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California Energy Commission

Overview on California Gas Reliability Issues

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Goals for Today's Workshop

Gas Track for 2021 IEPR will address two key areas:

- Situational awareness of emerging topics in natural gas system planning
- Refinement and development of critical analytical products necessary for gas planning

Today's Workshop focused on Gas-Electric Reliability topics:

- Summer 2021 Gas Reliability Assessments for Southern California
- Review of Winter 2021 Storm Uri Polar Vortex Impacts
- Alternatives to Aliso Canyon that Ensure Reliability

Anticipate future 2021 IEPR workshops on:

- Gas Demand & Rate Forecasts
- Long-term Demand Scenarios
- Renewable Gas
- Hydrogen



Gas-Electric Interdependencies

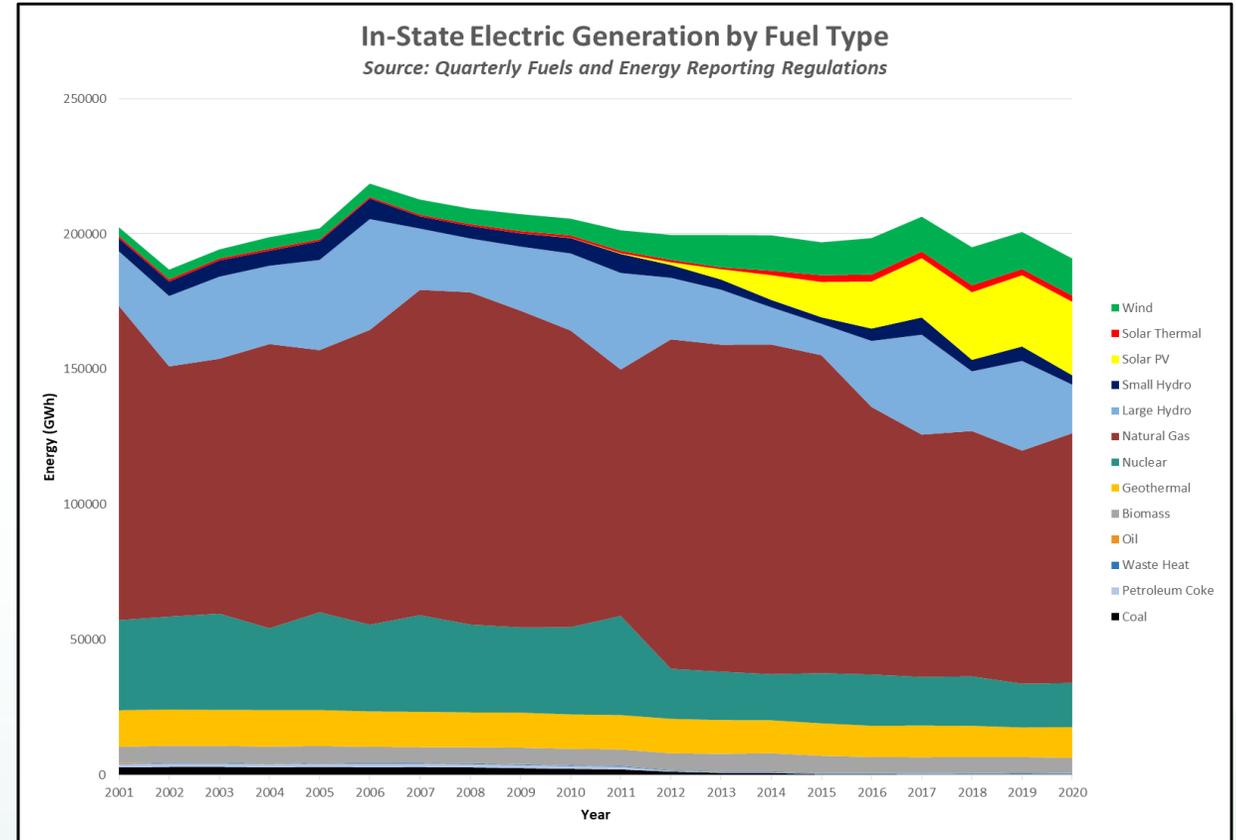
- For several decades natural gas-fired Electric Generation (EG) has been the dominant resource on the electric system for load following and grid reliability
- Rapid growth in solar and wind has shifted role of EG increasingly to integrating renewables on the grid
- Gas system operations are shifting to meeting EG demand for large afternoon/evening ramps and net peaks as the sun sets
- However, EGs curtailed when insufficient gas to meet all demand, in cold winter conditions, and under constrained system conditions in Southern California
- Gas and electric systems are deeply linked such that events and conditions in one have significant impacts on the other
- With large increases in renewables over the coming decades EG is becoming a driver of gas system needs and operations





Changing Role of Gas Fleet

- Gas generation used for load-following, peaking, and compensating for hydro losses
- Gas generation declined from 56% in 2001 to 48% in 2020
- Renewable generation increased from 14% in 2001 to 33% in 2020
- Gas generation is being used to integrate renewables and meet peak and net peak demand
- Gas generation between 86,000-121,000 GWh depending on hydro conditions from 2001-2020





SoCal Reliability Challenges

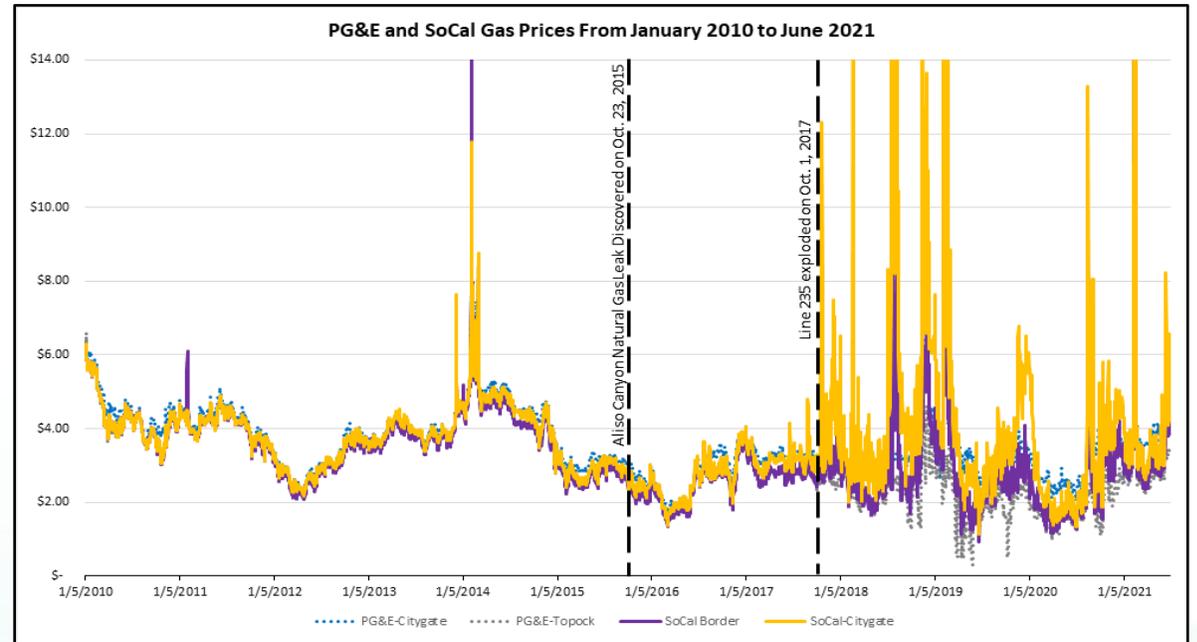
- 2010 reliability concerns emerged in implementing the OTC policy affecting over 20,000 MW of EG
- 2012 unplanned retirement of San Onofre increased challenges due to its role in maintaining grid stability
- In 2015, the Aliso Canyon leak and reduced storage were new challenges for both the gas and electric systems
- Starting in 2018, pipeline outages exacerbated the problem leading to price spikes and gas curtailments





SoCal Gas Prices

- Aliso leak occurred in 2015 and will be discussed in afternoon
- Increased gas price volatility from operational challenges
 - Limitations on use of Aliso
 - Pipeline outages (lines 235 and 4000)
- Price impacts on both summer and winter high demand days
- Most recent spike in Feb 2020 from Storm Uri events in Mid-continent & Southwest





Gas Demand In California

- Residential & Small Commercial – Space and water heating
- Commercial – Restaurants, educational facilities, commercial laundries, health care, food processing, etc.
- Industrial - Fuel and process heat
- Electric generation
 - Electric system reliability
 - Renewable integration
- Transportation fuels
 - Oil refineries
 - CNG/RNG fueling stations
- Gas delivered to customers via extensive gas infrastructure

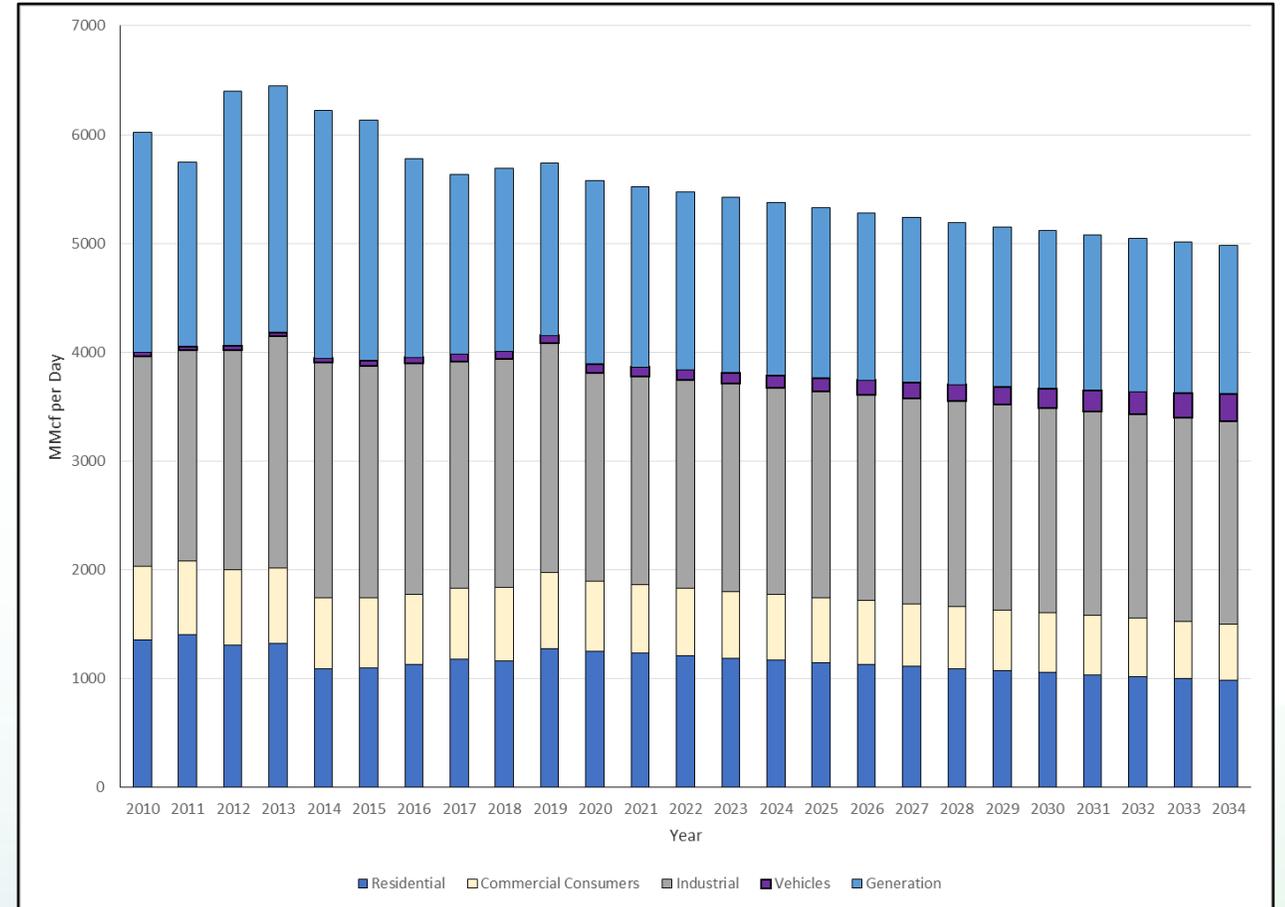


Images courtesy of the CEC, energystar.gov, Sacramento State University, National Park Service, UC Davis Medical Center, and CA Department of Industrial Relations.



Gas Demand Trends

- CA Gas Demand Declining since 2012-13
- PG&E and SoCalGas forecasting decline of 1% per year out to 2034
- Weather biggest driver for residential, commercial and EG
- 2020 Residential ~23% gas consumption
- 2020 Industrial, commercial, and EG ~75% gas consumption
- Renewable integration likely to increase EG gas demand in near-term





Gas Reliability Standards

- Reliability standards address physical capabilities of the gas utilities' systems
- A combination of gas flowing through intrastate pipelines and withdrawal from storage fields to balance supply and demand
- Delivery of gas is on a ratable basis – a constant flow of demand spread evenly over a 24-hour period,
- EGs take larger amounts gas over a shorter period
- Gas utilities meet core customer demand on *very cold winter day*, driven mostly by space and water heating loads
- Gas utilities meet lower winter peak day demand for noncore customers who accept risk of occasional curtailment in exchange for lower rates
- Storage key to ensuring gas system reliability and minimizing gas curtailments and severe price spikes



Intra-state Gas Infrastructure

Gas storage fields operated by:

- PG&E – Los Medanos, McDonald Island, and Pleasant Creek
- SoCalGas – Aliso Canyon, Honor Rancho, La Goleta, and Playa Del Rey
- Independent Storage Operators – Wild Goose, Lodi Gas, Gill Ranch and Central Valley Storage

Intrastate Backbone and Local Transmission Pipelines



Image from The California Gas Report.



Inter-state Gas Pipelines

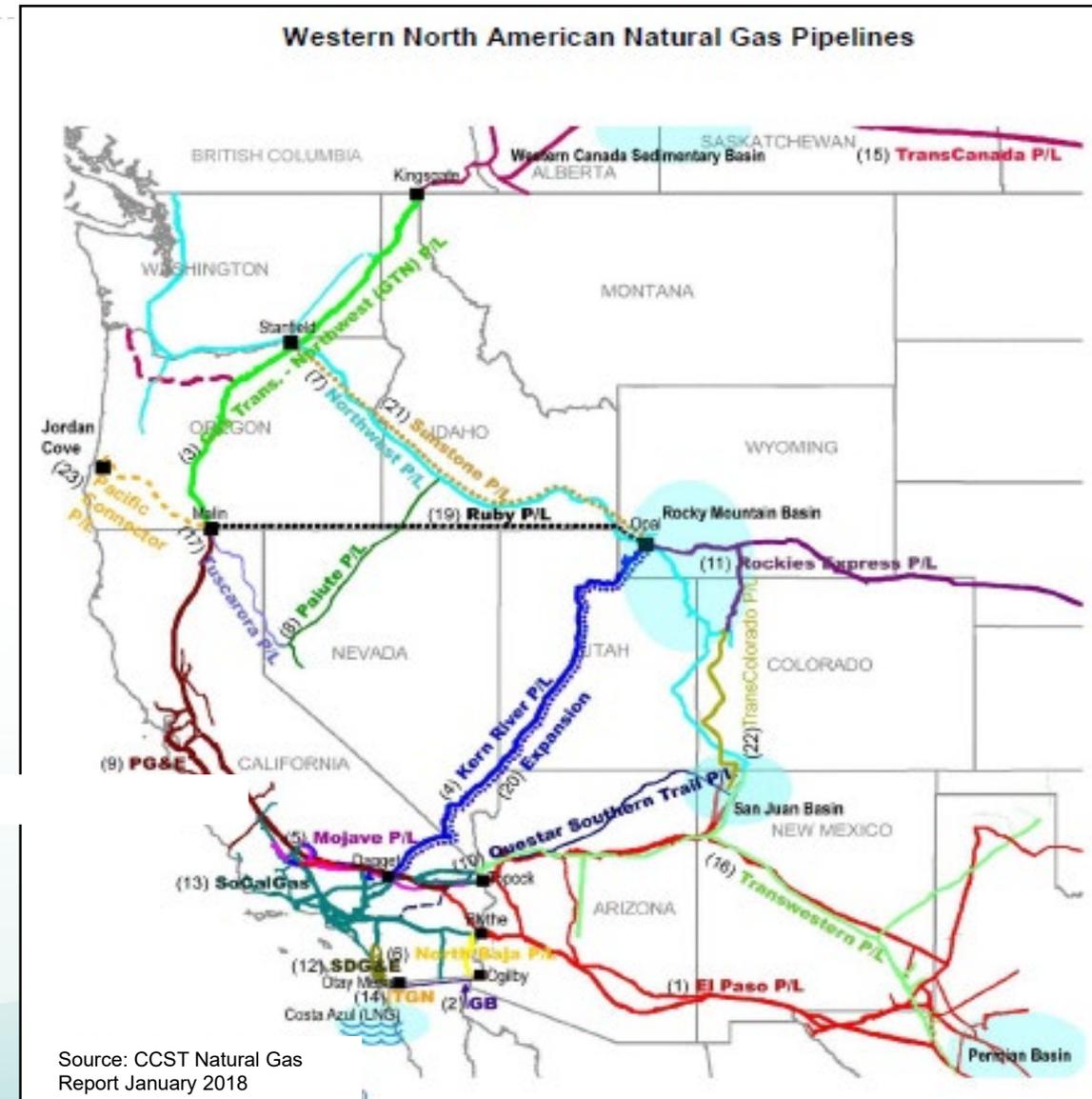
Out of State Gas Supplies ~ 90% Total

- Alberta Canada
- Southern Wyoming
- San Juan Basin (NW New Mexico)
- Permian Basin (West TX& SE New Mexico)
- Interstate Gas Pipelines

Receipt Points at Malin, Topoc N & S, and Wheeler Ridge

California at the End of Pipelines

- Many demand centers in PNW and SW before reaching California
- When supplies are tight, flows into California can be limited by upstream demand





Ensuring Core Reliability

- Gas utilities purchase gas & provide transportation and storage services for core customers – residential and small commercial
- Winter peak demand for residential and commercial has driven the need for infrastructure (pipelines, storage, etc.)
- Strict reliability standards designed to meet core demand under very cold winter conditions without interruption
 - SoCalGas uses an extreme peak winter day for core with a 1-in-35 probability of occurrence
 - PG&E uses an abnormal peak winter day for core with a 1-in- 90 probability of occurrence



Core Reliability Standards

- Curtailments of core customers considered as a last resort to maintain system operations
- Restoring core services takes several days up to weeks and involves tremendous manpower
 - Gas mains must be brought back individually and sequentially
 - Service to each home or building safely restored (pilot lights, etc.)
 - Safety concerns – potential for explosions
 - Pilot lights might flicker-out inconsistently as line pressures drop
 - Or if restoration not properly carried out





Noncore Reliability

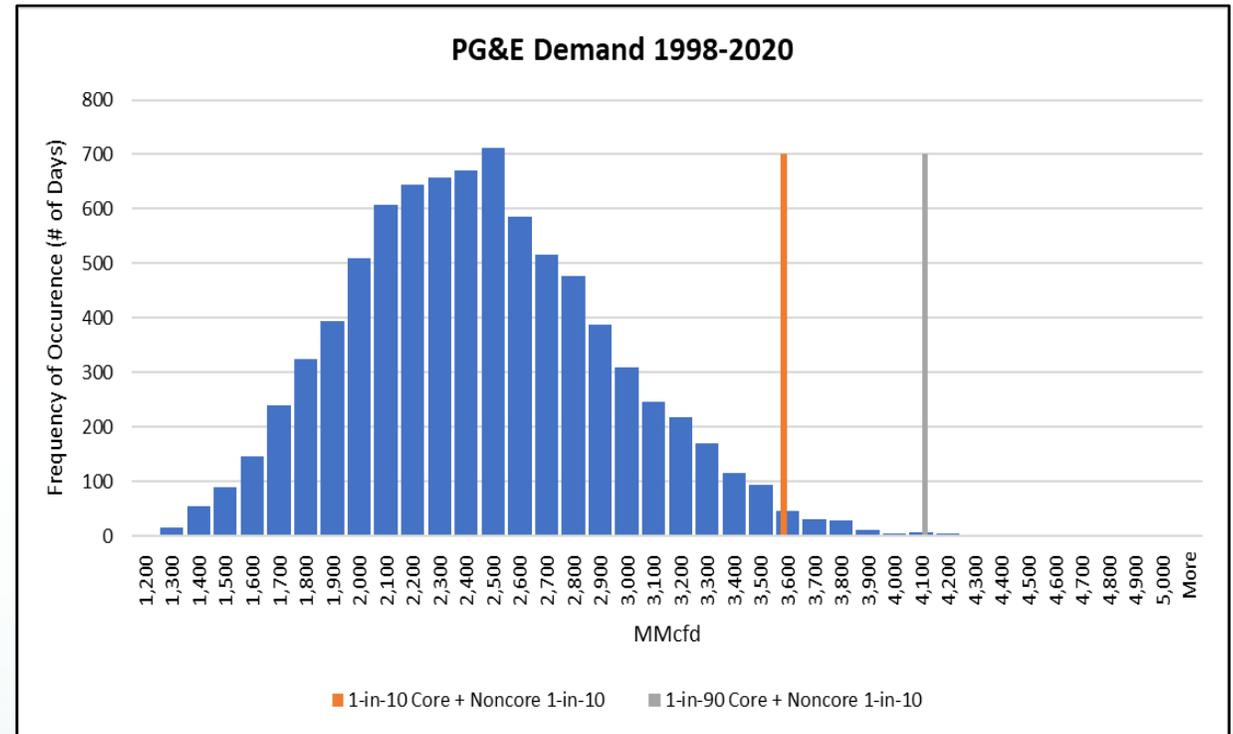
- Noncore reliability standard – cold winter day with a 1-in-10 probability of occurrence and dry hydro conditions for EGs
- Standard assumed noncore customers had alternatives fuels such as distillate and diesel fuel
- Noncore no longer dual-fuel capabilities, largely due to air quality regulations
- EGs take gas off the system when dispatched by the electric system operators
- EG demand patterns is a key example of inter-dependencies between gas and electric systems





PG&E Winter Peak Demand

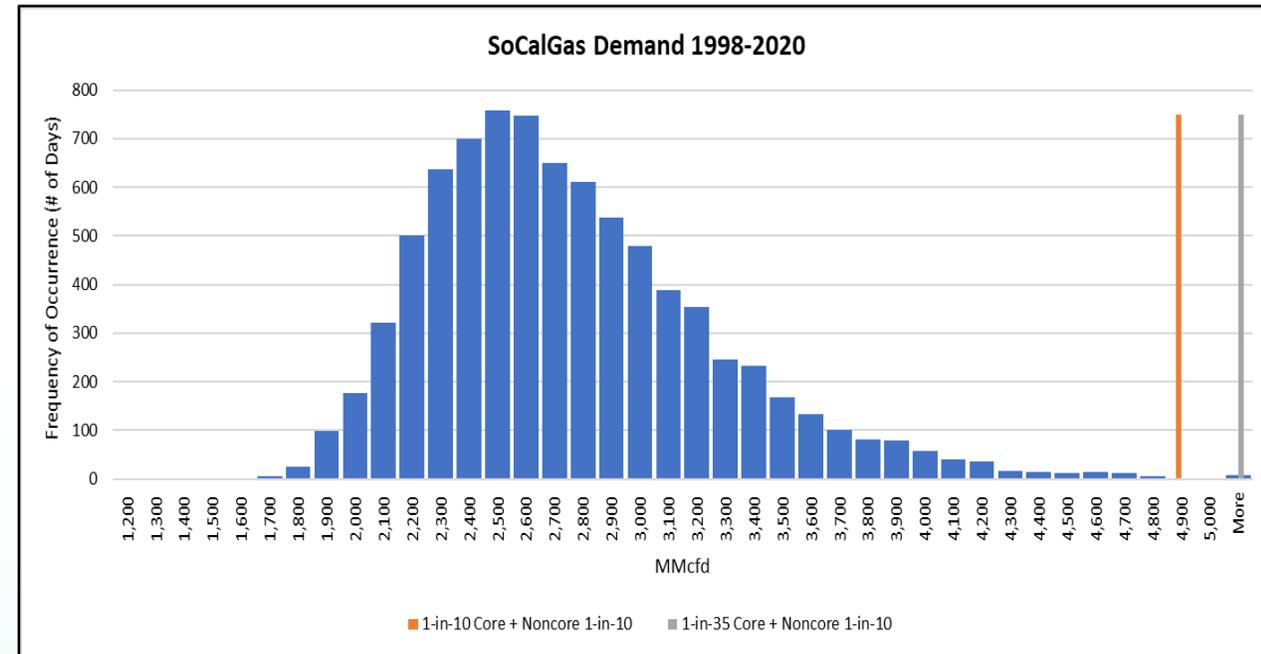
- PG&E demand on cold day ~3.6 Bcf, on abnormal cold ~4 Bcf
- PG&E experienced 13 days demand above 1-in-90 core and 1-in-10 noncore standard
- PG&E experienced 95 days when demand would exceed 1-in-10 core & noncore standard
- This would result in noncore customer curtailments:
 - Can degrade electric system reliability
 - Disrupt industrial operations important to the state's economy





SoCalGas Winter Peak Demand

- SoCalGas demand ~4.98 Bcf on a cold winter day and abnormal day
- SoCalGas experienced 3 days that exceeded that under a 1-in-35 core and 1-in-10 noncore
- SoCalGas experienced 8 days that exceeded that under 1-in-10 core & noncore
- Again on those days noncore curtailments would be expected





Gas-Electric Reliability Issues

- Historically, if the winter reliability standards can be met then summer reliability shouldn't be an issue – peak summer demand is lower
- However, EG gas demand is changing as additional renewables added to the grid –bigger ramps and meeting peak and net peak load
- More emphasis on impact of extreme heat on EG demand and ability to inject into storage to prepare for winter peak
- Future EG gas use will depend on the pace of deploying low carbon technologies to displace of gas for peak, net peak, and ramping
- Will need to assess how electric system demand will change with electrification of buildings and transportation – increasing winter peaks
- More emphasis on impacts of extreme cold events such as polar vortex on overall gas demand and potential for curtailments in winter



QUESTIONS?