

Market Concepts for Distributed Energy Resources

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Topics

- ◆ **Relevant Definitions**
- ◆ **Principles**
- ◆ **NYISO Approach to Market Concepts**
- ◆ **DER Technologies**
- ◆ **Incentives**
- ◆ **Resources**
- ◆ **DER Characteristics/Market Applications**
- ◆ **NYISO Focus**
- ◆ **Other Considerations**
- ◆ **Summary**
- ◆ **Next Steps**
- ◆ **Questions**

Distributed Generation and DERs

Document	Year	Guidance
Energy Policy Act	2005	Section 1817 required study into distributed generation
The Potential Benefits of Distributed Generation and Rate-Related Issues That May Impede Their Expansion (DOE)	2007	The potential of distributed generation, cogeneration and small power production, terminology interchangeability
NYISO's DER Study A Review of Distributed Energy Resources , available on the Publications and Presentations page of the NYISO website.	2013 - 2014	Includes NYISO's DER definition, resource types, incentives, current penetration and market/technical potential
NYSPSC Reforming the Energy Vision (REV)	2014	Objectives include system-wide efficiency, fuel and resource diversity, system reliability and resiliency. DERs include energy efficiency, demand response, and distributed generation

Guiding Principles

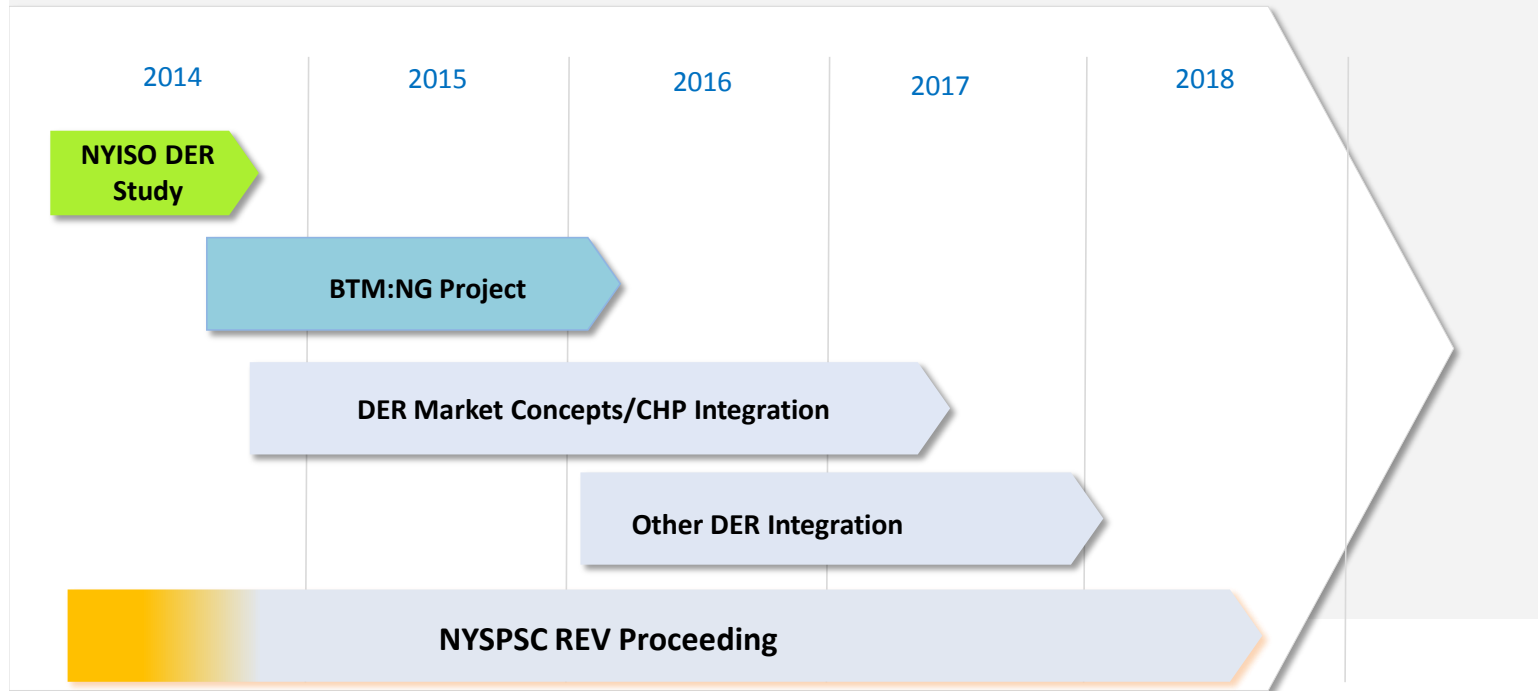
- ◆ **Maintain reliable operation of the grid and efficient wholesale markets while facilitating the integration of DERs into the planning and operation of wholesale power system**
- ◆ **DERs that are capable of and willing to respond to dispatch instructions should be permitted to participate in the markets for which they qualify, subject to reliability standards**
- ◆ **Products and services provided by DERs directly to the wholesale power system should be appropriately compensated in the wholesale markets**
- ◆ **DERs not participating in the wholesale markets should, where appropriate, be reflected in operational and planning processes**
 - *Ensures NYISO's situational awareness of DERs that impact operations*

General Considerations

- ◆ DER adoption and penetration is expected to be a gradual, long-term trend
- ◆ The evolution of technology, regulatory policy, and incentives will influence the rate and extent of DER adoption by end-use customers and integration into the wholesale markets
 - *The NYISO continues to participate in the NYSPSC's REV proceeding, providing comments as appropriate in that proceeding*

Timeline for DER Integration

Timeline for Integration of Distributed Energy Resources



- NYISO DER Study
- BTM:NG Integration
- DER Market Concepts/CHP Integration
- Other DER Integration
- NYS PSC REV Proceeding

NYISO Approach to Developing the Market Concepts for DERs

- ◆ **Used information from DNV-GL “KEMA” Study to evaluate trends that have highest potential for near-term implementation, considering:**
 - *Current installations in New York*
 - *Maturity of technology*
 - *Available incentives*

DER Technologies

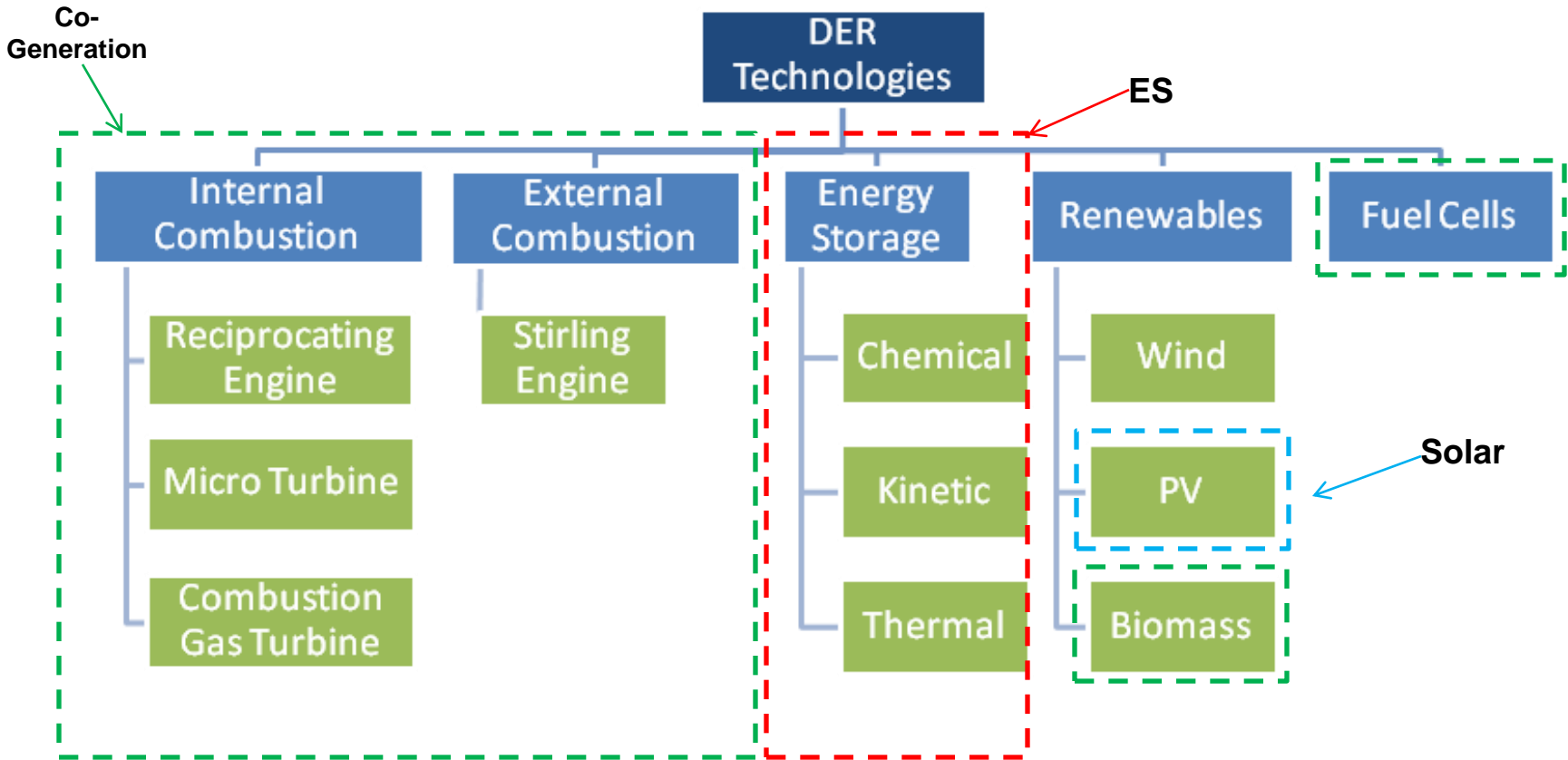


Figure 4-1. DER Technologies from DNV-GL “KEMA” Study

Current and Forecasted DER Capacity

DER Facility Type	Current Market Penetration	Technical Potential (residential)	Technical Potential (commercial)	Incentives / Programs
CHP (Includes Microturbines and Biomass/ADG)	122 MW		144 MW – 2020 324 MW – 2030	F, S, L
Solar (PV)	89 MW	881 MW – 2020 2615 MW – 2030	1174 MW – 2020 3487 MW – 2030	F, S, L
Energy Storage	5 MW		75 MW – 2020 201 MW – 2030	S, L
Microgrids	148 MW		244 MW	
Others: Fuel Cells Small Wind	9 MW 3 MW			F, S, L


F – Federal Incentives
S - State Incentives
L – Other Local Incentives


Values reflect MWs from the DNV-GL “KEMA” study.
 Current values may be higher based on more recent information.

Resources

- ◆ Actual number and MWs of resources available at the sub-transmission level and below are not readily available
- ◆ NYISO used two web pages/databases to determine the number of resources
 - *NYSERDA DG Integrated Data System:*
<http://chp.nyserda.ny.gov/facilities/index.cfm>
 - *DOE/ICF/EEA:*
<http://www.eea-inc.com/chpdata/States/NY.html>

NYSERDA/DOE-ECF-EEA DG Sources

New York  State
☰ State Agencies
🔍 Search all of NY.gov






DG Integrated Data System

▶ Home ▶ Facilities ▶ Reports ▶ Links ▶ Help ▶ Login

The facilities shown below are currently in the database. Click on a column heading to re-sort by that column. Click on a facility name to view details about that facility. [Click Here](#) to see a map showing all of the facilities.

All ADG CHP Solar Fuel Cell Main Tier RPS

<u>Facility</u>	<u>Facility Type</u>	<u>Developer</u>	<u>Primary Fuel</u>	<u>Installed Capacity</u>	<u>Monitoring</u>
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Combined Heat and Power Units located in New York

State	City	Organization Name	Facility Name	Application	SIC4	NAICS	Op Year	Prime Mover	Capacity (kw)	Fuel Type
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CHP Incentives/Programs

Incentives	Description	Maximum Incentive
F	Business Energy Investment Tax Credit (ITC) Rural Energy for America Program (REAP) Grant Modified Accelerated Cost-Recovery System (MACRS) USDA – Loan Guarantee Programs	10%, of project costs, 50MW max; M/T- \$200/kW (max) 25% of project cost N/A 25% of project cost
S	CHP Performance Program - \$40M CHP Acceleration Program - \$60M Indian Point Energy Center Reliability Contingency Plan - \$66M	50kW-1.3 MW, \$1.5M/project >1.3 MW, \$2.6M/project 50kW-1.3 MW, \$1.5M/project
L	NYC Energy Plan – Initiative 13 (“Encourage the development of clean distributed generation”)	

F – Federal Incentives
S - State Incentives
L – Other Local Incentives

Incentives listed are meant to be a highlight of incentives available for DER resources and does not represent a complete list of all available incentives.

Solar Incentives/Programs

Includes: Solar Water Heat, Solar Space Heat, Solar Thermal Electric, Solar Thermal Process Heat, PV

Incentives	Description	Maximum Incentives
F	Business Energy Investment Tax Credit (ITC) Rural Energy for America Program (REAP) Grant Modified Accelerated Cost-Recovery System (MACRS) Qualified Energy Conservation Bonds - Loan USDA – Loan Guarantee Programs - Loan	30% of project cost 25% of project cost Tax Credit 50% of project cost, construction bond 75% of project cost, \$25M max.
S	NY-Sun - \$960M (RPS and NY-Sun Solar Electric Incentive Program included in NY-Sun)	Multi-Block/MW, Starts at \$1/kW
L	NYC Energy Plan – Initiative 14 (“Foster the market for renewable energy in New York City”)	

Incentives listed are meant to be a highlight of incentives available for DER resources and does not represent a complete list of all available incentives.

- F – Federal Incentives**
- S - State Incentives**
- L – Other Local Incentives**

Energy Storage Incentives/Programs

Incentives	Description	Maximum Incentive
F	Business Energy Investment Tax Credit (ITC)	10% of project cost
S	IPEC Reliability Contingency Plan (Thermal Storage)	\$2600/kW
L	NYC Energy Plan – Initiative 17 ("Develop a smarter and cleaner electric utility grid for New York City")	

F – Federal Incentives
S - State Incentives
L – Other Local Incentives

Incentives listed are meant to be a highlight of incentives available for DER resources and does not represent a complete list of all available incentives.

Other Incentives/Programs

Includes: Fuel Cells, Small Wind, Microturbines, Microgrids, and Biomass

Incentives	Description	Maximum Incentive
F	Business Energy Investment Tax Credit (ITC)	Fuel cells: 30% of project costs, \$1,500/0.5 kW (max.)
	Advanced Microgrid Controllers and System Designs (DOE)	Small wind: 30% of project costs \$8M total, \$1.2M in NYS
S	Renewable Portfolio Standard (RPS) - Customer Sited Tier	\$1M/site/customer (small wind)
	NY Prize	\$40M total (microgrids)
L	NYC Energy Plan – Initiative 17 (“Develop a smarter and cleaner electric utility grid for New York City”)	

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DER Application Feasibility for Market Integration

Application	Combustion Engines & CHP	Fuel Cell	Storage: Power	Storage: Energy	PV
Base Load	Medium	High	Low	Low	Low
UPS	Medium	Low	High	Medium	Low
Back up	High	Medium	Low	High	Low
Back up w/ Islanding	Low	Low	Low	Low	Low
Renewable Integration	Medium	Low	Medium	High	High
Peak Shaving	High	Medium	Medium	High	Medium
Demand Response	High	Medium	Medium	High	Low
Regulation	High	Low	High	Medium	Low
Reserves	Medium	Low	Low	High	Low
Supply Capacity	Medium	Medium	Medium	Low	High
T&D Deferral	Medium	Low	Low	Low	Medium

Figure 4-16 from DNV-GL “KEMA” Study, Application Feasibility

DER Application Characteristics

Potential NYISO Market Products/Services	N/A	A/S	A/S	E, C, A/S	E!	E, C, A/S	E!		
Application	Characteristics			Duration			Frequency of use		
	Islanding	Short Start-Up Time	Quick Ramping Time	Continuous	2-6 hours	< 2 hours	Daily (> 2000 h)	Seasonal (500-2000h)	Yearly (< 500 h)
Continuous Power / Base Load				X			X		
Uninterrupted Power Supply (UPS)		X	X			X			X
Back Up		X			X				X
Back-up with Islanding	X			X					X
Renewables Integration			X		X	X	X	X	
Peak Shaving		X	X			X	X	X	
Demand Response		X	X		X	X		X	X
Regulation		X	X			X	X		
Reserves		X			X	X			X
Supply Capacity				X	X	X		X	X
T&D Deferral					X			X	X

Figure 4-14 from DNV-GL “KEMA” Study, DER Applications and Requirements

E=Energy, C=Capacity, A/S=Ancillary Services, E!=Emergency

NYISO's Focus for DERs

- ◆ **Focus on the resources that:**
 - *Have generation above host load to provide to the wholesale power system*
 - *Are receiving significant incentives*
 - *Are active in build out in the commercial/industrial sector*
 - NYISO has started market design for net generation from behind the meter resources
- ◆ **CHP resources are an immediate option for integration**
 - *Many are installed with spare units or additional capacity*
 - *Many have separate metering in place*
 - *Many have characteristics suitable for NYISO market participation*
- ◆ **Market design developed for net generation from behind the meter resources and CHP may serve as a foundation for most other types of DERs**

Other Potential DER Technologies

◆ Solar

- *While receiving a lot of incentives, solar seems to be focused on lower distribution voltages (below primary distribution)*
- *Many installations are residential and retail rates already recognize the output*
- *Solar is not easily dispatchable*
- *Current market design already able to accommodate grid-level solar installations for energy and capacity*

◆ Energy Storage and Fuel Cells

- *Much smaller numbers of installations*
- *Limited/sparse incentives at this time*
- *Current market design already able to accommodate grid-level energy storage installations as LESRs*

NYISO's DER Concept

- ◆ Large end users or aggregations with DERs that are connected at the transmission, sub-transmission, or primary distribution level
- ◆ Capable of injecting at least 1MW
 - *Even if capable, will need to consider whether distribution system can support the injection*
- ◆ Meets applicable environmental, NPCC, and NYS Reliability Council requirements

Planning Considerations

- ◆ **How should dispatchable and non-dispatchable DERs be represented in Reliability, Economic, and Resource Adequacy studies?**
- ◆ **Interconnection requirements?**
- ◆ **Are there limits to how much the system can rely upon these resources?**
- ◆ **How will dispatchable and non-dispatchable DERs be treated in the load forecast?**

Market Considerations

- ◆ **What wholesale market products/services can DERs provide?**
- ◆ **Are the current Energy, Capacity, and Ancillary Services markets properly structured for a future with large amounts of DERs?**
- ◆ **Are new market products and/or changes needed?**
- ◆ **How to design appropriate compensation for DERs to create efficiencies while not reducing reliability?**

Operational Considerations

- ◆ **What metering, communication standards and protocols will be needed to reliably integrate DERs into real-time operations?**
- ◆ **Will the existing SCADA/EMS system be sufficient?**
- ◆ **How will DERs be incorporated into the Day-Ahead and Real-Time market Load Forecasts?**
- ◆ **Will new operational tools and increased staff be required to support an increase in smaller resources?**

Financial Considerations

- ◆ **How would the costs of additional reliability services, if required, be allocated?**
- ◆ **Understanding the impact of fewer MWs of Load on Rate Schedule 1 cost allocation methodology**
- ◆ **Credit implications associated with DERs**

Summary

- ◆ **NYISO proposes to look at DER integration at the transmission, sub-transmission, or the primary distribution level**
 - *Helps ensure transmission system sees the benefit of the DER*
 - *Helps to align with the PSC's REV proceeding*
- ◆ **NYISO has started market design for net generation from behind the meter resources**
- ◆ **NYISO proposes to focus on the integration of CHP/Co-generation technology**

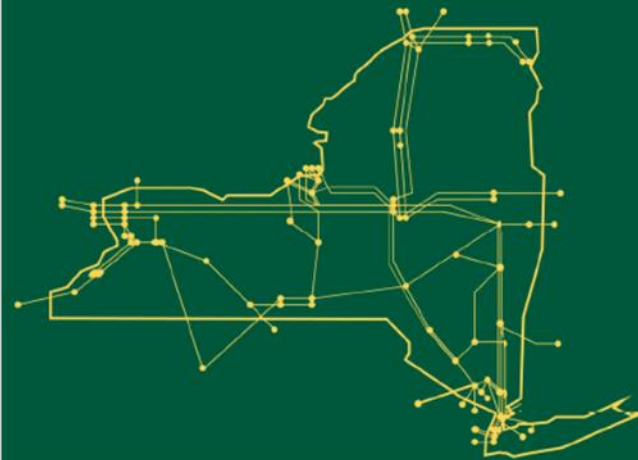
Next Steps

- ◆ In 2015, the NYISO has projects to:
 - *Develop market design for net generation from behind the meter resources*
 - *Develop market design for CHP/Co-generation DER technology*
- ◆ **May need to adjust focus to continue to align concepts with evolving REV process**

Questions



The New York Independent System Operator (NYISO) is a not-for-profit corporation responsible for operating the state's bulk electricity grid, administering New York's competitive wholesale electricity markets, conducting comprehensive long-term planning for the state's electric power system, and advancing the technological infrastructure of the electric system serving the Empire State.



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