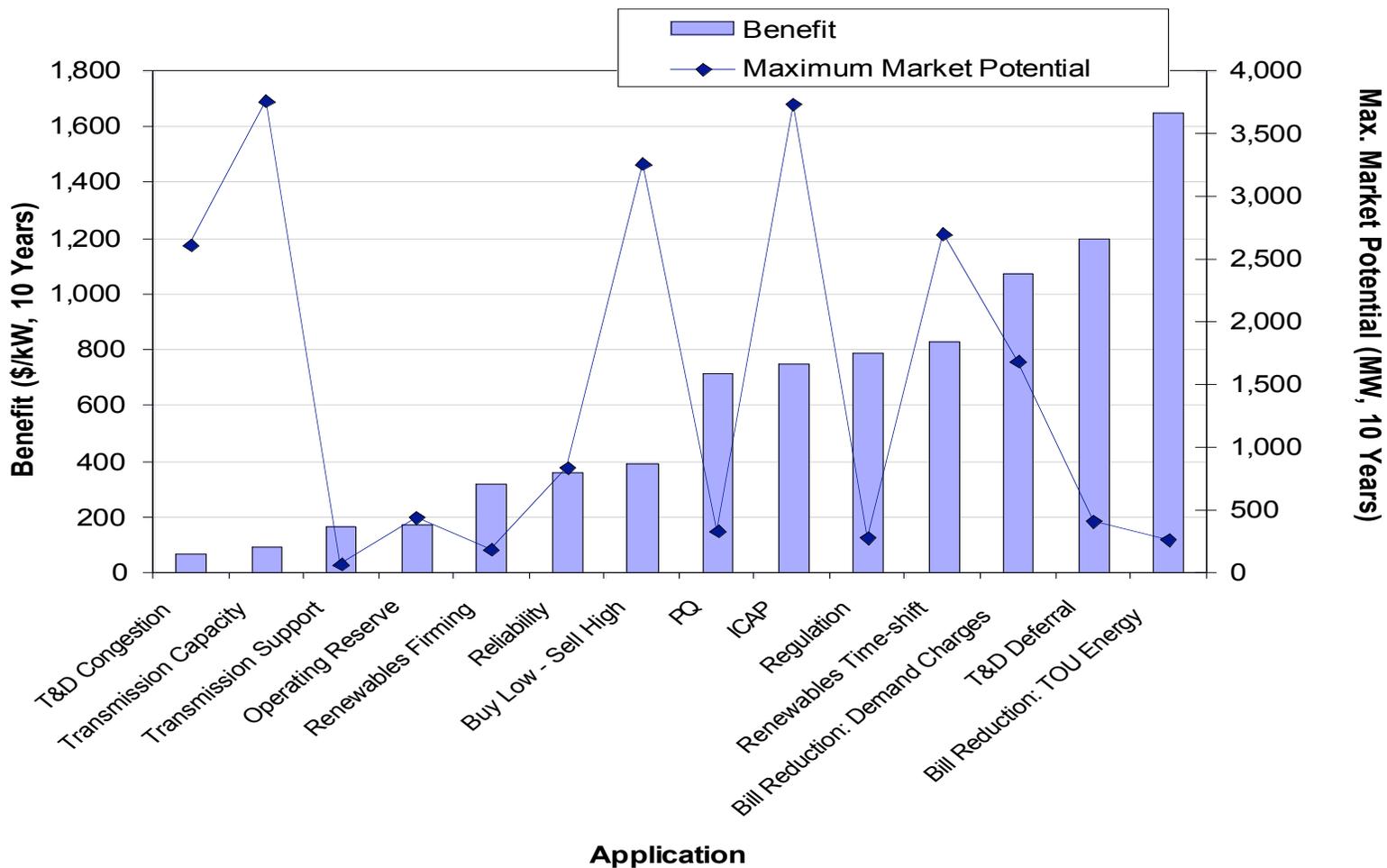
# What are New Demand Resource Opportunities for NY? (2007-2008 - NY) (2)

- **Promote CHP Portfolio Standard And Aggressive Awards Program**
  - Adopt a CHP Portfolio Std approach similar to CT as revised by 2007 Law
  - Move to aggressive CT model for Monetary Awards for CHP and EG with differential for SE New York. Open the door for projects of all qualified applicants -- not competitive elimination. Program is much more aggressive than NY.
  - Adopt CHP Savings Policy similar to Senator. Schumer's Senate Amend 1797 (June 19, 2007) deals with combined savings for gas & electricity sides, not either/or.
- **Promote Electricity Storage As Demand and Grid Resource**
  - Promote consideration of NYSERDA Report 8723 by DUA and The E Cubed Company, LLC, **Guide to Estimating Benefits and Market Potential for Electricity Storage in New York (With Emphasis on New York City)**
  - Promote utilization of storage as resource to integrate intermittent demand resources and wind and solar facilities.

# Sample New Demand Resource Opportunities for NY? (2007-2008 - NY)

- **Promote mass market aggregation of residential and other EE/DG/DR/storage/renewable capabilities for capacity, energy, ancillary and other benefits -**
- **Example of residential micro-CHP**
  - Assume 100-150,000 natural gas furnaces or boilers are replaced each year in New York.
  - If 20% were replaced with high efficiency micro-CHP systems (80% or better) then by 2015 approximately 160-240,000 residences can improve their household energy efficiency measurably.
  - Summer-time Peak grid needs could be moderated by 270-430 MW.
  - Ancillary services can be obtained within 30 seconds of notification at any level of aggregation within all zones of NYISO, each zone, each sub-zone, network, or even feeder.
- **Example of plug-in hybrid vehicles**
  - NYISO and NYS should take lead in collaborating with Smart Grid Study called for in Senate Amendment 1797 to the Energy Bill passed on June 21.
- **Example of Storage Facilitating Wind and Solar Installation**

### Application Benefit and Maximum Market Potential



# Further Information

- The E Cubed Company, LLC is available to assist you evaluate market entry and operations.

Contact Ruben S. Brown, or Arthur W. Pearson

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Table ES.2. Estimated Market Potential and Benefits for Applications -

#	Application	Benefit	Description	Cost Element(s) or Price Signal(s)
1	Electric Energy Buy Low – Sell High	Revenue - VOC - (Purchase + Efficiency)	1. Avoided market-based cost for purchases or 2. "Profit" from selling.	LBMP DAM
2	Electric Supply Capacity	Installed Capacity (ICAP)	Avoid charges/receive payment for "supply" installed capacity (ICAP).	NYISO ICAP Strip Auction
3	Reduce Transmission Capacity Requirements	Reduced Transmission Service Charges (TSCs) <sup>2</sup>	Avoid payment of charges incurred for access to the transmission system.	NYISO Transmission Service Charge (TSCs)
4	Reduce Transmission Congestion	Reduced Transmission Congestion Costs <sup>2</sup>	Reduce congestion on transmission system(s) -- to reduce congestion-related cost -- by serving peak load with storage.	LBMP DAM (Congestion Component)
5	Transmission and Distribution Upgrade Deferral	Avoided Annual Revenue Requirement for T&D Upgrade	Defer need for relatively expensive T&D upgrades by serving peak load downstream from hotspots.	Annual revenue requirement for upgrade.
6	Operating Reserve	Operating Reserve, Value	"Back-up" for Emergencies (loss of one or two large resources)	DAM Prices (LBMP and reserve capacity)
7	Regulation and Frequency Response (Regulation)	Regulation Service, Value	Maintain grid stability, frequency; attenuate small, frequent load fluctuations.	DAM Prices
8	Transmission Support	Enhanced Transmission Performance	Short duration support for transmission stability and improved throughput.	n/a
9	Electric Service Reliability	Reduced Outage Related Cost	Financial losses avoided due to improved PQ.	Value-of-Service as proxy
10	Electric Service PQ	Reduced PQ-related Cost	Financial losses avoided due to improved PQ.	Value-of-Service as proxy
11	Electric Service Bill Reduction: Demand Charges	Reduced Electric Service Bill <sup>2</sup>	Reduced electricity bill.	Tariff: PSC No. 9, Service Class 9, Rate I
12	Electric Service Bill Reduction: Time-of-use Energy Prices	Reduced Electric Service Bill <sup>2</sup>	Reduced electricity bill.	Tariff: PSC No. 9, Service Class 9, Rates II & III + Market Supply Charges
13	Renewable Electricity Production Time-shift	Enhanced Wind Energy Value	Increased benefit from wind energy if low value wind energy is sold when value is high.	DAM LBMP and "firmed capacity" (ICAP) Credit.
14	Renewables Capacity Firming	Enhanced Photovoltaics Capacity Value	Increase benefit from PV using low value grid energy to firm-up PV capacity on peak. Firming: from .5 to .95 effective capacity (Summer).	DAM LBMP and "firmed capacity" (ICAP) Credit.

Notes

1. Key Definitions: LBMP = Location Based Marginal Price (for energy). ICAP = Installed Capacity (electric supply). DAM = Day-ahead Market VOC = non-energy-related variable operating cost (e.g., battery replacement).
2. A cost avoided by one entity may reduce revenue needed by another entity to cover fixed and/or embedded costs.

— Joseph Sayer, Project Manager (NYSERDA), Jim Eyer (Distributed Utility Associates) and Ruben S. Brown (The E Cubed Company, LLC), **Guide to Estimating Benefits and Market Potential for Electricity Storage in New York (With Emphasis on New York City)** NYSERDA Report 8723, May 2007.

Table ES.2. Estimated Market Potential and Benefits for Applications -

#	Application	Maximum Market Potential MW, 10 Years*	Notes	Unit Benefit, \$/kW, over 10 Years**	Total Benefit \$ Million, over 10 Years**
1	Electric Energy Buy Low – Sell High	3,265	25% of Peak load and of load growth – storage cannot compete with intermediate, baseload gen.	394	1,288
2	Electric Supply Capacity	3,739	ICAP required in 2006 – 2,306 MW – plus all load growth for next nine years. (Does not include reserve capacity or capacity provided via bilateral contracts.)	753	2,815
3	Reduce Transmission Capacity Requirements	3,759	Portion of in-city peak demand not served by in-city generation (20%) plus peak load growth. (Does not include reserves or capacity via bilateral contracts.)	93	350
4	Reduce Transmission Congestion	2,612	Portion of NYC peak demand not served by in-city generation (20%) plus growth thereof. (Does not include reserves or capacity via bilateral contracts.)	72	187
5	Transmission and Distribution Upgrade Deferral	411	All T&D Upgrades: 1/30 of peak load each year (assume 30 year life); average 411 MW/year. Assume that storage can defer 10% of that amount, plus growth.	1,200 <sup>3</sup>	494
6	Operating Reserve	445	Premise: generation is at least 2/3 of reserves. Storage: 1/3 of operating reserves (1/3 of 1,200 MW = 396 MW) plus growth of that portion (49 MW).	258	115
7	Regulation and Frequency Response (Regulation)	281	Current market size for regulation (statewide) plus growth. <sup>2</sup>	789	351
8	Transmission Support	70	1/4 of existing market size for regulation (statewide) plus growth of that share.	169	47
9	Electric Service Reliability	842	1/4 of SC9 (tariff/customer class) load plus growth <sup>2</sup> of that load.	359	25
10	Electric Service PQ	337	10% of SC9 (tariff/customer class) load plus growth <sup>2</sup> of that load.	717	604
11	Electric Service Bill Reduction: Demand Charges	1,685	1/2 of SC9 (tariff/customer class) load plus growth <sup>2</sup> of that load.	1,076	362
12	Electric Service Bill Reduction: Time-of-use Energy Prices	270	8% of SC9 (tariff/customer class) load plus growth <sup>2</sup> of that load, for "peak clipping."	1,649	2,779
13	Renewable Electricity Production Time-shift	2,700	2,700 MW in Western upstate New York (per G.E./NYSERDA study).	832	2,246
14	Renewables Capacity Firing	188	1% of peak load (116 MW) and 5% of all load growth (72 MW).	323	61

\* MW of cumulative market potential over ten years.

\*\* \$ present worth, over ten years, 2.5% inflation, 10% discount rate, mid year convention.

1 Peak Load in 2006 = 11,627 MW.

2 Peak load growth rate = 1.30%/year

3 Transportable storage could provide the same single year benefit at several locations.

Key premise: existing resources/equipment – especially if it has useful life – will not be replaced with storage.