Briefing on 2022 Summer Loads and Resources Assessment results

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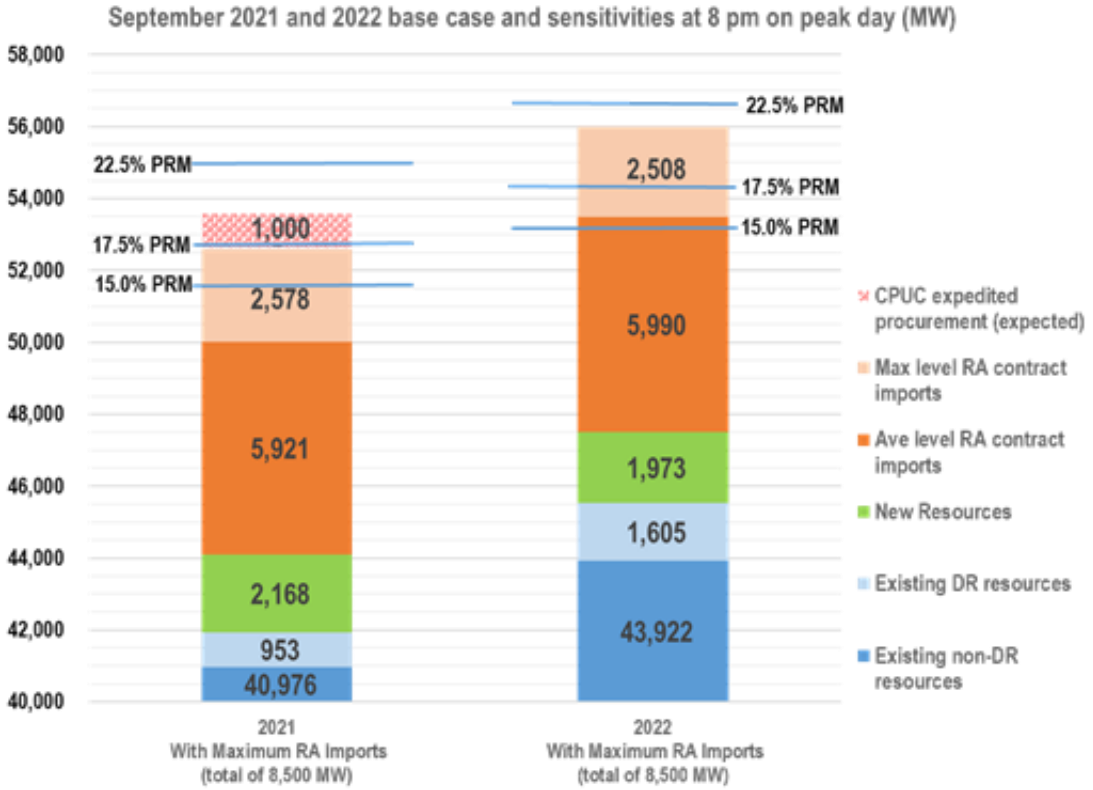
The 2022 Summer Assessment provides the ISO's view of anticipated conditions in the summer ahead

- The analysis includes probabilistic results from a stochastic model and deterministic "stack analysis" results
  - Deterministic stack analysis of September when conditions are can be most challenging due to declining solar and hydro
    - based on latest Energy Commission forecast
- The stochastic analysis relies on a production simulation model that runs 2,000 simulations modeling:
  - An ISO projection of 2022 load levels and a distribution of load scenarios using 20 years of historical weather data
  - Historical renewable resource generation profiles
  - Import limits to characterize declining availability of imports as ISO load levels increase
    - to simulate declining imports as temperatures increase in the ISO and across the west

The 2022 "stack analysis" demonstrates an improvement in supply conditions compared to 2021

- Load levels plus Planning Reserve Margins are based on CEC 1-in-2 load forecast
- Resource levels based on late April data



Observations:

- 2022 stack analysis shows marginally better supply than 2021
- Over 4,000 MW NQC was added from June 1, 2021 to June 1, 2022
- The increase from September 1, 2021 to September 1, 2022 was 2,582 MW NQC
- This gain is offset by 1,005 MW higher load forecast for 2022 based on the latest CEC forecast

The ISO's stochastic model assumptions vary slightly from the stack analysis

- The ISO load forecast used the most recent 20 years of historical weather data versus 26 years of history used in 2021
  - 20 year historical weather period provides a forecast that more explicitly accounts for the effects of climate change.
  - Load forecast distribution contains larger population of high loads in 2022
  - The 2022 1-in-2 and 1-in-5 load forecasts are relatively unchanged from 2021 and generally aligns with the latest Energy Commission forecast
  - The 2022 1-in-10 load forecast is 1% higher than 2021 and 4% higher than the Energy Commission forecast
- Hydro: third year below normal – snowpack was 38% of average on April 1, compared to last year's 60% of average on April 1, 2021
  - The Northwest hydro reservoirs projected to be 94% of average
- Generation additions: 3,206 MW net increase in dispatchable capacity from June 1, 2021 to June 1, 2022, largely battery energy storage

Stochastic model results

- Typically year to year results compare the number of samples (out of 2,000 drawn from the historical data) that experience at least an hour of shortfall and the depth of the shortfall.
- Since the samples were drawn from a more recent and smaller number of years of historical data, comparisons to 2021 are now more nuanced.
- Probabilities for EEA 2 and EEA 3 have increased for 2022 due to a larger population of high loads in the forecast distribution

2022		
System Capacity Shortfall	Shortfall Probability	Number of Shortfall Cases (out of 2,000)
Entering EEA 3 (Stage 2)	15.1%	301
EEA 3 - firm load used for contingency reserves (Stage 3)	7.7%	154
Unserved energy EEA 3 - firm load interruption	4.0%	80
2021		
System Capacity Shortfall	Shortfall Probability	Number of Shortfall Cases (out of 2,000)
Entering EEA 3 (Stage 2)	6.4%	128
EEA 3 - firm load used for contingency reserves (Stage 3)	4.8%	96
Unserved energy EEA 3 - firm load interruption	4.6%	91

- However, the probabilities for unserved energy has decreased, reflecting a lower probability for firm load shedding

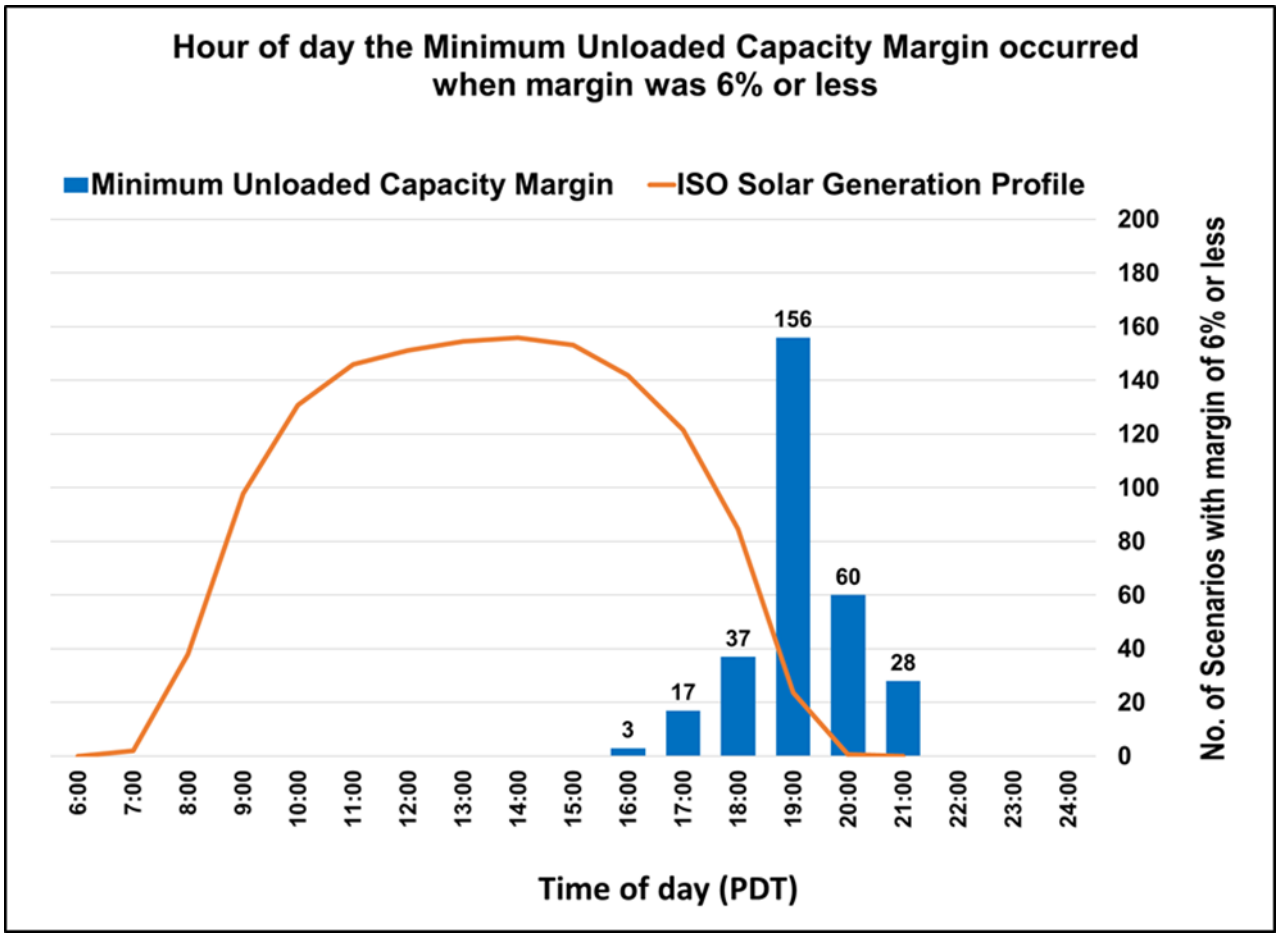
Stochastic model results (continued)

- The number of hours of risk and the amount of load shed at risk is significantly reduced in 2022 - despite the larger population of high loads in the forecast distribution increasing the number of scenarios that have at least one hour of operating reserves in the EEA 2 and EEA 3 range

Comparison of Unserved Energy Results

	2021	2022	Percent Reduction (2021-2022)/2021
Total unserved energy MWH of all hours in 2 ,000 scenarios	1,085,168	177,394	**84%**
Number of hours of unserved energy in all 2 ,000 scenarios	645	190	**71%**
Percent of hours of unserved energy in all 2 ,000 scenarios	0.011%	0.003%	

The greatest risk of low reserve margins is when solar is unavailable



- 81% percent of the minimum reserve margins occurred during the hours ending 19:00 to 21:00 – hours of little to no production from solar resources.

The ISO analysis does not fully reflect more extreme climate induced load and supply uncertainties, and procurement delay risks such as:

- More extreme weather events beyond those projected from the most recent 20 years of historical data;
- Wildfire events that could limit key transfer paths or resources, and other potential transmission outages;
- The unexpected confluence of extreme heat, drought affecting fire risk, and smoke impacting solar production; and
- Project development delays such as those triggered by the recent Department of Commerce investigation of solar panel tariff issues.
- These types of events tend to be managed in part by additional reliability measures beyond normal resource planning and market operation.

Conclusions

- Overall, 2022 capacity conditions are better compared to 2021 due to new resources (especially storage) despite load changes and hydro conditions
  - But the grid remains vulnerable to high loads and availability of imports during widespread heat events, especially in late summer
- While progress has been made in overcoming past supply shortfall conditions, additional resources are needed to ultimately achieve long term reliability margins
- Conventional planning techniques do not take into account growing risks of more extreme events, stemming from climate change, supply chain disruptions, etc. These pose additional risks not included in this analysis.