Distributed Energy Resources: California vs. New York

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Dr. Marija Prica, Assistant Professor
mxp438@case.edu

Outline

- What are DERs?
- DERs: penetration level in the USA
- DERs: types and applications
- DERs: California approach
- DERs: New York approach
- Summary

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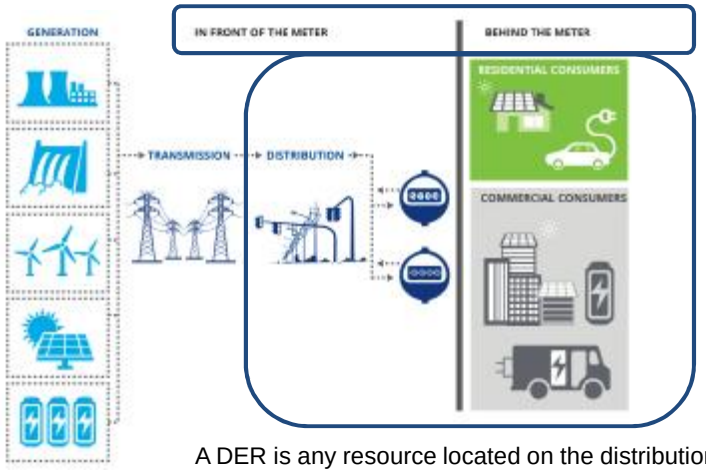
What are DERs?



A DER is any resource located on the distribution system

Source: Deloitte, Managing variable and distributed energy resources: A new era for the grid , https://www2.deloitte.com/content/dam/Deloitte/us/Documents/energy-resources/us-er-grid-integration.pdf

DER Definition

- There is no single definition for a DER
- Some technologies and services, such as residential rooftop wind or solar, easily fit into any definition but others do not
- Examples of definitions of DERs by
  - Public Utility Commissions (PUC)
  - Electric Power Research Institute (EPRI)
  - North American Electric Reliability Corporation (NERC)
  - Federal Energy Regulatory Commission (FERC)

DER Definition - PUC

- **California**

  "Distributed resources means distributed renewable generation resources, energy efficiency, energy storage, electric vehicles, and demand response technologies."[1]

- **New York**

  "DER is a resource, or a set of resources, typically located on an end-use customer's premises that can provide wholesale market services but are usually operated for the purpose of supplying the customer's electric load. DER can consist of curtailable load (demand response), generation, storage, or various combinations aggregated into a single entity." [2]

Source: 1. Cal. Pub. Util. Code § 769(a) (2015); 2. NYISO, Distributed Energy Resources Roadmap for New York's Wholesale Electricity Markets

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5

DER Definition - EPRI

"Distributed Energy Resources (DER) are electricity supply sources that fulfill the first criterion, and one of the second, third or fourth criteria:

1. *Interconnected to the electric grid, in an approved manner, at or below IEEE medium voltage (69 kV)*
2. *Generate electricity using any primary fuel source*
3. *Store energy and can supply electricity to the grid from that reservoir*
4. *Involve load changes undertaken by end-use (retail) customers specifically in response to price or other inducements or arrangements."*

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Source: NARUC, Distributed Energy Resources Manual, 2016

6

DER Definition - NERC

"A Distributed Energy Resource (DER) is any resource on the distribution system that produces electricity and is not otherwise included in the formal NERC definition of the Bulk Electric System (BES)."

- DER are located solely within the boundary of:
  - Any distribution utility
  - Distribution provider
  - Distribution provider-UFLS only
- DER includes any non-BES resource, such as:
  - Distributed generation
  - Behind the meter generation
  - Energy Storage Facility
  - DER aggregation
  - Micro-grid
  - Cogeneration
  - Emergency, Stand-by, or Back-Up generation

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Source: NERC, Distributed Energy Resources Connection Modeling and Reliability Considerations, 2017

7

DER Definition - FERC

"Distributed energy resources is a source or sink of power that is located on the distribution system, any subsystem thereof, or behind a customer meter.

These resources may include, but are not limited to, electric storage resources, distributed generation, thermal storage, and electric vehicles and their supply equipment."

- Given the wide range of DER definitions, it is important that any adopted definition for DER be well-tailored to the purpose.

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Source: FERC, Electric Storage Participation in Markets Operated by Regional Transmission Organizations and Independent System Operators, https://www.ferc.gov/whats-new/comm-meet/2016/111716/E-1.pdf

8

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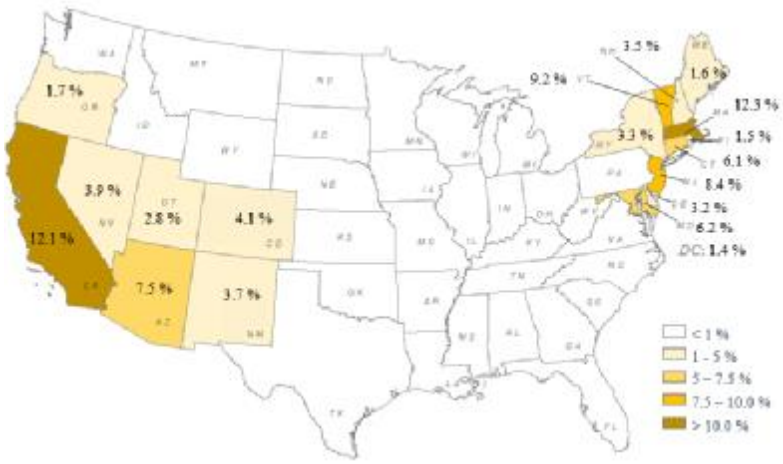
DER Penetration Level

In 2016, DERs accounted for about two percent of the installed generation capacity in the United States

Data Source: EIA - Form EIA-826 detailed data files – Net - Metering February 2017

DER as Percent of the State Peak Load



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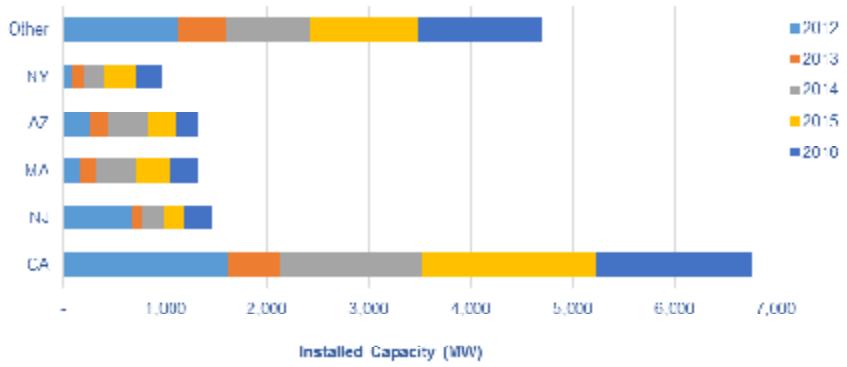
Data Source: EIA - Form EIA-826 detailed data files – Net - Metering February 2017

DER 5-year Growth

Installed Capacity 2012- October 2016, Top 5 States



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Data Source: EIA - Form EIA-861 detailed data files - Net_Metering_2012-2016

DER: increasing adoption rate

DERs are being adopted at increasing rates due to:

- Favorable the state and federal policies
- Improvements in technology, and reduction in costs
- Becoming more widely accepted with identifiable customer benefits, both at the individual level and for the grid

Source: NARUC, Manual on Distributed Energy Resources Rate Design and Compensation, 2016

DER: benefits and challenges

Benefits

- Reduce monthly bill
- Improve reliability
- Defer the upgrade of distribution and transmission facilities
- Reduce the need for large generation facilities
- Reduce system losses
- May improve power quality
- Provide market services

Challenges

- Modeling
- Voltage and frequency ride through
- System protection
- Visibility and control
- Load and generation forecasting
- Coordination

Source: NERC, Distributed Energy Resources Connection Modeling and Reliability Considerations, 2017

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DER: CA vs. NY Differences

	California "use what we have"	New York "if we build they will come"
Starting point	> 7,500 MW 12% of the peak demand Fully deployed AMI	1,300 MW > 3.3 % of the peak demand Beginning AMI deployment
Approach	Focus on technical challenges caused by increased number of DERs.	Focus on creating the infrastructure and incentives to bring DERs to the state.
Implementation	Leverage the CAISO market.	Create a distribution level market for DERs and energy services.
Driving force	California Section 769	Reforming the Energy Vision

Source: https://www.scottmadden.com/insight/integration-of-der-california-and-new-york/

DER: CA – How did it start?

- Assembly Bill 970 (2000) - Directed the CA Energy Commission (CEC) to provide incentives for distributed generation resources
- SB 1 (2005) - The CEC would be required to adopt, implement, and finance a comprehensive solar program equivalent to one million solar roofs or 3,000 MW through IOU distribution rates by the end of 2016.
- In 2007, Go Solar California! is launched by CEC and CPUC
- Clean Energy Job Plan (2011) - Set a goal to develop 12,000 MW of localized electricity generation and 8,000 MW of large scale renewables generation that require transmission lines by 2020
- Assembly Bill 2514 (2010) - Directed the California Public Utilities Commission (CPUC) to adopt an energy storage program and procurement target.
- Rulemaking 10-12-007 (2013) - CPUC established an energy storage target of 1,325 MW by 2020 that has to be implemented by 2024.

DER: California - Section 769

Each utility has to submit a distribution resources plan proposal by July 1, 2015:

- Evaluate locational benefits and costs of DERs
  - Reductions or increases in local generation capacity needs
  - Avoided or increased investments in distribution infrastructure
  - Safety benefits and reliability benefits
  - Any other savings the DERs provide to the electrical grid or costs to ratepayers
- Propose or identify standard tariffs or other mechanisms
- Propose cost-effective methods to maximize the locational benefits and minimize the incremental costs of distributed resources
- Identify any additional utility spending necessary to integrate cost-effective DERs with the goal of yielding net benefits to ratepayers
- Identify barriers to the deployment of distributed resources

Source: Cal. Pub. Util. Code § 769(a) (2015)

DER: CA - DRP Ruling

In 2015, the CPUC issued an Assigned Commissioner's Ruling which identifies the supplemental goals for the DRP proposal:

- Supporting greenhouse gas (GHG) reduction targets
- Modernizing the electric distribution system to accommodate two-way flows of energy and energy services
- Enabling customer choice of new technologies and services that reduce emissions and improve reliability
- Animating opportunities for DERs to realize benefits through the provision of grid services

Source: SCE, Application of Southern California Edison Company (U 338-e) for Approval Of Its Distribution Resources Plan, 2015

DER: CA – Hosting Capacity

Source: https://www.pge.com/b2b/energysupply/wholesaleelectricsupplier solicitation/PVRFO/PVRAMMap/index.shtml

DER: CA - DER Aggregation Model

- In 2016, adopted tariff provisions that created a new market participant category called a distributed energy resource provider (DERP)
- DERP aggregates distributed energy resources to participate in the CAISO market and provide energy and ancillary services
- DER aggregations, meeting a 0.5 MW minimum capacity requirement, can participate in the CAISO day-ahead, real-time and ancillary services markets

Source: CAISO, Distributed energy resource provider

DER: NY - Reforming the Energy Vision

- Why was it needed?
  - Cost-of-service paradigm

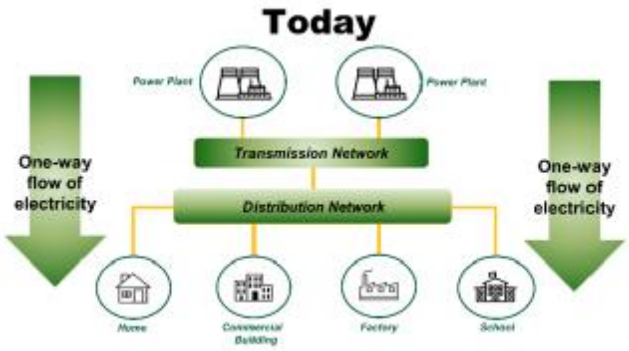
  - Few incentives for innovate
  - Efficiency and clean energy are funded through surcharges and programs that are not directly integrated with utility business models
- Central vision of REV – increasing the use and coordination of DER via markets operated through a Distributed System Platform Provider (DSPP)

DER: NY – REV

- Track 1: Implementation - developing DER markets and the utility as Distributed System Platform (DSP) provider
- Track 2: Regulatory and Ratemaking - reforming ratemaking practices for utilities and revenue streams for the DSP provider model.
  - Stepping away from the net metering
  - Value Stack mechanism, a new pricing mechanism, is based on avoided utility costs and DER values, including components for wholesale energy values, distribution system values and environmental values.
- In 2015, utilities filled proposals for the Distribution Service Implementation Plans (DSIP) process and rolled out pilot programs.

DER: NY – DER Road Map

- In 2017, NY ISO published a DER Road Map



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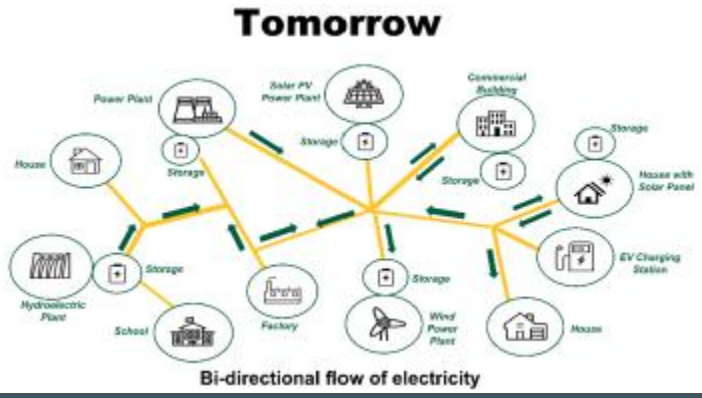

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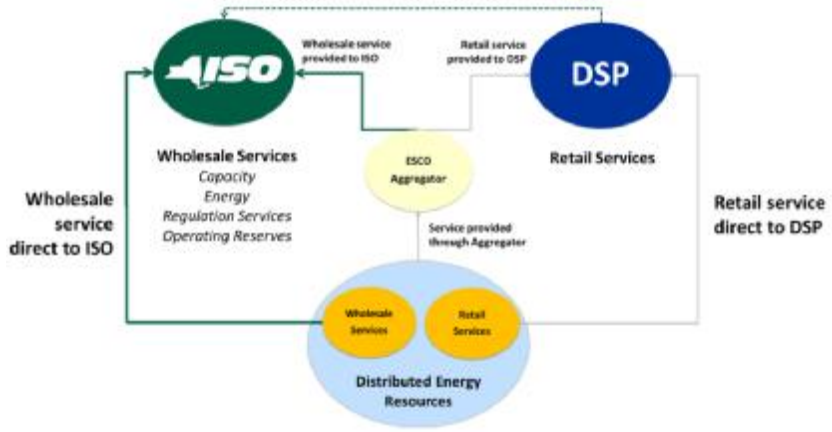
Source: NYISO, Distributed Energy Resources Roadmap for New York's Wholesale Electricity Markets

DER: NY – Market Participation



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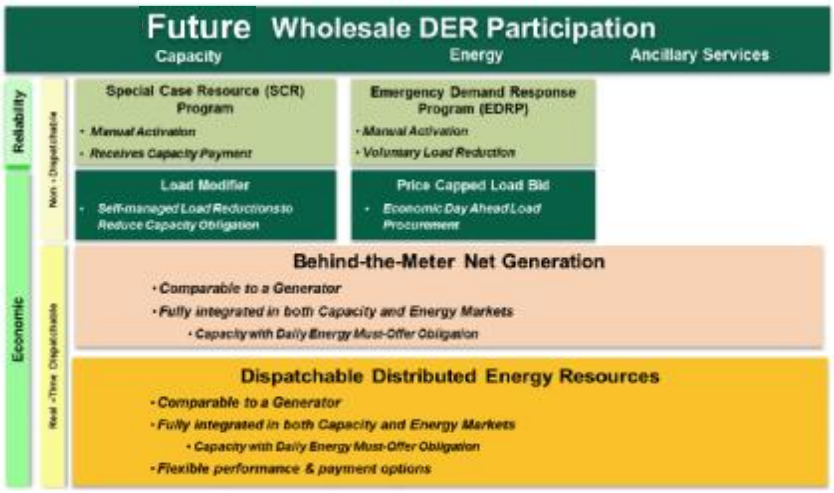
Source: NYISO, Distributed Energy Resources Roadmap for New York's Wholesale Electricity Markets

DER: NY – Wholesale Market Participation



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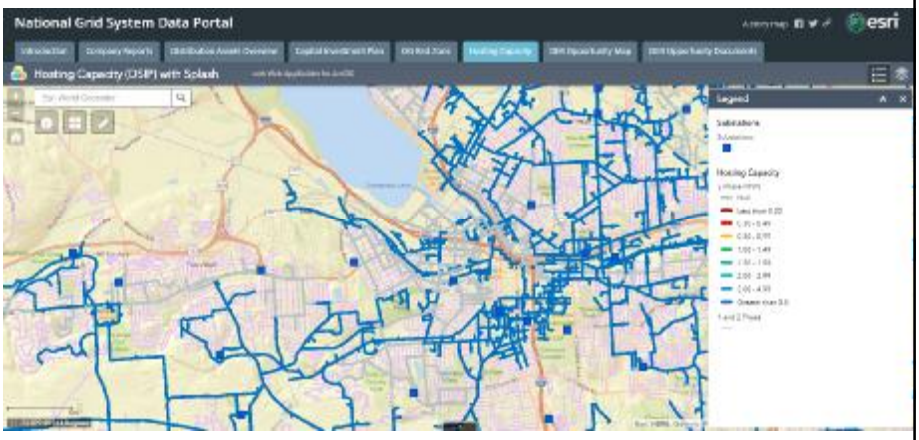
DER: NY - Hosting Capacity



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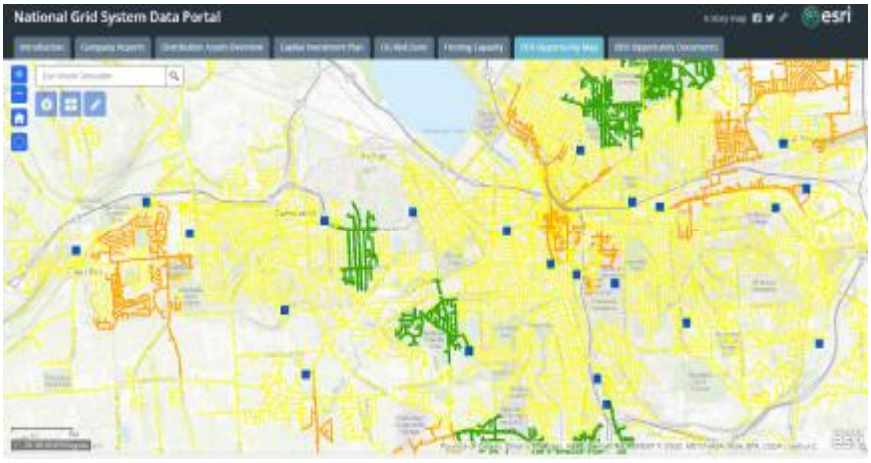
Source:
http://ngrid.maps.arcgis.com/apps/MapSeries/index.html?appid=4c8cfd75800b469abb8febca4d5dab594&folderid=8ffa8a74bf834613a04c19a68eefb43b

DER: NY – DER Opportunity Map



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Source: http://ngrid.maps.arcgis.com/apps/MapSeries/index.html?appid=4c8cfd75800b469abb8febca4d5dab59&folderid=8ffa8a74bf834613a04c19a68eefb43b

DER: NY – DER Opportunity Documents

Project Name/Description	Project Type	Description of Need
Baldwinsville	Load Relief	Substation MWh[1] violation -- includes two substations and 5-6 overloaded feeders. The Sorrell Hill Substation currently exceeds the National Grid Distribution Planning Guidelines for Load at Risk and the Lysander Substation is nearing the point at which it will exceed this guideline as well.
Old Forge	Reliability	Area of poor reliability - looking to NWA to solve summer loading and reliability problems. Radial Sub-transmission line (46kV) that runs through the Adirondack park in the Mohawk Valley Region of National Grid's territory.

Status	Loading Relief Needed	Voltage Type	Voltage (kV)	Project Size	Estimated RFP Timing	Need Timing
BCA Application	4-6 MW	Distribution	13.2kV	Large	Providing information to NY DPU Staff	2023+
Proposal Review	13 MW	Distribution/ Sub-Transmission	46kV / 13.2kV / 4.8kV	Large	Proposal Review	2023+

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Summary

- q DER definitions needs to be well-tailored to the purpose
- q In 2016, DERs accounted for about two percent of the installed generation capacity in the United States
- q The top five states are California, Arizona, New Jersey, Massachusetts and New York
- q Main reasons for the increased DER penetration level: polices, technology improvement and reduced costs
- q California and New York are solving the same problem using different approach

Questions?