SOUTHERN CALIFORNIA EDISON®

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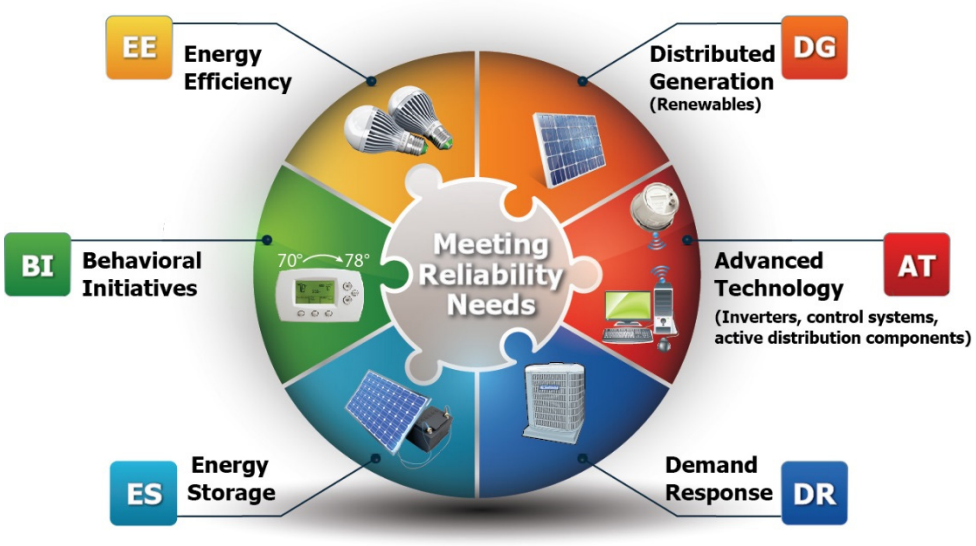
SCE's Preferred Resources Pilot (PRP)
Annual Progress Update



December 2014

http://on.sce.com/preferredresources

http://edison.com/preferredresources

PRP Annual Progress Update Outline

Content

- PRP Overview
- 2014 Progress
  - Portfolio Design
  - Acquiring Resources
  - Measuring Performance
- Summary & Next Steps

The PRP Annual Progress Update highlights the 2014 achievements and delineates next steps for 2015 and beyond.

PRP Overview

Purpose of the PRP

- To investigate and demonstrate how the integrated use of preferred resources* may simultaneously offset growth in the pilot project region's electricity demand and reduce or eliminate the need for additional natural gas power plants through at least 2022
- To assess the capabilities of preferred resources and inform the development of the grid of the future, contributing toward California's environmental and renewable energy goals

Key Drivers

- SONGS closure resulted in a 2,200 MW loss of reliable power to Southern California
- Anticipated retirement of ocean-cooled power plants may result in regional transmission constraints
- Forecasted electricity demand growth in the region served by Johanna and Santiago substations requires additional power capacity or demand reduction measures
- Increasing amounts of preferred resources may impact the distribution grid

*For the PRP, "preferred resources" include energy efficiency, demand response, renewable generation, and energy storage

PRP Overview

Innovative Approach

- New precedent for SCE to use solely **preferred resources to manage local demand growth** to net zero
- Departure from procuring preferred resources only to meet statewide (e.g., energy efficiency and demand response) or resource portfolio level (33% renewables) goals by also using them to address **specific, local electricity needs**
- Shift from the current top-down, system-wide integrated resource planning to **bottom-up, targeted planning approach**

Objectives

- Measure the local grid impact of preferred resources
- Implement a preferred resources portfolio to address local peak needs
- Demonstrate preferred resources can be used to meet local capacity requirements
- Minimize/eliminate need for gas-fired generation at these locations
- Identify lessons learned for application to other grid areas

The PRP will test if preferred resources are available when called upon (dependability), can deliver an expected load reduction or production (predictability), and can deliver in future years (persistence)

PRP Overview

The PRP has two major milestones and is being implemented in three phases

Phase 1:
Lay the Foundation
Nov 2013-2014

- Portfolio Design: defined the customer electricity needs in the PRP region and designed a diverse portfolio with types and quantities of preferred resources to meet the need attributes accordingly
- Acquiring Resources: developed and began implementing plan for acquiring resources through existing customer programs*, existing solicitation processes, and new solicitations to fill gaps
- Measuring Performance: established measurement processes to assess dependability and predictability

Phase 2:
Demonstration and Proof
2015-2017

- Evaluate effectiveness of acquiring preferred resources to meet attributes and measure impact at the grid level
- Re-evaluate the mix of preferred resources to deploy based on initial PRP acquisition and performance experience
- Test advanced automation, enhanced communication networks, and grid-management systems enabling the integration of preferred resources

2017 Milestone: Demonstrate ability to acquire and measure mix of preferred resources that meet local needs (and make determination on need for new gas-fired generation in PRP region)

Phase 3:
Sustainability
2018-2022

- Implement changes as required to acquire sufficient preferred resources to meet 2022 needs
- Develop and implement program and process changes to support using preferred resources to meet local capacity requirements

2022 Milestone: Meet 2022 reliability needs in PRP region

*Customer programs include energy efficiency, demand response and solar programs

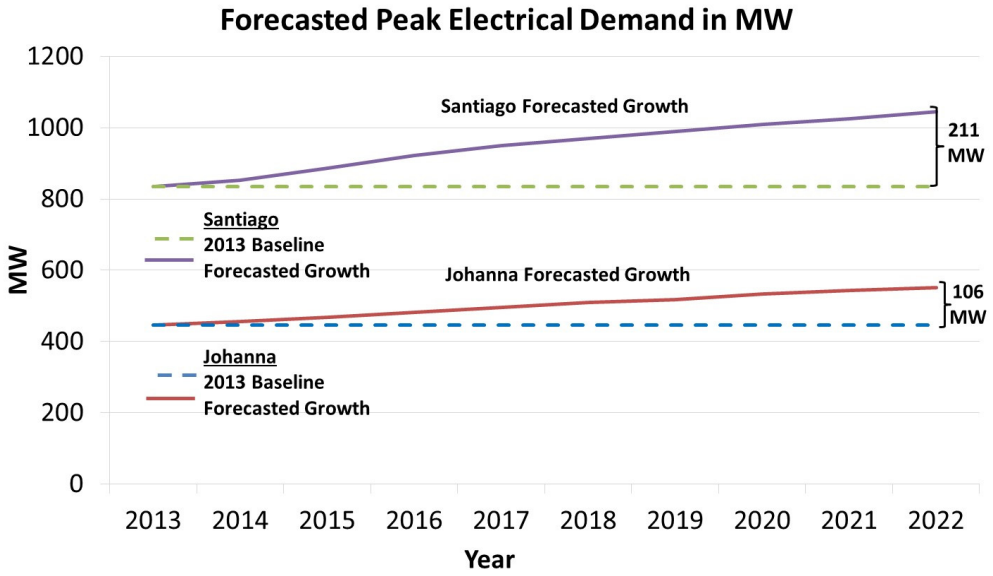
Phase 1: Portfolio Design

Completed Portfolio Design Process

- Established iterative process to develop portfolio scenarios based on new data and forecasts
- Forecasted substation demand through 2022 using SCE's annual Distribution Planning Process
- Developed 2022 hourly shape of electricity demand
- Assessed the attributes (quantity, duration, frequency, and time of day) of the local needs
- Assessed the market potential for energy efficiency and demand response
- Designed potential resource portfolio scenarios to meet needs based on the above

Results of Demand Forecast

- Peak months were identified as June through September
- Demand is expected to grow more than 300 MW by 2022 (from 1,280 MW in 2013 to 1,590 MW)



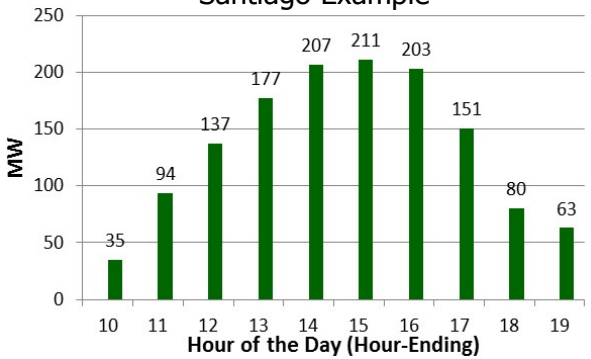
Phase 1: Portfolio Design

Results of Attributes Analysis

To understand customers' future demand, SCE developed a 2022 forecast using historical hourly demand data. In addition to identifying the peak, SCE's analysis identified other attributes of the forecast, including quantity (how many MW), duration (for how many hours), frequency (how often the need for MWs occurs), and time of day

- Analyses of the expected highest peak demand and the associated duration of the incremental MW quantity:

Hourly Demand (Quantity) on Peak Day - Santiago Example



Duration and MW Quantity of Peak Event

MW's Required to Meet All Need		
Duration	Johanna MWs Required	Santiago MWs Required
0-2 Hours	5 MW	10 MW
2-4 Hours	15 MW	50 MW
4-6 Hours	15 MW	50 MW
> 6 Hours	70 MW	100 MW

- Estimated number of days that demand will be above the 2013 baseline (incremental demand) and by how much:

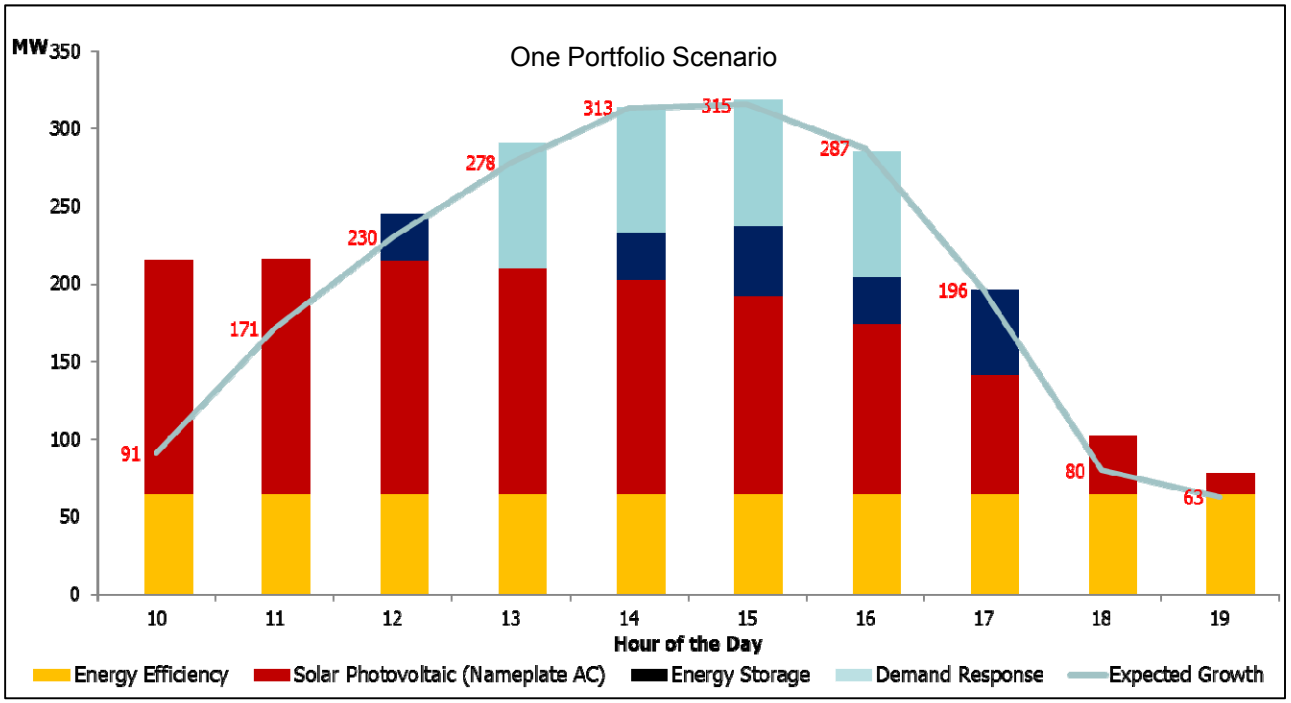
MW Quantity and Frequency of Peak Events

Annual MW Requirements			
Johanna		Santiago	
MWs Required	Days	MWs Required	Days
> 100 MW	1	> 200 MW	1
> 85 MW	3	> 150 MW	2
> 70 MW	11	> 100 MW	6
> 0 MW	81	> 0 MW	36

Phase 1: Portfolio Design

Results of Portfolio Scenarios

- By meeting the 2022 peak day's incremental demand, SCE will necessarily meet demand for the entire year. SCE designed numerous preferred resource combinations (portfolio scenarios) to meet the forecasted peak day
- To develop portfolio scenarios, SCE selected resources based on their different capabilities, limitations, and market potential. For example, SCE limited demand response because customers may opt out if used excessively



Example in which customer EE & DR programs deliver at the market potential: solar expected to fill remaining needs in daytime hours and energy storage expected to fill the rest

Phase 1: Acquiring Resources

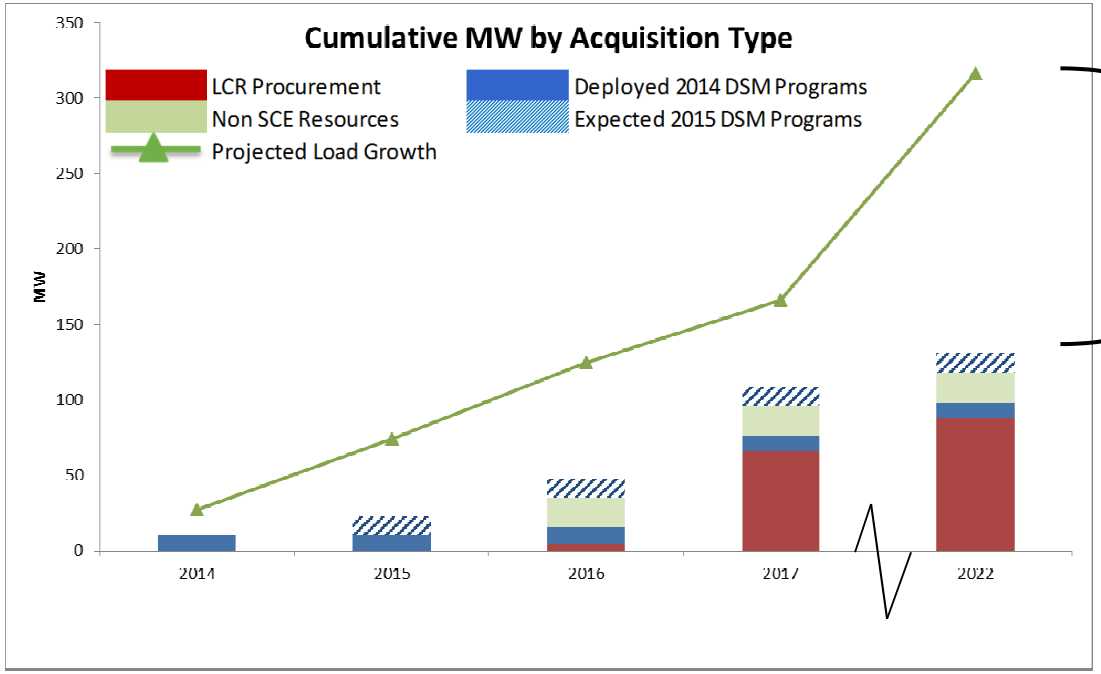
Developed PRP Acquisition Strategy

Acquire preferred resources through:

- Existing demand-side management (DSM) programs (energy efficiency and demand response) and customer self-generated power
- Existing solicitations processes
- PRP resource-specific solicitations

Results to Date

- SCE has contracted for 88 MW through the LCR RFO (66 MW expected to deliver in 2017)
- In 2014, SCE's customers deployed 10 MW through existing SCE programs
- In 2015, SCE is targeting to deploy 13 MW through existing SCE customer programs



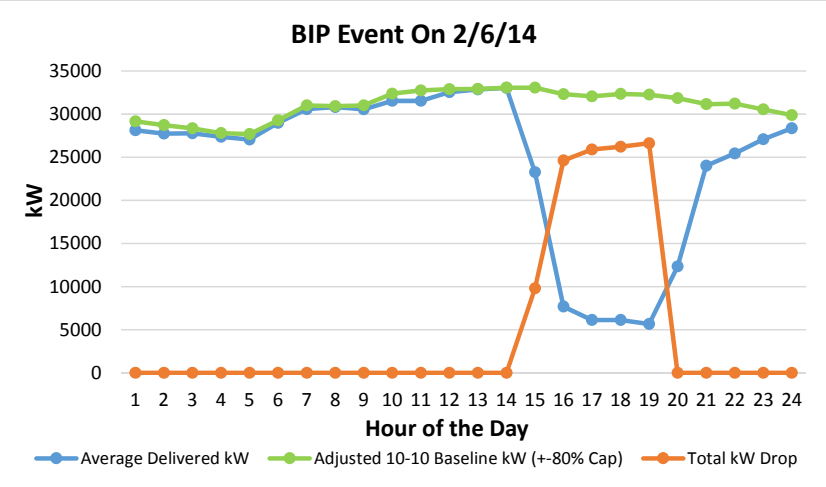
Remaining MW will be acquired through other solicitations (e.g., PRP Distributed Generation RFO, Energy Storage RFO) and future deployed DSM

Non SCE Resources info here

Phase 1: Measuring Performance

Began Measuring Preferred Resource Energy Delivery

SCE is measuring preferred resource to confirm they are available when called upon (dependability), can deliver an expected load reduction or production (predictability), and can deliver in future years (persistence)

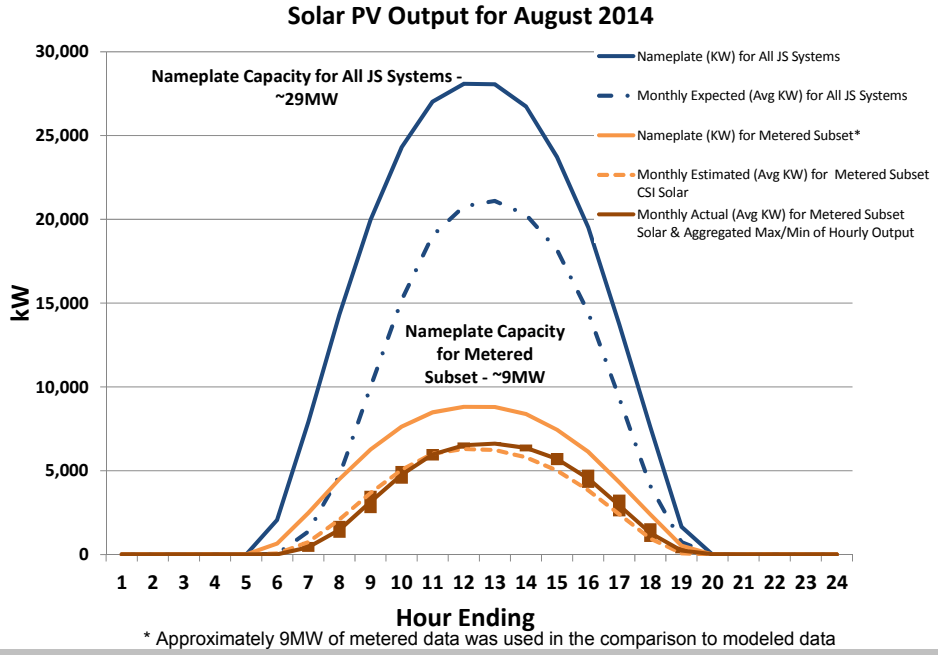


Results of Solar PV Measurement

- The metered solar production in the PRP region (~60% of the ideal nameplate curve) may allow for increased accounting of solar dependability in system planning
- The solar production model closely tracked metered systems in measurement test, therefore the model will likely provide information for systems not metered by SCE
- Evaluation of the aggregated metered solar data reflects a dampening of solar intermittent output

Results of Demand Response (DR) Measurement

- DR for the Base Interruptible Program (BIP) was triggered once in 2014
- Over 90% of the enrolled customers (34 total) reduced their load
- An average of 22 MW of load reduction was delivered over the event
- Based on these results, PRP will explore increasing customer enrollment in this type of program



* Approximately 9MW of metered data was used in the comparison to modeled data

Key Implementation Issues and Challenges in the PRP

The inherent purpose of a pilot is to discover unforeseen issues and develop solutions to address these issues. Already, the PRP has uncovered areas that will need further exploration and attention in order to most effectively use preferred resources for reliability, including, but not limited to:

- Integrating the measured performance results of PRP resources, such as energy efficiency, into future load forecasts
- Balancing enrollment in demand response programs for reliability with enrollment in price-responsive demand response programs
- Identifying preferred configurations for energy storage in constrained areas (such as behind a customer meter, paired with an intermittent renewable source, or stand-alone and distribution-connected)
- Utilizing solar measurement results to inform SCE's planning process with respect to the local and regional solar PV output and capacity during the evolving changes in the peak time of the day
- Overcoming owner/tenant barriers to further customer demand reductions

Summary and Next Steps

In 2014, SCE created an action plan based on feedback from stakeholders to lay the foundation for the PRP, including:

- Developed a portfolio design process to incorporate acquired resources and forecast updates
- Updated the 2022 need for the Johanna and Santiago region
- Began implementing the PRP acquisition strategy through both existing and new processes
- Commenced measuring solar, demand response, and energy efficiency

Next Steps:

SCE will continue to gather insights on the use of preferred resources, evaluate the PRP's progress and use the lessons learned to inform the PRP and the grid of the future. In 2015, activities include:

- Evaluate solicitation results and use them to adjust portfolio design to meet the PRP targets
- Adjust plans for future preferred resource acquisition and decide if incremental solicitations are required
- Measure and report demand response and distributed generation resource grid-level impacts
- Begin evaluation of energy efficiency measurement methodologies
- Seek and utilize stakeholder feedback to continuously improve PRP implementation

Appendix

Laying the Foundation – Measuring Performance

Began Measuring Preferred Resource Energy Delivery

To "measure grid level impacts" the source of data and analytic method was determined

Preferred Resources Measurement				
Preferred Resource	**Data Source and Analytic Method**	**Target**	**Key Process Findings**	**Next Steps**
Demand Response (DR)	• Customer meter data, establishing an expected demand (baseline) then measuring the impact of the DR events	• Largest load reduction potential programs (BIP and SDP) to manage peaks in PRP	• Measuring these DR programs more contemporaneous to the events provide timely feedback on their impact but may include some margin of error if system perturbations are not included.	• Continue measuring BIP and SDP to confirm dependability, predictability and persistence (DPP)
Energy Efficiency (EE)	• Customer meter data, establishing an expected demand (baseline) then measuring the impact of the EE upgrade(s)	• 50 commercial & industrial customers with projects 20kW or greater of savings and a 5% savings to load ratio or greater	• Developed processes to use customer meter data to confirm on-going energy efficiency effectiveness are not common but could inform the PRPs portfolio and acquisition plan.	• Evaluate different vendors' approaches to measure EE savings for DPP
Renewable Distributed Generation (R-DG)	• Solar generation meter data* (when available) and production modeling for remaining systems	• All known R-DG, which is solar in the PRP region	• Meter data not available for most solar systems; access to available solar production data allowed for evaluation of alternative measurement tools	• Obtain seasonal production data and confirm DPP. Also, further validate modeling tool
Energy Storage (ES)	• Generation meter data (once deployed)	• Larger scale ES are not yet deployed in the PRP region	• ES industry measurement processes not yet developed; developing processes for PRP	• Collect and analyze data on charge and discharge states

* Approximately 9MW of metered data was used in the comparison to modeled data

PRP By The Numbers