SCE’s Grid Modernization, Grid Readiness and Project Portfolio

New Framework for Distribution Planning and Deployment of New Technologies

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New Framework for Distribution Planning

- ... to begin the process of moving the IOUs towards a more full integration of DERs into their distribution system planning, operations, and investment
- ... dramatically streamline and simplify processes for interconnecting to the distribution grid to create a system where high penetrations of DER can be integrated seamlessly.
- ... provide the greatest net benefits to the grid. These benefits include enhanced reliability of delivery and the opportunity to introduce innovation - whether driven by the IOUs or by non-traditional parties - into the utility of the future.
Resources Plan Deliverables

Integration Capacity Analysis (ICA)

Output of available capacity to integrate DERs across electric grid

Net Benefit Analysis

Demonstration and Deployment

- Line section or node level
- Thermal, protection, safety, power quality limits
- Dynamic modeling methods
- All circuits or representative circuits in initial DRP
- Published via online maps
- Available to the public
- Completed by July 1, 2015
- Additional analysis of DER penetration scenarios to the circuit line section level
- Unified methodology enhanced to include location-specific values
- Avoided Capex and Opex in capacity increases, reliability, voltage, and power quality
- Avoided flexible resource adequacy, avoided societal and public safety costs
- ICA All line sections in a distribution planning area
- Optimal location benefit analysis methodology
- Validate multiple DER in concert to achieve net benefits
- Operations managed by dedicated control system

Other requirements include data access, proposed tariffs and contracts, safety, and barriers to deployment
Recommended Phasing by DRP Guidance

2016 - 2017
- Evaluation of capacity and load forecasting scenarios
- Tool development and design of system instrumentation (sensors) to validate system models
- Planning and design of communications infrastructure for monitoring and control

2018 - 2019
- Determine distribution system impacts to identify optimal locations and combinations of DER
- Deploy sensors and communications infrastructure
- Identify “Distributed Energy Resource Development Zones” defined by value optimization

2018 and beyond
- Stakeholder-driven development of DER procurement policy
- Accommodate non-utility owned distribution systems that include island-able microgrids
- Development of Distribution System Markets
- Specify plan for developing a rolling 5-year DER forecast as part of distribution infrastructure planning
Required Capabilities of a modern grid

Grid of the future requires that SCE has better abilities to Monitor the Grid status, Predict the Grid conditions, and take corrective controlling actions.

**Monitor**
- Real Time Situational Awareness
- Power Quality Awareness
- Distribution Load flow Analysis
- Auto Circuit Reconfigurations
- End to end circuit model

**Predict**
- Distribution demand forecasting
- Near term DER forecasting
- Long term DER forecasting

**Control**
- Voltage Optimization
- Power Flow Optimization
- Reconfigurable Protection
- Bi-directional protection
- Communication with remote relays

**Forecast of World Energy Consumption**

![Graph showing forecast of world energy consumption]

**Grid of the Future**
- Requires improved monitoring, prediction, and control capabilities.
- SCE must enhance its ability to monitor grid status, predict grid conditions, and implement corrective control actions.
Assets installed on the grid need to provide additional intelligence to better measure and manage the grid.

Communications: (both SCE and third party owned) data needs to be collected and communicated in near real time for proactive control actions.

Technologies deployed at SCE need to be revamped to accommodate and act on the additional intelligence being obtained from grid assets.

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

Enabled By:

**People Strategy**
- Increased Resource Requirements
- Evolving skill sets
- Training needs

**Business Processes**
- Design Standards
- Integration of Planning Processes
- Procurement & Planning Integration
Emerging Modernization Challenges

- Legacy automation and communication technology
- Technology readiness
- Deployment life cycle
- Speed of technology change and risk of stranded assets
- Increasing need for granular data
FRAMEWORK OF ADVANCED TECHNOLOGIES PORTFOLIO UPDATE

AT PROJECTS

Distribution

- Operations
- Customer Device Integration
- Grid Integration
- Electric Transportation Integration

Transmission

1. Driving Principles
2. Projects
**Distribution Evolution**

**Operations: Driving Principles**

<table>
<thead>
<tr>
<th>Focus Area</th>
<th>Questions</th>
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<tbody>
<tr>
<td>Safety</td>
<td>• Can technology help reduce injuries or exposure to potentially hazardous situations? (e.g. High impedance fault detection, remote line monitoring and directional power flow detection, reduce strains and sprains, etc.)</td>
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<tr>
<td>Operational Excellence</td>
<td>• What technologies can improve the cost-effectiveness of operations?</td>
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<tr>
<td>System Reliability</td>
<td>• How can technology improve operational functions such as protection schemes and control algorithms to increase system reliability?</td>
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Mapping to Strategic Initiatives

Distribution Grid Readiness
- **Integrated Grid Project**
- Distributed Optimized Storage
- Beyond the Meter: Customer Device Communications, Unification and Demonstration (Phase II)
- Dynamic Power Conditioner
- Next-Generation Distribution Automation
- Integration of Big Data for Advanced Automated Customer Load Management
- Proactive Storm Impact Analysis Demonstration
- **Distribution Planning Tool**
- Energy Savings Model Using Smart Meter Data
- Advanced Storage Sizing Tool for Grid Reliability
- Advanced Grid Capabilities Using Smart Meter Data
- EPRI PS180C: Distribution Reliability Management
- CSI#4: Standard Communication Interface and Certification Test Program
- EPRI PS180D: Distribution Reliability Management
- Integration of Big Data for Advanced Automated Customer Load Management
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Preferred Resources Pilot
- **Integrated Grid Project**
- Beyond the Meter: Customer Device Communications, Unification and Demonstration (Phase II)
- Integration of Big Data for Advanced Automated Customer Load Management
- **Distribution Planning Tool**
- CSI#4: Standard Communication Interface and Certification Test Program

Energy Storage Initiative
- **Integrated Grid Project**
- Dynamic Power Conditioner
- **Distribution Planning Tool**
- Advanced Storage Sizing Tool for Grid Reliability
- EPRI Program 94: Energy Storage
- Energy Storage Controls & Monitoring Infrastructure
- Electrochemical Energy Storage Laboratory Evaluation