



Briefing on post 2020 grid operational outlook

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Board of Governors Meeting

General Session

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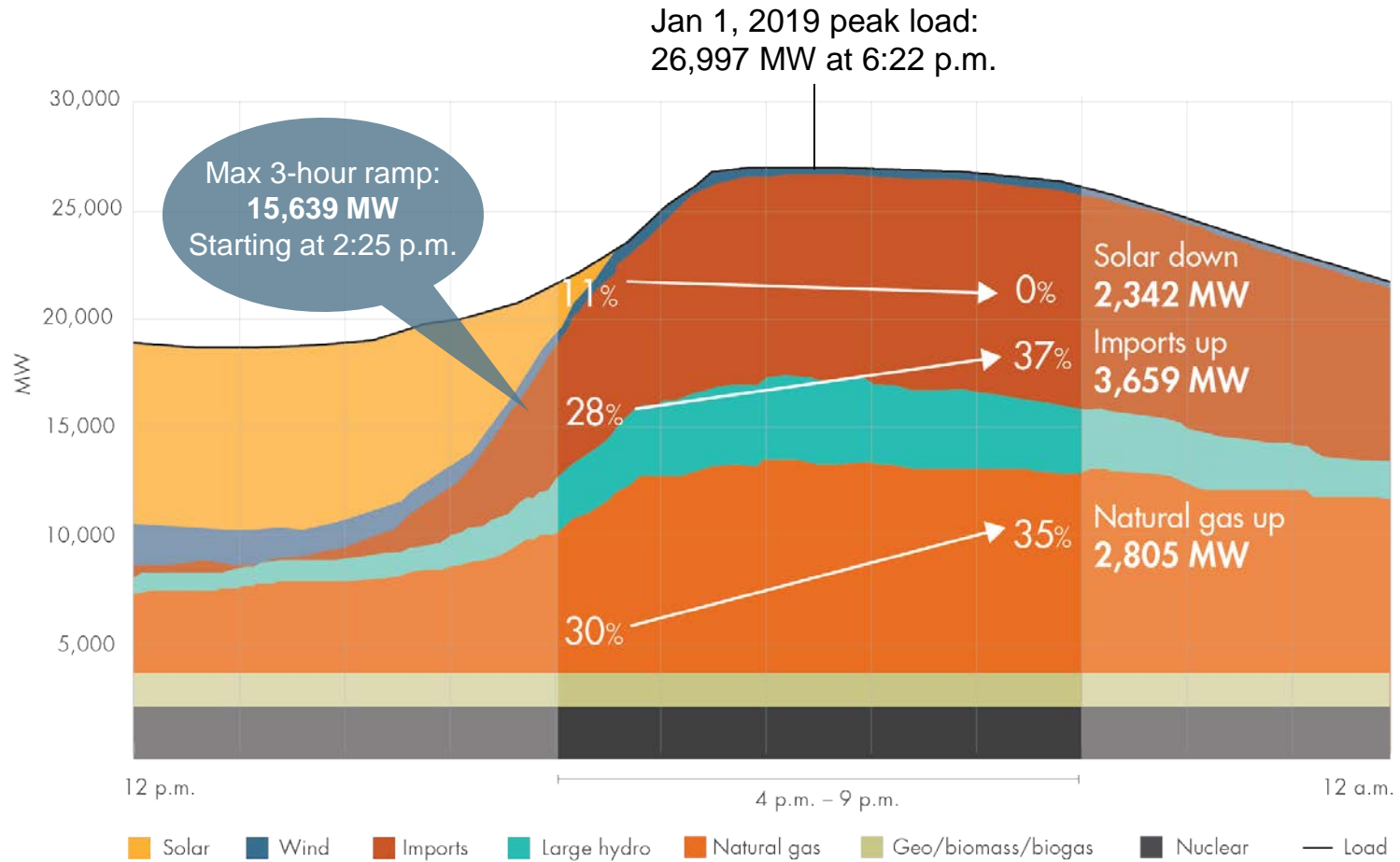
Challenges

- 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**

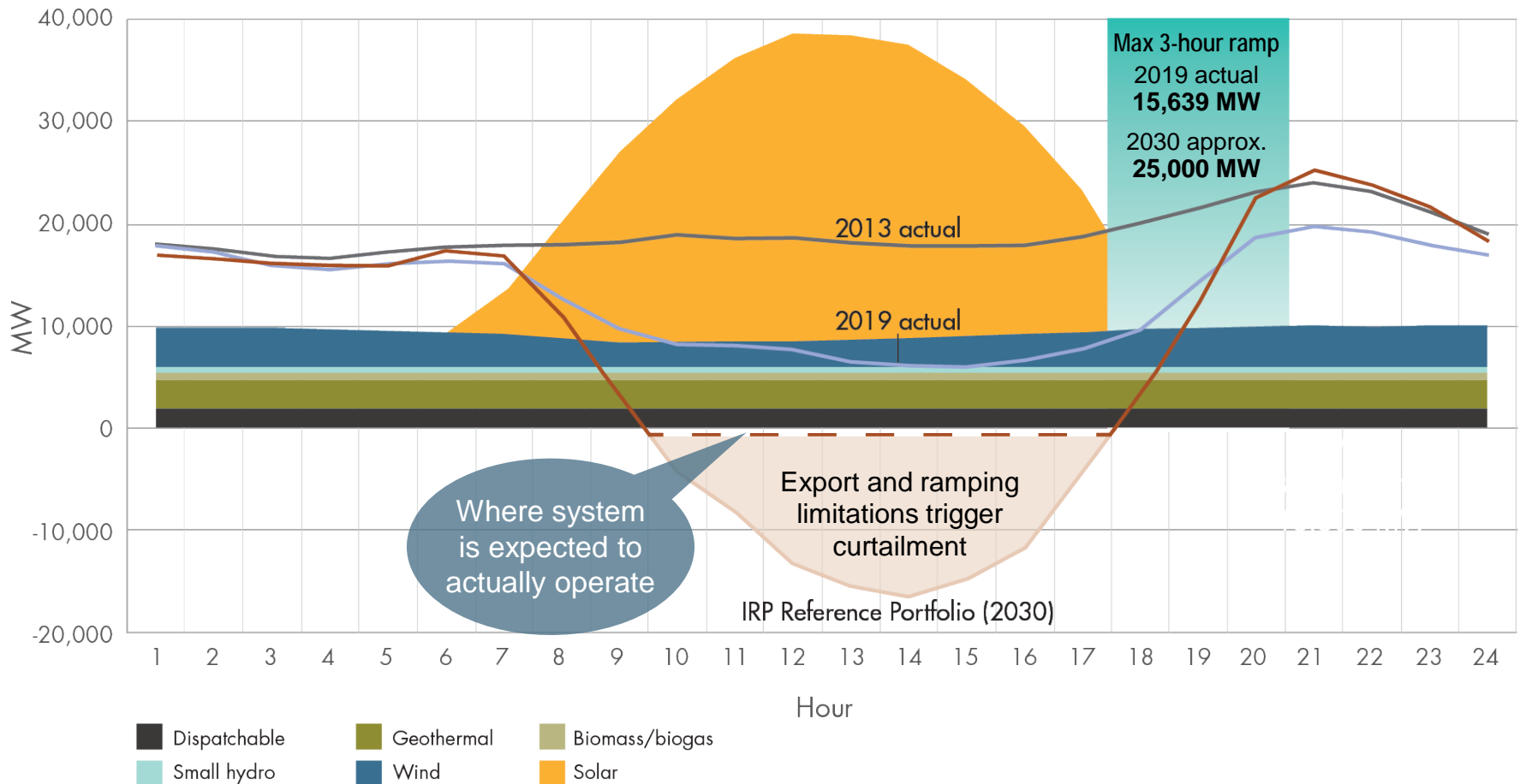
Challenge 2: Increased ramping needs

- 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 (Senate Bill 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 – *ISO actions*

- Completed
 - Expand the ISO's western markets to maximize solar production with greater geographic diversity
 - Ensure inverter-based resources ride-through fault events
- In progress
 - Ensure resources are following dispatch instructions
 - Incent all resources, including renewable resources, to provide dispatch bids, ancillary and other services
- Future
 - Consider ramp constraints on variable resources to ensure they are not ramping up faster than can be accommodated

Challenge 2: Increased ramping needs – *other 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

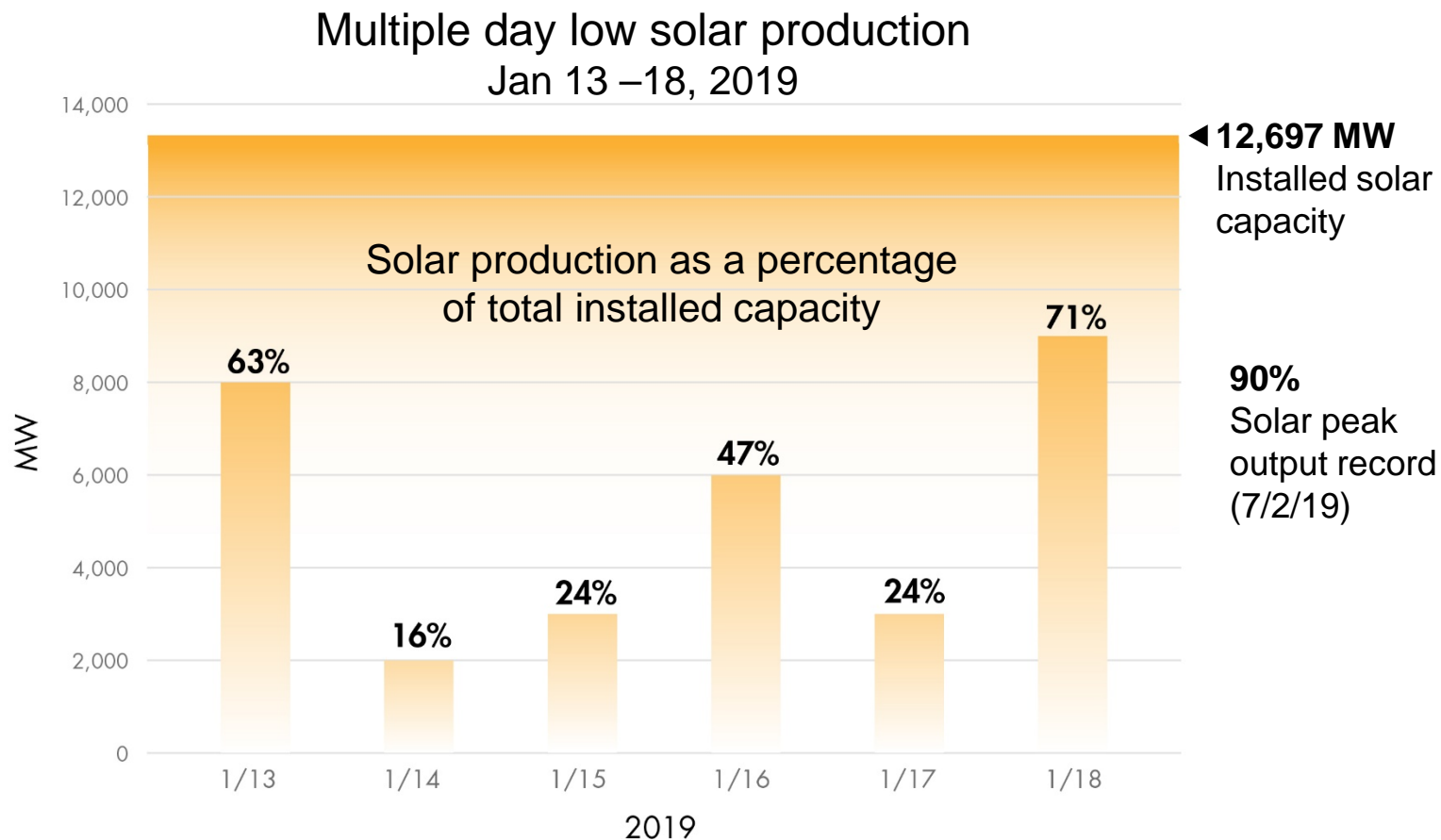


Electric vehicle integration

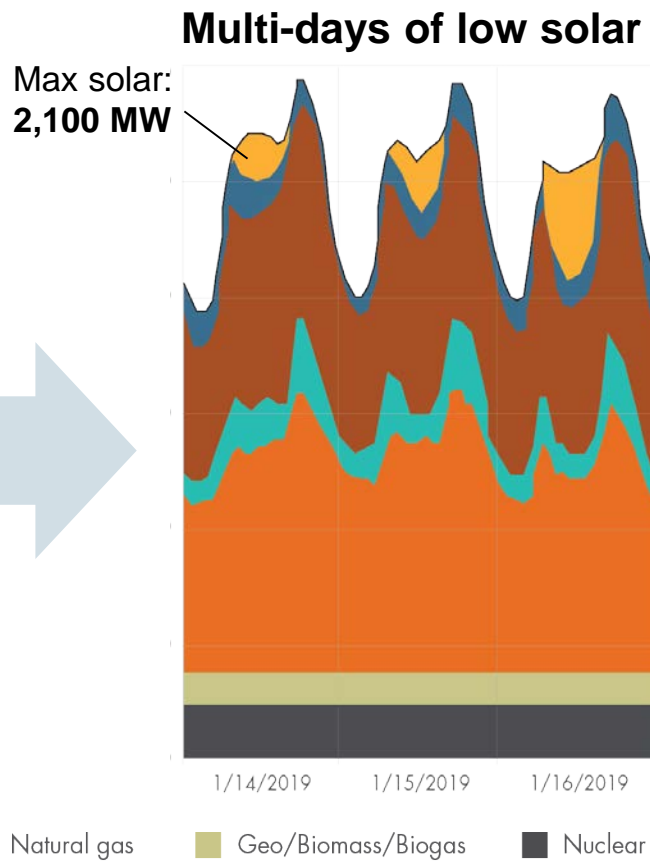
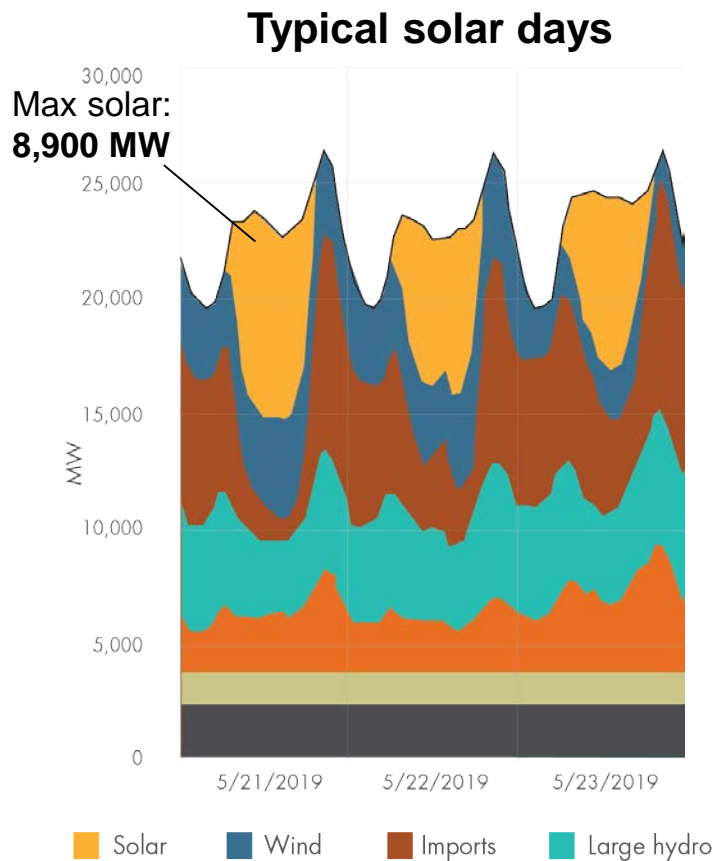
Challenge 3: Low renewable energy production from multi-day weather events

- 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



Low solar production across multi-day event – high reliance on natural gas and imports



Multi-day low solar will hinder short-duration storage ability to recharge

The Kauai experience – July 21, 2019

- Kauai Island Utility Cooperative – approximately 70 MW of load
- Loss of gas generation – 27.5 MW
- All hydro resources on maintenance outage – 16 MW
- Major storm caused low solar production for multiple days
- Solar – Battery storage unable to serve load each day
 - A. 28 MW solar with 100 MW-hr storage (four hours)
 - B. 13 MW solar with 52 MW-hr storage (four hours)
- Result: initial outage of two hours, two days rotating outage of 30 min for 3-4 hours in early morning
- Restored regular service after offline generation was put into service and solar production was increased

Challenge 3: Multi-day low renewable production events – *other 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