



Briefing on post 2020 grid operational outlook

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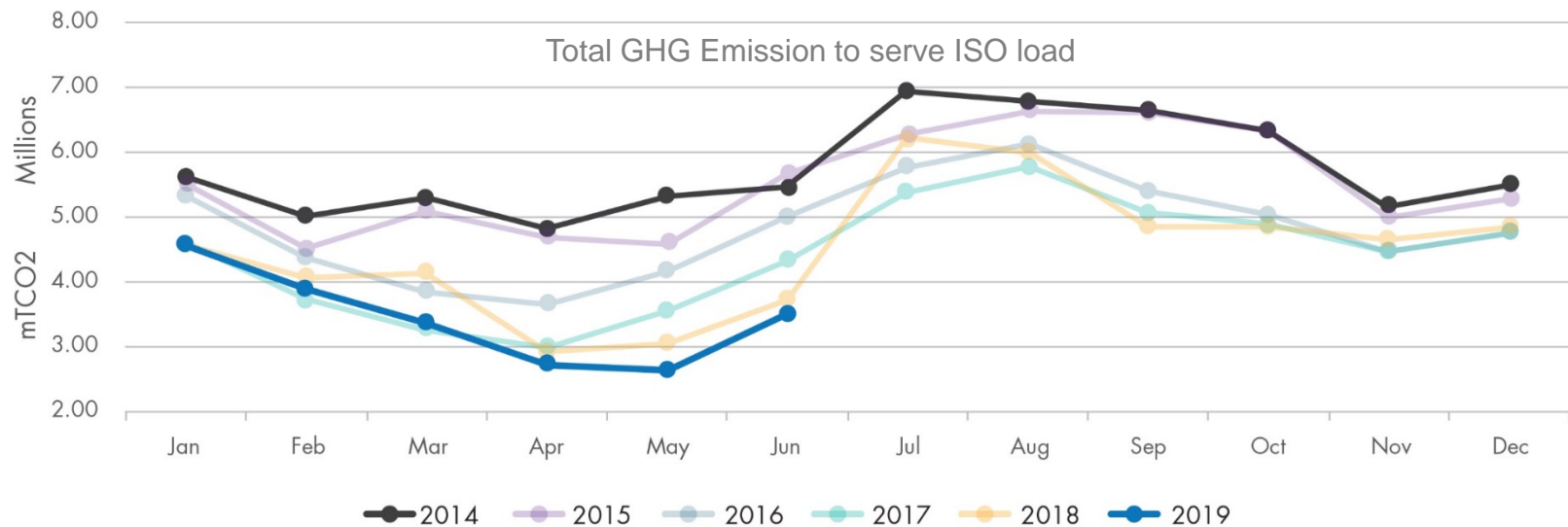
ISO supports California's clean energy goals

33% RPS
achieved ahead
of 2020 target

78%
highest load level served
by renewable energy

98.7%
highest load level served
by carbon-free resources

34% Reduction in GHG Emission associated with serving ISO since 2014



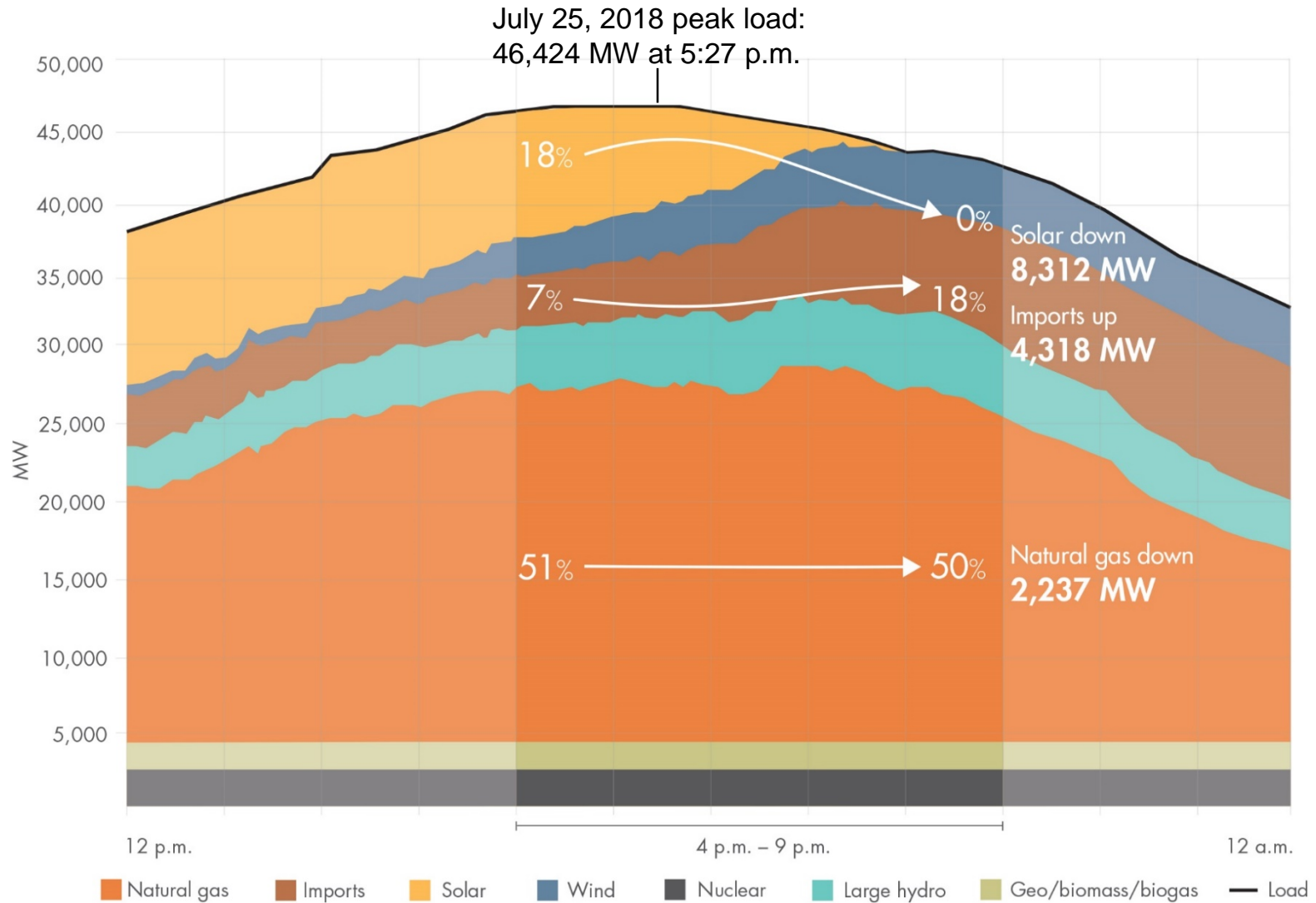
Challenges

- **Challenge 1: Capacity shortfall in 2020 and meeting summer evening peak load**
- Challenge 2: Increased ramping needs
- Challenge 3: Low renewable energy production from multi-day weather events

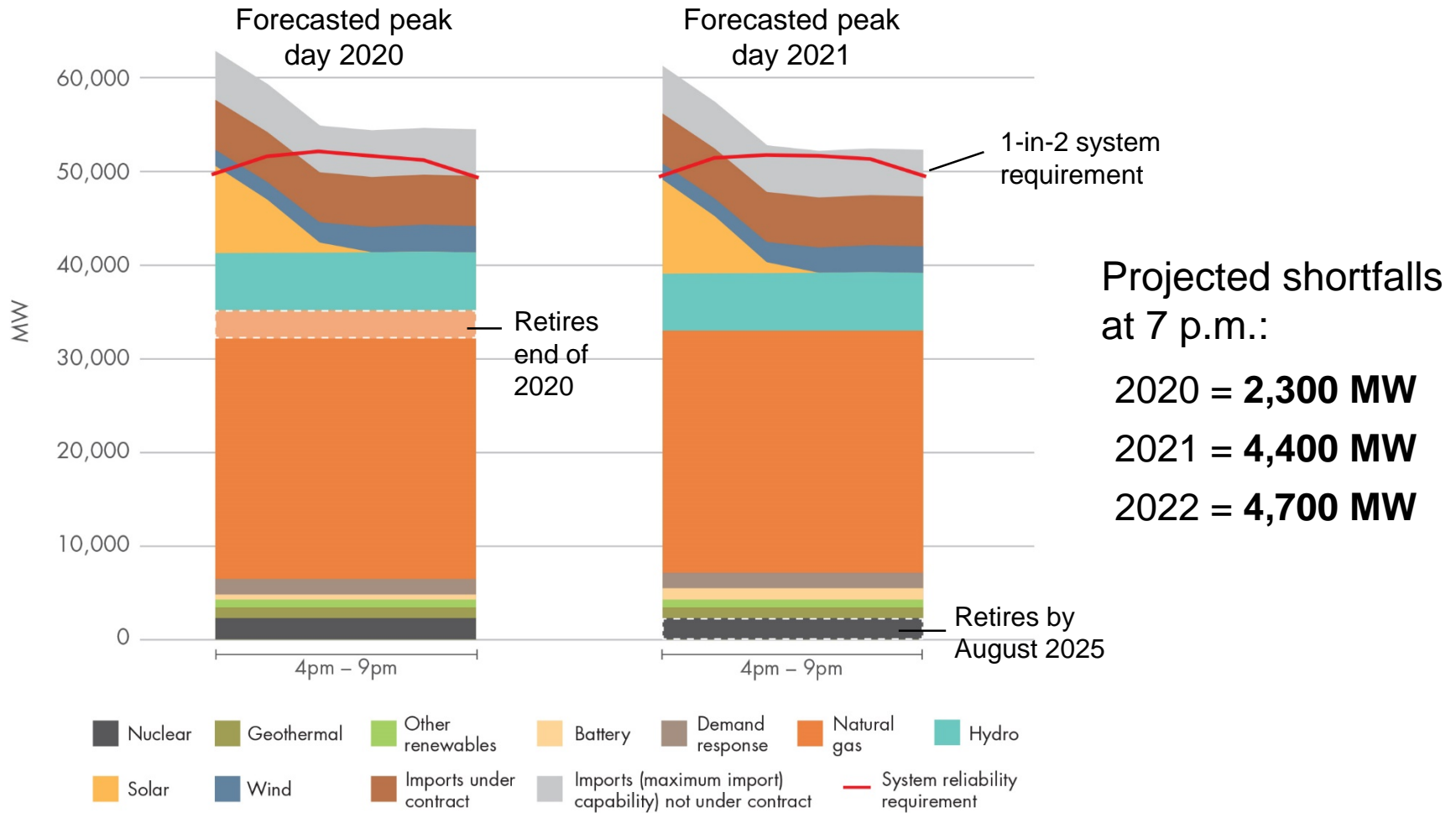
Challenge 1: Capacity shortfall in 2020 and meeting summer evening peak load

- The peak demand the ISO serves is shifting from the afternoon to the early evening
- Solar production is significantly reduced or not available during these new, later peak demand hours
- Instead, we now rely on energy from natural gas resources and imports
- However, energy capacity is decreasing due to:
 - Net retirement of 4,000 MW of once-through cooling steam generation
 - Reduced imports due to increasing load, thermal resource retirement, and increasing renewable integration needs outside of California
 - Potential changes in hydro conditions and availability in CA and west

Gas and imports support high loads after sun sets



Potential resource shortage¹ starting in 2020



¹ Assumes no transmission outages or other significant events affecting availability of generation

Challenge 1: Capacity shortfall in 2020 and meeting summer evening peak load – *Recommended actions*

- Address 2020 capacity concerns
 - Increase resource adequacy contracting from operational, mothballed and new resources
 - Secure available import capacity
 - Consider extension of once-through cooling compliance date on critical units until CPUC identifies alternatives
- After 2021
 - Diversify fleet for evening peaks, include preferred resources that align with needs; e.g. geothermal and wind
 - Add both short- and long-duration storage focused on evening peak
 - Strategically maintain gas fleet

Other actions to consider:



Add automated demand response



Increase energy efficiency