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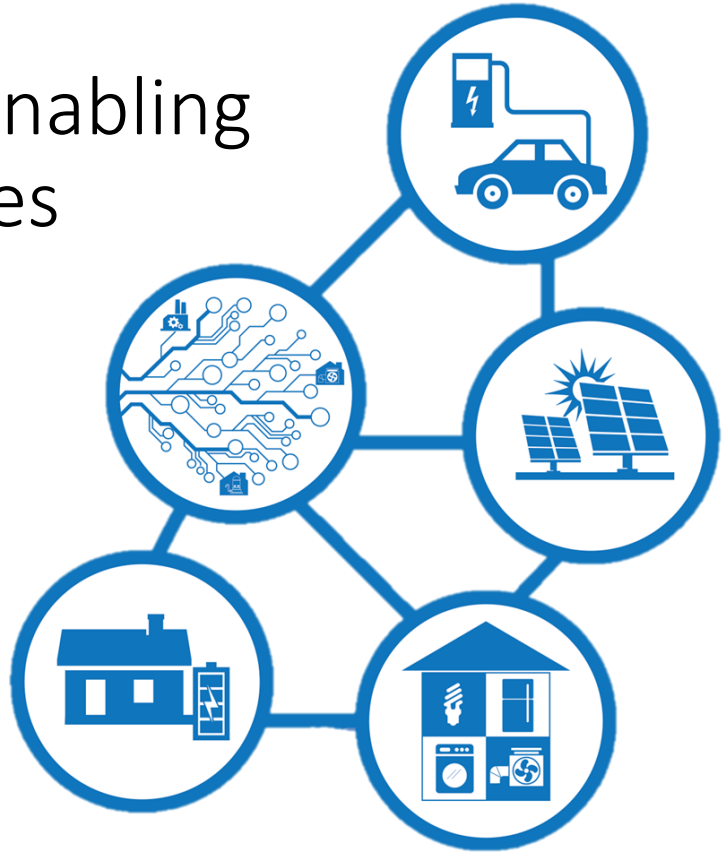
Modernizing the Grid and Enabling Distributed Energy Resources



APEC

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Distributed energy resources can become grid resources, integrated with traditional infrastructure

Traditional distribution infrastructure solutions

- Voltage regulators
- Conductor upgrade
- Breaker, bus, lead upgrade
- Transformer upgrade
- New circuits
- Substation upgrade
- New substation

Distributed energy resource solutions – combined portfolio

- Energy efficiency
- Demand response
- Energy storage
- Solar PV
- Other distributed generation

A modernized distribution planning process identifies grid needs and DER solution attributes

Deferral framework and competitive DER procurement produce lowest cost solution

Develop forecasts, assumptions & scenarios

- Integrated forecast
- Load
- Distributed Generation
- Demand Response
- Energy Efficiency
- Electric Vehicles

Perform distribution planning assessment

- Thermal
- Voltage
- Protection

Locational distribution needs and associated traditional solutions

Determine DER operational requirements (attributes) + **Identify areas where DERs have greatest benefit**

- Screen projects through a deferral framework to ensure system reliability
- Identify feasible DER locations and associated attribute requirements
- Quantify range of locational deferral benefits

Perform competitive sourcing for DER deferrals

- Existing hosting capacity
- Operational requirements
- Performance metrics and validation
- Other relevant information

DER portfolio solutions fulfill required performance attributes, however are not entirely equivalent

DER portfolios bring different dynamics than traditional infrastructure

	Traditional infrastructure	**DER portfolio solution**
Availability	Accessible when required	Competing priorities for use can affect availability, may be serving customer needs or wholesale market
Dependability	Installed for specific use and perform function as specified	Depends on other factors such as weather, time of day, and customer process demands
Durability	Well-defined and understood asset life	Customers may decide to exit voluntary programs, fail to maintain resources, or move
Flexibility	Increased operating options due to inherent capacity margin	Maximizes utilization of existing infrastructure, however limits operating possibilities

Grid reinforcement and modernization is required to maintain reliability and realize DER operational capability

DER installation for customer use increases grid operation complexity; when DER portfolios are relied on as part of reliability, that complexity escalates

Monitor

Situational Awareness

Resource output / status

Power flow and direction

Voltage

Circuit configuration

Analyze

Forecasting (short and long-term)

Distribution load flow analysis (short and long-term)

Interconnection tools

Grid state estimation

Control

Distributed and centralized

ISO dispatch coordination

Auto circuit reconfiguration

Capacitor bank switching

DER operations disatpch

Optimize reliability

Power flow optimization

Voltage optimization

Adaptive, bidirectional protection

Optimize economics

Real-time market operation layer on top of reliability optimization

Customer objectives

Customer objectives, small volume of DER providing grid services

Customer objectives, increasing reliance of DER providing grid services

Customer objectives, reliance of DER providing grid services, prioritized by DER costs

Thank you

To access SCE's Distribution Resources Plan (DRP), SCE's Distributed Energy Resources Interconnection Map (DERiM), and additional information, please visit the CPUC's DRP website at: http://www.cpuc.ca.gov/PUC/energy/drp/