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SCE's Grid Modernization, Grid Readiness and Project Portfolio

New Framework for Distribution Planning and Deployment of New Technologies

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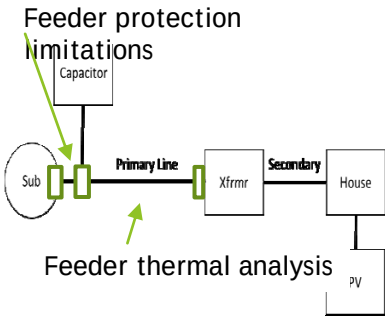
PUC Code Section 769 – Distribution Resource Planning

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.

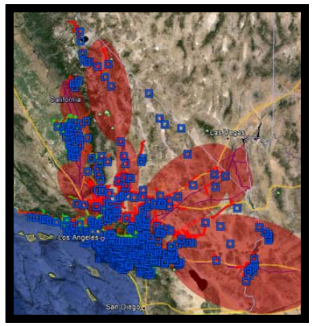
Resources Plan Deliverables

Integration Capacity Analysis (ICA)



- Line section or node level
- Thermal, protection, safety, power quality limits
- Dynamic modeling methods
- All circuits or representative circuits in initial DRP

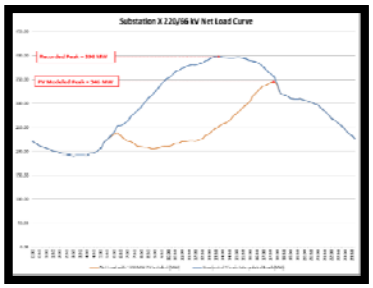
Output of available capacity to integrate DERs across electric grid



- 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

Net Benefit Analysis



- 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

Demonstration and Deployment

- 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

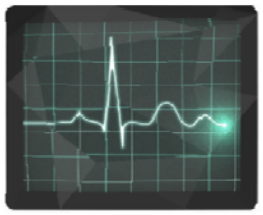
Recommended Phasing by DRP Guidance

- 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

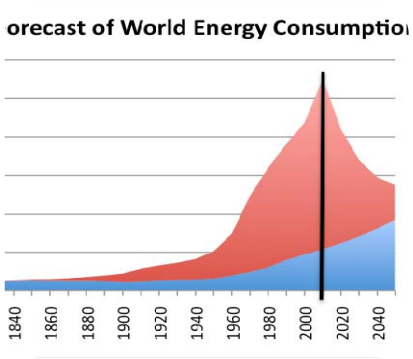
Monitor



Monitoring:

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

Predict



Prediction

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

Control

Grid Control

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

Grid Modernization Requirements

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

System Performance

Assets installed on the grid need to provide additional intelligence to better measure and manage the grid

Communications and Interoperability

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

Optimization

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

Enabled By:

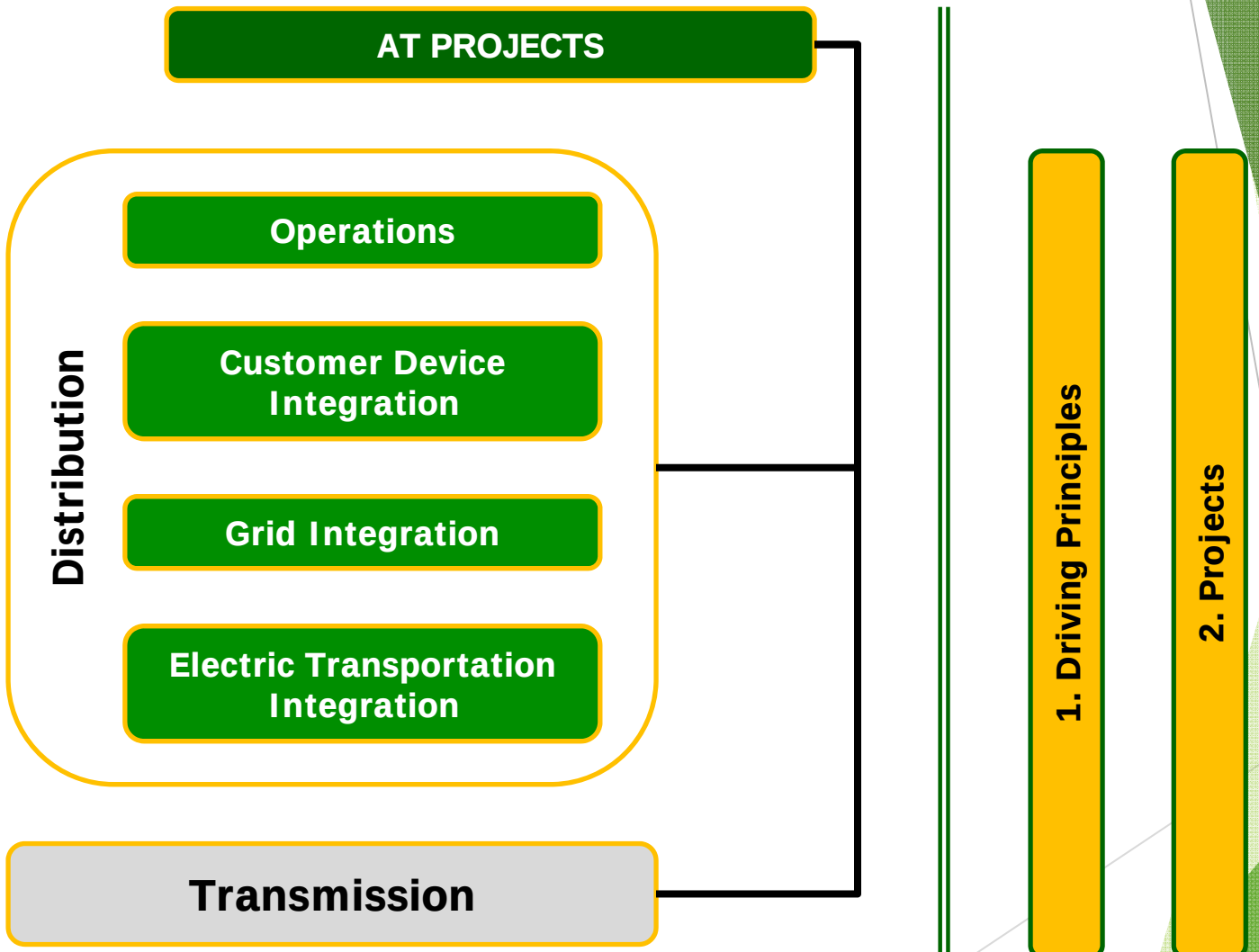
People Strategy
- Increased Resource Requirements
- Evolving skill sets
- Training needs

Business Processes
- 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



DISTRIBUTION EVOLUTION

Operations: Driving Principles

Focus Area	Questions
Safety	• 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.)
Operational Excellence	• What technologies can improve the cost-effectiveness of operations?
System Reliability	• How can technology improve operational functions such as protection schemes and control algorithms to increase system reliability?

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

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