



California ISO

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

ESIG – 2020 Spring Technical Workshop

Phil Pettingill, Director Regional Integration

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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

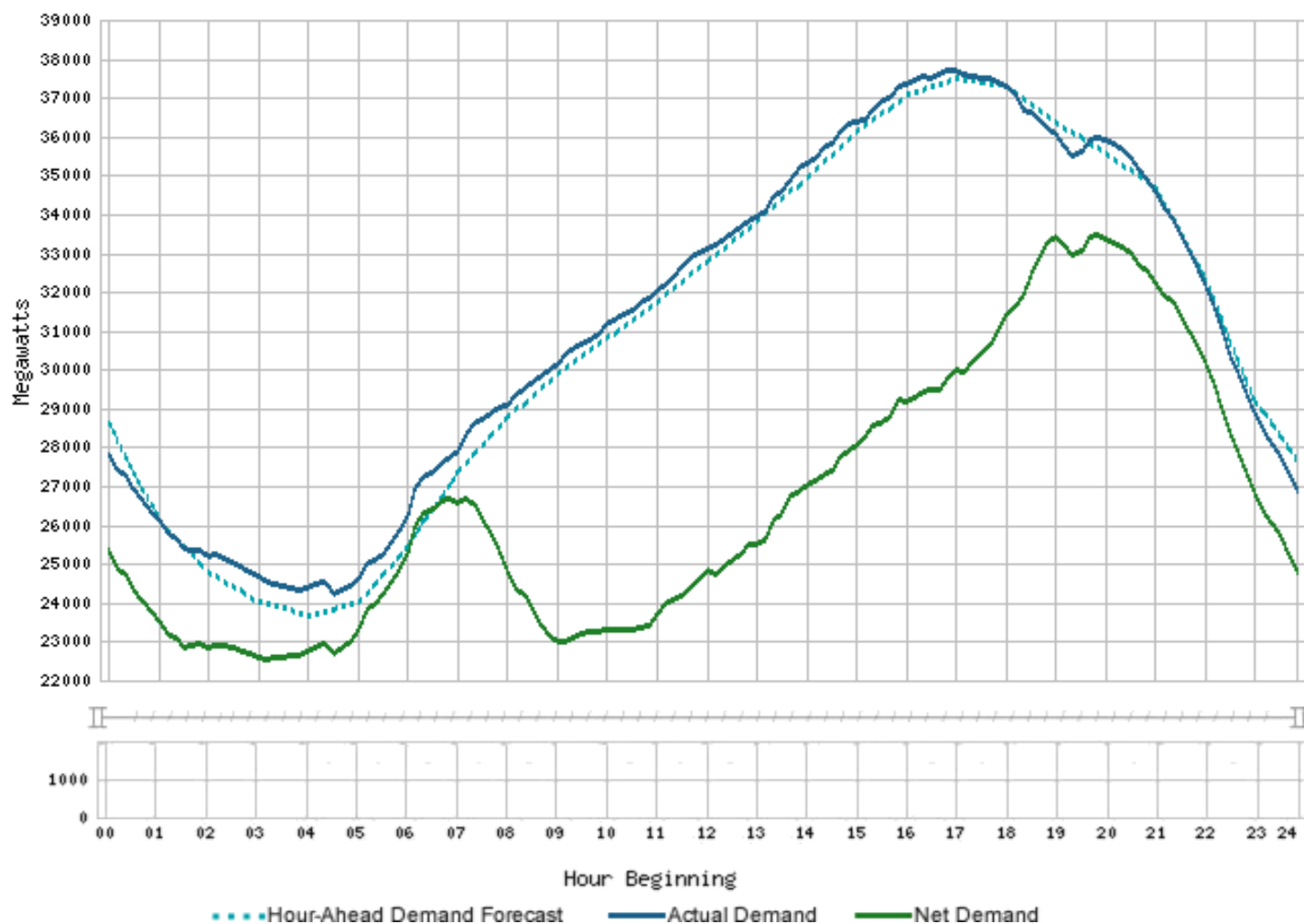
Challenges

- **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

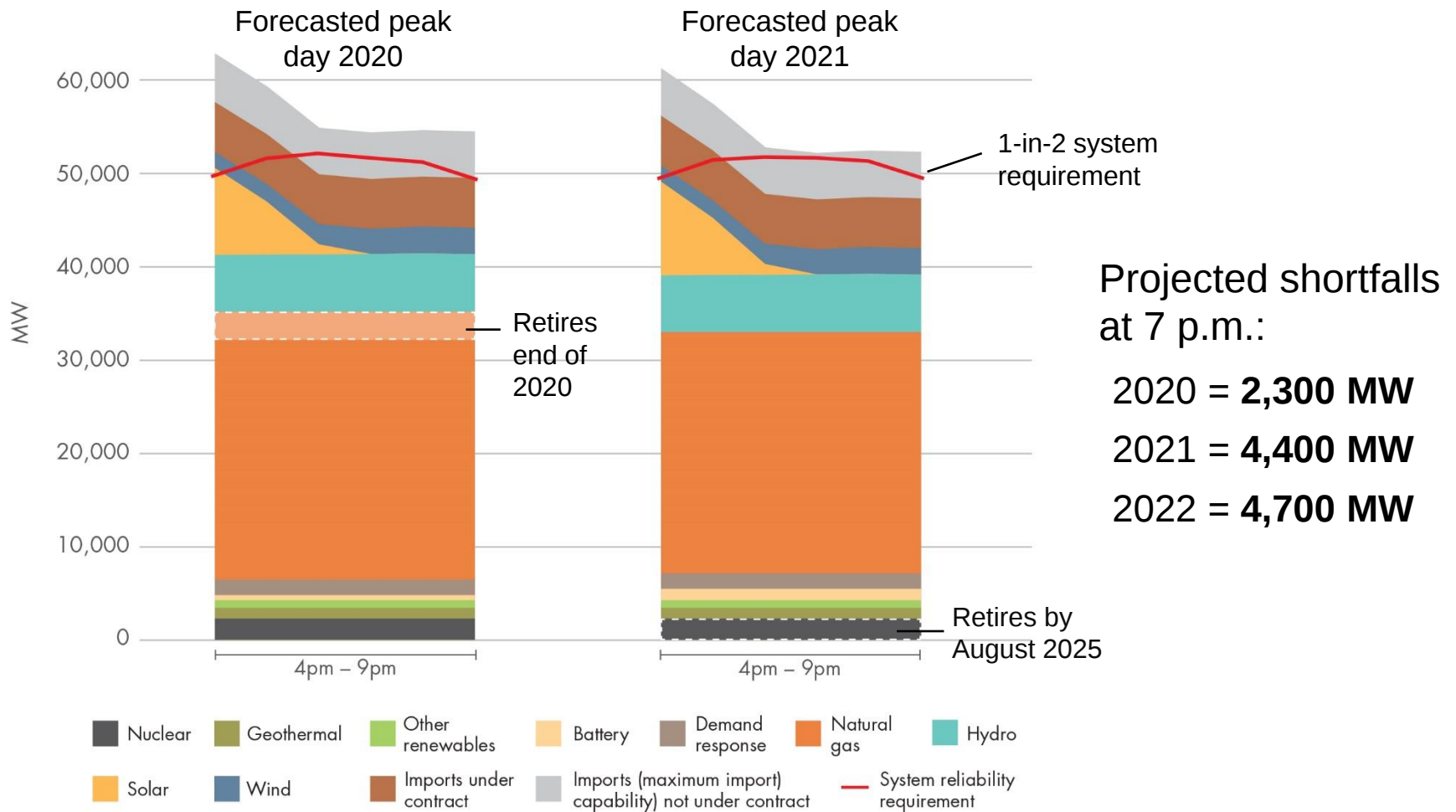
Capacity shortfall in 2020 and meeting summer evening peak load

- 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 shortage¹ starting in 2020



¹ 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

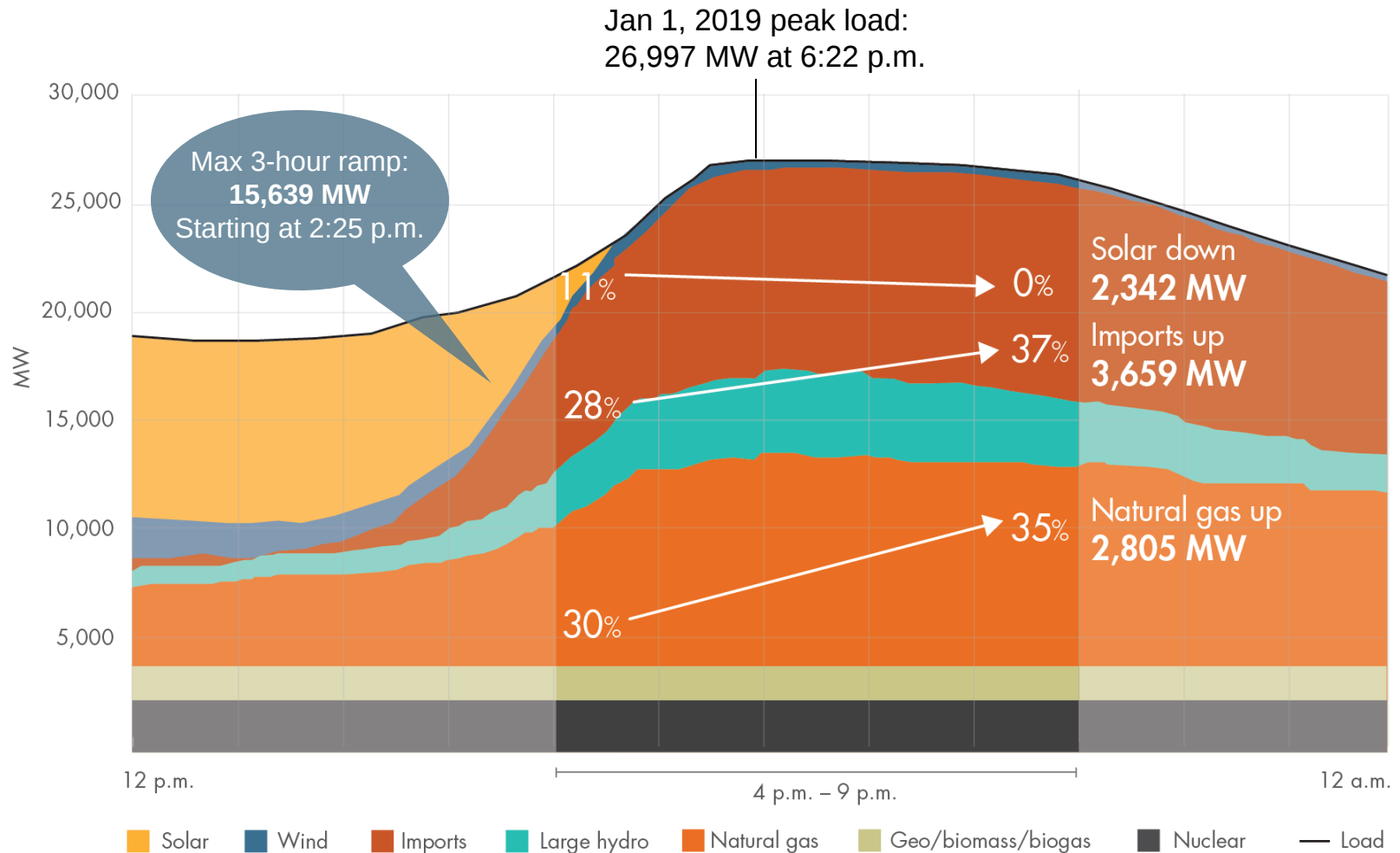
Challenges

- 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**

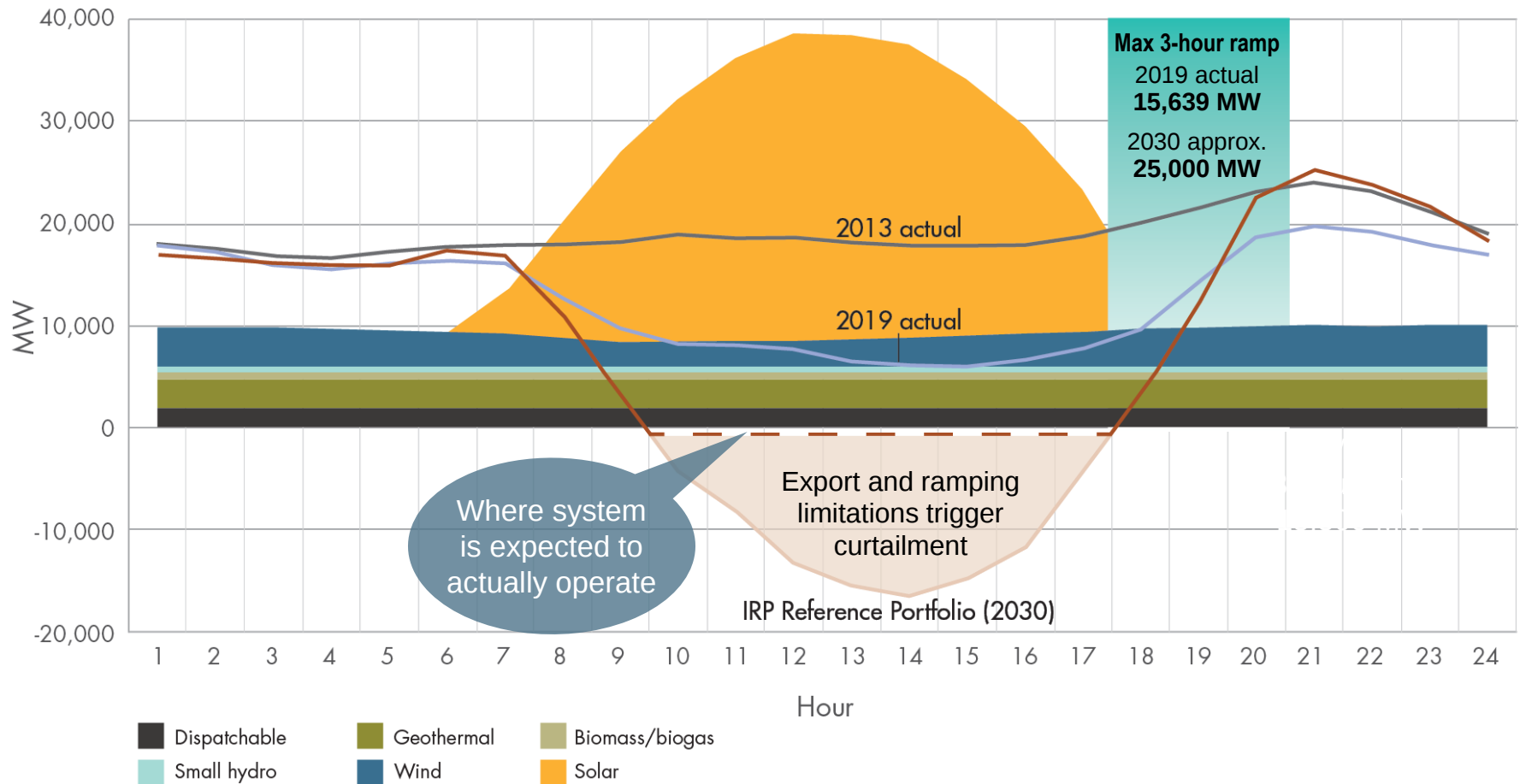
Challenge 2: Increased ramping needs

- 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

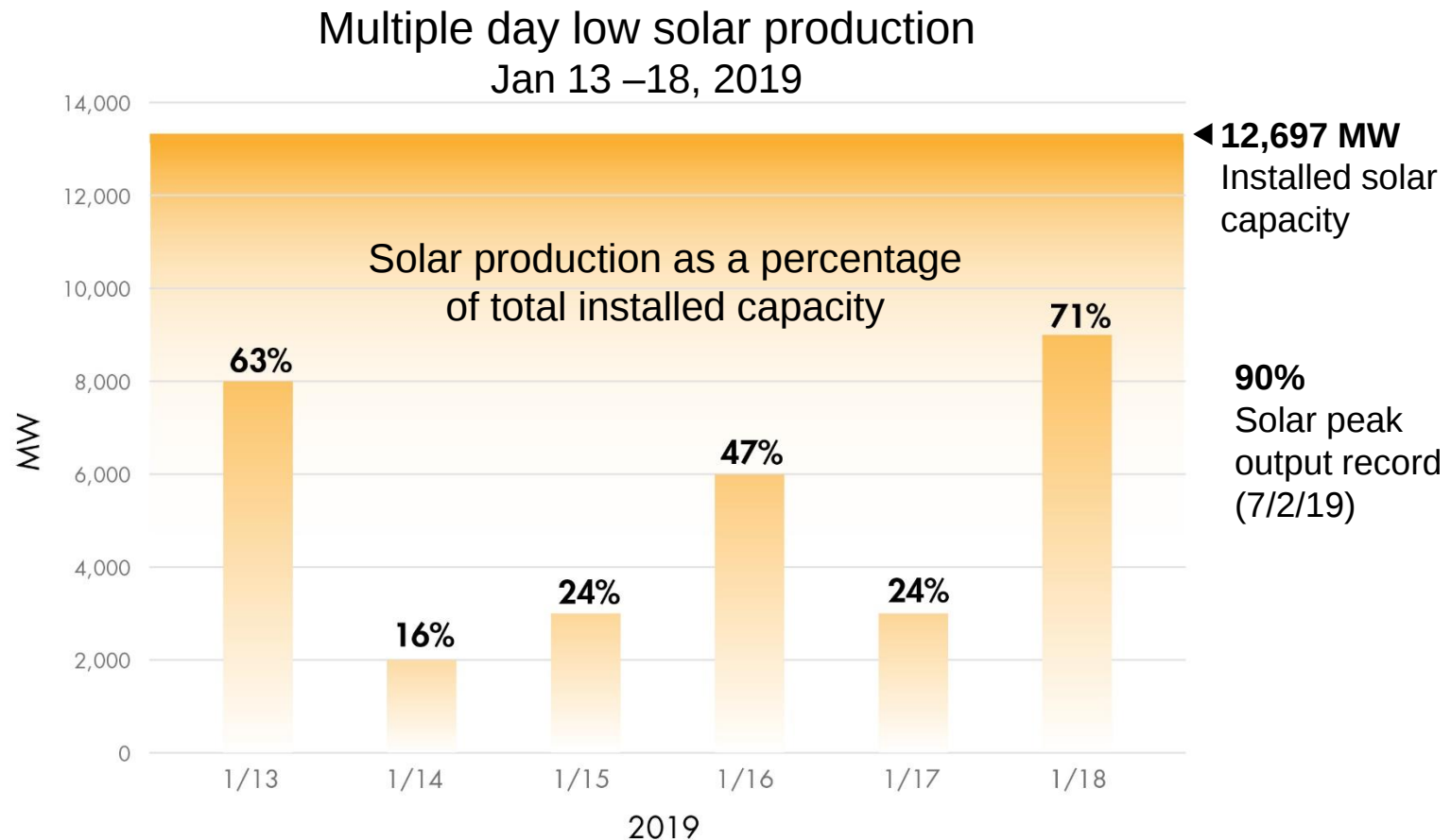


Electric vehicle integration

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