ComEd
An Exelon Company

Valuing DER for Distribution Grid

Shay Bahramirad, PhD

Director, Distribution Planning and Smart Grid

i-PCGRID Workshop

March 29th, 2018

Outline

- Potential Value Created by a DER
- How does DER affect the distribution grid?
- How to measure DER value to the Distribution Grid?
- Need for a Framework to Assess Value to the Grid
- Conclusions

Potential Value Created by a DER

CONSUMER	Total Energy Costs
	Demand Charges
	Consumer Green Lifestyle
	Consumer Back Up Generation
DISTRIBUTION SYSTEM	Distribution Capacity
	Voltage
	Reliability
TRANSMISSION SYSTEM	Transmission Capacity
WHOLESALE ENERGY MARKETS	Losses
	Congestion Costs
	Generation Energy
	Ancillary Services
	Resource Adequacy
	RPS Procurement
SOCIETY	Societal Avoided Costs
	Public Safety Avoided Costs
ENVIRONMENTAL	Emissions
	Waste Products
	Water Pollution
	Siting

Value to Distribution Grid

- DER value is realized by various parties.
- Several categories of value are potentially realized from DER
- Few value streams are associated with value to distribution grid
- Value streams realized are dependent on DER location and type

How does DER affect the Distribution Grid?

DER can provide contribute to benefits of distribution grid by:

- Providing real, reactive power, and reserves (*Three R's*) to areas where otherwise the forecasted demand would surpass the system's capacity or to address reliability or correct voltage on feeder, requiring grid investments
- These value streams are dependent on DER location and type: What, Where, and When (*Three W's*)

DER integration also possess challenges to grid that was not originally designed to host DER, potential challenges may include:

- Voltage (overvoltage, flicker)
- Thermal (over current)
- Protection (coordination, loss of reach, back-feed)

How to measure DER value to Distribution Grid?

- The value DERs provide varies not only by each of the approximately 5,500 feeders on the ComEd system, but potentially within a given feeder.
- The system is designed to provide sufficient capacity to meet peak demand at a particular location and time.
- We then identify how much traditional grid improvements (e.g. replacing transformers) would cost to address the projected overload. This determines the monetary value provided by DER

Implementation Challenges:

- Granularity of implementation: zonal, substation level, feeder level, nodal level, other?
- These methodologies are computationally complex and commercial software may not be capable to handle
- Based on the assumption that the forecasted loads are accurate
- Lifetime (distribution asset vs. DER)

Need for a Framework to Assess Value to the Grid

A framework for assessing the Value to the Distribution Grid needs to:

- Establish a value of DER to the Distribution Grid only
- Provide a mathematical formulation to calculate the Value of DER based on the location
- Provide a mathematical formulation to calculate the Value of DER compared to annualized cost of traditional distribution investment
- Utilize annual hourly ("8760") time-series analysis to calculate the Value of DER, which means that the time profile of DER output will be considered to understand the temporal impact
- Be able to consider all DER types and should treat them fairly what, where and when the DER provides
- Avoid under/over compensation of DERs and consider the cost to integrate in parallel with the benefits

Conclusions

- Accurate DER valuation is a complex process
- Not all DERs are able to provide Real Power, Reactive Power, and Reserves (*Three R's*) as core products to the grid at all times.
- Value of DER to the grid is largely dependent on DER capabilities, as wellas location, and time of production (*Three W's*)?
- Detailed engineering analysis is needed to establish a value reflective of deferral of costs associated with traditional upgrades