DOCKETED

Docket Number:	17-IEPR-12
Project Title:	Distributed Energy Resources
TN #:	219942
Document Title:	Transmission Implications of Shift to DER
Description:	6.29.2017 Presentation by Jeff Billington of CA ISO
Filer:	Raquel Kravitz
Organization:	California Energy Commission
Submitter Role:	Commission Staff
Submission Date:	6/28/2017 9:04:21 AM
Docketed Date:	6/28/2017

Transmission Implications of Shift to DER

J.E.(Jeff) Billinton
Manager, Regional Transmission - North

2017 IEPR Joint Agency Workshop on Integration of Distributed Energy Resources on the California Grid

June 29, 2017

Transmission System

- 500 kV
- 230 kV
- 115 kV
- 60 / 70 kV

Coordination of Assumptions

- **CEC IEPR Energy Demand Forecast**
  - **Input for Demand side assumptions**
    - Includes the consumption load and the load modifiers (behind the meter distributed generation, demand response, electric vehicles, committed energy efficiency and the additional achievable energy efficiency, are included in the forecasts as a baseline assumption
- **CPUC Assumptions and Scenarios**
  - **Input of Supply side assumptions**
    - Includes assumptions of renewable portfolios, conventional generation, storage and demand response

Load Forecast Assumptions for 2017-2018 TPP

Energy and Demand Forecast

- California Energy Demand Updated Forecast 2017-2027 adopted by California Energy Commission (CEC) on January 25, 2017 is being used.

- The following are how load forecasts are used for each of the reliability assessment studies.
  - 1-in-10 weather year, mid demand baseline case with low AAEE load forecasts will be used in PG&E, SCE, SDG&E, and VEA local area studies including the studies for the local capacity requirement (LCR) areas
  - 1-in-5 weather year, mid demand baseline case with mid AAEE load forecast will be used for bulk system studies

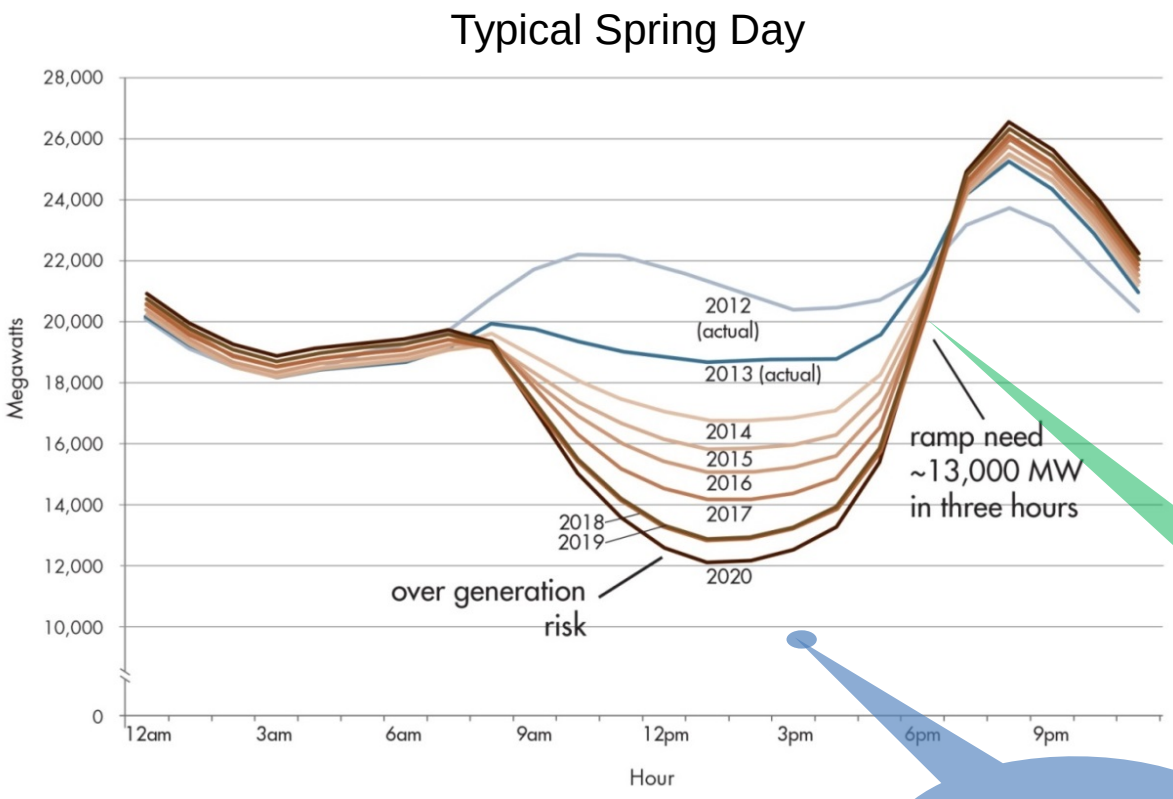
Load Forecast Assumptions
Peak-Shift

- The California Energy Demand Updated Forecast 2017-2027 includes Peak-Shift Scenario Analysis and states the following with respect to the use results of this analysis in the ISO TPP studies:

  – *"The results of the final adjusted managed peak scenario analysis can be used by the California ISO in TPP studies to review previously -approved projects or procurement of existing resource adequacy resources to maintain local reliability but should not be used in identifying new needs triggering new transmission projects, given the preliminary analysis. More complete analyses will be developed for IEPR forecasts once full hourly load forecasting models are developed."*

- In the 2017-2018 TPP, the ISO is using the CEC energy and demand forecast for the base scenario analysis

Oversupply and ramping: A new challenge as more renewables are integrated into the grid

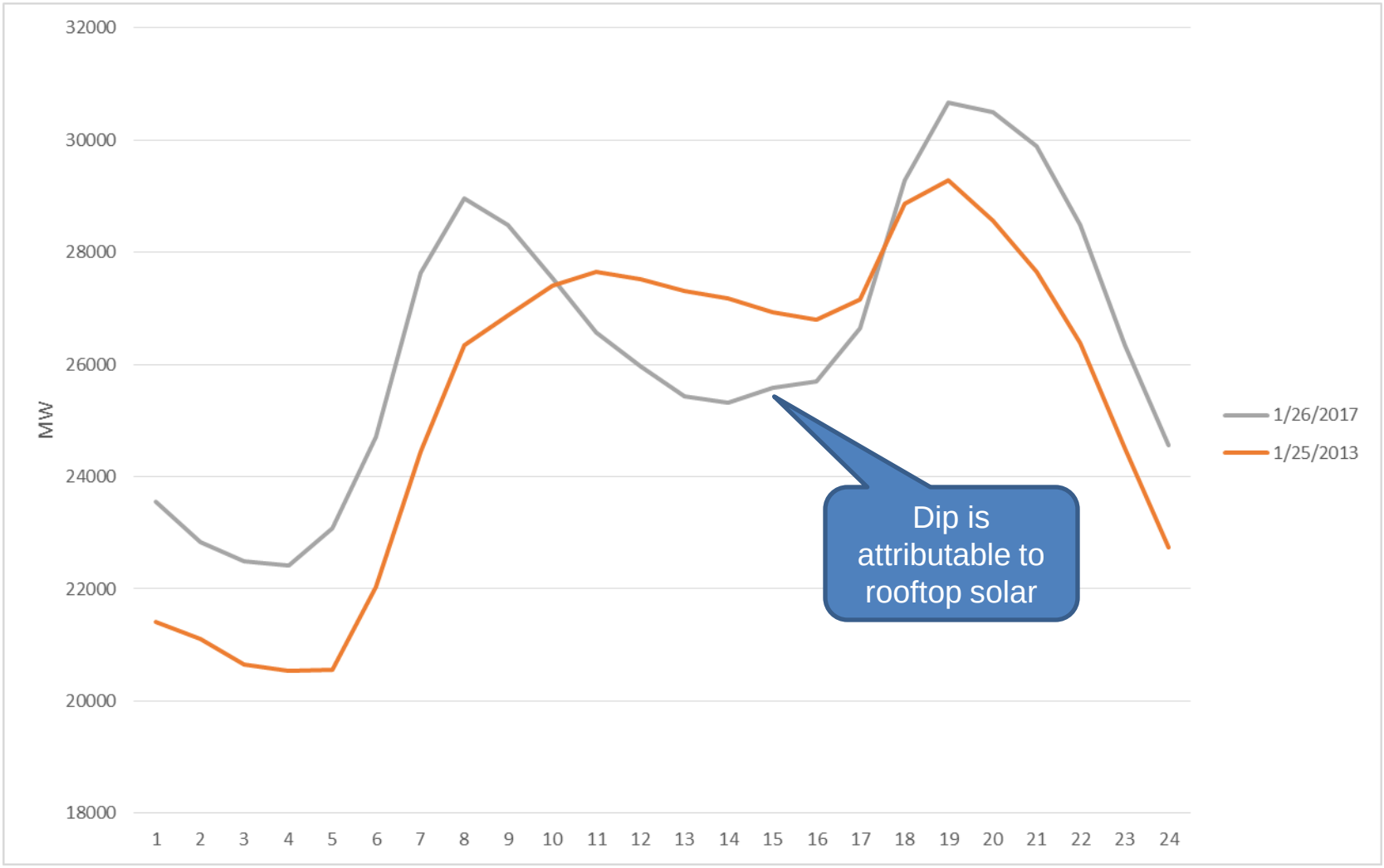


- ISO has already seen the need to curtail generation
- Oversupply may lead to curtailment because of dispatch limitations on some resources, such as
  - geothermal
  - nuclear
  - small hydro
  - combined heat and power
- Operational requirements include
  - minimum gas necessary to provide ramping
  - necessary ancillary services
  - load following

Net Load 8,507 MW on May 14, 2017

Actual 3-hour ramp 12,960 MW on December 18, 2016

Changing Profile - ISO Controlled Grid Gross System Load



2017-2018 TPP Self-Generation Assumptions

- PV component of the self-generation in the CEC demand forecast will be modeled as discrete element in the 2017-2018 TPP base cases.
  - Amount of the self-generation PV to be modeled will be based on 2016 IEPR data.
  - Location to model self-generation PV will be identified based on location of existing behind-the-meter PV, information from PTO on future growth and behind-the-meter PV capacity by forecast climate zone information from CEC.
  - Output of the self-generation PV will be selected based on the time of day of the study using the end-use load and PV shapes for the day selected.
  - Composite load model CMPLDWG will be used to model the self-generation PV.

Forecast of Installed Capacity of Self Generation

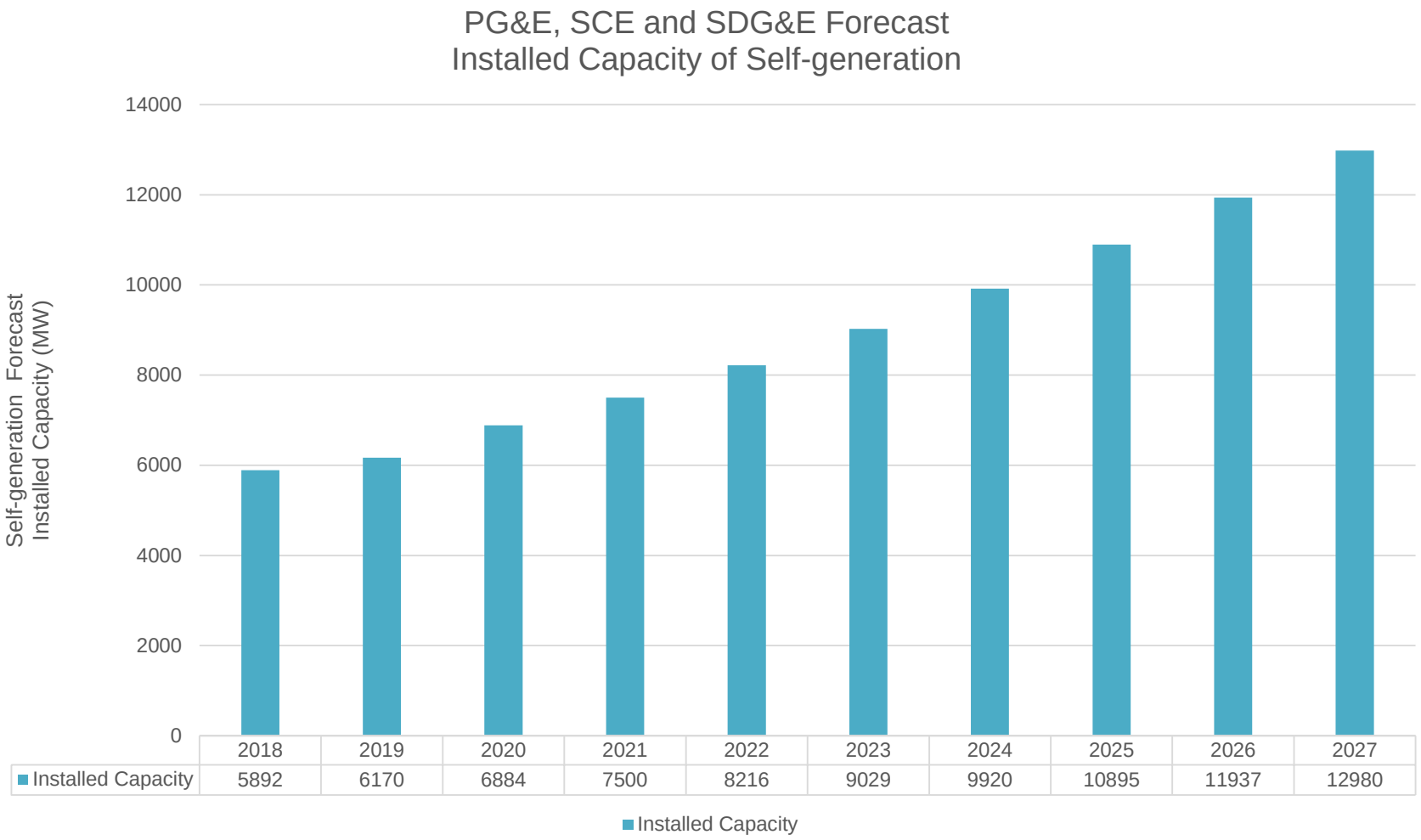


Chart developed from Table 4.6-2 of ISO 2017-2018 TPP Study Plan
http://www.caiso.com/Documents/Final2017-2018StudyPlan.pdf

Modeling of Load and Load Modifiers
Top Down – Bottom Up Approach

- CEC IEPR Energy and Demand Forecast
  - At System Level

Alignment of assumptions between:

- CEC IEPR
- CPUC IRP
- Utilities Distribution Planning and DRP
- ISO Transmission Planning Process

- Utilities Distribution Planning
  - Allocation at ISO Controlled Grid Transmission – Distribution Interface

Challenges for Transmission Planning

- There are a number of uncertainties
  - Location
    - To granularity of ISO controlled grid transmission – distribution interface
  - Output Capacity Locational and seasonal profiles
    - Changing times of critical system conditions to plan for
    - Environmental impacts
      - Cloud cover
      - Monsoonal heat waves
- Voltage regulation issues
- Peak-load shift
- Additional off-peak seasonal study cases to be studied
- Technical modeling assumptions for invertors

Questions!