



California ISO

# Ensuring RA in Future High VG Scenarios – A View from CA

ESIG – 2020 Spring Technical Workshop

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# California has state mandates of zero greenhouse gas emissions from electricity generation by 2045

- CAISO operates a system that peaks with loads around 50,000 MW in the summer
- The current supply is principally gas generation
- Expected forecasts for installed electricity generation\* may include:
  - 8,500 MW of new wind
  - 75,000 MW of new solar
  - 25,000 MW of new behind the meter solar
  - 55,000 MW of new storage

\* California Public Utility Commission Integrated Resource Plan for 2045

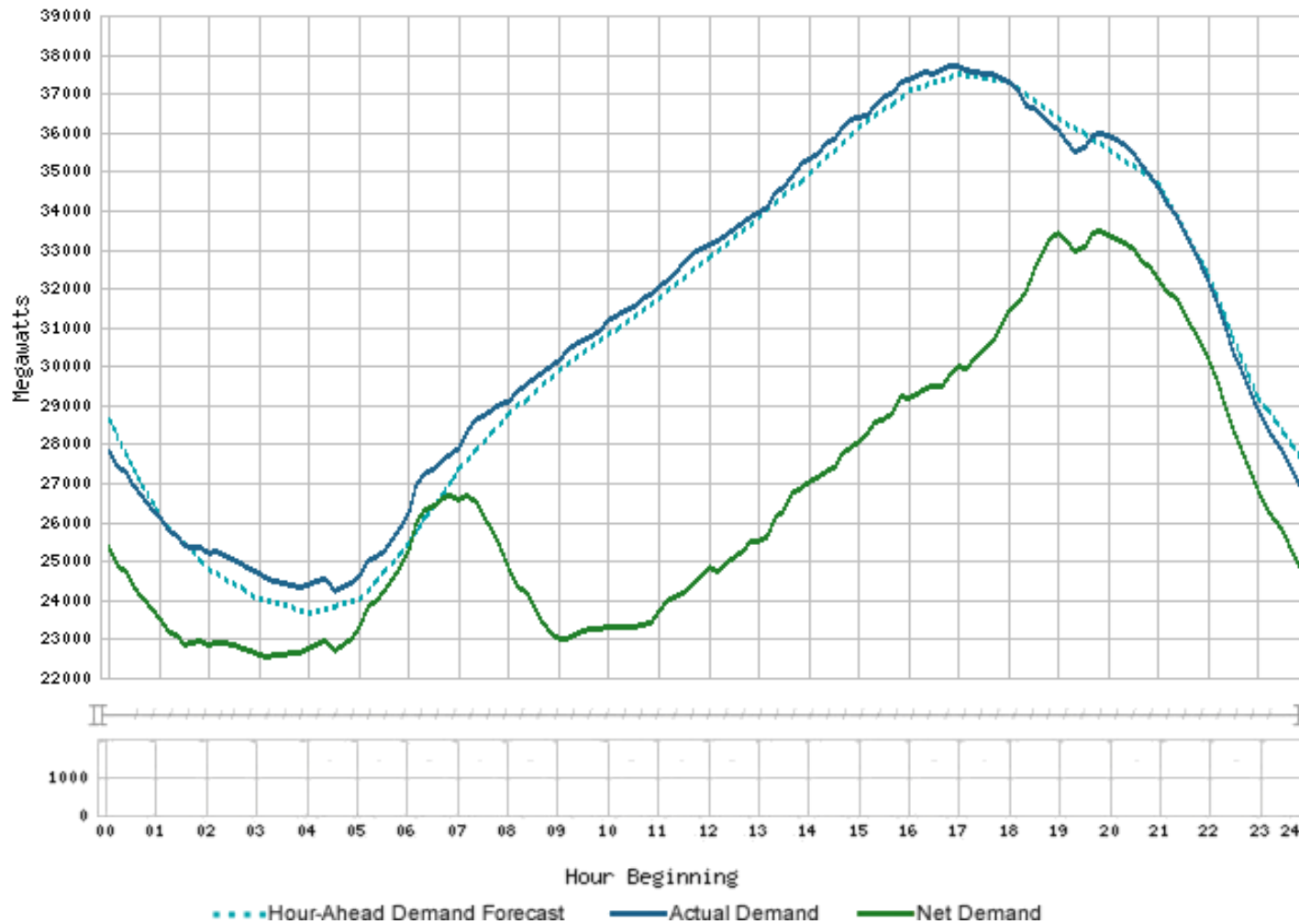
# Challenges

- **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

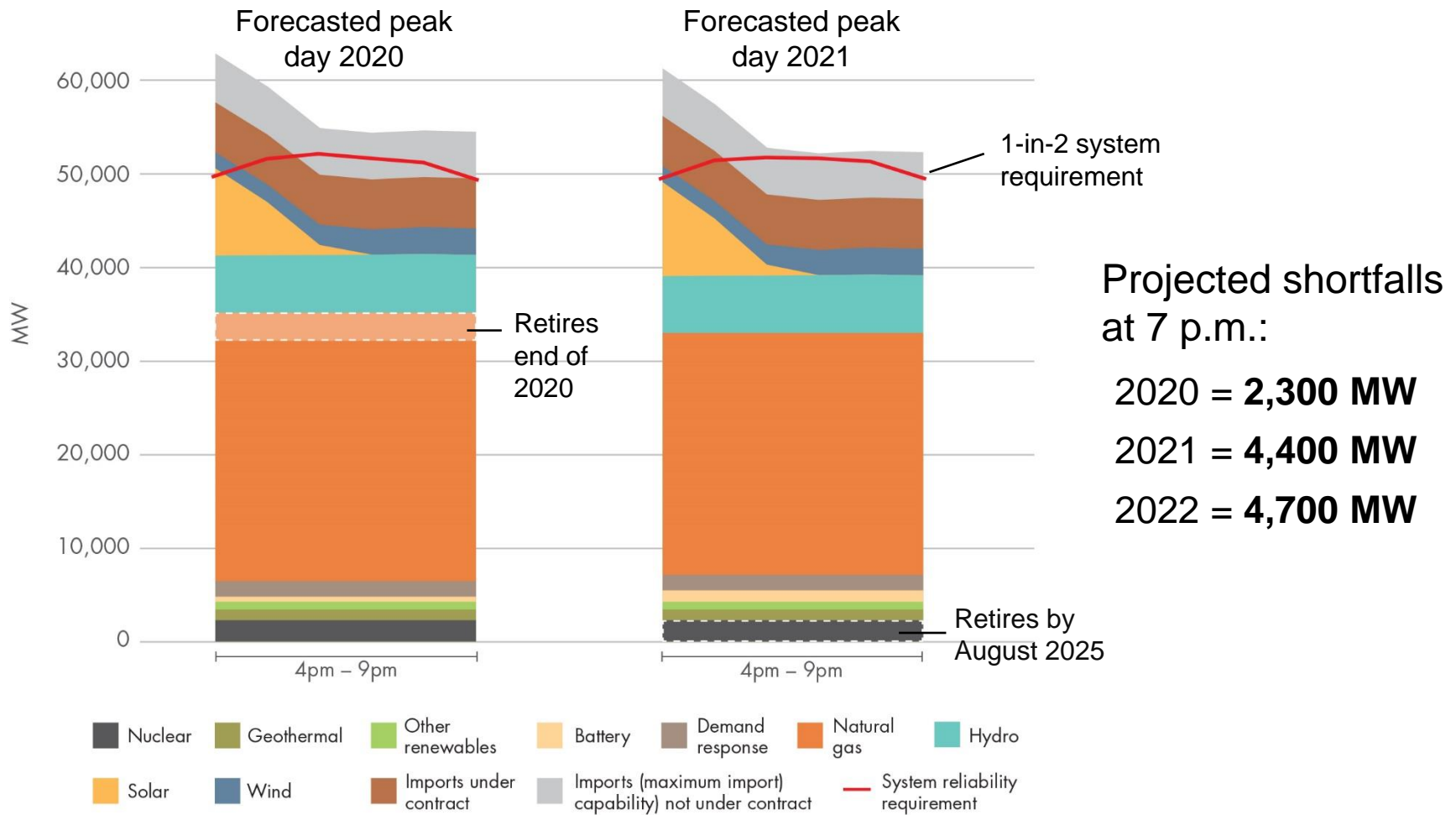
# Capacity shortfall in 2020 and meeting summer evening peak load

- 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

# Solar & wind production drive a shift in use pattern for conventional resources on peak demand days



# Potential resource shortage<sup>1</sup> starting in 2020



<sup>1</sup> Assumes no transmission outages or other significant events affecting availability of generation

# California Public Utilities Commission actions to date

- In Decision 19-11-016, the California Public Utilities Commission:
  - Authorized 3,300 MW of incremental procurement by 2023
  - Requests that the State Water Resources Control Board extend up to 3,750 MW of once-through cooling resource compliance dates on a staggered timeline as backup to incremental procurement
  - Continue to consider capacity needs through the Integrated Resource Planning proceeding

# Challenges

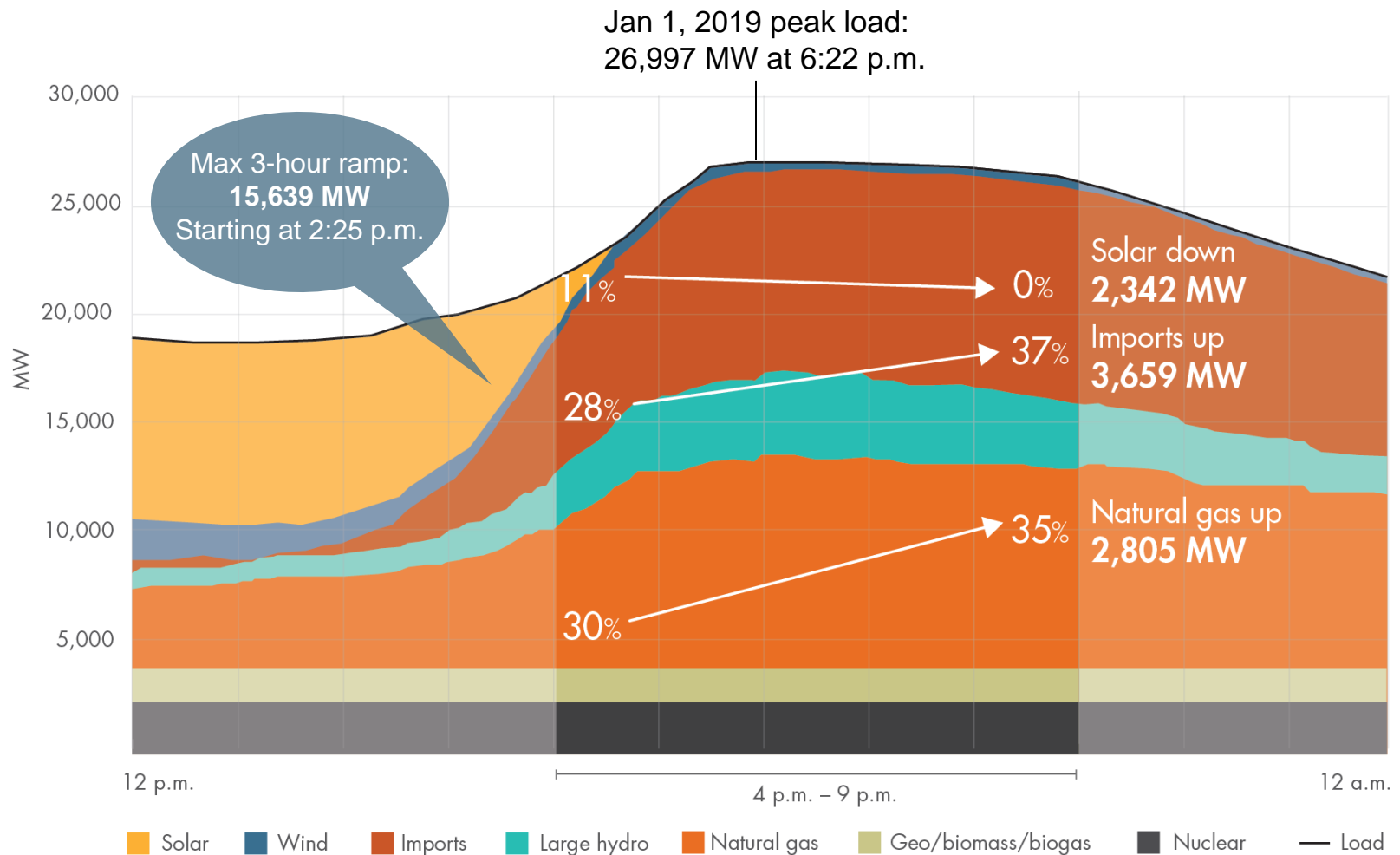
- Update on Challenge 1: Capacity shortfall in 2021 and meeting summer evening peak load
- **Challenge 2: Increased ramping needs**
- **Challenge 3: Low renewable energy production from multi-day weather events**



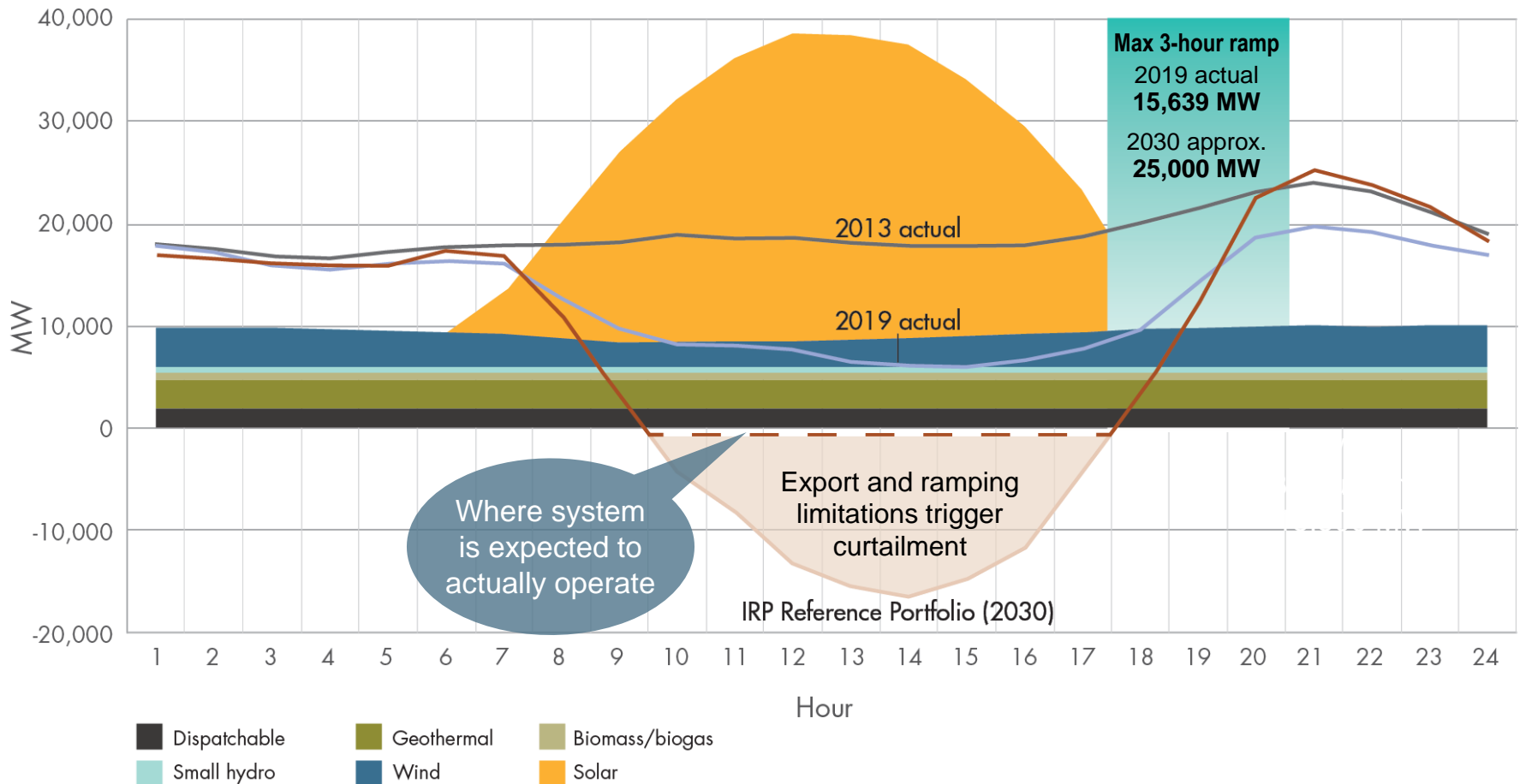
## Challenge 2: Increased ramping needs

- Rapid increases in demand or “ramps” are being met by natural gas resources and imported energy
  - Relying on natural gas resources is counter to low-carbon power grid (SB 100)
  - Availability of imports are uncertain
- Curtailment of solar resources may be increased to flatten the ramp and avoid operational issues

# Gas and imports respond to meet maximum ramp rate after the sun sets



# By 2030, solar is expected to contribute to increasing ramping needs



## Challenge 2: Increased ramping needs – *actions needed*

- Increase visibility and control of commercial and consumer solar resources
- Implement dynamic pricing policies that shift load to periods of high solar
- Diversify the mix of renewable resources to increase output at the right times to match system needs; e.g. offshore wind
- Ensure resources have low minimum operating points or shut down mid-day
- Increase regional collaboration to improve flexibility and geographic diversity

### Other actions to consider:



Long & short duration storage



Time of Use rates

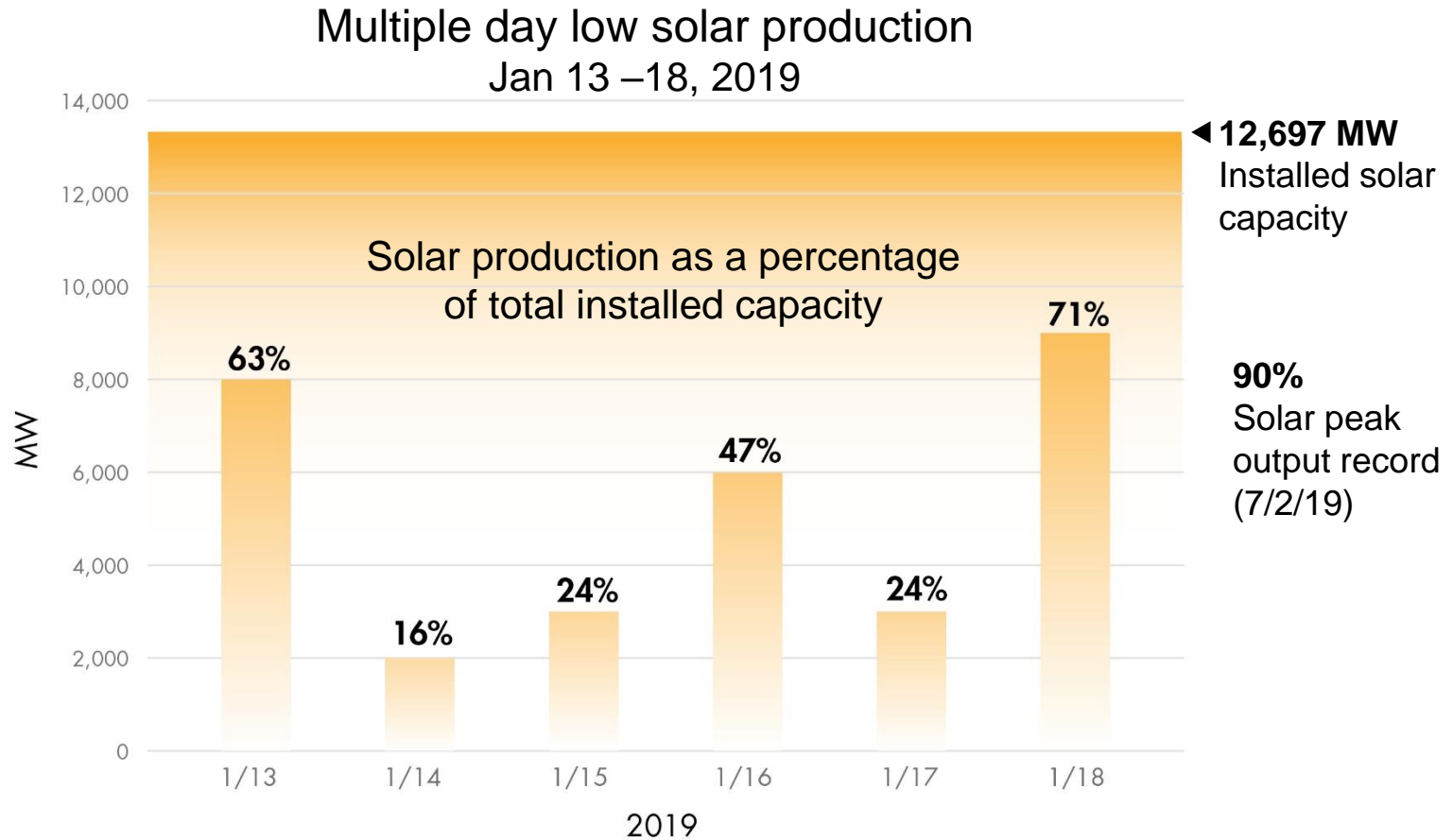


Electric vehicle integration

## Challenge 3: Low renewable energy production from multi-day weather events

- During multi-day cloudy or low wind events, energy from other sources will be needed to meet demand
- Storage resources with short durations (~4 hours) might not have an opportunity to recharge during a multi-day event
- Multi-day events are hard to forecast in both operational and planning horizon

# Multiple days of low solar production hinders ability of storage to recharge



## Challenge 3: Multi-day low renewable production events – *actions needed*

- Diversify resource mix both technologically and geographically
- Develop resource strategy that supports multi-day events:
  - Develop significant amounts of storage with varying duration
  - Assess availability of imports
  - Develop cost-effective alternatives for multi-day and seasonal events; including, demand response, etc.
  - Reduce use of natural gas resource while strategically maintaining sufficient capacity for reliability
- Consider multi-day low production events in resource planning studies