Energy+Environmental Economics

DER Distribution Cost-Benefit Approaches and Grid Modernization Considerations

MADRI WORKING GROUP MEETING

March 11, 2019

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Maximizing DER distribution benefits

- DER can trigger (+cost) or defer (+benefit) distribution investments
- Regulators and utilities are increasingly exploring strategies for maximizing the benefits of DER for the distribution system

Distributed Generation

Distributed Storage

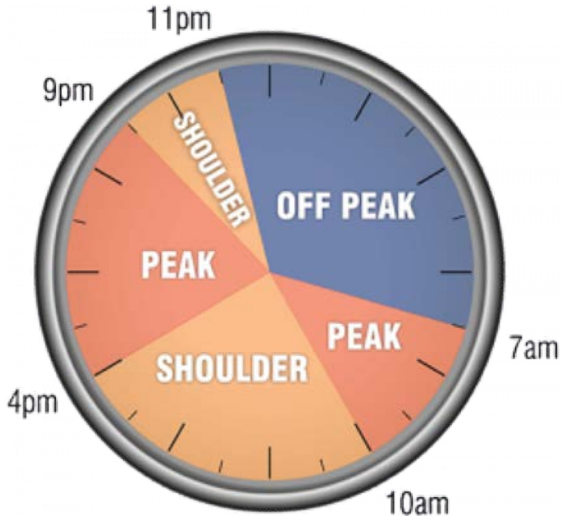
Electric Vehicles

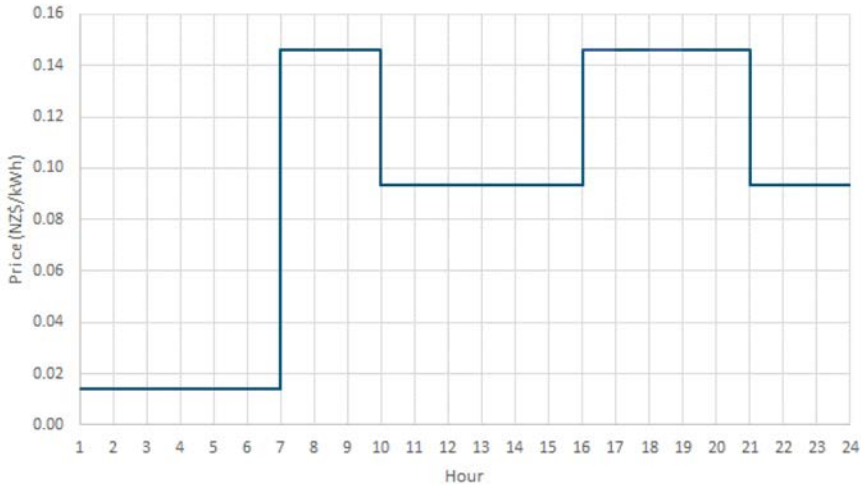
Demand Response

Energy Efficiency

Emerging strategies for capturing DER distribution benefits (1)

1. Time-Dependent Distribution Rates



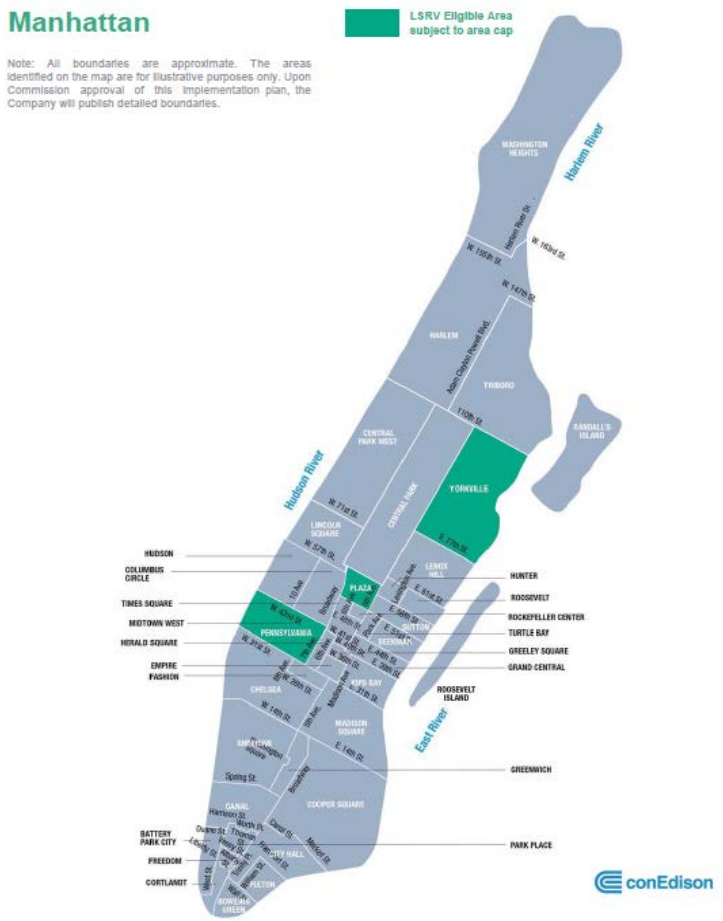


Utilities are increasing piloting time-dependent distribution rates, including TOU, demand charges, and demand subscription

Figure shows Waipa Networks' (NZ) time-of-use distribution rates for residential customers

Emerging strategies for capturing DER distribution benefits (2)

2. Value-Based Tariffs



Through the value of DER (VDER) tariff, utilities in New York are paying DERs to reduce net loads in distribution-constrained areas

Figure shows local system relief value (LSRV) eligible areas in Manhattan*

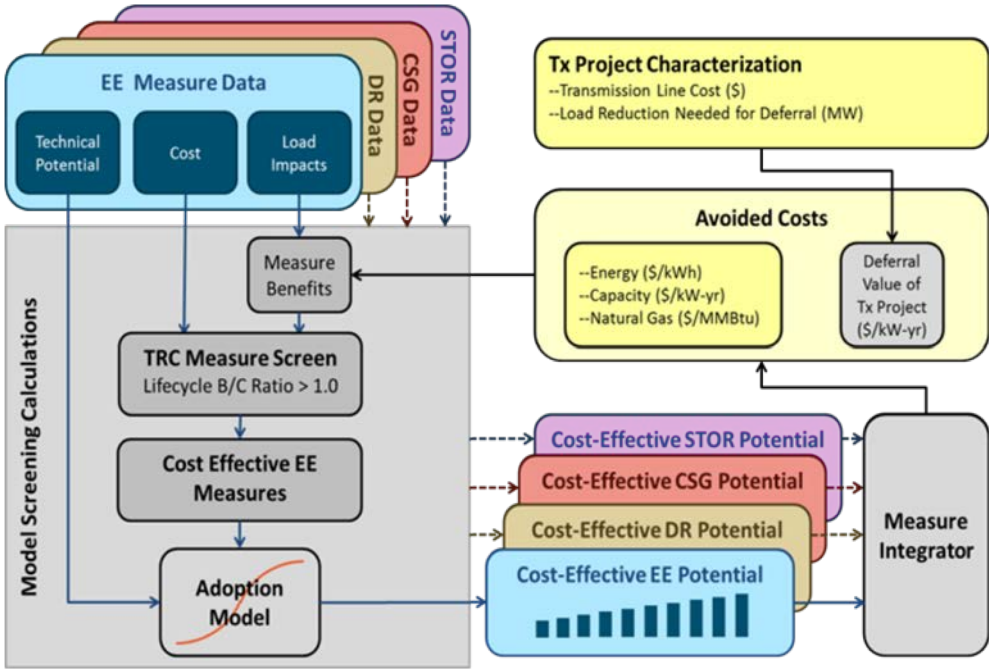
** New York is considering a sunset of the LSRV; the VDER demand reduction value (DRV) includes spatially averaged distribution deferral values*

Emerging strategies for capturing DER distribution benefits (3)

3. Non-Wires Procurement

Regulators in California and New York are requiring utilities to integrate regular non-wires procurement in their distribution planning

Figure shows the architecture of E3's integrated demand-side management (IDSM) tool, used to evaluate non-wires resources



New York NWA experience

NY Utilities developed a common suitability criteria to identify NWA opportunities

In the early phase with limited success to date[1]

Criteria	Potential Elements Addressed	
Project Type Suitability	Project types include Load Relief and Reliability*. Other categories currently have minimal suitability and will be reviewed as suitability changes due to State policy or technological changes.	
Timeline Suitability	Large Project	36 to 60 months
	Small Project	18 to 24 months
Cost Suitability	Large Project	> $1M
	Small Project	> $300k

	ConEd	Central Hudson	National Grid	Avangrid	O&R	Total	%
Completed Projects	1	3	0	0	0	4	6%
RFP phase	6	1	7	5	4	23	34%
Planning Phase			6	25	3	34	50%
Not Proceeding	4	0	3	N/A	N/A	7	10%

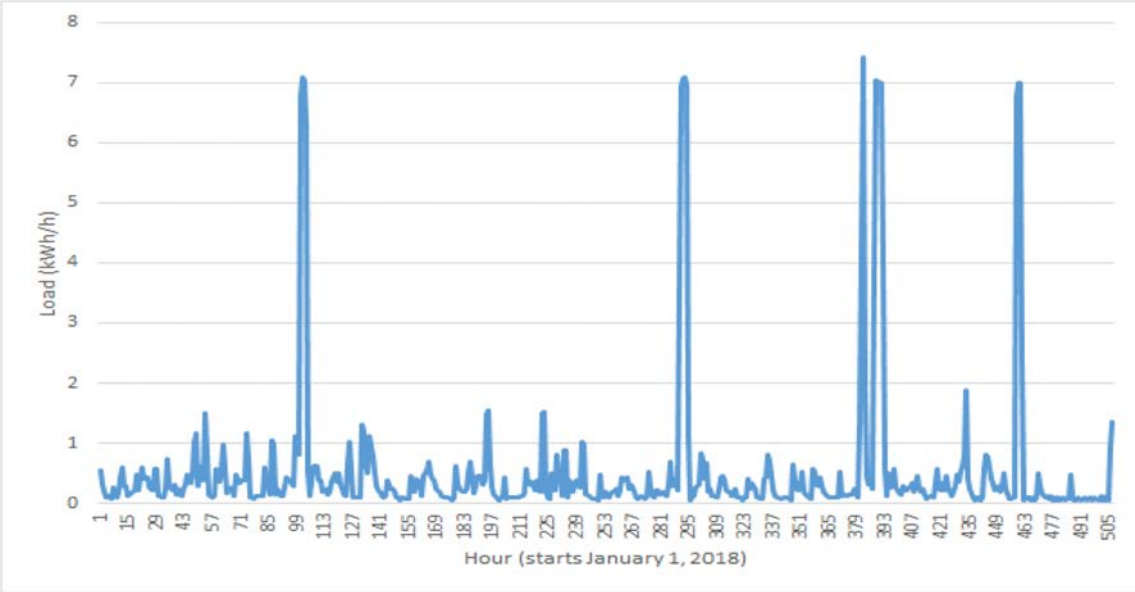
[1] Data from utility websites 2/13/18

Looking to the future, electrification and DER

- **Electrification is required to achieve decarbonization objectives in many states**
- **Electrification and higher DER levels will increase distribution costs if they aren't managed by a modern, information-rich, and automated distribution system**

EVs and heat pumps have the potential to trigger significant distribution upgrades, or could improve distribution utilization

Figure shows the load profile of a California colleague with level 2 EV charging



Optimizing DER costs and benefits requires a modern grid

Modernization Options[1]	1 Base Case (No AMI/GMP)	2 Least Regrets GMP/No AMI	3 Least Regrets GMP/Targeted AMI	4 Least Regrets GMP/Full AMI	5 Full GMP Full AMI
Costs	D	GMP, D	AMI, GMP, D	AMI, GMP, D	?
Benefits Quantitative	Ø	Reliability +	Reliability + Conservation + Load Shift +	Reliability ++ Conservation ++ Load Shift ++	Reliability +++ Conservation +++ Load Shift +++
Benefits Qualitative	Ø	Customer Empowerment Planning Operational Capability Resiliency			

1 All options meet the same decarbonization objectives and minimum reliability requirements

Grid modernization filings

- Grid modernization filings have achieved limited success in recent years
- Of the $9 billion in utility funding requests for grid modernization plans covering smart meters, distribution automation, VVO, and operational systems and technologies, only $310 million received approval in the 2nd quarter of 2018[1]
- Many plan filings have been entirely rejected while others have received partial funding approval
- Smart meter investments have in most cases not received favorable treatment

[1]Green Tech Media, August 15, 2018, A Snapshot of US Utility Grid Modernization Plans: What's Working, and What Isn't. Based on North Carolina Clean Energy Technology Center 2nd Quarter 2018 report

Lessons Learned

E3's experience and review of recent national grid modernization filings identified a consistent set of lessons learned to guide future filings

Survey Results

- Grid riders did not fare well in 2018
- Stakeholder participation is integral
- Utilities need to address obsolescence argument head-on in filings
- Utility accountability gives regulators comfort
- Concrete near-term programs and actions that fit into a long-term strategic vision/roadmap are key for regulatory approvals
- Pilots are a good way to get commissions comfortable with new technologies and rate designs

Potential Path Forward

- Detailed cost-benefit analysis that shows incremental benefits of technologies and programs over alternatives and existing system is one way to combat the obsolescence question
- Breaking filings down into concrete programs/pilots increases potential for nearer-term approval

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Appendix: New York's Approach to Calculating Distribution Value

New York's Alphabet Soup Approach to Distribution Value

- **New York has a long history of calculating "distribution" value, first for ratemaking purposes**
  - Each utility was required to file a "marginal cost of service" or MCOS study to inform how well distribution rates communicate longer run marginal distribution capacity costs, i.e. how much does 1 kW of increased demand increase costs?
- **In the early 2000s these MCOS studies were used for EE cost-benefit calculations to determine the "D' or distribution value from load reduction**
- **MCOS values were also used as the basis for utility DR program compensation like CSRP**
- **As part of the REV initiative these MCOS values took on even greater importance and scrutiny**
  - They are now the basis for how the utilities perform cost-benefit analysis for all DERs (BCA Handbook) as well as the basis for the DRV component of their value-based tariffs (VDER)

REV

MCOS

DRV

LSRV

NWA

BCA

CSRP

New York's Alphabet Soup Approach to Distribution Value, continued

- **How to both quantify distribution value as well as how it is communicated and applied is an ongoing debate**
- **Currently there is no standardized MCOS methodology across the utilities in New York**
- **E3 has been working on this issue since it's founding in 1989 and it has supported our 20+ year NWA practice**
  - We have also been assisting New York's Department of Public Service (DPS) on this topic for a number of years
- **There remain three key challenges that DPS and other stakeholders are working to address:**
  - First, there is no uniformity of method and approach on MCOS across New York utilities
  - Second, balance is needed need to get the "number" right over time in a dynamic fashion vs. sending a longer term price signal for DER revenue certainly /bankability
  - Third, balance is needed between sending a more "average" system wide signal (DRV) vs. a more localized or "hotspot" signal (LSRV/NWA)

REV

MCOS

DRV

LSRV

NWA

BCA

CSRP

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Thank You

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