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Planning for Distributed Energy Resources

U.S. Department of Energy, Electricity Advisory Committee

Clean Power Plan

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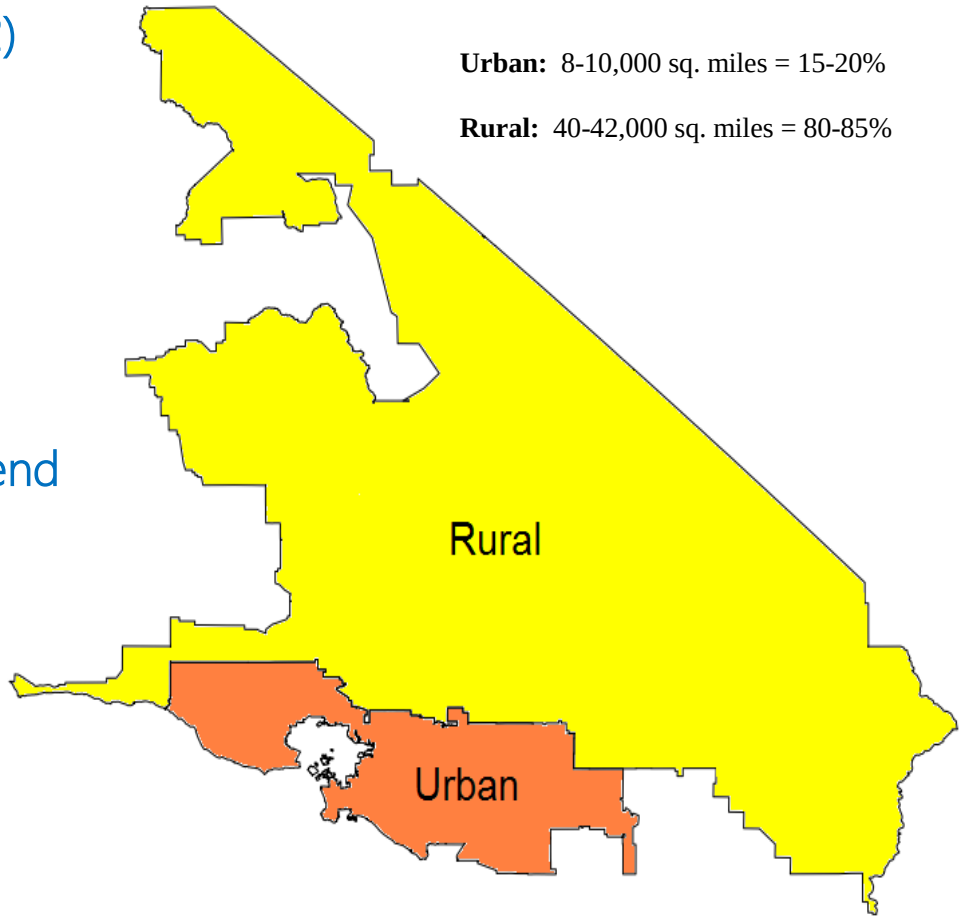
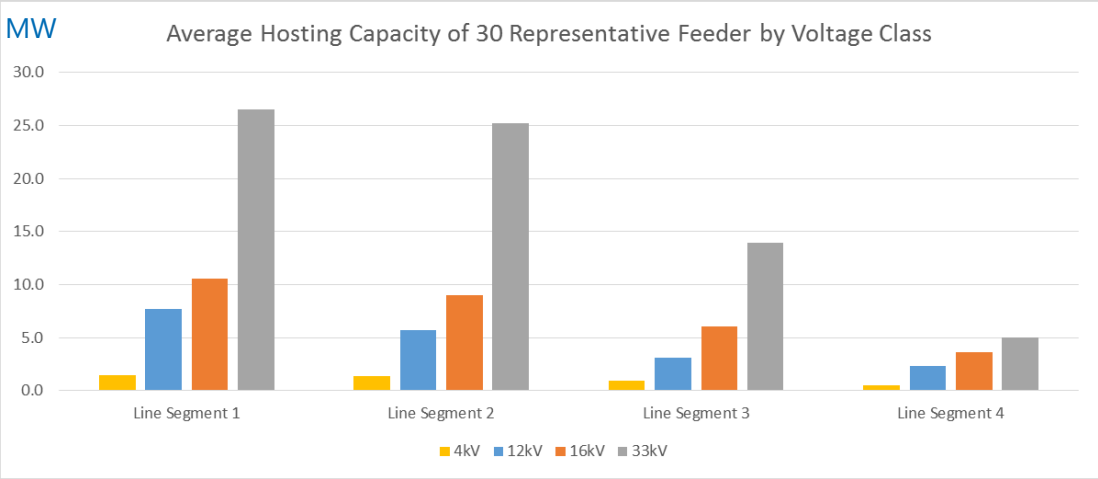
Impact of Location of Renewable Resources

- Study of Impact Higher Penetration of Distributed Energy Resources (May 2012)
  - Identified locational differences in integration costs based on historical interconnection applications
  - Did not consider value of DER providing grid services
- Unguided case follows current queue trend
  - 30% urban, 70% rural
  - Higher integration costs (2x)
- Guided case is inverse of unguided case
  - 70% urban, 30% rural
  - Not “ideal” or “optimal”



DRP - Integration Capacity Analysis and Reliability Considerations



Capability of the grid for DER is based on:

- Distribution Voltage
- Distance from the substation

Key Takeaways:

1. The higher the distribution voltage, the higher the integration capacity.
2. The closer the line segment is to the substation, the more DERs it can accommodate
3. Results are displayed on SCE's new Distributed Energy Resource Interconnection Map
4. Integration Capacity will be subject to continuous change due to dynamic nature of system (e.g., reconfiguration, growth in customer load and DERs)

Grid End States

- CA More than Smart Stakeholder Working Group
  - "Grid as Platform" – Consensus on open and interactive distribution grid, increasing value number of interactive connected points
  - Other end states discussed – grid as back up, current path, convergence
- Considerations
  - Alignment and definition of forecasting between distribution system and transmission system (state planning processes)
  - Long Term Balancing of Supply and Demand
  - Changes to existing system design, protection, and performance characteristics
  - Increasing the dependability and availability of distributed energy resources

Grid Modernization Requirements

The future grid will require investments in technology that build capabilities enabled by the future workforce and process improvements.

Advanced capabilities needed to support higher penetrations of DERs

- Monitor
- Predict
- Control

Investments needed to achieve desired capabilities

Grid Assets	Communications and Interoperability	Technology Solutions
Assets installed on the grid need to provide additional intelligence to better measure and manage the grid, proactive reinforcement	Data (both utility and third party owned) needs to be collected and communicated to back office systems in near real time for proactive control actions	Technologies deployed need to be revamped to accommodate and act on the additional intelligence being obtained from grid assets

Enabled By:

People Strategy
- Increased resource requirements
- Evolving skill sets
- Training needs

Business Processes
- Work management
- Design standards
- Procurement & planning integration

Opportunities to Explore Further

- Modernization of forecasting and planning methodologies that incorporate both distribution and transmission system needs
- Development of metrics that account for reliability, resiliency, and environmental benefits
- DER portfolio optimization, EM&V methods to meet varying system needs
- Development of automation and control technologies, and grid management systems that enable more flexibility
- Adaptive protection schemes considering changes in power system due to increased reliance on inverter-based power
- High speed communication requirements
- Design standards based on changes to diversity and load factors
- Workforce of the future – needed knowledge, skills, and training