2019 Summer Loads & Resources Assessment results

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ISO Summer Assessment – a probabilistic approach

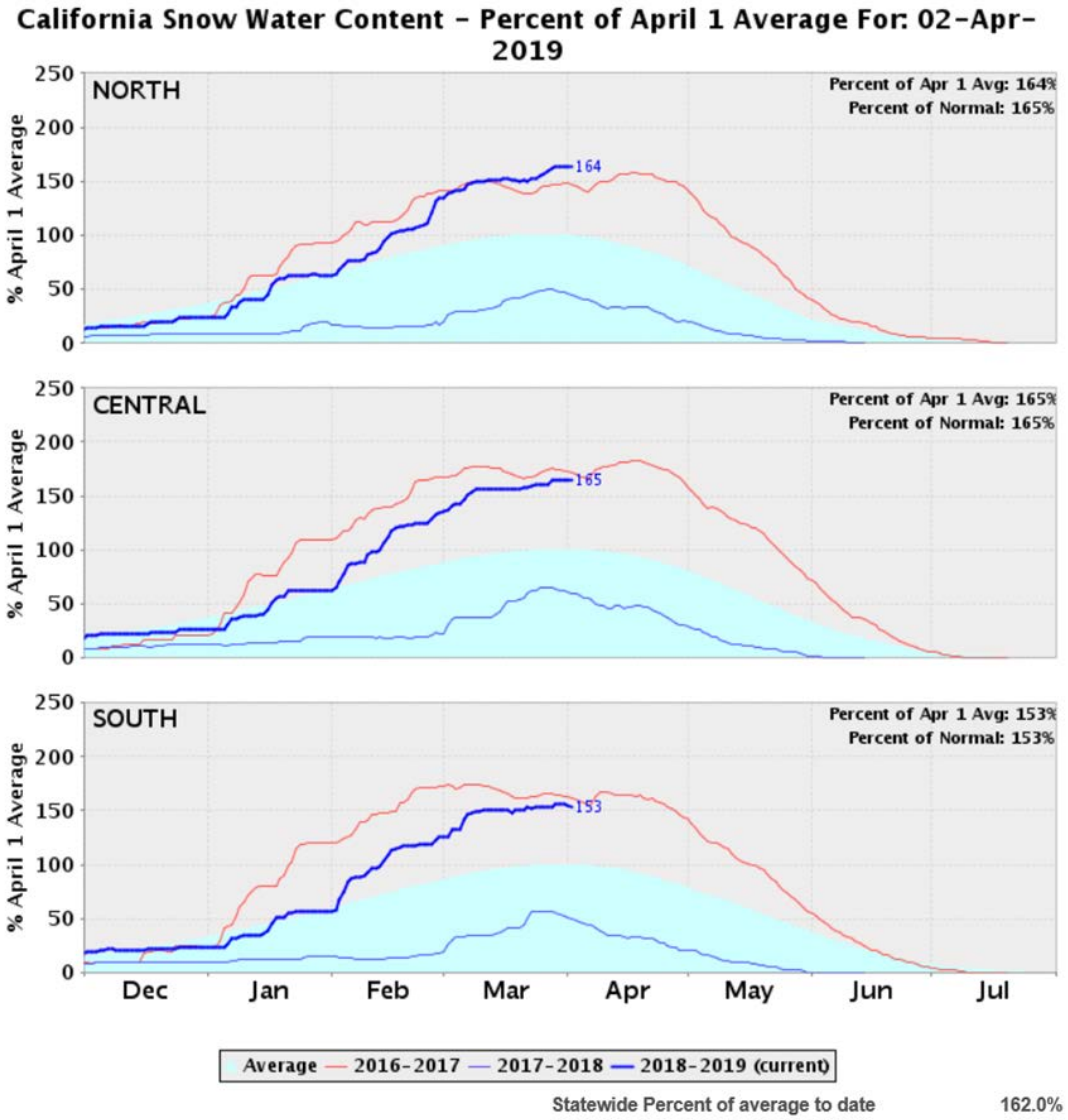
- Models all hours of the summer in 2,000 scenarios
- Models full range of load forecasts based on 24 years of historical weather patterns
- Models all resource adequacy eligible resources
  - Commits resources based on unit specific forced outage rates, ramp rates, start times and minimum down times
- Designed help ISO operations prepare for operational issues ISO could encounter, including potential extremes

2019 summer operational conditions projected to be more favorable than 2018.

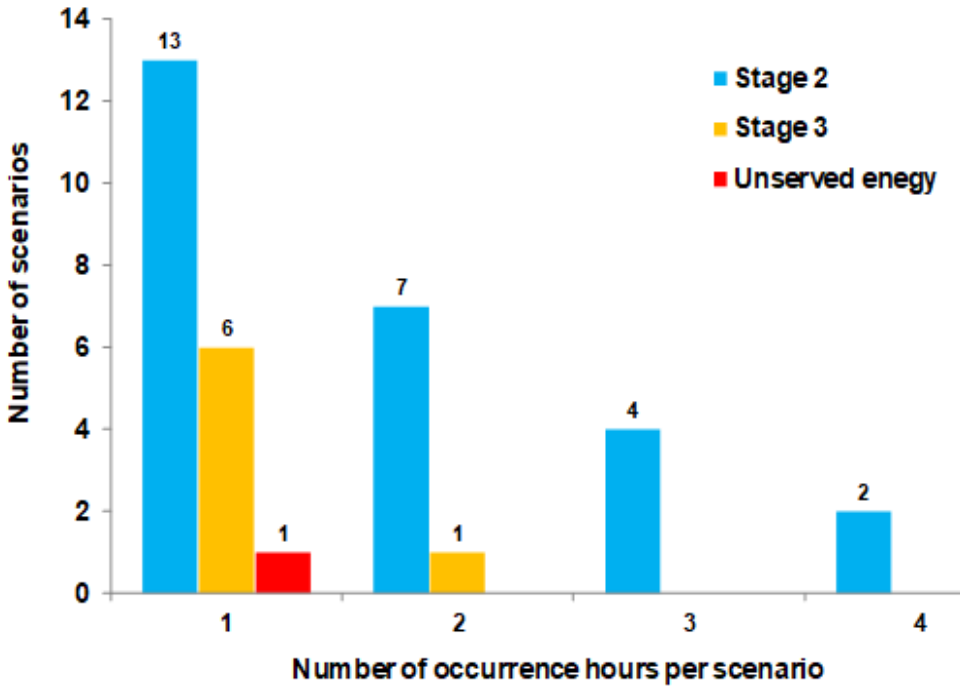
- California hydro conditions for 2019 well above average
- Forecasted peak demand relatively unchanged from 2018
  - Modest economic growth
  - Load reductions from behind-the-meter solar and energy efficiency
- 2,061 MW net-reduction in dispatchable resources
- Aliso Canyon related gas restrictions not included in analysis but creates additional operational risk for Southern California

California hydro conditions much better than 2018

- 2019 snow water content 162% of April 1 average
- 2018 snow water content 51% of April 1 average
- Reservoir storage improved, 109% of normal on average



2,000 simulated scenarios show very low probability of system emergencies



Stage 1 Emergency

Contingency Reserve shortfalls exist or forecast to occur.

Strong need for conservation.

Stage 2 Emergency

The ISO has taken all mitigating actions and is no longer able to provide its expected energy requirements.

Requires ISO intervention in the market, such as ordering power plants online.

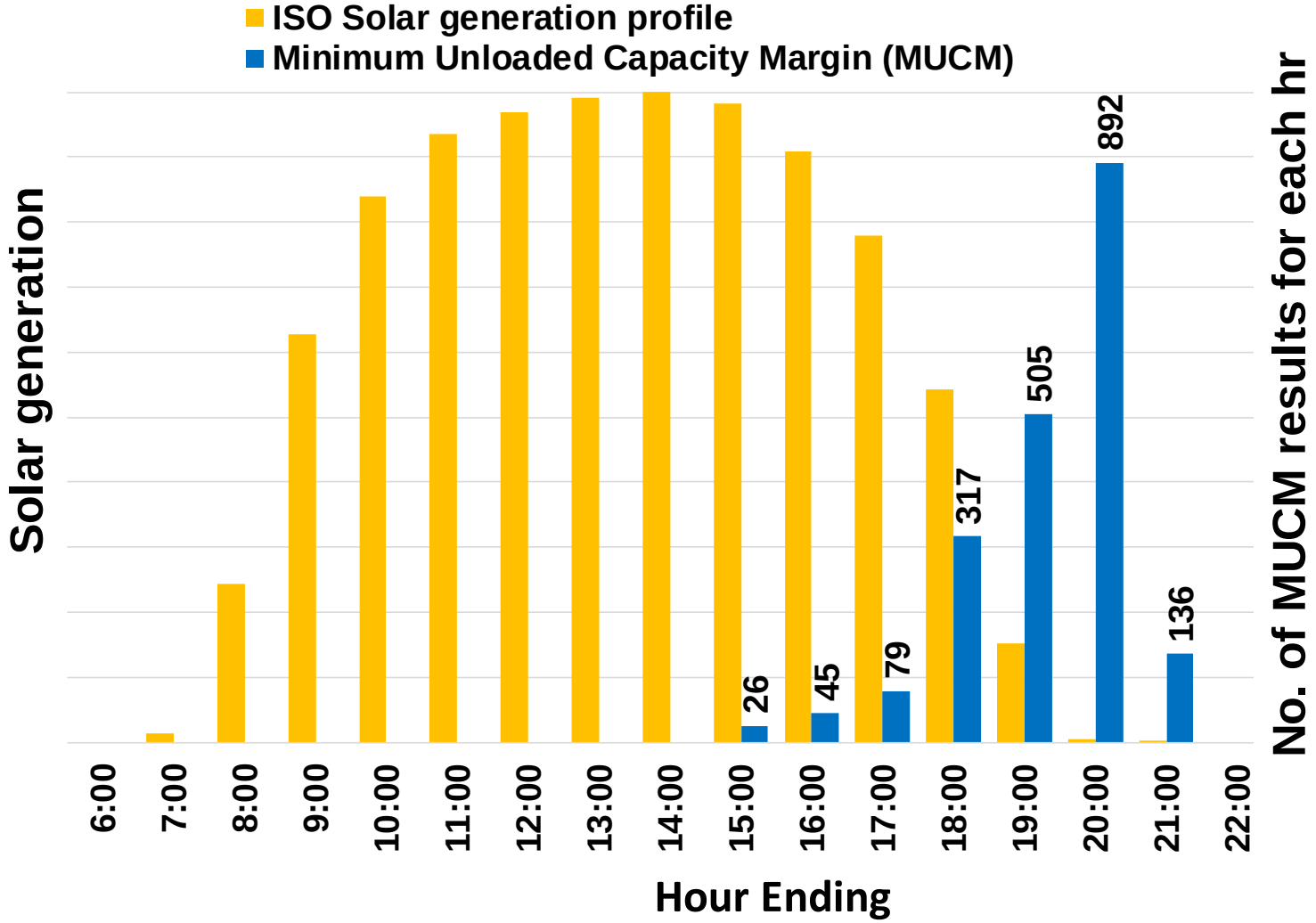
Stage 3 Emergency

The ISO is unable to meet minimum contigency reserve requirements, and load interruption is imminent or in progress.

Notice issued to utilities of potential electricity interruptions.

- 1.3% probability of Stage 2
- 0.4% probability of Stage 3
- 0.1% probability of unserved energy

Nearly all of low operating reserve margins occur during low to zero solar generation.



An additional low hydro sensitivity case was developed to assess reliability under less favorable conditions.

- Base case:
  - Representing projected conditions for 2019
  - Imports capped at 11,701 MW

- Low hydro sensitivity:
  - Low ISO hydro year: 2018 hydro profile (51% of average snowpack)
  - 1-in-10 loads in Southwest (APS and SRP)
  - BPA and BCH hydro 93% of normal
  - Imports capped at 9,309 MW
    - max 2018 import when load within 90% of annual peak

Low hydro sensitivity case highlights the importance of California hydro and imports in managing peak summer conditions.

System capacity shortage probabilities

	Base case	Sensitivity case
Stage 2	**1.3%**	**26%**
Stage 3	**0.4%**	**12%**
Unserved energy	**0.1%**	**6%**

Aliso Canyon operational limitations and pipeline outages create additional risk to electric reliability.

- Southern California Gas system continues to operate at less than full capacity
  - Continuing restrictions on use of the Aliso Canyon natural gas storage facility
  - Pipeline outages continuing through much of the summer
- Risk to electric reliability is similar to previous years
- Greatest risk to electric reliability in the local reliability areas in Southern California

Preparation activities and operational actions:

- Preparation discussions held
  - FERC, Operations annual summer outlook meeting (ISO LSEs, neighboring BAs, EIM participants, gas suppliers)

- Actions ISO will implement if system operating conditions get near or go into the emergency stages
  - Utilization of Flex Alert program
  - Utilization of CAISO Restricted Maintenance program
  - Exceptional dispatch of resources
  - Utilization of Alert/Warning/Emergency program
  - Utilization of Demand Response program at “Warning” stage