Modern Distribution Planning

Emerging Complexity and Opportunities for the Future

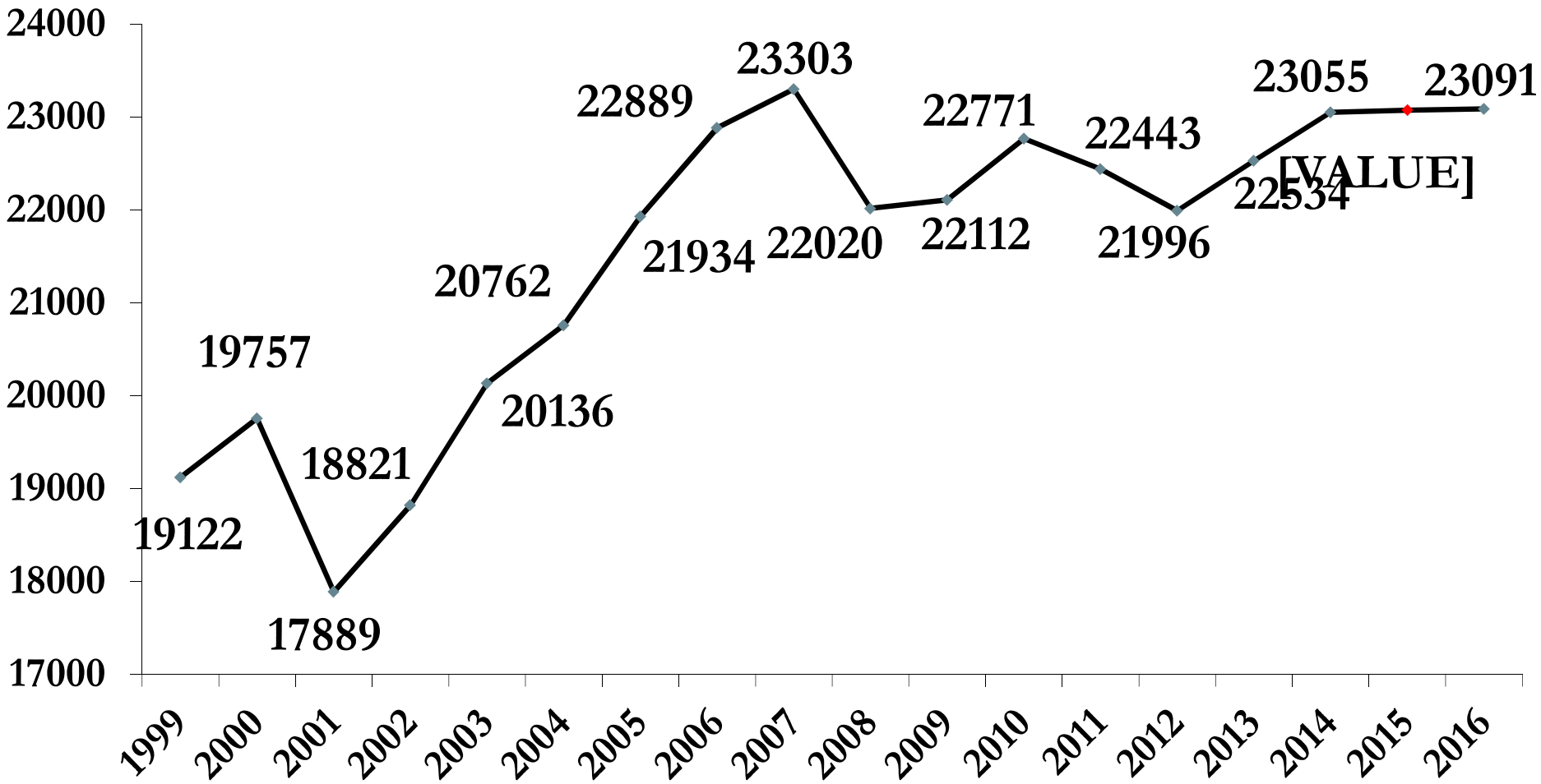
HECO Stakeholder Engagement Workshop

May 10, 2017

SOUTHERN CALIFORNIA EDISON®

An EDISON INTERNATIONAL® Company

SCE Recorded Peak Load (MW)



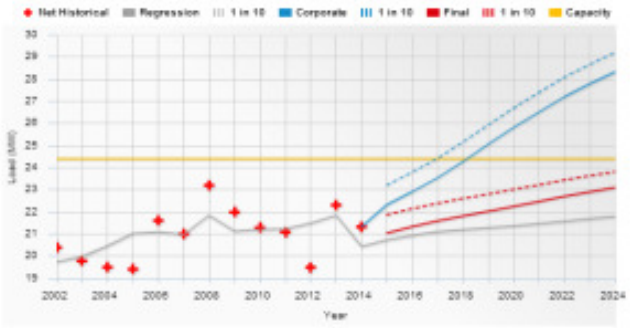
SOUTHERN CALIFORNIA EDISON®
An EDISON INTERNATIONAL® Company

Traditional Long Term Distribution Planning

Thermal Capacity → Voltage and Power Quality → Protection → Safety and Reliability

Timeline

- Process is performed on a yearly basis
- Needs are based on expected timeline
  - Near Term: 1-3 Years (i.e. distribution lines)
  - Mid Term: 3-5 Years (i.e. substation transformers)
  - Long Term: 5-10 Years (i.e. new substations)



Things to Consider

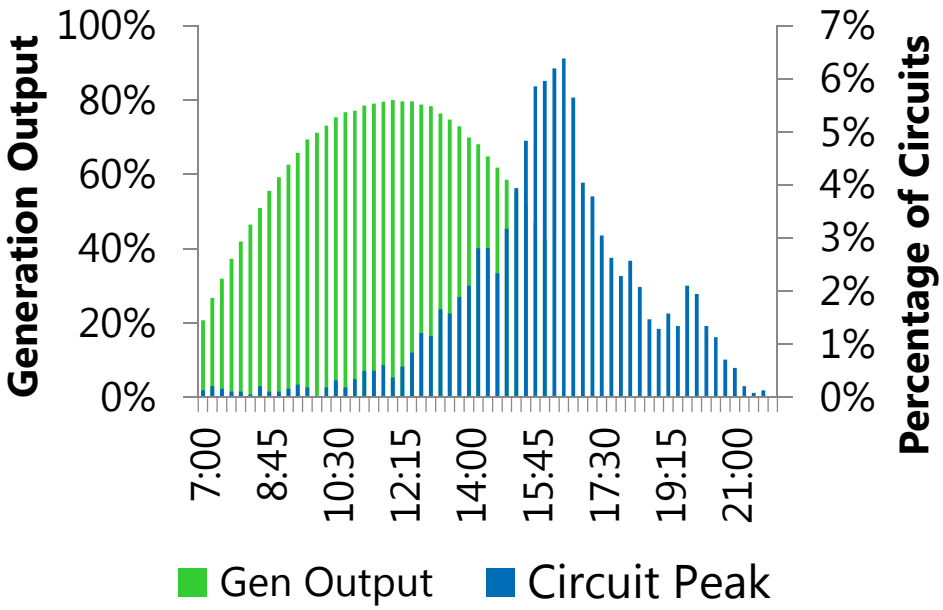
- Micro and macro economic drivers
- Maintain operability and proper voltage to transfer customers during emergencies
- Diversity of specific geographic load and customer mix
- Impact of weather and micro climates
- Protection coordination
- Customer behavior

General Process

- Determine Thermal Capacity Needs
- Evaluate Voltage and Power Quality Needs
- Analyze Protection Needs
- Ensure Safety and Reliability Needs

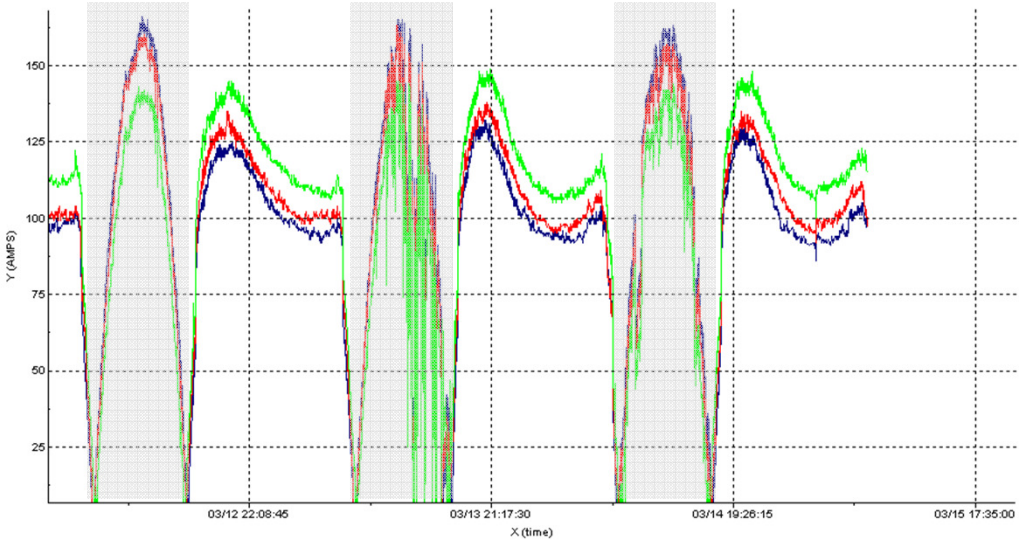
DERs and Increasingly Complex Grid

As distributed energy resources are added to the grid, operating characteristics of the grid are changing, leading to increased complexity.



- Shaded areas show 3-phase reverse powerflow and intermittent output from PV from an actual circuit, this appears as one-way flow to operators
- Operators need visibility to power flow magnitude and direction

- Peak Time for Distribution Circuits Load and PV do not typically coincide
- The grid needs to accommodate this available power for the benefit of the customer and the grid



SOUTHERN CALIFORNIA EDISON
An EDISON INTERNATIONAL Company

Considerations with High DER Penetration

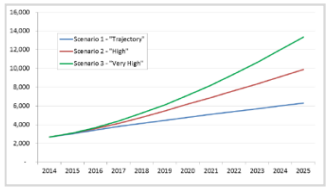
New Considerations

- Thermal Capacity – Use of Integration Hosting Capacity
- Voltage and Power Quality – Leveraging Future Potential of Smart Inverters
- Protection – Impact of Increasing or Decreasing Short Circuit Duty
- Modeling – Impact of Circuit Reconfigurations, Lack of Situational Awareness
- Safety and Reliability – Effect on Grid Operations, Increased Masking of Load
- Impact on Future Standards
- Age and Condition of Distribution System Equipment

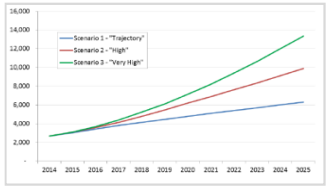
Long Term Planning Process Flow

Forecasts

Load Growth



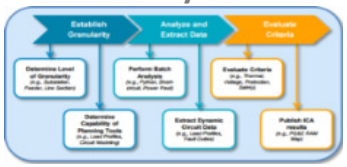
DER Growth



Analysis

Load Growth Analysis

Integrated Capacity Analysis



Grid Operations Issues

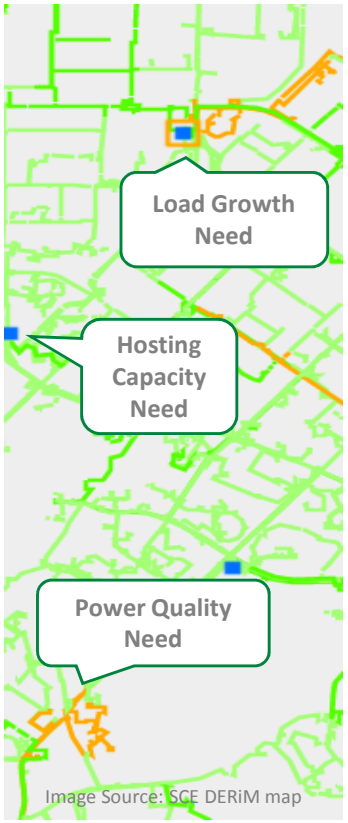


Image Source: SCE DERiM map

Prioritize grid needs / projects

Locational net benefits analysis

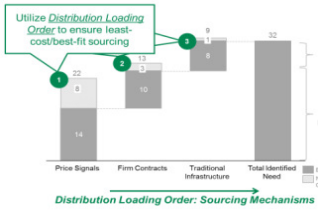
Deferral framework / technical feasibility

Sourcing

or

Direct deployment

Mitigation



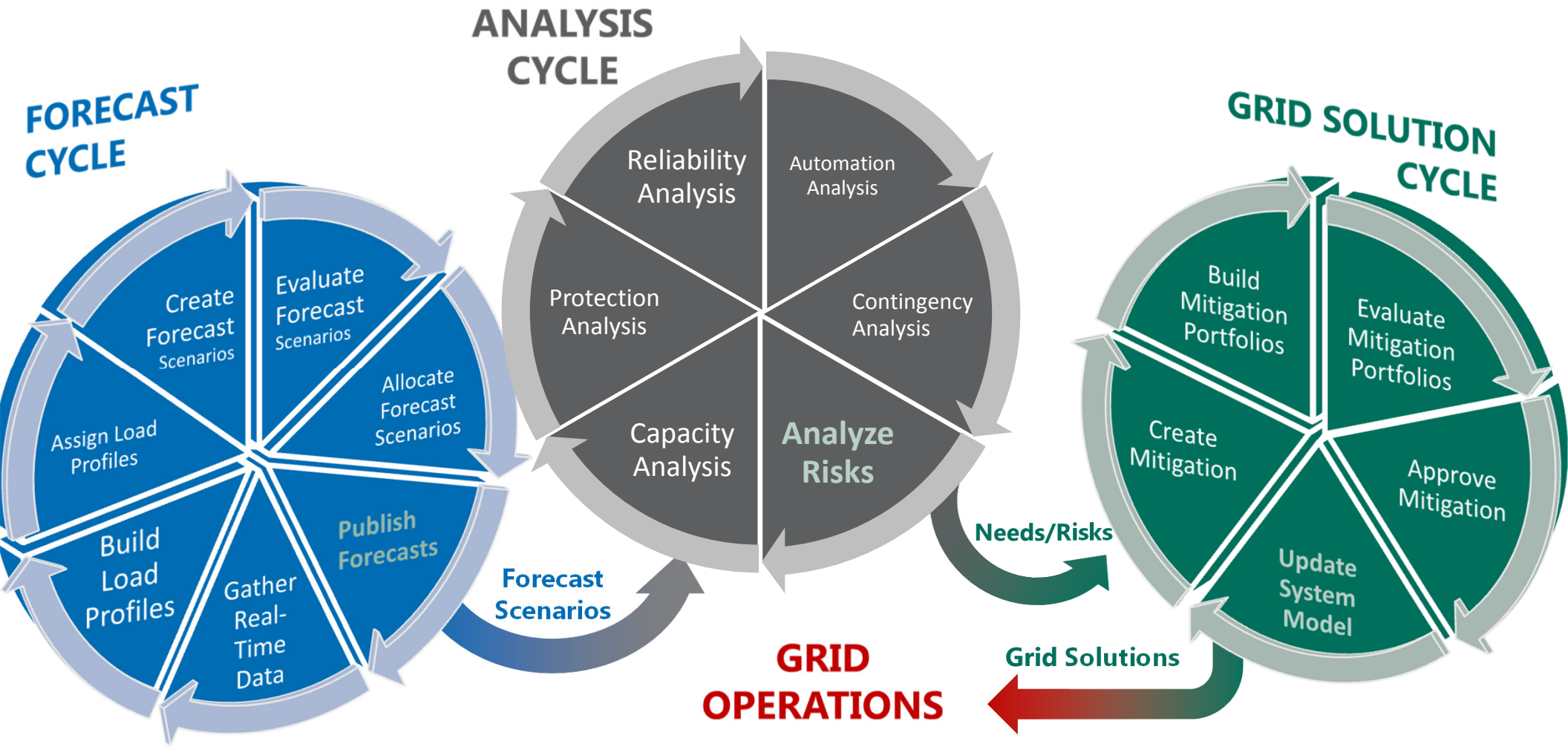
1. Dispatchability/ Price Signals
2. Firm Contracts
3. Traditional investment

Input ICA into Interconnection (Rule 21)

Data Sharing

SOUTHERN CALIFORNIA EDISON®
An EDISON INTERNATIONAL® Company

Long-Term Planning Analysis Flow

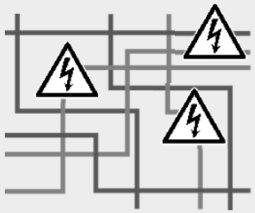


Planning Tool Capabilities

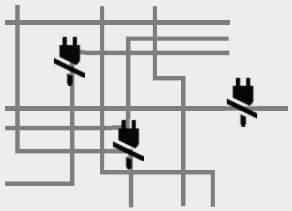
Planning tools will enable forecasting, analysis, and sharing.

Grid Analytics

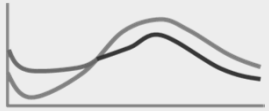
Voltage Analytics



Outage Analytics



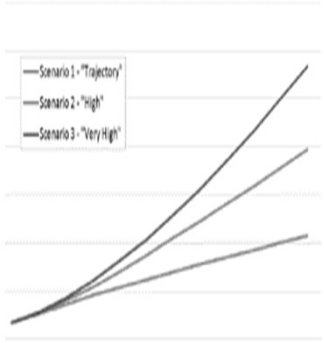
Historical Load Profiles



Grid Analytics Applications

Load and DER Forecasting

Load & DER Growth

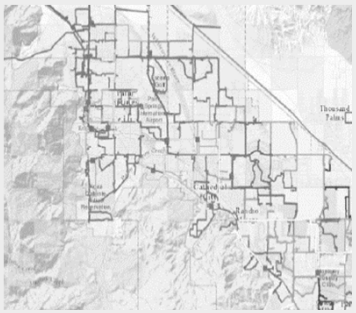


Substation/Circuit Time Series Profile Forecasts

Long Term Planning Tools

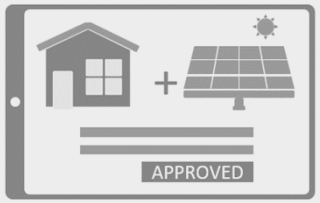
System Analysis

Capacity Analysis



System Modeling Tool

Streamlined Interconnection



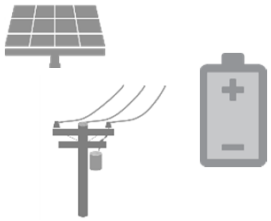
Grid Interconnection Processing Tool

Optimal Grid Solutions

Develop Wires Solutions

Identify Optimal Locations

Determine optimal solutions



Long Term Planning Tools

External Communication

Present Information Online

DRP External Portal

SOUTHERN CALIFORNIA EDISON
An EDISON INTERNATIONAL Company

Thank You

Erik.Takayesu@sce.com