Market Structure and Regulations

R.20-01-007 Track 1B

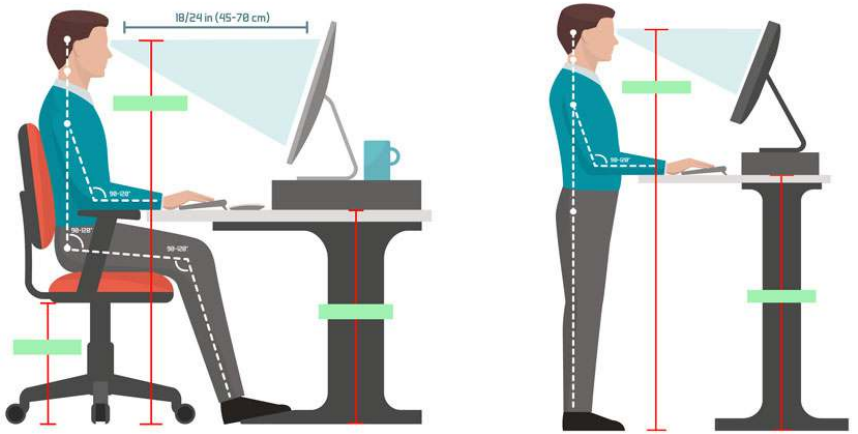
Staff Workshop

July 21, 2020

Workshop Logistics

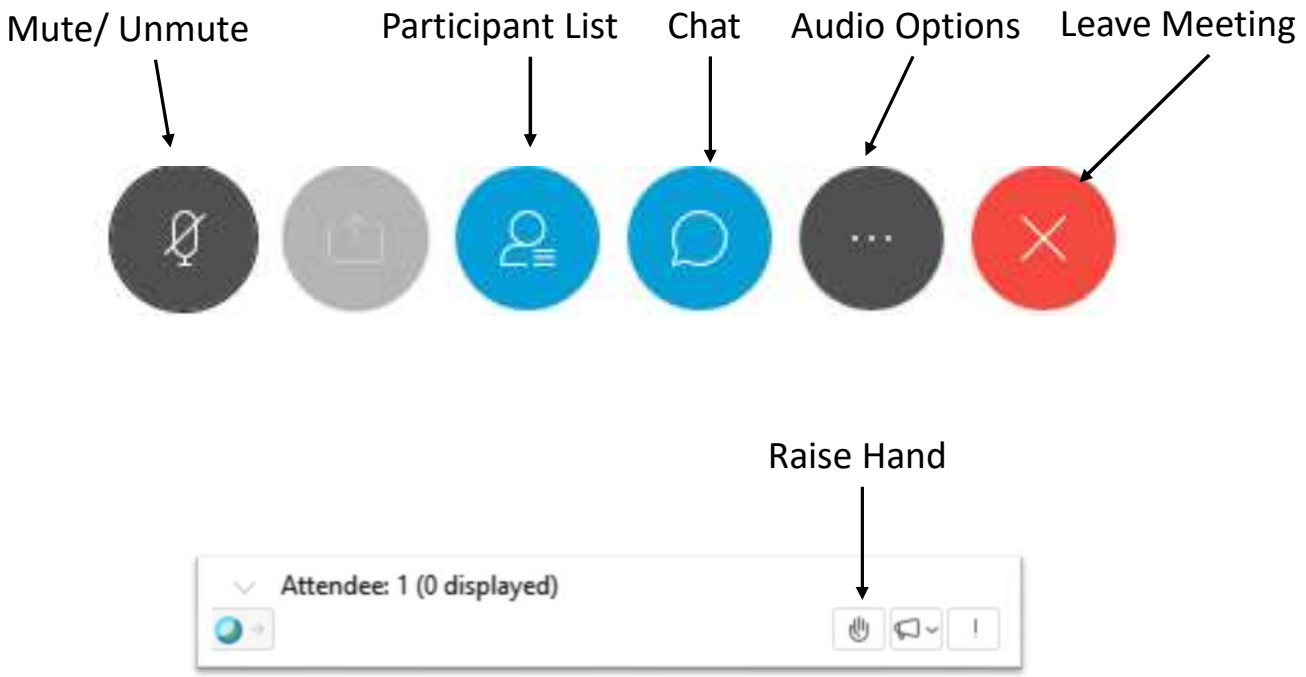
- Online only
  - Audio through computer or phone
  - Toll-free 1-855-282-6330
  - Access code: 146 066 7997
  - ***This workshop is being recorded***
- Hosts:
  - Administrative Law Judge Ava Tran
  - Energy Division Staff:
    - Kristina Abadjian
    - Christina Ly Tan
    - Jean Spencer

- Safety
  - Note surroundings and emergency exits
  - Ergonomic Check



Workshop Logistics

- Today's presentations (.pdf) and agenda are available on the WebEx link under “Event Material” type password “Gasplanning0” into the box and click “View Info”
- Please submit questions for panelists in the Chat box
- Questions will be read aloud by staff but you will be unmuted to respond to the answer. (Reminder: Mute back!)



Purpose

- Assigned Commissioner's Scoping Memo and Ruling announced two workshops in July
- Gather information and facts
- Seek feedback and input
- Identify solutions
- Opportunity to:
  - Address the questions outlined in scoping memo and ruling
  - Hear views of parties and stakeholders
  - Ask questions
  - Voice concerns

Workshop Goals

- Gain a better understanding of the facts upon which testimony, hearings (if needed), and briefs (if needed) will proceed upon
- Energy Division staff will publish a workshop report in September providing recommendations or, at a minimum, a range of options for resolving the issues

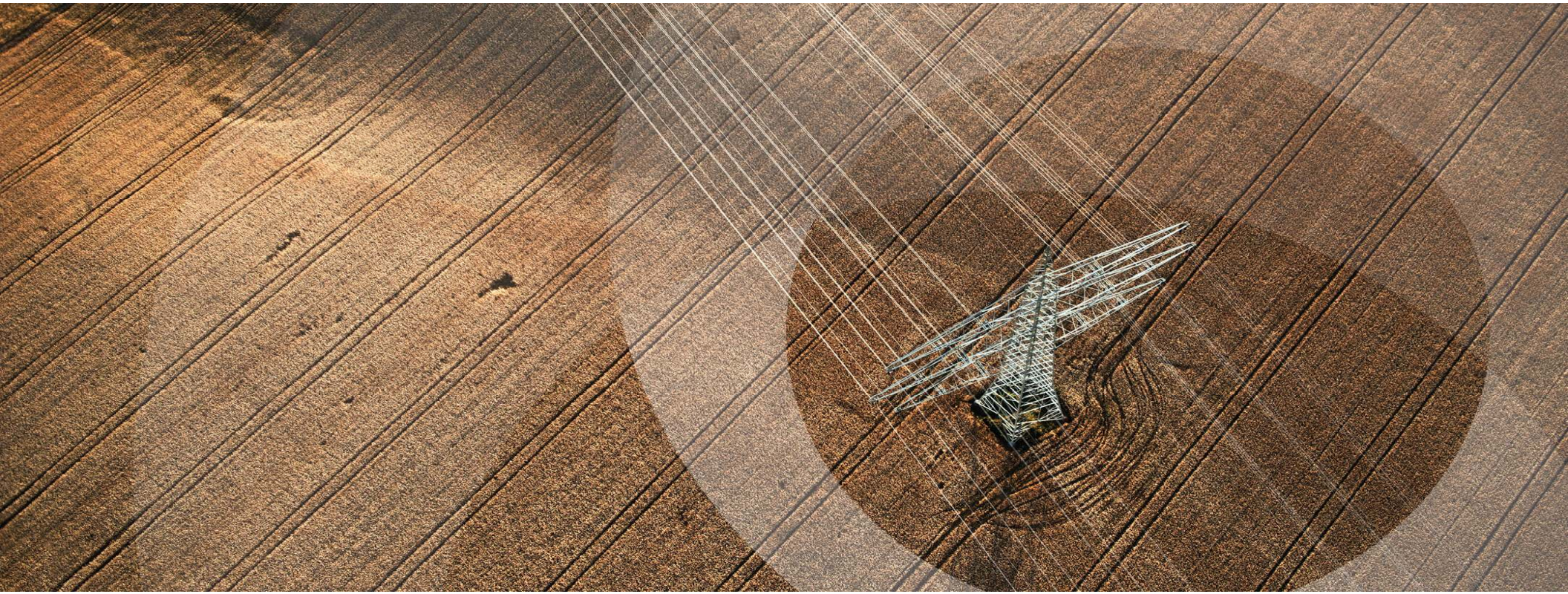
Ground Rules

- Workshop is structured to stimulate an honest dialogue and engage different perspectives
- Keep comments friendly and respectful
- Chat feature is only for Q&A or technical issues. Do not start or respond to sidebar conversations

Gas Demand Fluctuation and Interstate Capacity Contracts: Risks & Resolutions

Track 1B Presentation – Wood Mackenzie & E3

July 21, 2020



Trusted Intelligence

Wood Mackenzie
A Verisk Business

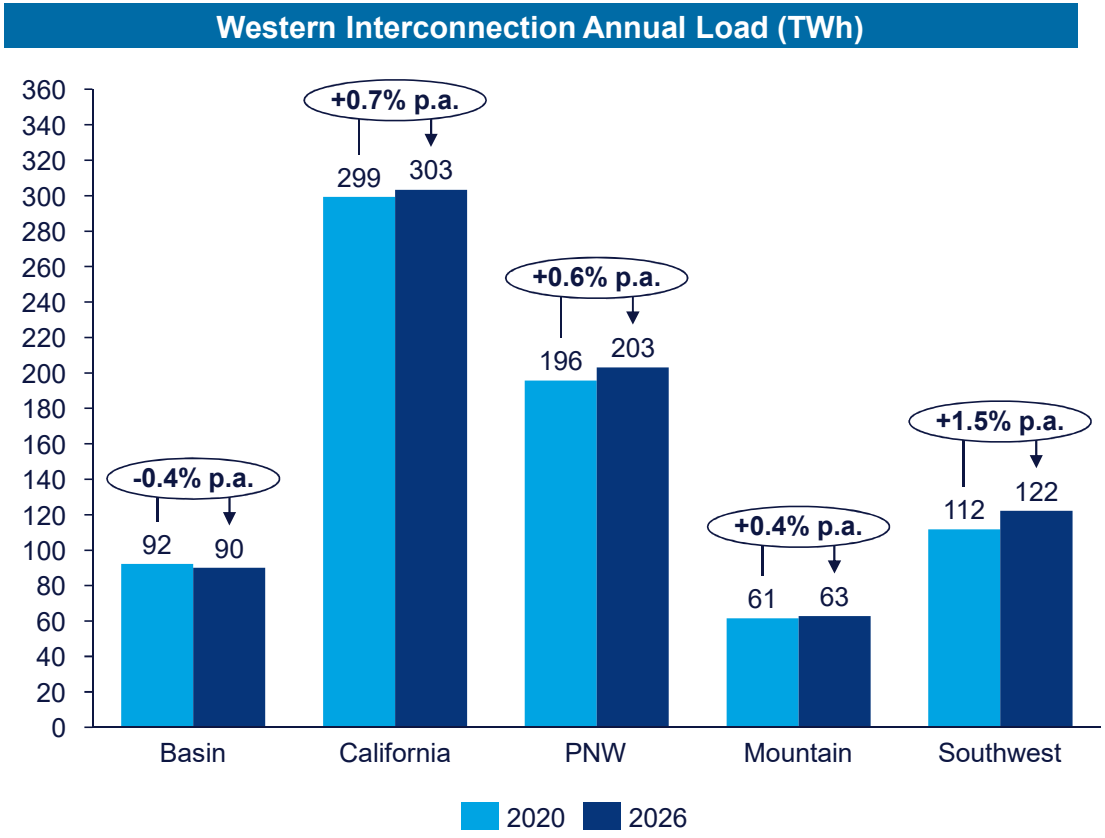
Agenda

Western Interconnection BPS Dynamics

Western Interconnection Fuel Assurance

Appendix

Load growth will increase power generation needs across the Western Interconnection

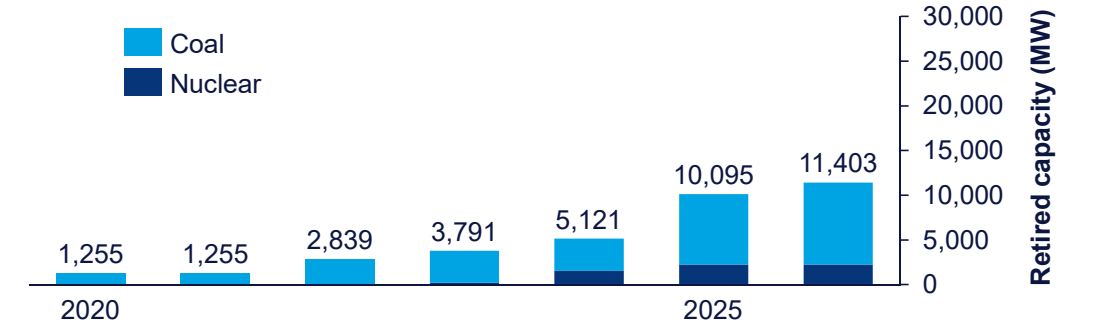


- Regional load grows over the course of 2020-2026, with an annual average growth rate of 0.6% per year across the entire footprint.
- Southwest load increases the most at 1.5% per year, inclusive of Energy Efficiency and Behind-the-Meter (BTM)
- Basin load reduces 0.4% per year over the period, driven by Nevada-North load expectations

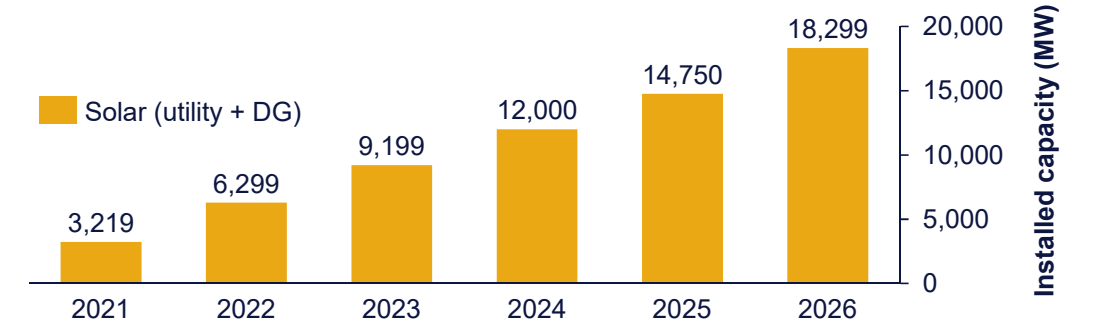
Source: E3

The Western grid continues to be transformed through baseload retirements and additions of solar and wind generation

Cumulative West Coal/Nuclear Retirements to 2026



Cumulative New CA Solar Capacity through 2026



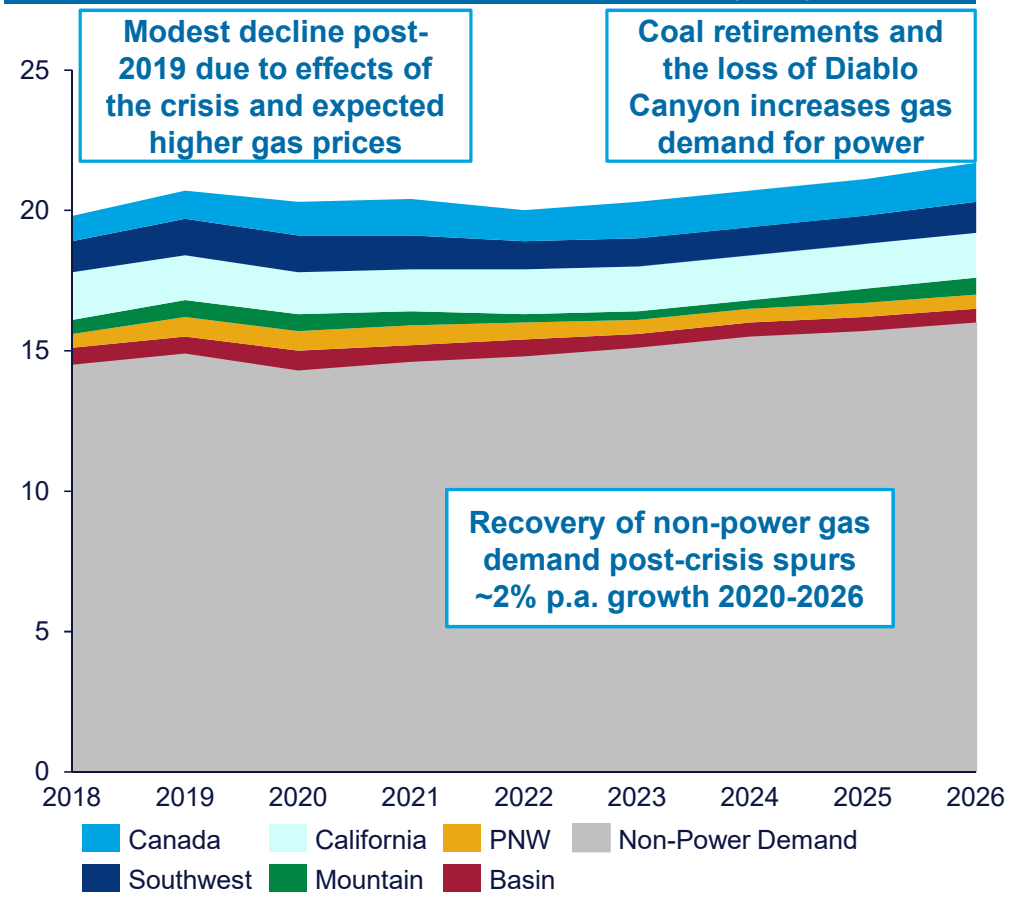
- 9 GW of coal and 2.2 GW of nuclear generation is projected to be retired by 2026
- More than 18 GW of new solar (utility & distributed generation) is projected to be installed in California from 2021-2026
- Bulk electricity storage will play an increasing role, but there is little clarity on the scale and timing

Gas generation has increased significantly since 2018, but additional infrastructure expansion is becoming more difficult due to climate concerns

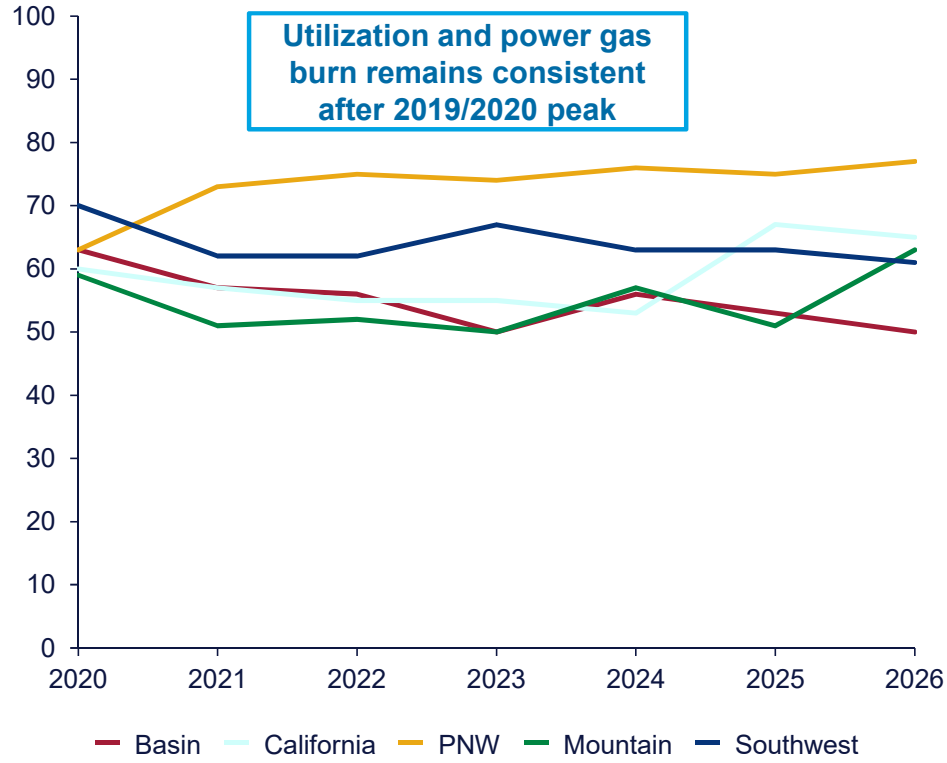
Source: E3

Baseload retirements spur power gas burn resiliency and, combined with post-crisis non-power gas load recovery, Western US gas demand returns to growth in 2023

Western Interconnection Gas Demand (bcfd)



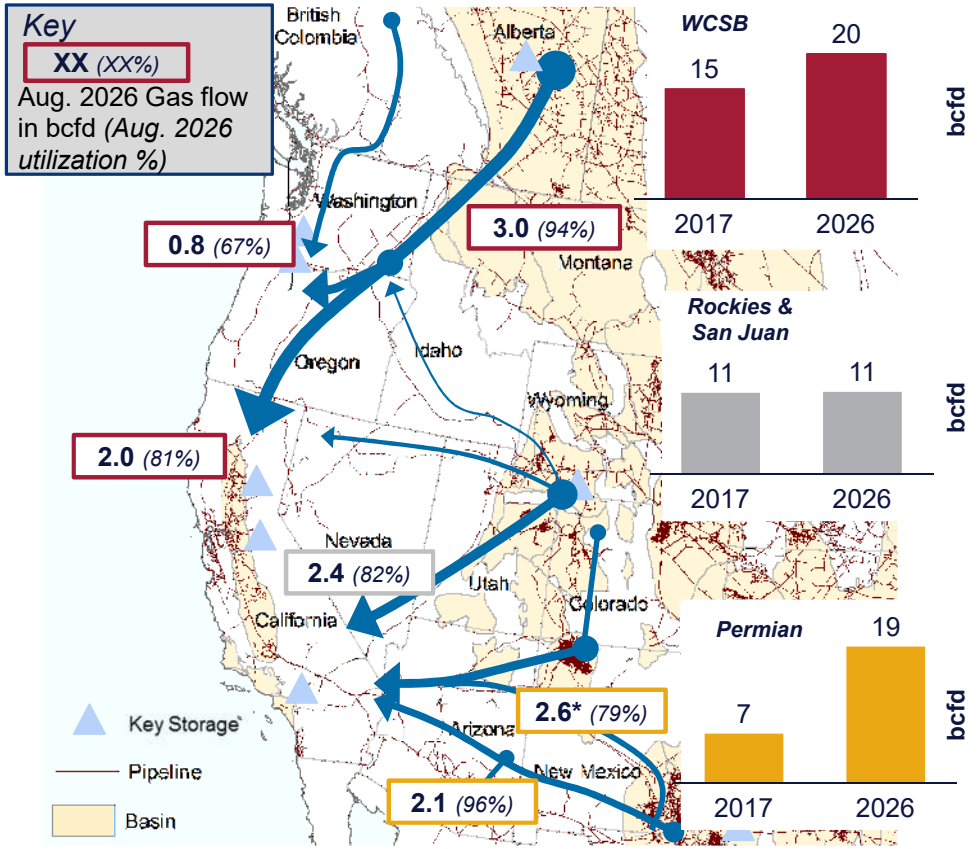
Average CCGT Capacity Factors (%)



Source: Wood Mackenzie, E3

The West is dependent on a variety of long-haul pipelines and supply basins, as well as key gas storage assets (e.g. Aliso Canyon) to provide necessary system flexibility

Western US & Canada Gas Pipe Flows & Producing Basins



- **Diverse and economic supply sources between Western Canada, Permian and Rockies plays provide abundant resource**
  - » Total reserves of 350 tcf available at <$4/mmbtu for dry gas and <$50/bbl for associated gas
- **Markets mostly concentrated along coast**
- **7 major pipeline systems transport gas from supply basins to key markets**
  - » High gas demand will continue to result in tight system balances even during normal operating conditions across Southwest (AZ, NM) and CA
- **Underground gas storage is a key resource in load pockets and the large Aliso Canyon storage facility has provided necessary flexibility in Southern CA to manage load variability and disruptions**

Source: Wood Mackenzie
* Combined flows and capacities of El Paso & Transwestern

In 2018, the WECC Gas-Electric Interface Study demonstrated the impact of an Aliso Canyon outage/retirement and its ripple effects into neighboring regions

Scenario[1]	Regional Focus	N-1 + Aliso Canyon Retirement Case	N-2 + Aliso Canyon Retirement Case	Impact
Disruption on a major DSW gas pipeline	DSW/ Southern CA	Disruption on critical Southern NM section of DSW pipeline. Aliso Canyon at 30% of capacity fully mitigated the unserved energy and 75% of the unmet spinning reserve		Significant unserved energy and unmet spinning reserves resulting in ~$1 bn risked impact across Southwest / CA
Winter gas supply freeze-off in the Permian & San Juan	DSW	Week-long winter supply freeze-off in Permian and San Juan basins reducing supply by 1.5 bcfd, higher residential gas demand. 15% of generation in AZ/NM unavailable. Aliso Canyon at 30% of capacity fully mitigated disruption	Low hydro conditions; CA wildfire transmission outage	Unmet spinning reserves result in up to >$0.5 bn risked economic impact across Southwest / CA
Seismic event disrupting Alberta supply	PNW	M6+ earthquake in the Rocky Mountain House area, that disrupts natural gas production in Alberta	Low hydro conditions	Unmet spinning reserves but limited risked economic impact in PNW
Disruption on a PNW pipeline	PNW	Disruption at the US/Canada border (or upstream) receipt point on the system	Low hydro conditions	System able to compensate for outages
Disruption on a Basin pipeline	Basin/ California	Disruption on the critical mainline section downstream of the supply basin and upstream of the demand centers	Low hydro conditions	System able to compensate for outages

Source: E3, Wood Mackenzie – Western Interconnect Gas-Electric Interface Study (2018)

1. Assumes Aliso Canyon storage facility has been retired

Agenda

- Western Interconnection BPS Dynamics
- **Western Interconnection Fuel Assurance**
- Appendix

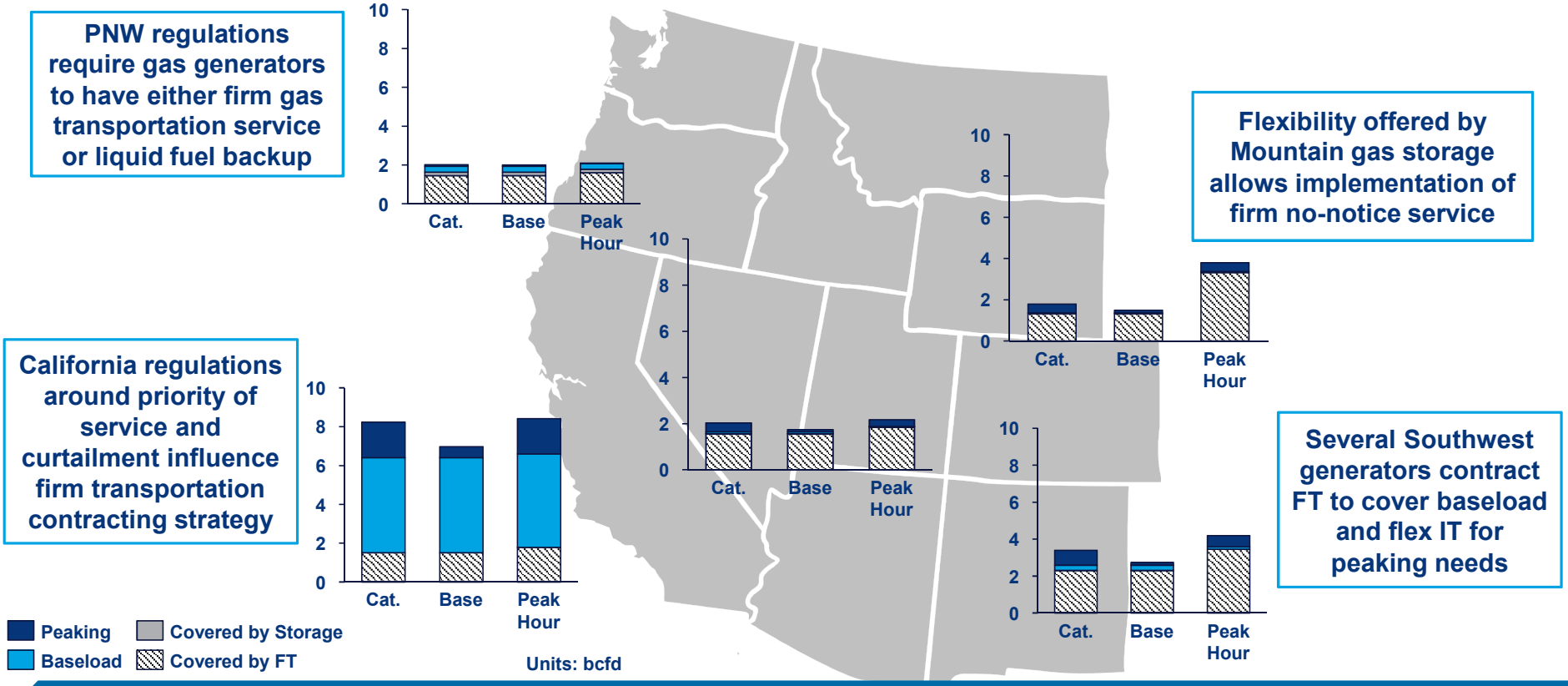
While the regional gas infrastructure system should be sized to meet peak demand, in 2018, our contracting analysis showed differing levels of gas fuel assurance for power

PNW regulations require gas generators to have either firm gas transportation service or liquid fuel backup

California regulations around priority of service and curtailment influence firm transportation contracting strategy

Flexibility offered by Mountain gas storage allows implementation of firm no-notice service

Several Southwest generators contract FT to cover baseload and flex IT for peaking needs



Utilities generally contract firm transport to cover gas baseload capacity and use IT to supply gas peaking plants – combined with low CA firm transport, this approach will become less feasible as system flexibility declines

Source: Wood Mackenzie, E3 – Western Interconnect Gas-Electric Interface Study (2018)

Reconciliation and improvement of gas/electric coordination and strategic investment will be key to maximizing ability to manage demand and provide fuel assurance

	Recommendations	Benefits
Resource Adequacy Accounting	• Report all firm contracts and explicitly link to power plants served in IRP process and other firm reserve reports	• Allows for more robust planning processes and fuel assurance transparency especially as gas and power capacity dynamics tighten
Curtailment Priorities	• Re-visit classification of electric generation as "non-core" end-use • Designation of plants critical to grid reliability as core end-use	• Ensuring that critical power plants are not the first to be curtailed allows for additional flexibility for compensation via transmission
Improved Regional Coordination	• Conduct regional contingency planning exercises led by WECC to prepare for a number of disruption scenarios	• Maximizes compensation ability for utilities across the Western Interconnection
Forecasting & Execution	• Require intra-day LDC core load balancing to ensure fair OFO/penalty implementation • Additional clarity around interstate pipeline curtailment protocol	• Higher accountability for prior-day forecasting allows easier utility operation • Explicit interstate curtailment protocols allow for better contingency planning
Gas-Electric Day Mismatch	• Split weekend nomination period into daily blocks, resulting in a 7-day nomination cycle	• A feasible step for both gas and electric sides that would minimize response lead times over the weekend period
Strategic Regional Investments	• Invest in regional mitigation solutions, including renewables/batteries, demand side response, gas infrastructure, and maintain dual-fired generation flexibility	• Meeting the future needs of the BPS in the Western Interconnection reliably and at low cost will require a portfolio of mitigants

While NERC[1] has recently developed a framework for effectively evaluating potential reliability risks to the BPS at all times through the lens of fuel assurance, region-wide change will only progress with implementation and collaboration between state and regional regulatory and reliability entities and industry

Source: Wood Mackenzie, E3, Wood Mackenzie – Western Interconnect Gas-Electric Interface Study (2018)

1. NERC Reliability Guideline: Fuel Assurance and Fuel-Related Reliability Risk Analysis for the Bulk Power System published March 2020

Agenda

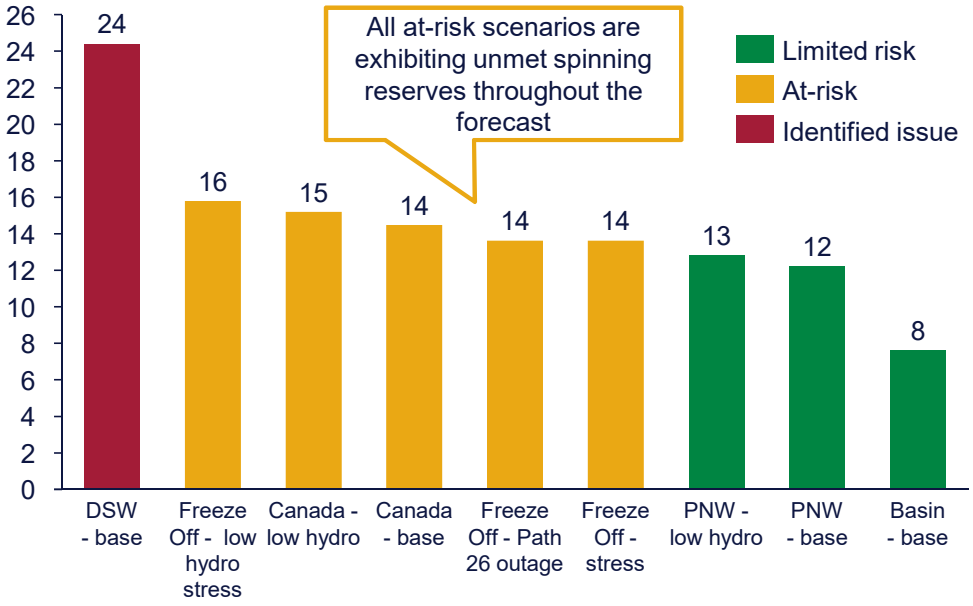
Western Interconnection BPS Dynamics

Western Interconnection Fuel Assurance

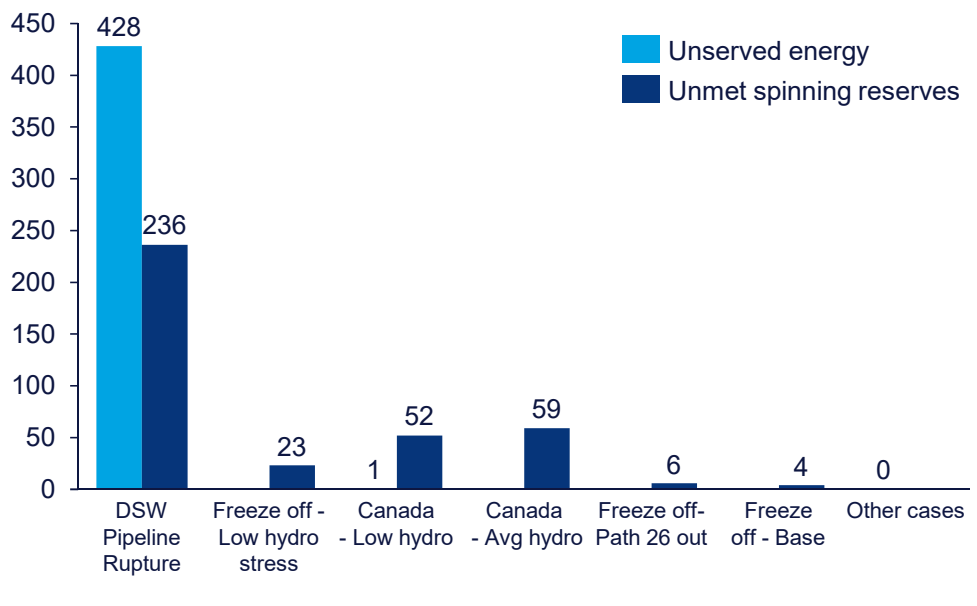
Appendix

The Southwest disruptions constitute the primary vulnerabilities within the Western Interconnection that the WECC Gas-Electric Interface Study identified in 2018

Outage Nameplate Capacity (GW)



Unserved Energy & Unmet Reserves (GWh)



Unrisked Economic Impact[1] ($US bn)	$27.4	$2.2	$3.4	$3.7	$0.8	$0.6	$0
Risked Economic Impact[2] ($US bn)	$1.1	$0.27	$0.002	$0.02		$0.6	$0

Unserved energy in the Southwest scenarios results from the configuration of the gas network, which limits deliverability in isolated "islands" of power plants in Phoenix and Southern California

Source: Argonne, E3, Wood Mackenzie – Western Interconnect Gas-Electric Interface Study (2018)

1. Economic impact estimated based on cost of unserved energy in each state for each type of demand sector
2. Risked Economic Impact estimated based on probability of each disruption

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Southwest Gas Corporation

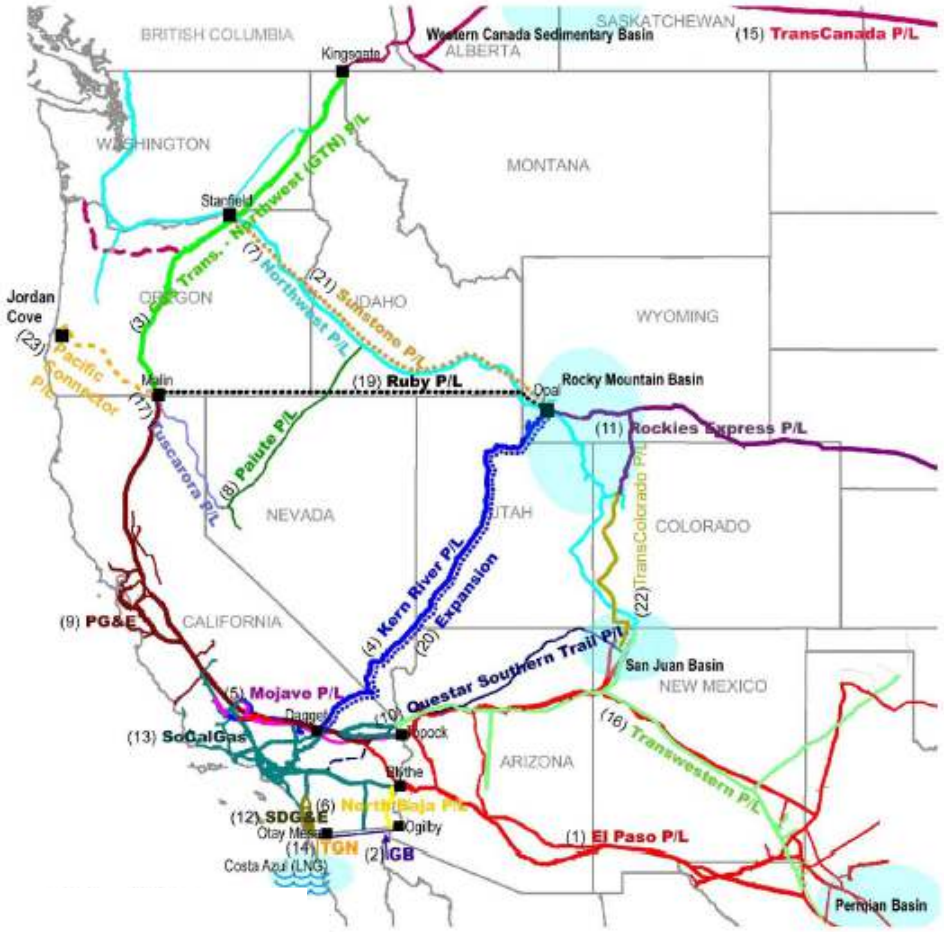
RULEMAKING 20-01-007
TRACK 1B WORKSHOP
JULY 21, 2020

STEVE WILLIAMS, P.E.
DIRECTOR/SYSTEMS PLANNING

Scope Discussion Items

- Should the Commission consider whether potential fluctuations in natural gas demand combined with potentially insufficient firm interstate gas pipeline contracts held by California customers could pose risks to interstate pipeline capacity services?
  - What measures, if any, can be taken to ensure interstate pipeline transportation capacity reliability?

Western North American Natural Gas Pipelines



Source: 2018 California Gas Report, page 13

Out of State Gas Supply

- Historical annual average[1]
  - 2014 through 2018
    - Northern California 2,295 MMcfd
    - Southern California 2,391 MMcfd
    - Total 4,686 MMcfd
- Average 2018 interstate capacity contracted by CPUC-regulated utilities[2]
  - Approximately 1,836 MMcfd

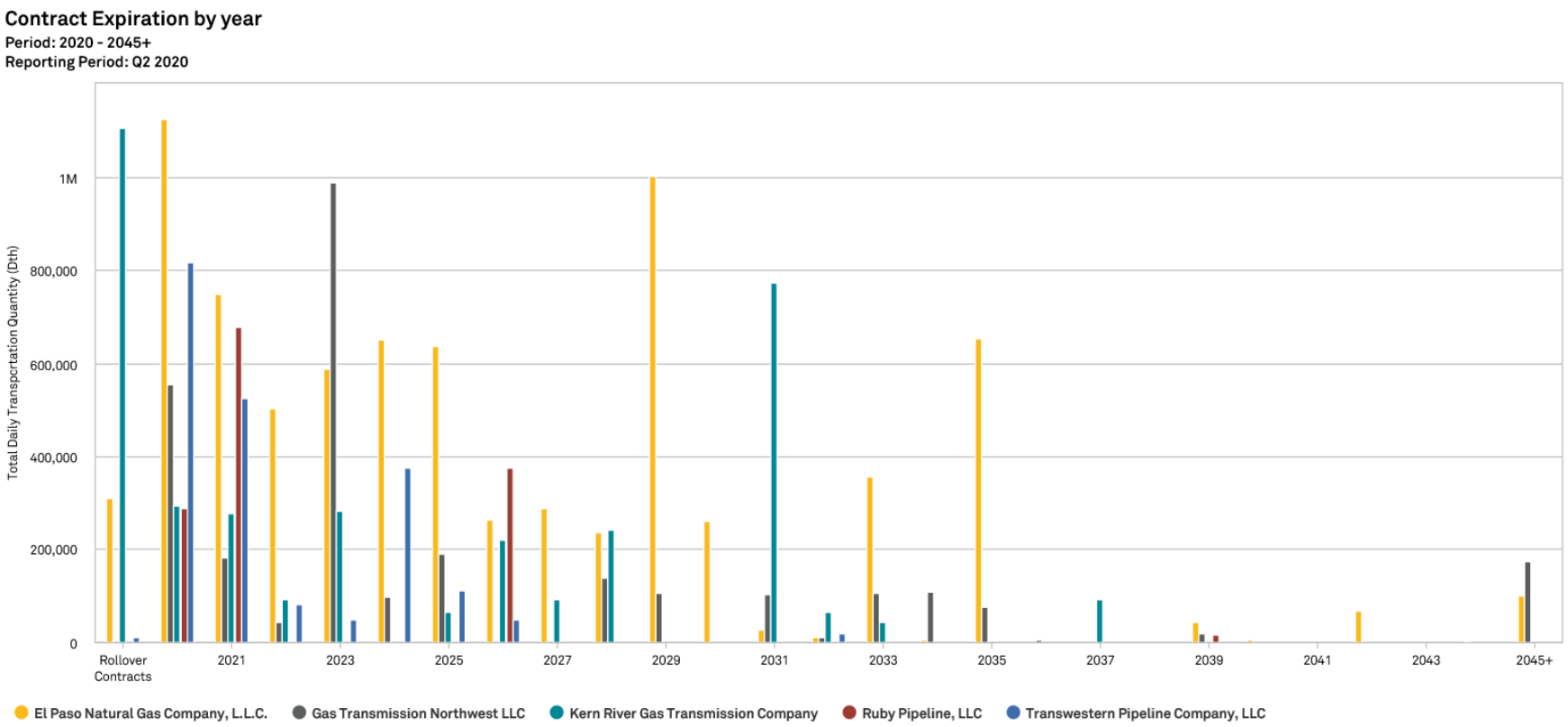
1. Derived from data found in 2019 California Gas Report Supplement, page 22, line 13 and page 25, line 12.
2. Source: S&P Global Market Intelligence, Shipper Contract Summary, 1st, 2nd, 3rd, and 4th quarters 2018, El Paso Pipeline, Ruby Pipeline, Transwestern Pipeline, Kern River Pipeline, and Gas Transmission Northwest Pipeline. Data retrieved for Southern California Gas Company, Pacific Gas and Electric Company, San Diego Gas and Electric Company, and Southwest Gas Corporation. Retrieved from: https://platform.marketintelligence.spglobal.com/web/client?auth=inherit&ignoreIDMContext=1#industry/shippercontractsummary.

Historical Average Usage 2014-2018
(Commercial, Industrial, & NGV)

	PG&E[1]	SoCalGas[2]	SDG&E[3]
Core	222 MMcfd	304 MMcfd	51 MMcfd
Noncore	545 MMcfd	437 MMcfd	11 MMcfd

In aggregate, approximately 63% of average demand was noncore

1. Derived from data found in 2019 California Gas Report Supplement, page 22, lines 20, 21, 24, and 26.
2. Derived from data found in 2019 California Gas Report Supplement, page 26, lines 17-19, and 21-22.
3. Derived from data found in 2019 California Gas Report Supplement, page 30, lines 2,3, 5, and 6.



Source: S&P Market Intelligence, Contract Expiration, Retrieved from:https://platform.marketintelligence.spglobal.com/web/client?auth=inherit#industry/contractExpiration

Interstate Pipeline Dilemmas

- Market becomes weak
  - Face cost recovery risks
    - Demand high negotiated reservation rates
    - Establish high tariff reservation rates through rate cases
    - May not invest to replace aging systems
    - May decommission capacity
  - Aggressively look for other opportunities upstream of California
    - El Paso Pipeline – Approximately 1.4 Bcfd to Mexico[1]

1. Source: S&P Global Market Intelligence, Shipper Contract Summary, Second Quarter 2020, El Paso Pipeline. Retrieved from: https://platform.marketintelligence.spglobal.com/web/client?auth=inherit&ignoreIDMContext=1#industry/shippercontractsummary. Excludes capacity held by marketers that can sell gas supply to end-users in Mexico.

California Market Dilemmas

- Interstate transportation services could become less reliable
  - Reliability will correlate with timing of any significant reduction in demand of natural gas
- CPUC-regulated utilities do not procure interstate pipeline services for significant portion of the market
  - Could cause severe interstate service volatility
    - No Commission oversight to mitigate volatility
    - Could lead to less reliable interstate transportation services to CPUC-regulated utilities sooner than later

Potential Solutions to Maintain Reliable Interstate Pipeline Services

- Require CPUC-regulated utilities to enter into long-term firm interstate capacity contracts
  - Possibly 10-year blocks at gradual decline levels
    - Promotes some level of revenue certainty for interstate pipelines
- If CPUC-regulated utilities require California border and on-system city gate supplies
  - Long-term contracts similar to primary terms of interstate pipeline contracts
    - Promotes long-term contracting between suppliers and interstate pipelines
- CPUC hold workshops with interstate pipelines
  - Address potential service reliability issues that may be caused by contracting behavior of customers for whom CPUC-regulated utilities do not contract interstate services

R. 20-01-007: Gas Demand Fluctuations and Interstate Capacity Contracts

Presentation to Workshop in Track 1B

Tom Beach
Crossborder Energy on behalf of Calpine

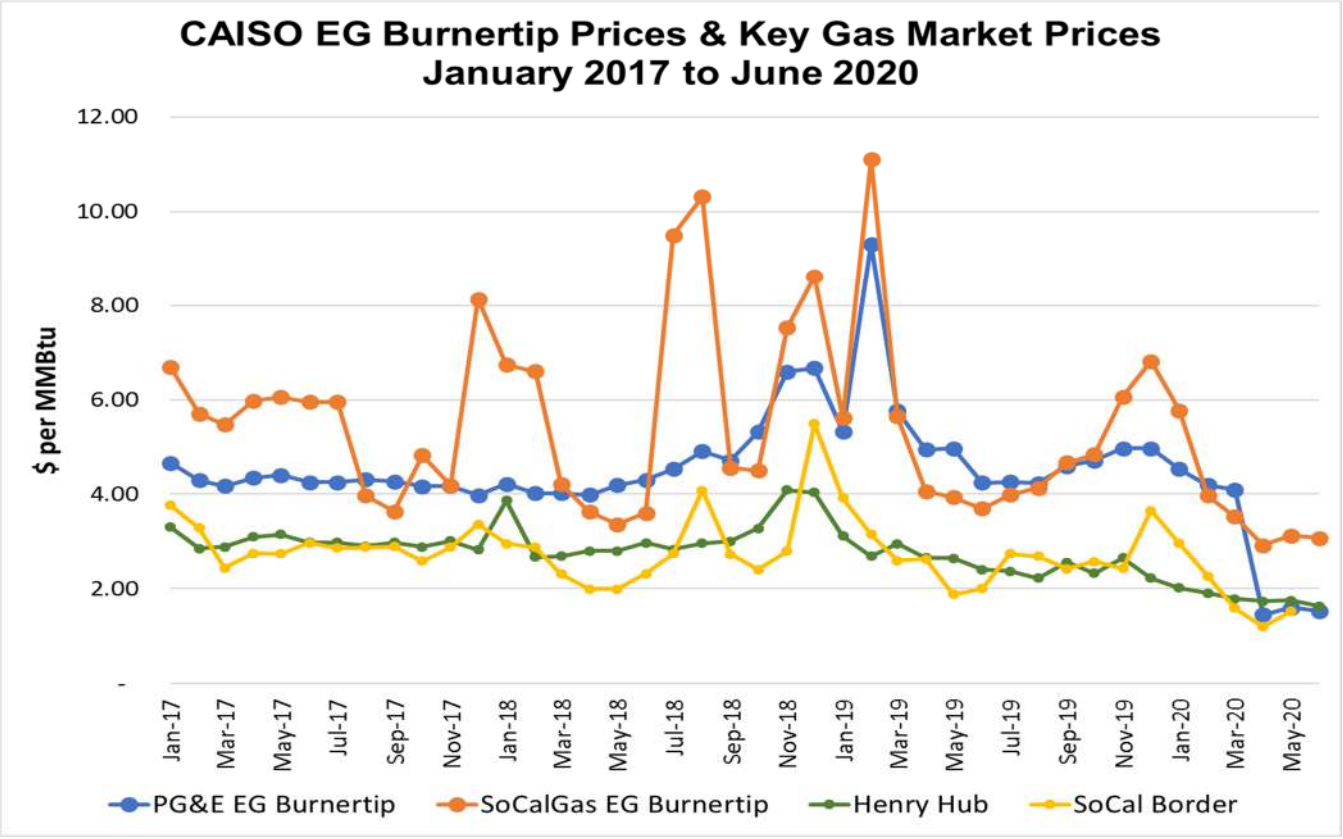
July 21, 2020

California's Competitive Gas Market

- 10 Bcfd of interstate pipeline capacity to a declining 5 Bcfd market
- Major access to WCSB, Rockies, San Juan, and Permian basins
- Liquid markets with prices at or near the Henry Hub benchmark
  - PG&E and SoCalGas city-gates
  - California border points: Malin and Topock
- Gas storage available in northern California
- FERC SFV pipeline rate design / PG&E MFV backbone rate design
  - Reservation charges become a fixed cost and limit flexibility.
  - Holding pipeline capacity requires high load factors.
  - EGs will hold pipeline and storage capacity depending on market conditions.

Impact of recent pipeline outages in southern California

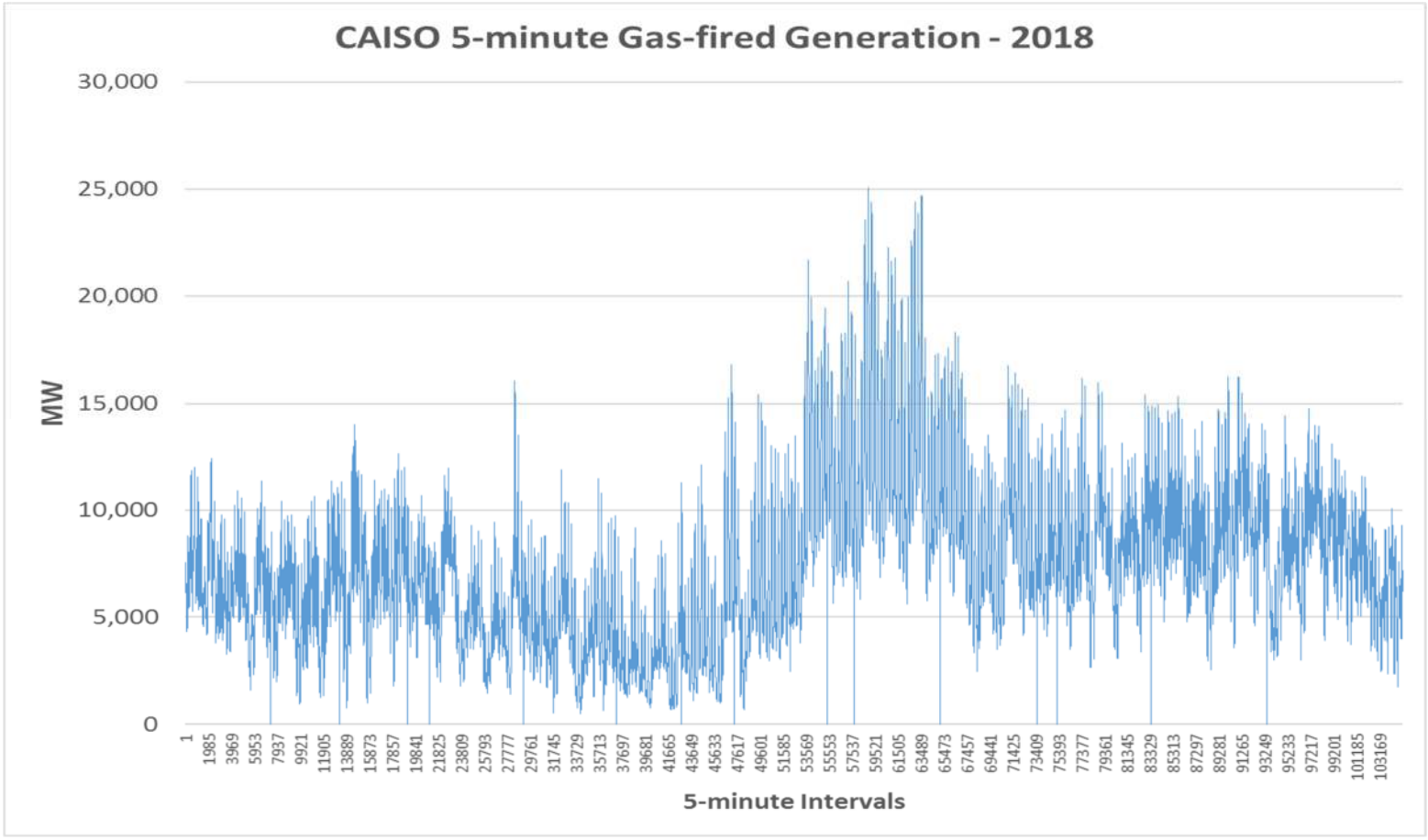
- Problem was the availability of intrastate pipeline (7 Bcfd) and storage infrastructure.
- No shortage of supply or interstate pipeline capacity



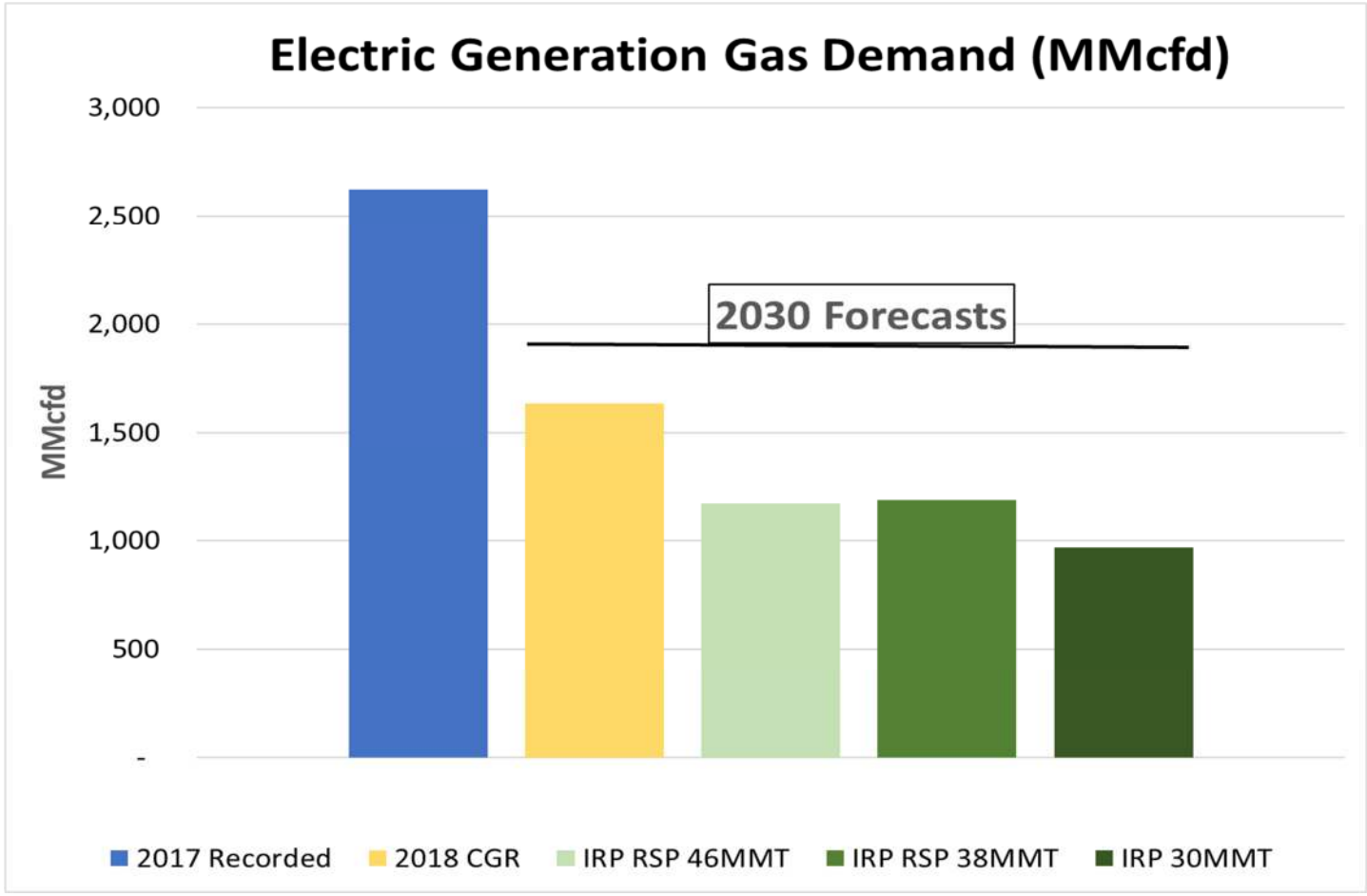
Variations in EG Gas Demand

- Marginal generation in the competitive hourly CAISO market
- EG gas demand varies on multiple time scales.
  - Daily and hourly – see the CAISO duck curve
  - Seasonal – EG demand is an off-peak load on the gas system.
  - Annual – hydro conditions are the most important variable.
  - Multi-year – as electric resource mix changes
- Gas system can handle hourly EG load changes….
  - … if existing infrastructure is available.
  - Winter core peak days are more challenging than summer peak EG loads.
  - Recent decisions have expanded gas balancing and reserve services.

EG Gas Demand Peaks in the Summer



Per SB 100, EG throughput will fall substantially over time



Should EGs Be Required to Hold Interstate Capacity? No – here's why:

- Large surplus of interstate capacity to CA's declining gas market.
- Recent issues involve the availability of intrastate infrastructure.
- Holding capacity can raise EG costs and limit flexibility.
  - Pipeline capacity costs increase fixed costs for EGs.
  - We need a competitive and flexible gas market to support a competitive and flexible electric market.
  - Allow gas market participants to bear the risks of holding capacity.
- MOO in RA contracts incentivizes EGs to have a reliable gas supply.
- What if certain EG plants are deemed "core" or "essential"?
  - Long-term electric contracts would be needed to support long-term gas pipeline contracts.


Questions or comments?
Submit questions in the chat or raise your hand


BREAK
TIME !!
10 minutes, return at 10:50

California ISO

Reliability in All Timescales: Getting Gas to Electric Generators

Delphine Hou
Director, California Regulatory Affairs

Presented at California Public Utilities Commission R.20-01-007 Track 1B Workshop: Market Structure and Regulations

July 21, 2020

Scoping memo issues

- Issue 1b: What measures, if any, can be taken to ensure that gas needs of electric generators are met during hourly and intraday fluctuations?
- Issue 1c: What measures, if any, can be taken to ensure that gas needs of electric generators are met during multiple days of low renewable generation?

  – *Today, the CAISO coordinates with gas utilities to inform them of the projected electric generation gas burn*

1b. What measures, if any, can be taken to ensure that gas needs of electric generators are met during hourly and intraday fluctuations?

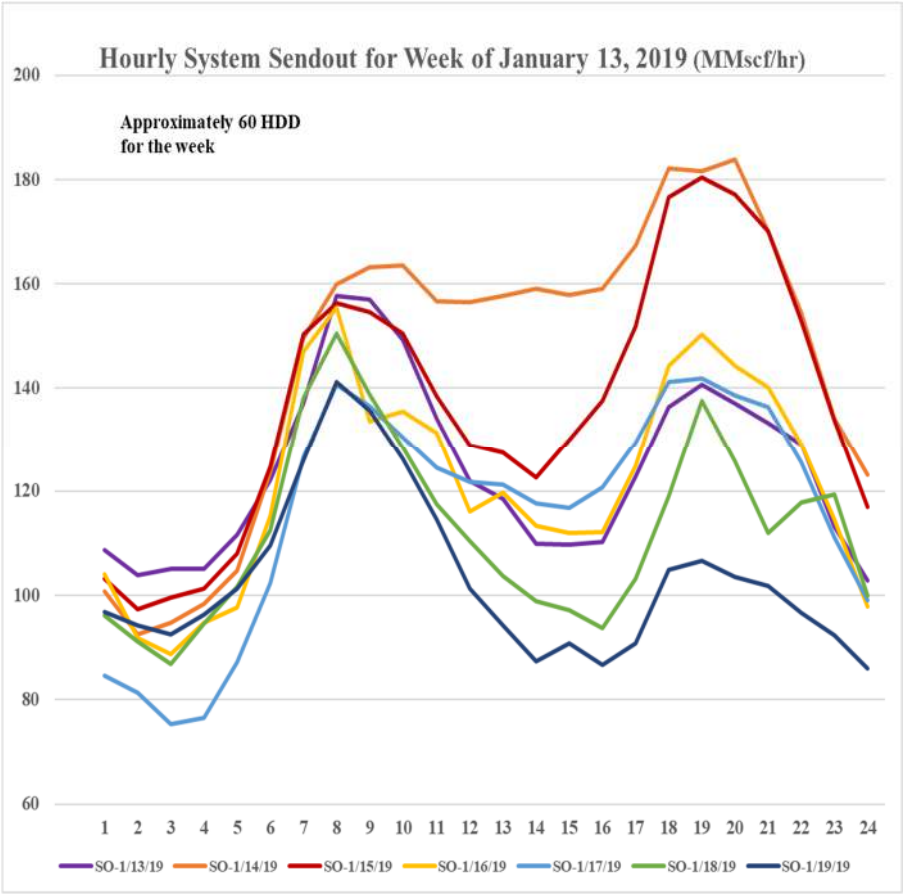
1c. What measures, if any, can be taken to ensure that gas needs of electric generators are met during multiple days of low renewable generation?

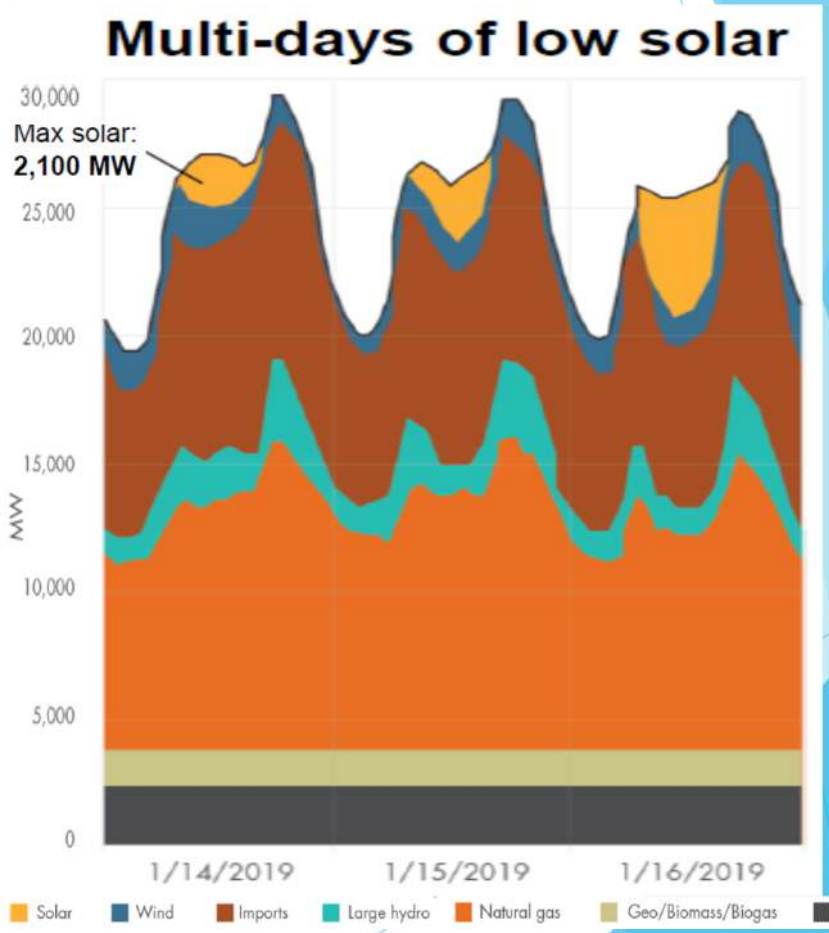
Norman Pedersen, Hanna and Morton, LLP, and
Catherine E. Yap, Barkovich & Yap, Inc.
on behalf of Southern California Generation Coalition
July 21, 2020

There can be large fluctuations in gas loads from hour to hour during the day.

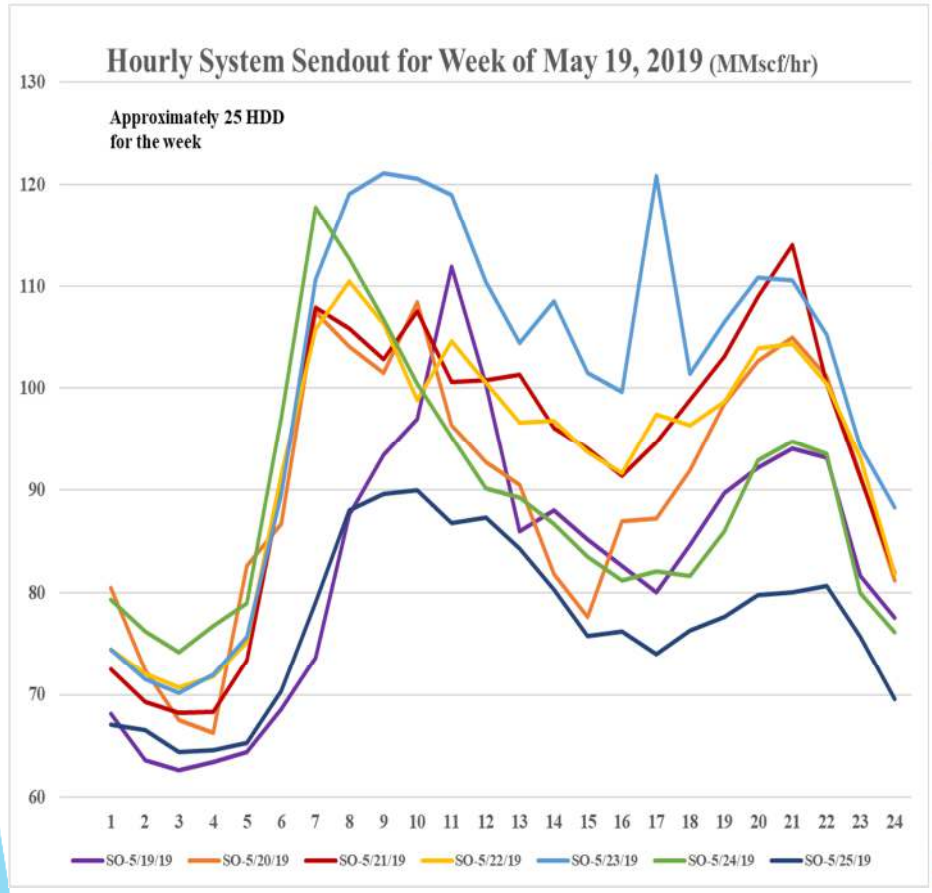
- The morning peak can be particularly pronounced during the winter heating period.
- The evening peak can be driven by evening heating requirements and electric generator loads in the winter and electric generator loads during the summer.
- Solar availability or lack of availability can also contribute to the fluctuations.

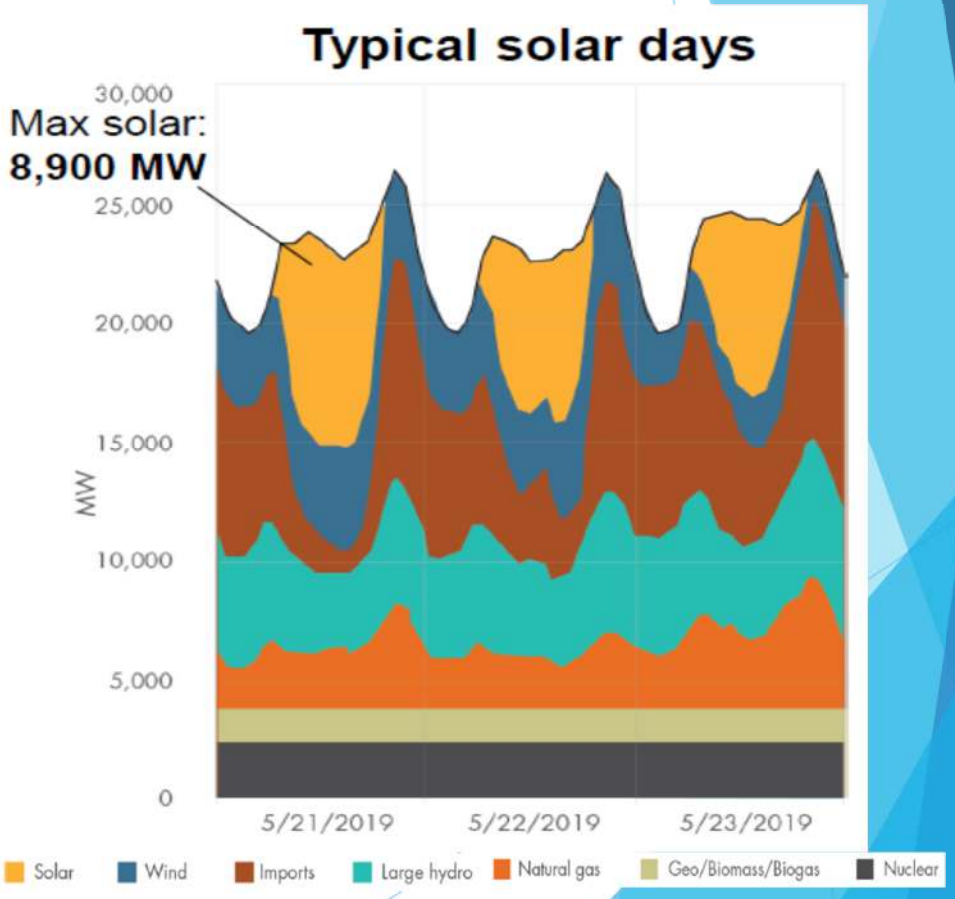
EG Loads in January Vary by Day and by Hour





EG Loads in May Vary by Day and by Hour





Gas utilities can serve electric generator demand through flowing supply, line pack, and gas in storage.

Flowing supply

- **The interstate pipelines have large amounts of capacity for ratable delivery of gas to SoCalGas receipt points.**

SOUTHERN ZONE	
Ehrenberg (El Paso)	2,985,000 Dthd
Otay Mesa (TGN)	940,000 MMcfd
NORTHERN ZONE	
Topock (El Paso)	976,040 Dthd
Topock (TW)	300,000 Dthd
North Needles (TW)	850,000 Dthd
Kramer Junction (Kern/Mojave)	729,920 Dthd
WHEELER RIDGE ZONE	
Wheeler Ridge (Kern/Mojave)	1,056,000 Dthd
Kern River Station (PG&E)	630,000 MMcfd

Interstate pipeline capacity to California is ample and is held under contract for firm deliveries to SoCalGas.

- Generators hold capacity on interstate pipelines.
  - Interstate pipeline shipper lists show numerous generators. Example: LADWP holds 152 Mdth/d of capacity on Kern River.
- Suppliers who sell gas at the border or the SoCalGas Citygate typically also hold firm interstate pipeline capacity.

SoCalGas firm Backbone Transmission Capacity offered in current open season for capacity for three years (October 1, 2020 – September 30, 2023) is limited:

Open Season 2020 Capacity Offering		
	2017	2020
Southern Zone	1,210 MMcfd	750 MMcfd
Northern Zone	1,590 MMcfd	990 Mmcfd
Wheeler Ridge Zone	765 MMcfd	765 MMcfd
CP Line 85 Zone	160 MMcfd	60 MMcfd
CP Coastal Zone	150 MMcfd	150 MMcfd
Total	**3,875 MMcfd**	**2,715 MMcfd**

Line pack is a relatively small resource on the SoCalGas system

- SoCalGas line pack: approximately 200 MMcfd.
  - Available intraday to respond to customer usage.
  - Limited availability at low pressure sinks on SoCalGas system
  - Large loads (*e.g.*, electric generation & refineries) are located in the South Bay region.
  - The South Bay region is hydraulically a low-pressure point on the SoCalGas system

Need to improve the ability of capacity holders to use their capacity flexibly

- Intraday nominations during a flow day are a tool to manage intraday swings in demand.
- The nomination protocol permits customers to make Intraday nominations at 8:00 am, 12:30 pm, and 5:00 pm on the flow day.
- However, the gas markets for the Intraday nomination cycle are thin on high demand days.
- California gas buyers find that gas sellers are reluctant to sell in the Intraday cycles because receipt point capacities may be cut ("windowed") by SoCalGas to prevent potential over-pressurization of the backbone transmission system.

Proposal: if SoCalGas cuts receipt point capacities during Intraday nomination cycles, shareholders should credit the associated amount of reservation charges to the nominating customer's account.

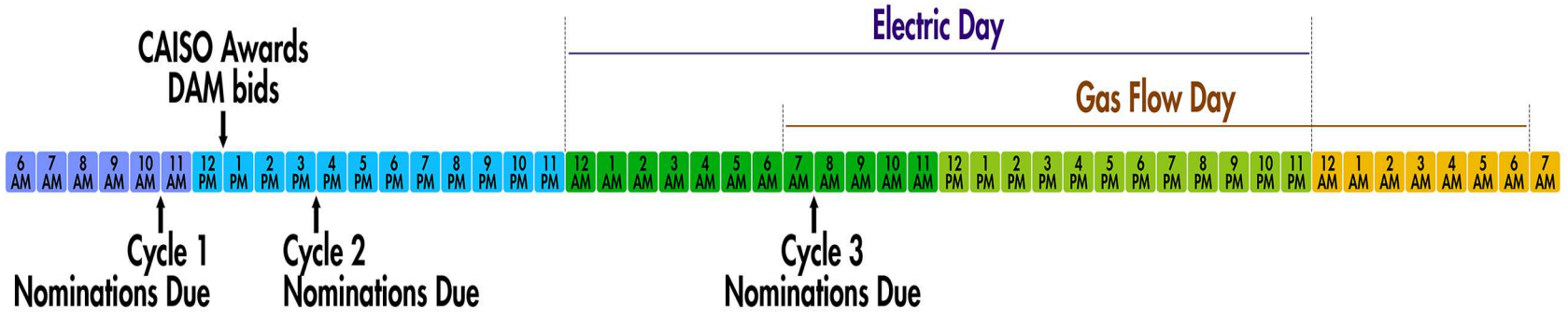
- This may reduce SoCalGas threat of "windowing" and enhance participation in Intraday Cycle markets.
- SoCalGas should use the high Operational Flow Order tool to address over-pressurization issues, not cuts in nominations for firm BTS transportation service.

Market reform proposal to enhance flexibility of SoCalGas downstream backbone capacity: Liquid daily published index for each day of the week

- Currently, day-ahead (Timely Cycle and Evening Cycle) nominations are made on Friday for three days, Saturday, Sunday, and Monday.
- Published index prices are available for the three days for the same volume each day.
- For EGs, daily loads for the three days (Saturday, Sunday, Monday) can vary significantly.
- Enabling EGs to buy gas at a liquid daily published index for each day of the week would help electric generators manage their flowing supply.

Electric generator need for gas supplies in the intraday cycles is also driven by the mismatch in the electric market schedules and gas market schedules.

Day Ahead Market awards occur after the close of Cycle 1 furthering the mismatch between the electric day and the gas flow day.



Infra-marginal generators generally have to rely on gas purchases outside of Cycle 1.

- Generators low on the dispatch order will generally be dispatched so they may purchase gas in Cycle 1 prior to when they receive their Day Ahead award to generate during the next electric day.
- Generators higher on the dispatch order will likely wait to find out whether they have been directed to generate during the next electric day.
  - They will miss purchasing gas in Cycle 1 and be forced to purchase in Cycle 2 or during the gas flow day Intraday cycles.

Another tool to meet intraday fluctuations in gas demand is storage

- System Operator uses storage to balance the system
- SoCalGas' Noncore Storage Services have been suspended
- Gas Acquisition is only major market participant with access to storage
  - Gas Acquisition sells gas in the citygate market, which is allowed under the GCIM mechanism
  - Gas Acquisition provides hub services, which are allowed under the GCIM mechanism

Thank you for your attention

ELECTRIC GENERATOR WORKSHOP COMMENTS

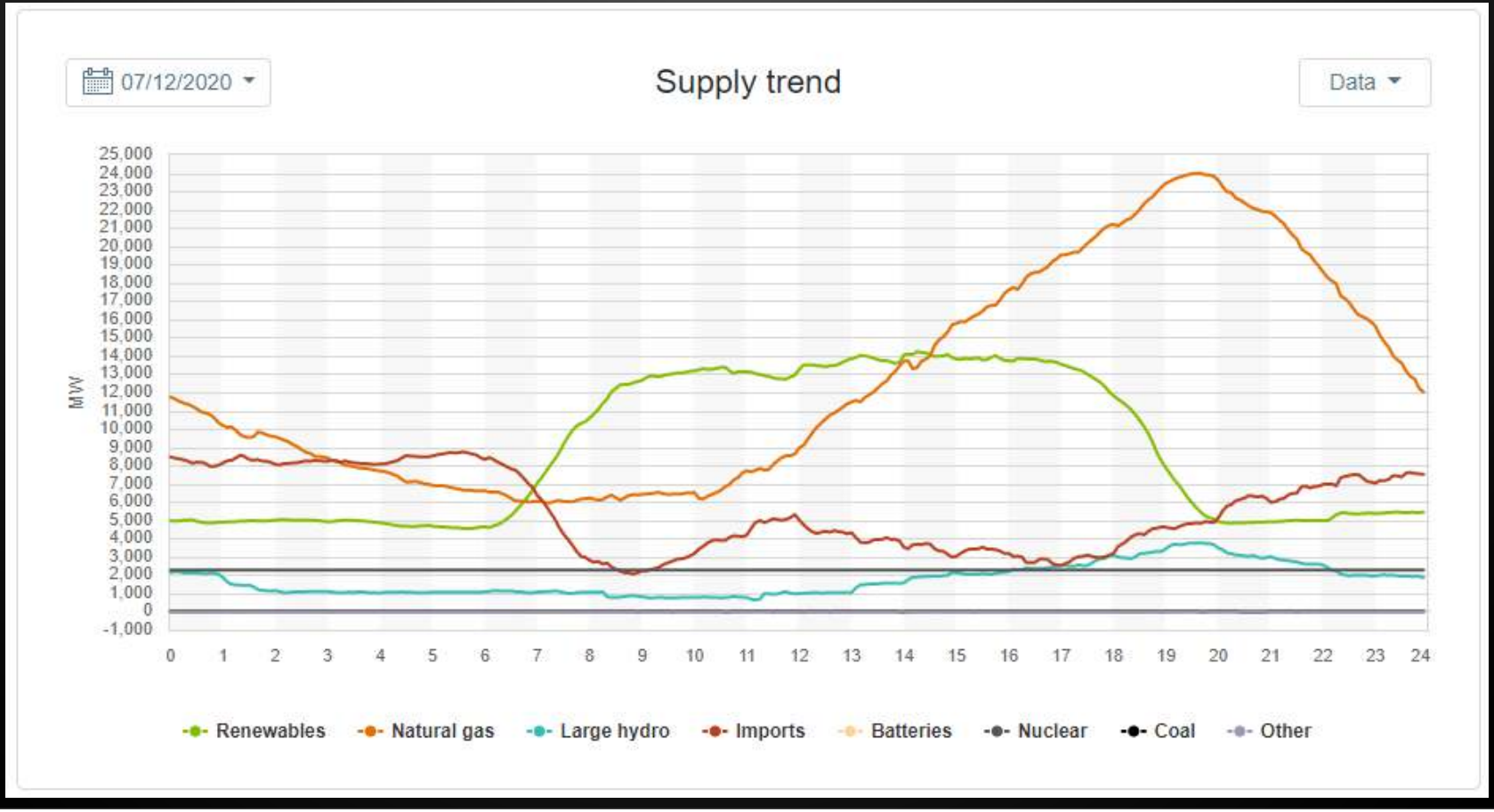
R.20-01-007 TRACK 1B WORKSHOP: MARKET STRUCTURES AND REGULATIONS

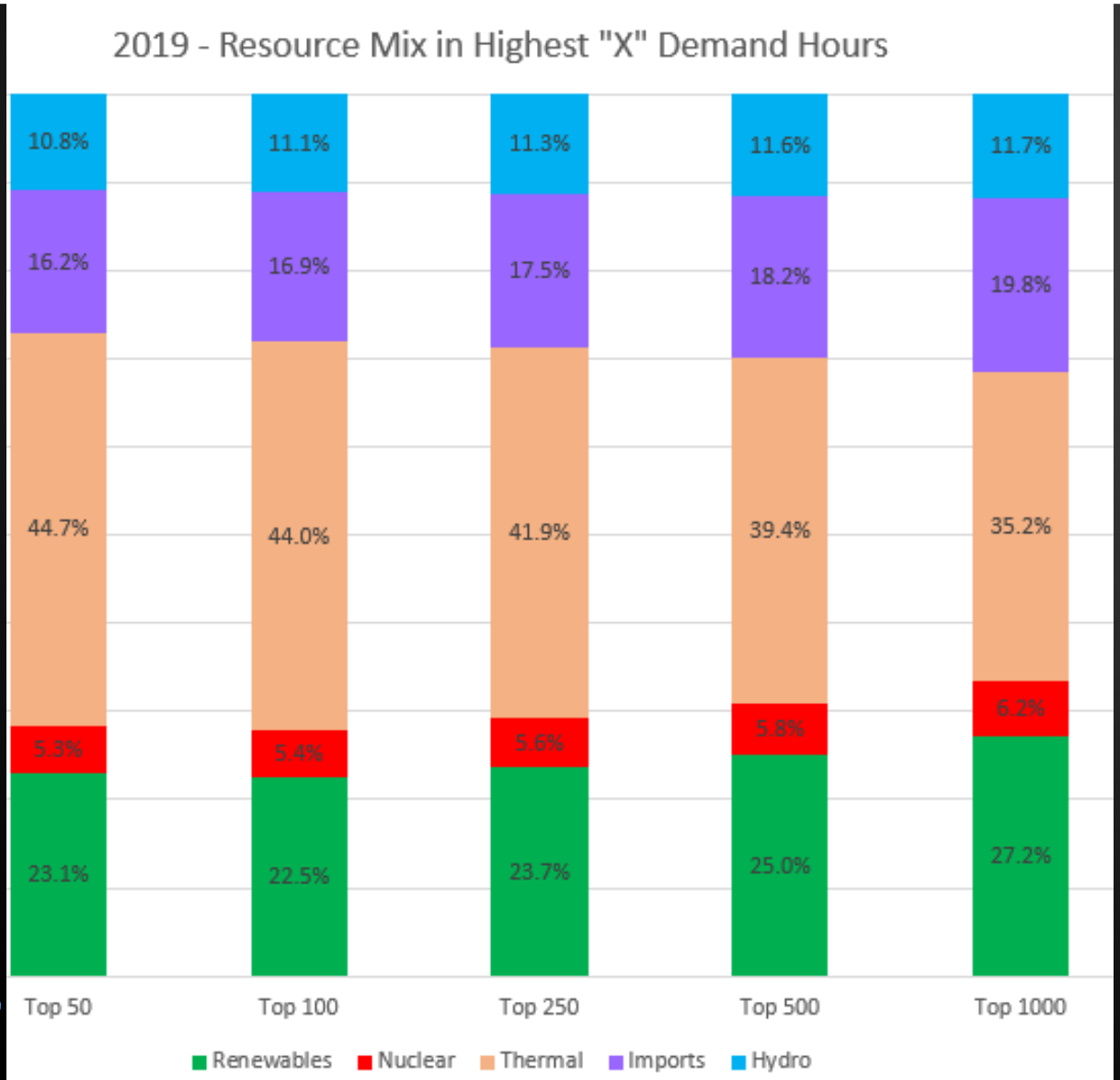
JULY 21, 2020

JAN SMUTNY-JONES

INDEPENDENT ENERGY PRODUCERS (IEP)

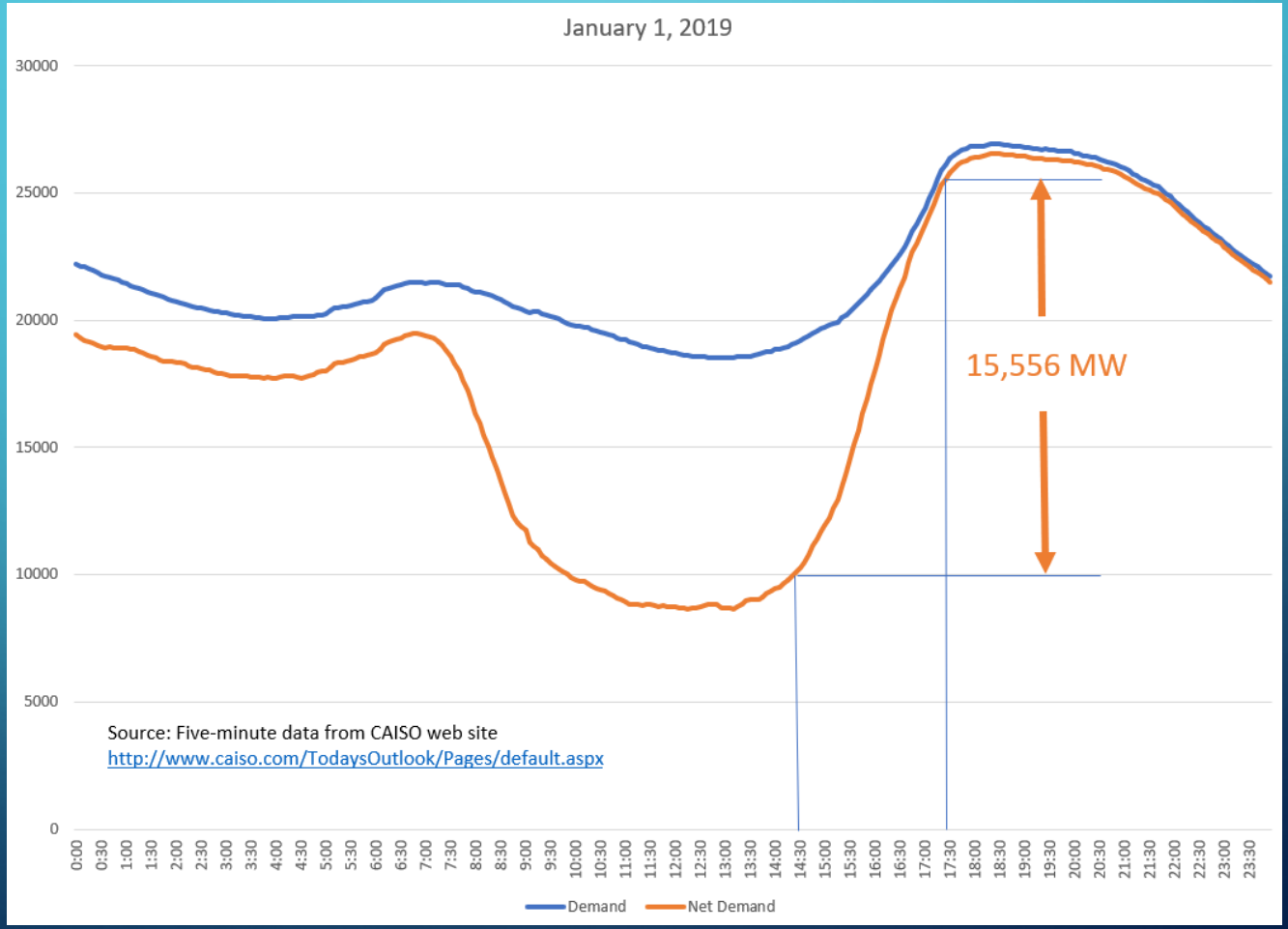
CAISO Supply Trend 7/12/2020:
40,000 MW Demand, 24,000 MW Thermal Generation at Peak

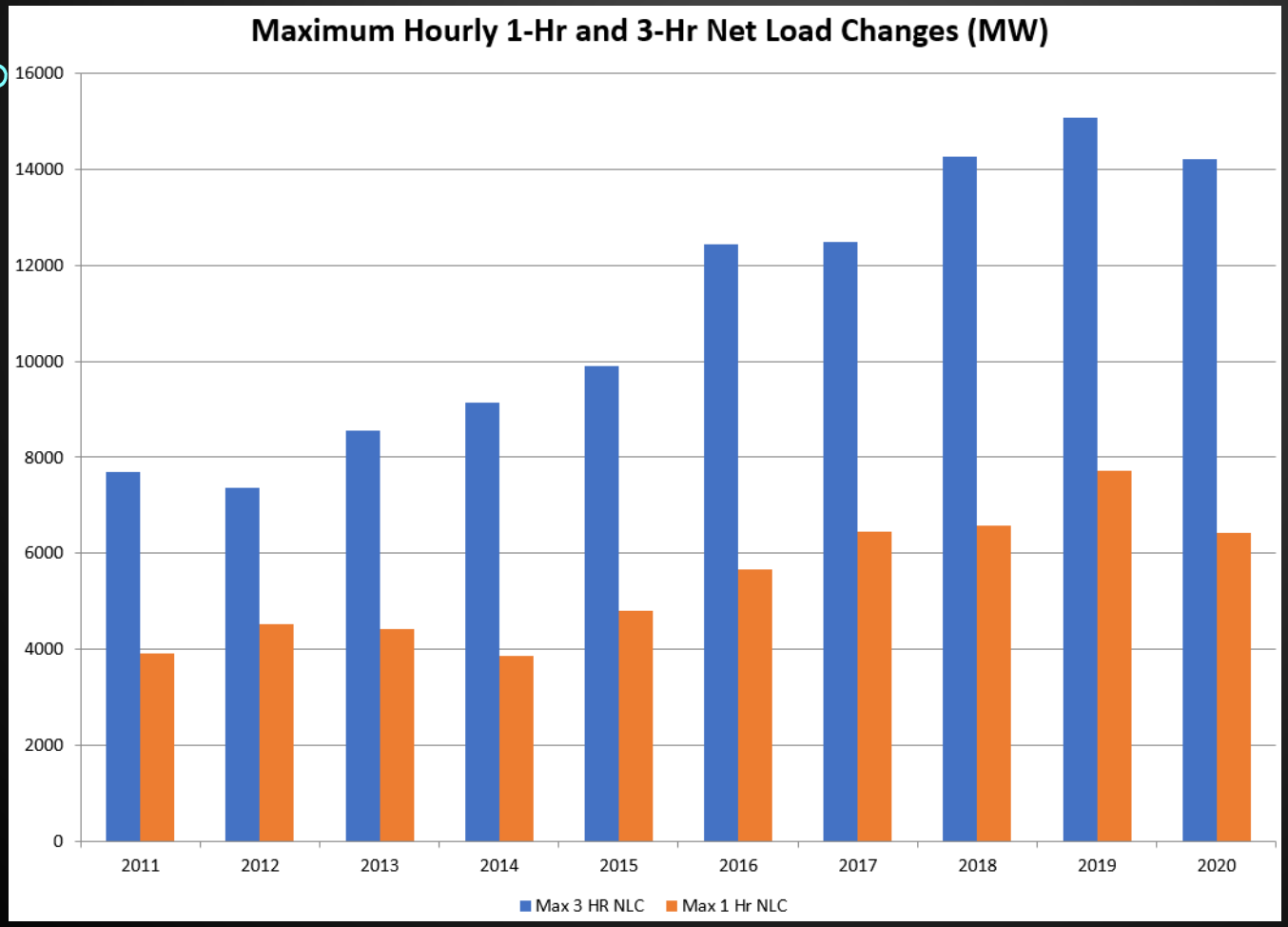




GAS GENERATION PROVIDES BULK OF RELIABILITY NEEDS IN THE HIGHEST DEMAND HOURS

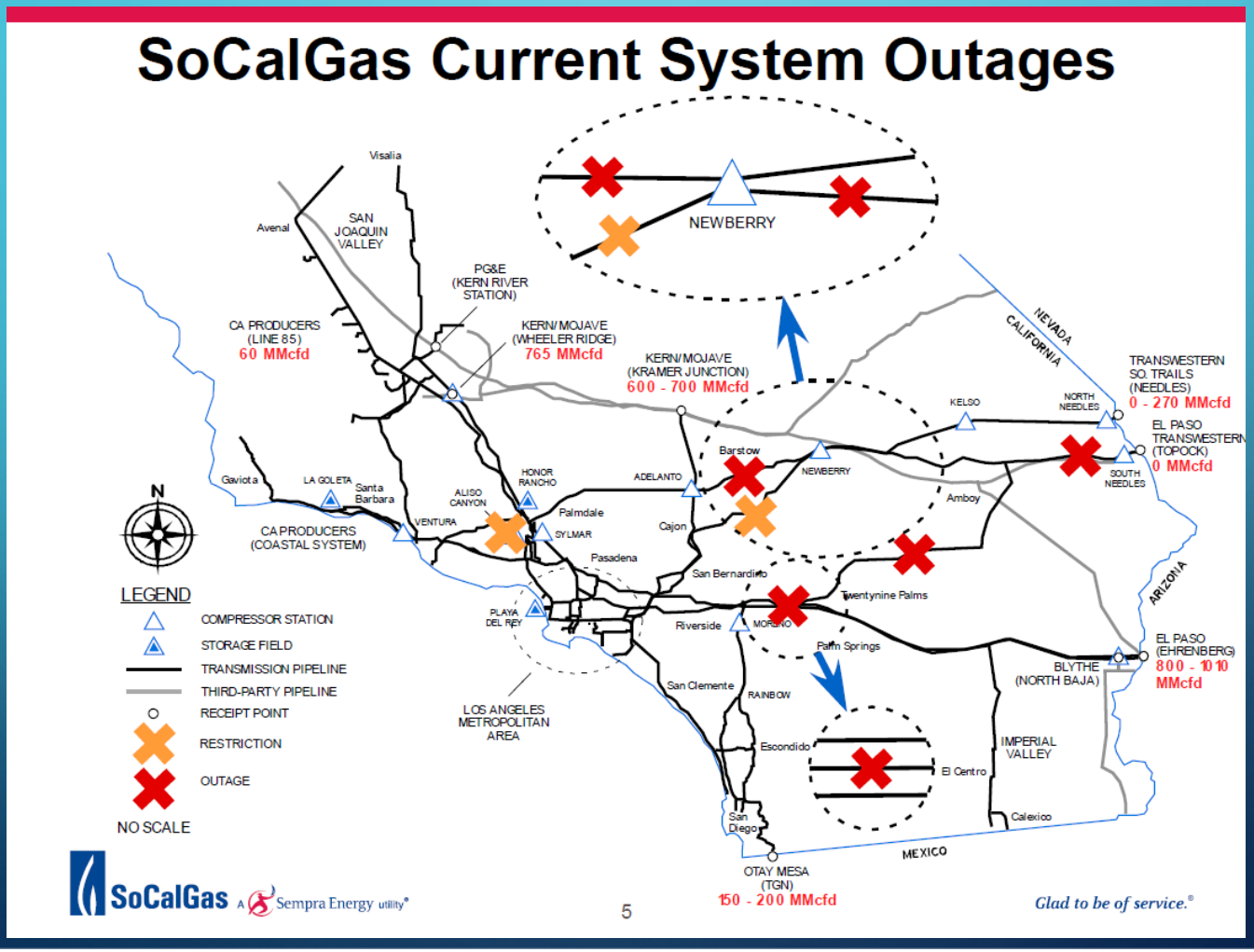
NATURAL GAS GENERATION NEEDED TO HELP MEET LARGE WINTER AND SPRING NET LOAD RAMPS





RAMPING NEEDS HAVE BEEN STEADILY INCREASING

FAILURE OF PIPELINE INFRASTRUCTURE: SOURCE OF PRICE VOLATILITY



Source: CEC-18IEPR-035182018 "Summer 2018 Outlook Summary"

Role of UGS in Meeting Intraday and Interday Needs of Gas-Fired Electric Generation

Jane C.S. Long, Ph.D.

Independent Consultant and CCST Distinguished Expert

Information drawn from 2018 CCST report requested by Governor Brown:

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Long-Term Viability of Underground Natural Gas Storage in California

An Independent Review of Scientific and Technical Information

Study Request

In response to Governor Brown's January 2016 state of emergency proclamation regarding the Aliso Canyon gas leak, Governor Brown directed the following agencies to submit a report that assesses the long-term viability of natural gas storage facilities in California:

- Division of Oil, Gas and Geothermal Resources (DOGGR)
- California Public Utilities Commission (CPUC)
- California Air Resources Board (CARB)
- California Energy Commission (CEC)

Via Senate Bill 826, the Budget Act of 2016, the California Council on Science and Technology was asked to enter into a contract with the CPUC to conduct this study.

California Council on Science and Technology (CCST)

- CCST is a nonpartisan, impartial, not-for-profit corporation established via Assembly Concurrent Resolution (ACR 162) in 1988 to provide objective advice from California's scientists and research institutions on policy issues involving science.

- CCST is dedicated to providing impartial expertise that extends beyond the resources or perspective of any single institution.

- CCST is governed by a Board of Directors and studies are funded by government agencies, foundations, and other private sponsors.

Partner Institutions

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- California Community Colleges
- CalTech
- California State Universities
- Stanford University
- University of California
- Sandia National Labs
- Lawrence Livermore National Lab
- National Accelerator Laboratory
- Lawrence Berkeley Laboratory
- Jet Propulsion Laboratory
- NASA Ames Research Center

Study Purpose and Key Questions

Conduct an independent scientific assessment of the past, present, and potential future uses of underground natural gas storage in California

- **Key Question 1:** What risks do California's underground gas storage facilities pose to health, safety, environment and infrastructure?

- **Key Question 2:** Does California need underground gas storage to provide for energy reliability in the near term (through 2020)?

- **Key Question 3:** How will implementation of California's climate policies change the need for underground gas storage in the future?

The Basis of our Assessment

- Peer-reviewed published literature.
- Analysis of available data from DOGGR, CPUC, CARB and other publicly available sources.
- Other relevant publications including reports and theses. We state the qualifications of the information used in the report.
- The expertise of the committee and scientific community to identify issues.

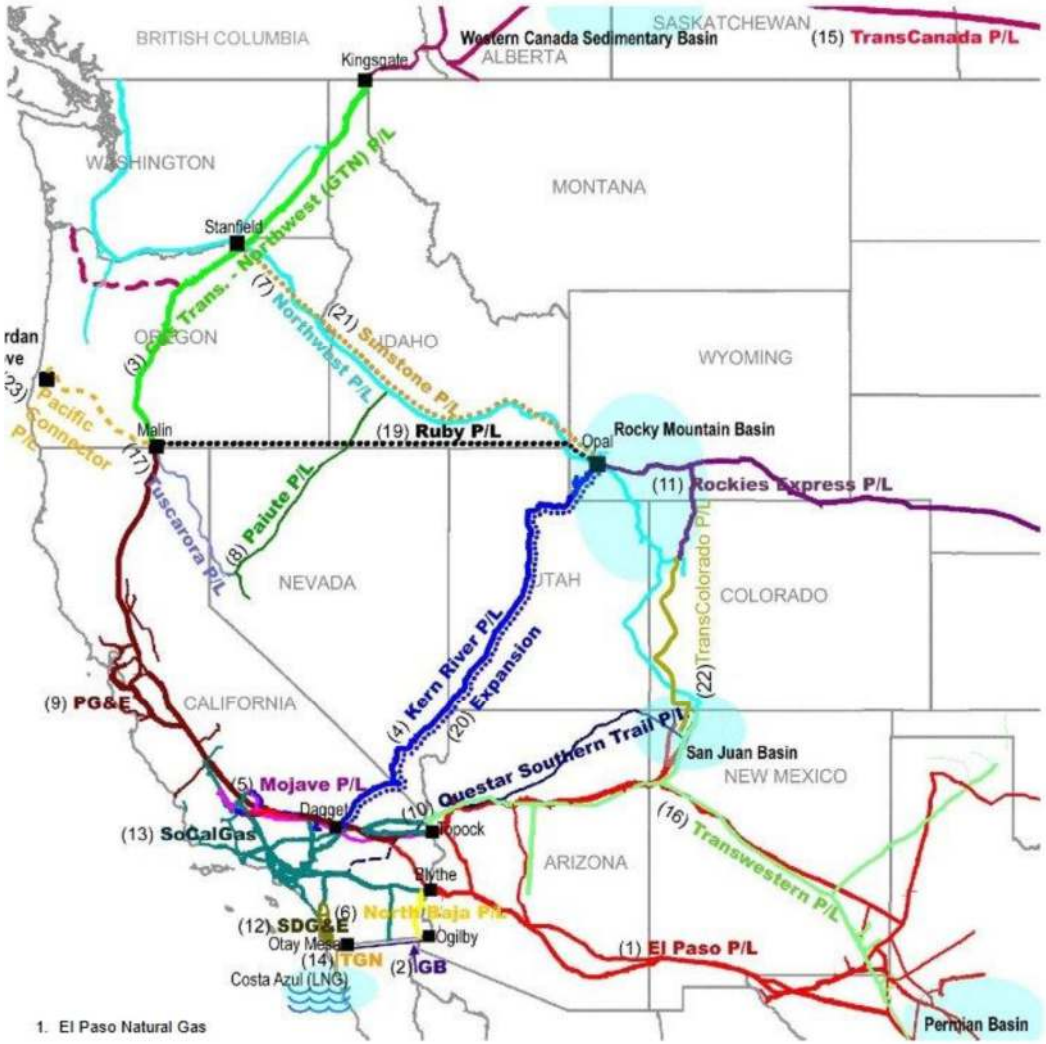
Second Major Conclusion and Recommendation

- **Conclusion ES-2:** California's energy system currently needs natural gas and underground storage to run reliably. Replacing underground gas storage in the next few decades would require very large investments to store or supply natural gas another way, and such new natural gas-related infrastructure would bring its own risks. The financial investment would implicitly obligate the state to the use of natural gas for several decades.

- **Recommendation ES-2:** In making decisions about the future of underground natural gas storage, the state should evaluate tradeoffs between the quantified risks of each facility, the cost of mitigating these risks, and the benefits derived from each gas storage facility—as well as the risks, costs, and benefits associated with alternatives to gas storage at that facility.

Key Question 2

Does California need underground gas storage to provide for energy reliability in the near term (through 2020)?



Western Gas Pipelines *Source: California Energy Commission*

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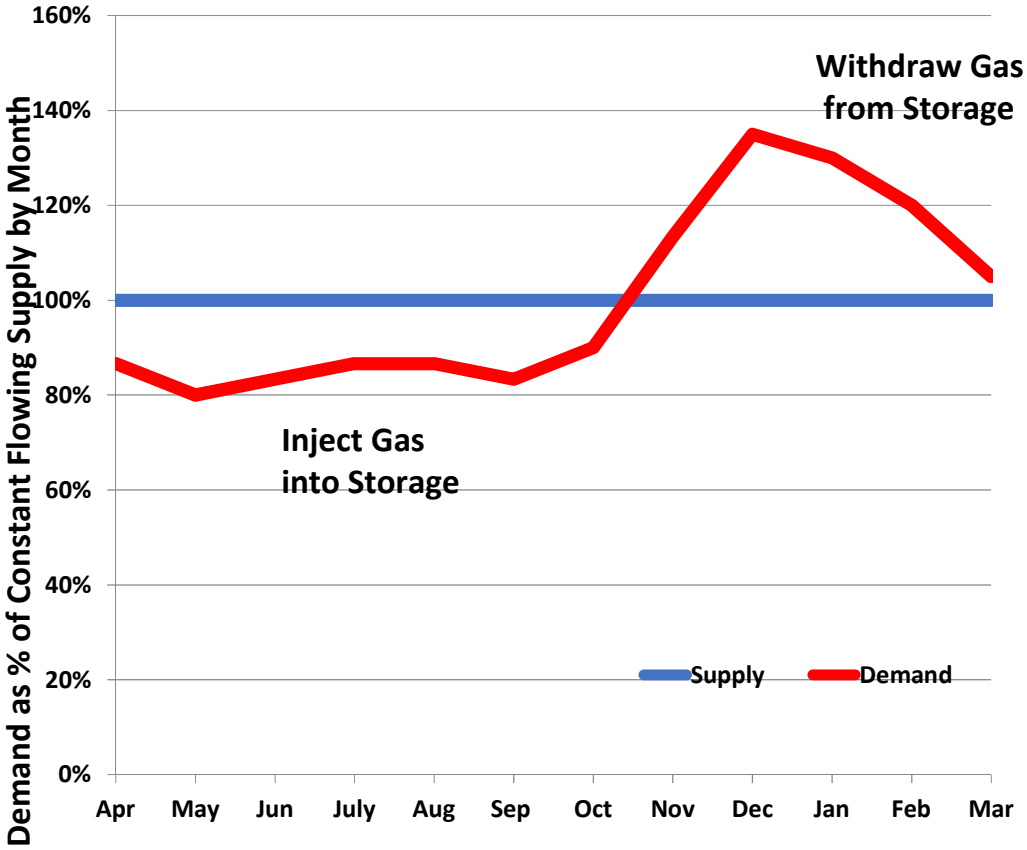
California gas import capacity

Import takeaway capacity:
PG&E: 2.9 bcfd
SoCalGas: 3.4 bcfd

CA production : 1.2 bcfd

TOTAL IMPORT CAPACITY:
7.5 bcfd

Gas storage functions

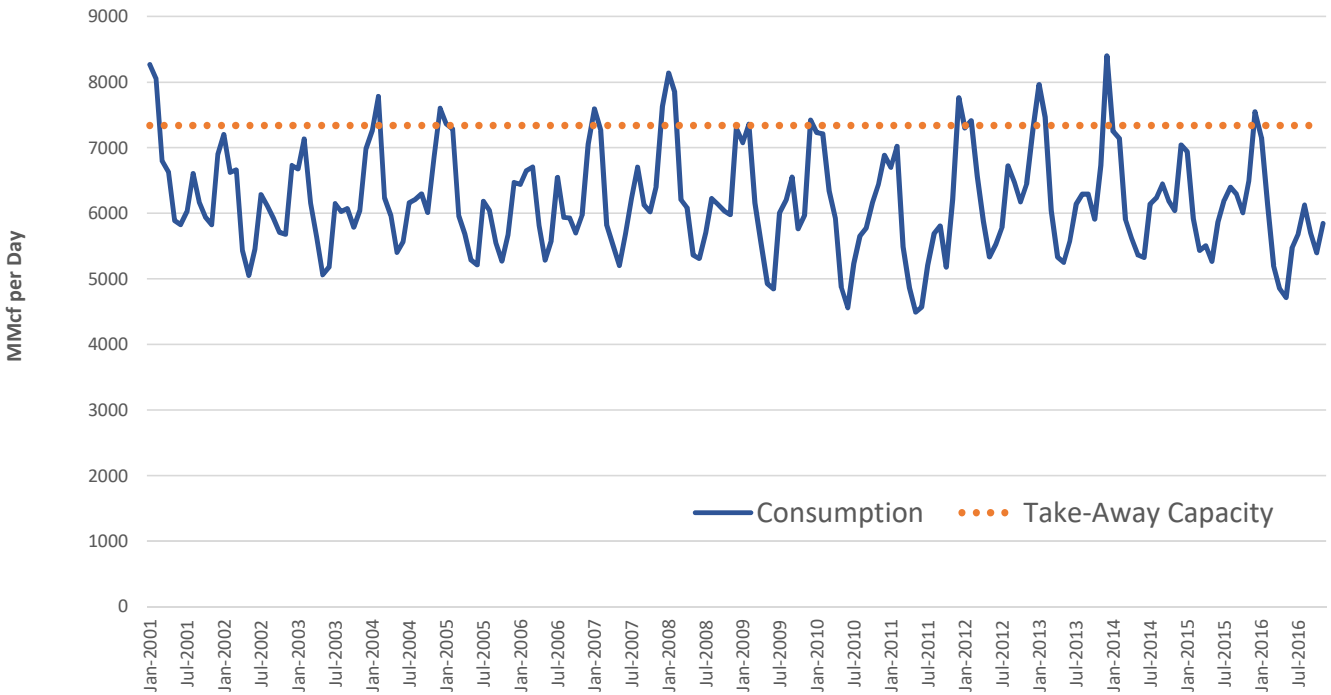


Source: Aspen Environmental Group

1. **Monthly Winter Demand**
   Provides supply when monthly winter needs exceed the available pipeline supply capacity.

2. **Flat Production**
   Provides supply when demand exceed supply production rate.

Gas storage functions



3. Winter Peak Day Demand

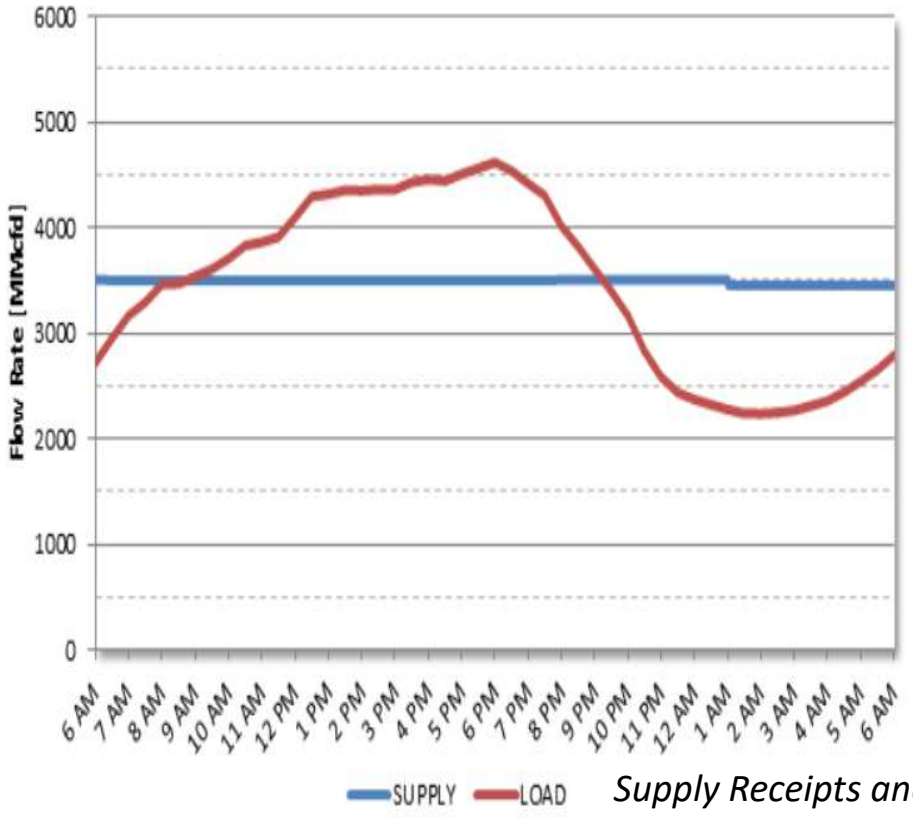
Winter peak demand is 11.8 Bcfd

Import capacity is 7.5 Bcfd

Shortfall is 4.3 Bcfd

Without storage, California would be unable to consistently meet winter demand for gas.

Gas storage functions



Supply Receipts and Total Load by Hour for SoCalGas September 9, 2015

Source: Aliso Canyon 2016 Summer Technical Assessment

4. Intraday Balancing

- Supports hourly changes in demand.
- Allows back up of renewable generation.

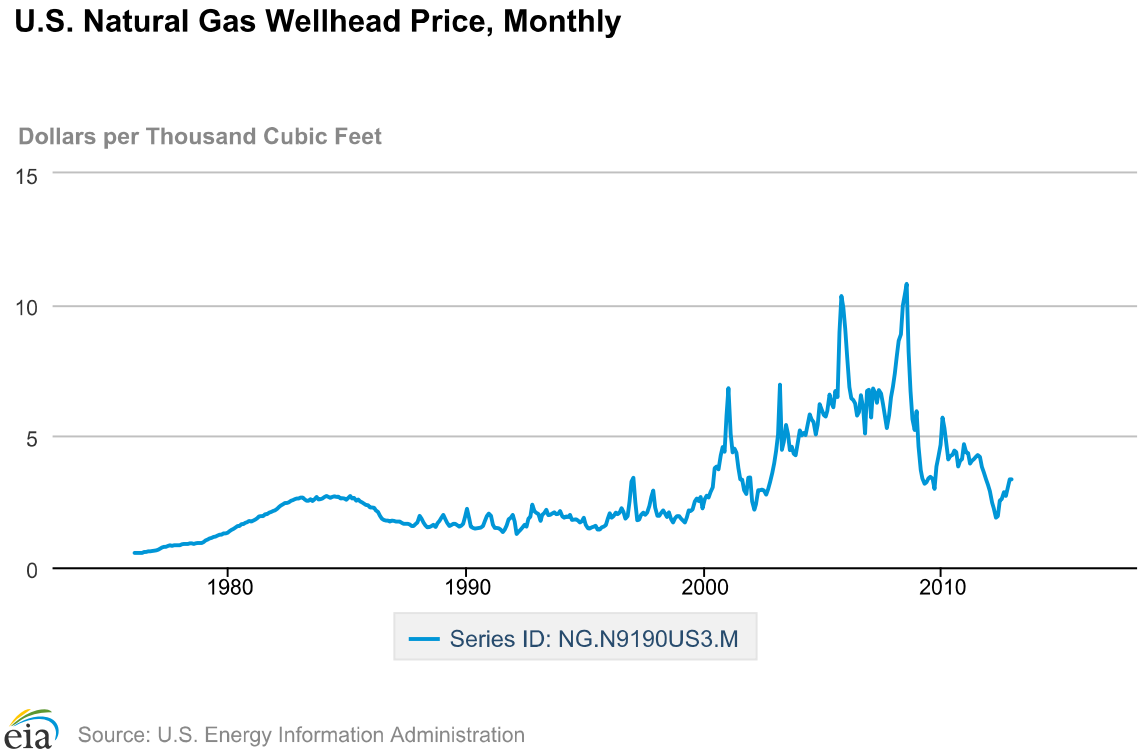
Gas storage functions

- **5. Gas storage provides gas and electric reliability during extreme weather and wildfires.**
  - Problems may increase with climate change
  - These emergencies can threaten supply when demand simultaneously increases.

https://www.independent.com/news/2008/jul/03/early-morning-gap-fire-update/

Financial functions are secondary

- **6. Seasonal Price Arbitrage**
  - Allows savings through seasonal price arbitrage
    - winter prices usually higher than summer prices
- **7. Liquidity/Short-term Arbitrage**
  - Grants marketers a place to hold supply and take advantage of short-term prices for liquidity and short-term arbitrage.

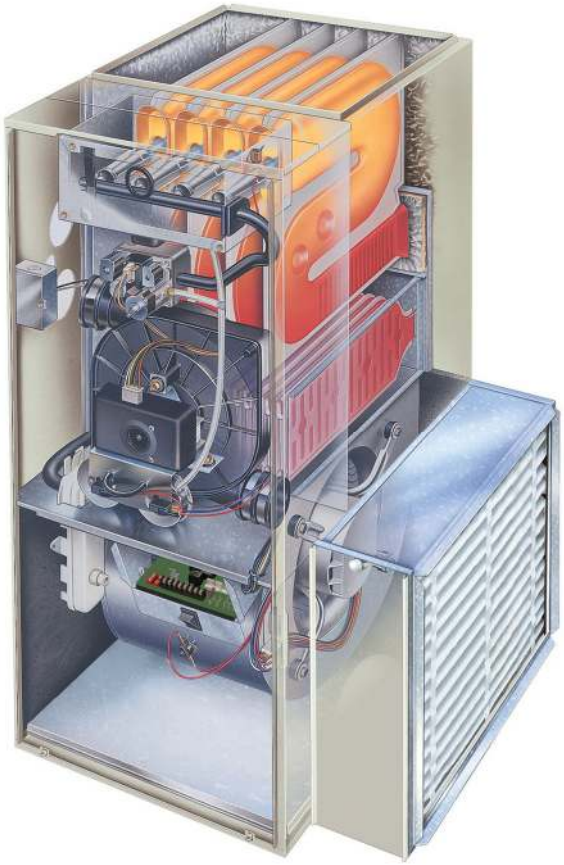


The overarching reason for the utilities' underground gas storage is to meet the winter demand for gas.

If storage can meet winter demand then it can do all the other functions:

- intraday balancing,
- compensating for steady production,
- creating an in-state stockpile for emergencies, and
- allowing arbitrage and market liquidity.

Winter peak is for heat, not electricity



High efficiency gas furnace:
https://hvacdealers.com/blog/high-efficiency-gas-furnaces/

No method of conserving or supplying electricity can replace the need for gas to meet the winter peak in the 2020 time frame including

- electricity storage,
- new transmission,
- energy efficiency measures, and
- demand response.

- The winter peak is caused by the demand for heat and heat will continue to be provided by gas, not electricity, in that time frame.
- Gas storage is likely to remain a requirement for reliably meeting winter peak demand.

Additional pipelines could replace UGS

San Bruno fire
https://www.flickr.com/photos/pkingdesign/4975247309/

- Would cost approximately $15B
- Difficult to do by 2020 (maybe by 2025?)
- Shifts the risk of supply not meeting demand to upstream, out-of-state
- Is a further commitment to gas
- Presents its own set of risks

Replace UGS with LNG peak shaving units

To meet the 11.8 Bcfd extreme winter peak day demand forecast for 2020 would be extremely difficult to permit.

Would require about $10B.

http://www.russoonenergy.com/content/it-time-rethink-gas-storage-and-pipelines

Containerized LNG

- 2,000 containers required to support a 50 MW power plant for four hours,
- Takes a day to recharge
- Container transportation would incur potential safety issues, increased emissions
- The number of containerized LNG units required to generate each MWh suggest containerized LNG does not appear viable at the scale required to replace California's 4.3 Bcfd winter peak
- May have application in meeting system peaks for a few hours or supporting power plant demands for a few hours.

Figure 32. GE's CNG Technology Solution
Source: Photo courtesy of BHGE

LNG from Costa Azul

- LNG from Sempra's Costa Azul terminal in Mexico could provide 300 MMcfd to San Diego and obviate this amount of gas storage in Los Angeles.

http://www.sandiegouniontribune.com/sdut-ensenada-municipal-government-orders-sempra-plant-2011feb11-htmlstory.html

There is no “silver bullet” to replace underground gas storage in the 2020 time frame

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- We could not identify an alternative gas supply system that would:
  - meet the 11.8 Bcfd extreme winter peak day demand forecast and
  - allow California to eliminate all underground gas storage by 2020.

- Two possible longer-range physical solutions would
  - be extremely expensive
  - carry their own risks
  - incur barriers to siting
  - commit CA to more gas infrastructure

Take Away Messages: Key Question 2

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- California needs natural gas and natural gas storage to meet the winter demand and winter peak daily demand for heat. Pipelines do not have the capacity to meet these demands.

- Replacing UGS would be very expensive and nearly impossible to do in the near term.

- Nothing done for electricity will have much effect on the peak winter demand because this demand is caused by demand for heat and CA has no policy to electrify heat.

Third Major Conclusion and Recommendation

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- **Conclusion ES-3:** Some possible future energy systems that respond to California's climate policies might require underground gas storage including natural gas, hydrogen, or carbon dioxide—and some potentially would not. California's current energy planning does not include adequate feasibility assessments of the possible future energy system configurations that *both* meet greenhouse gas emission constraints *and* achieve reliability criteria on all time scales, from subhourly to peak daily demand to seasonal supply variation.

- **Recommendation ES-3:** The state should develop a more complete and integrated plan for the future of California's energy system, paying attention to reliability on all timescales in order to understand how the role of natural gas might evolve and what kind of gases (e.g., natural gas or other forms of methane, hydrogen, or carbon dioxide) may need to be stored in underground storage facilities in the future.

Key Question 3

How will implementation of California's climate policies change the need for underground gas storage in the future?

Energy scenarios

- Examined 26 studies, more than 300 scenarios that looked at future energy systems (California, U.S., and a few global).
- No study provided sufficient detail to convincingly inform the future need for UGS in California.
- Commission studies to identify future configurations of the energy system with modeling of natural gas use on *all relevant time scales (subhourly to seasonal)*.

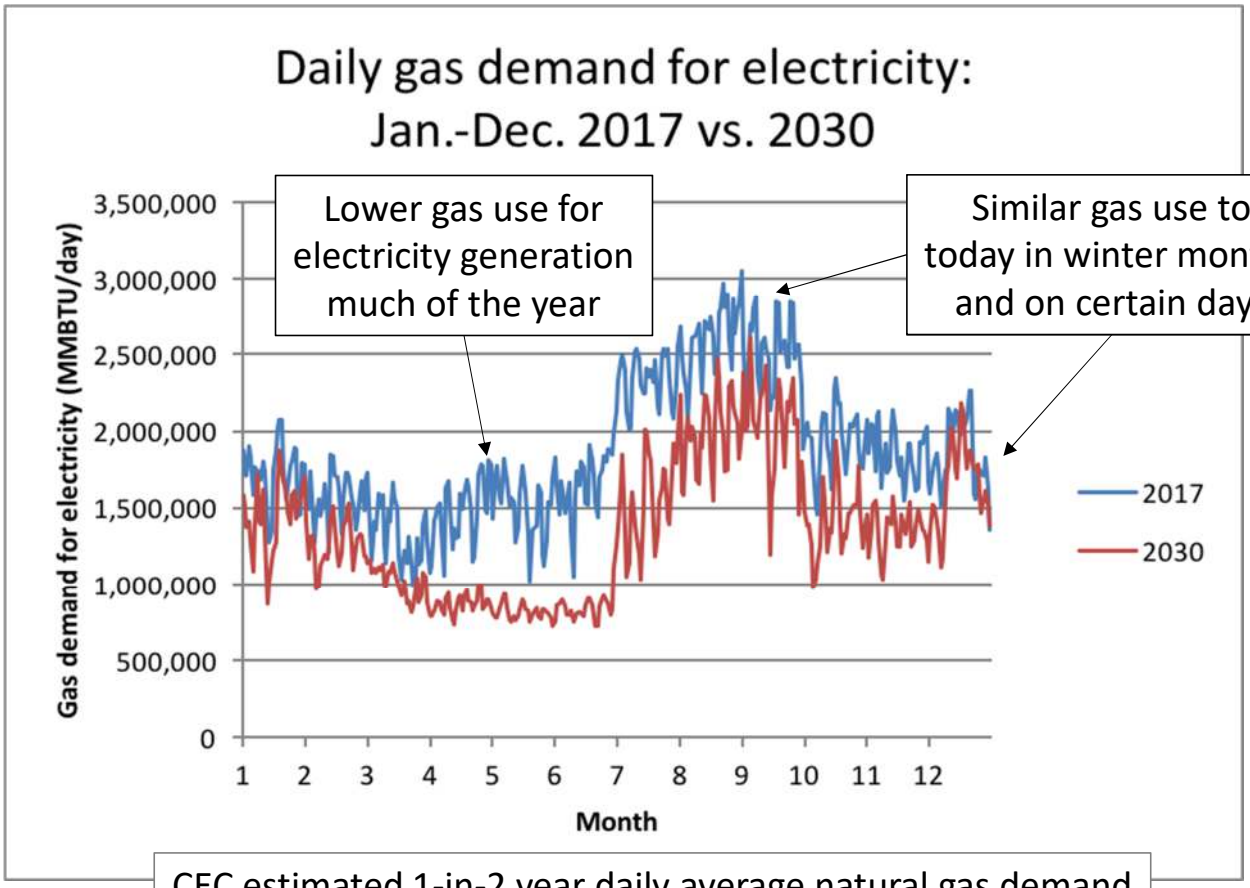
What will change by 2030?

Electricity:

- Renewables will provide >50% of generation.
- Some energy efficiency, energy storage, demand response, and electric vehicle growth.

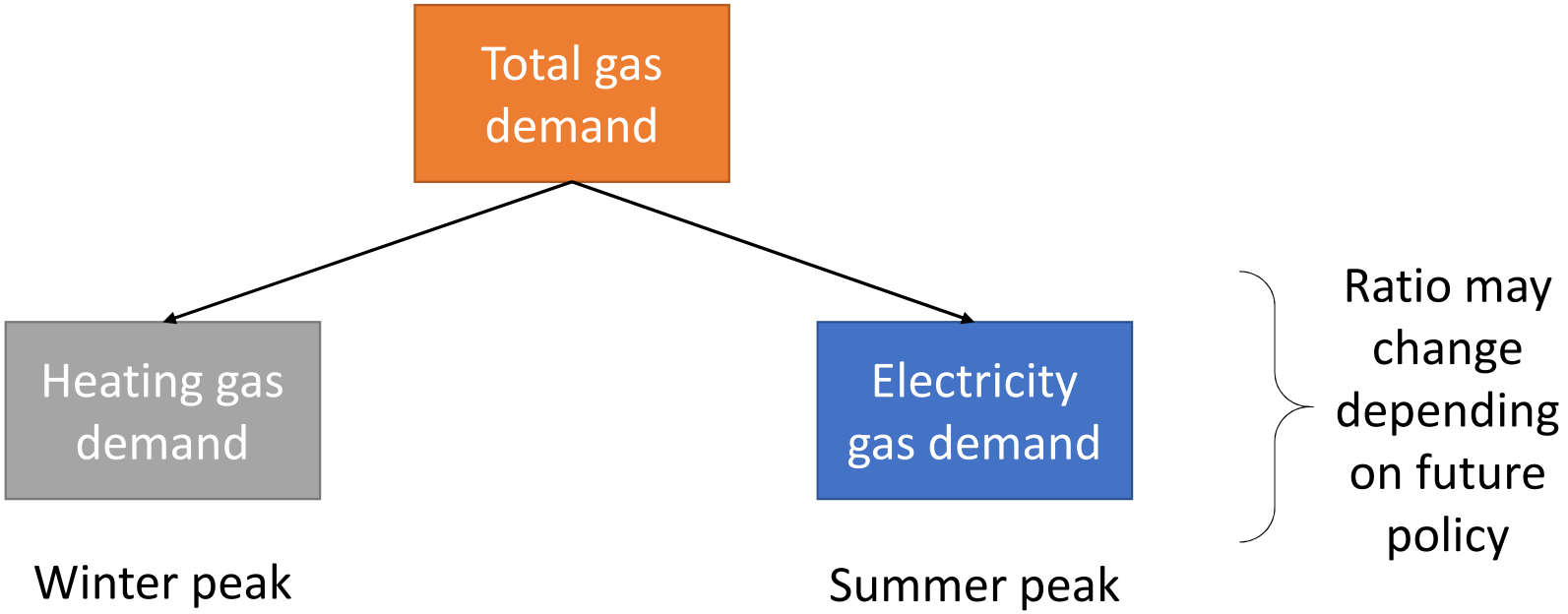
Non-electricity gas:

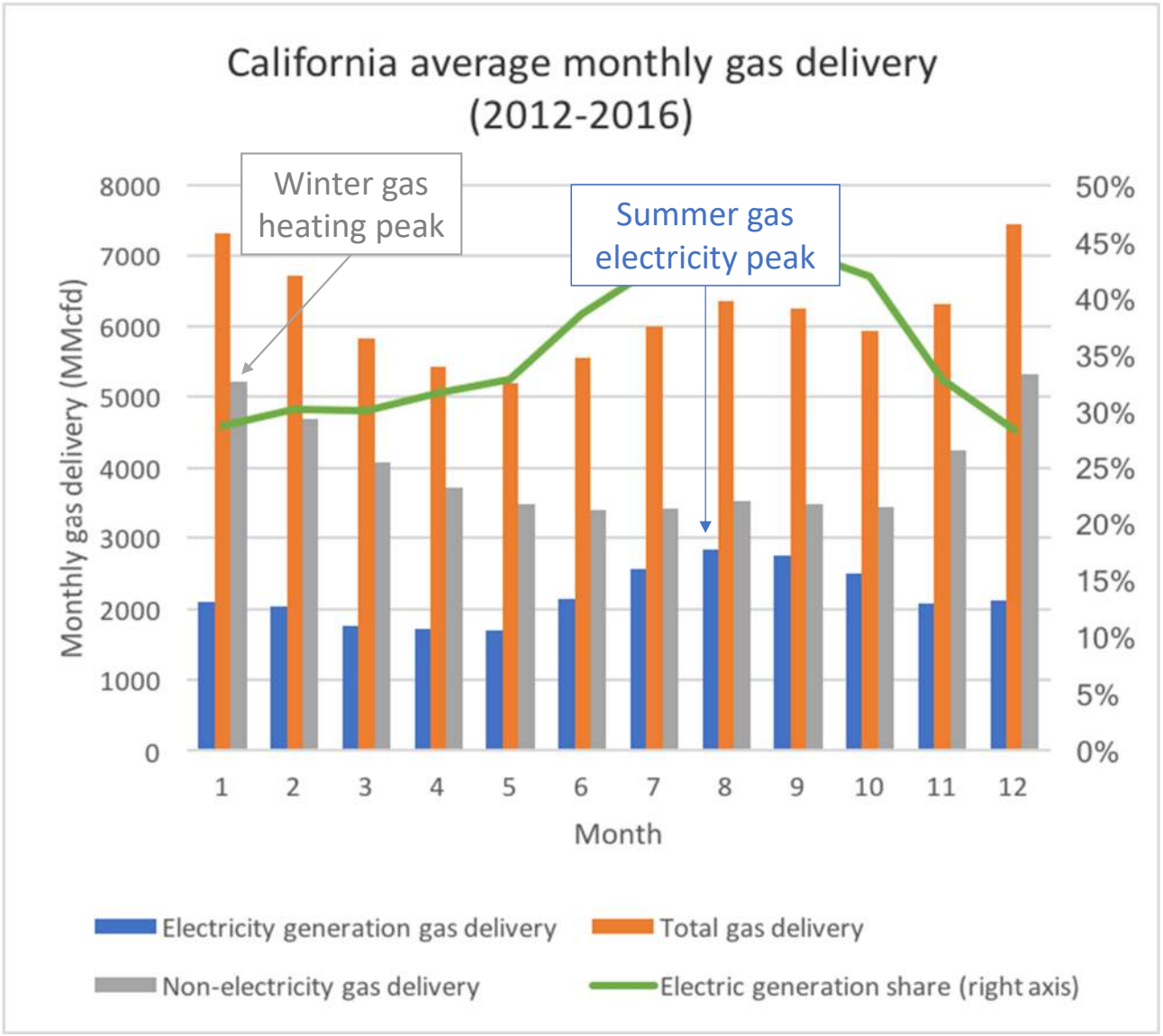
- Scenarios estimate that demand will decrease 11-22%, not enough to reduce the need for UGS.



CEC estimated 1-in-2 year daily average natural gas demand for electricity generation in California in 2017 vs. 2030.

Major uses of natural gas





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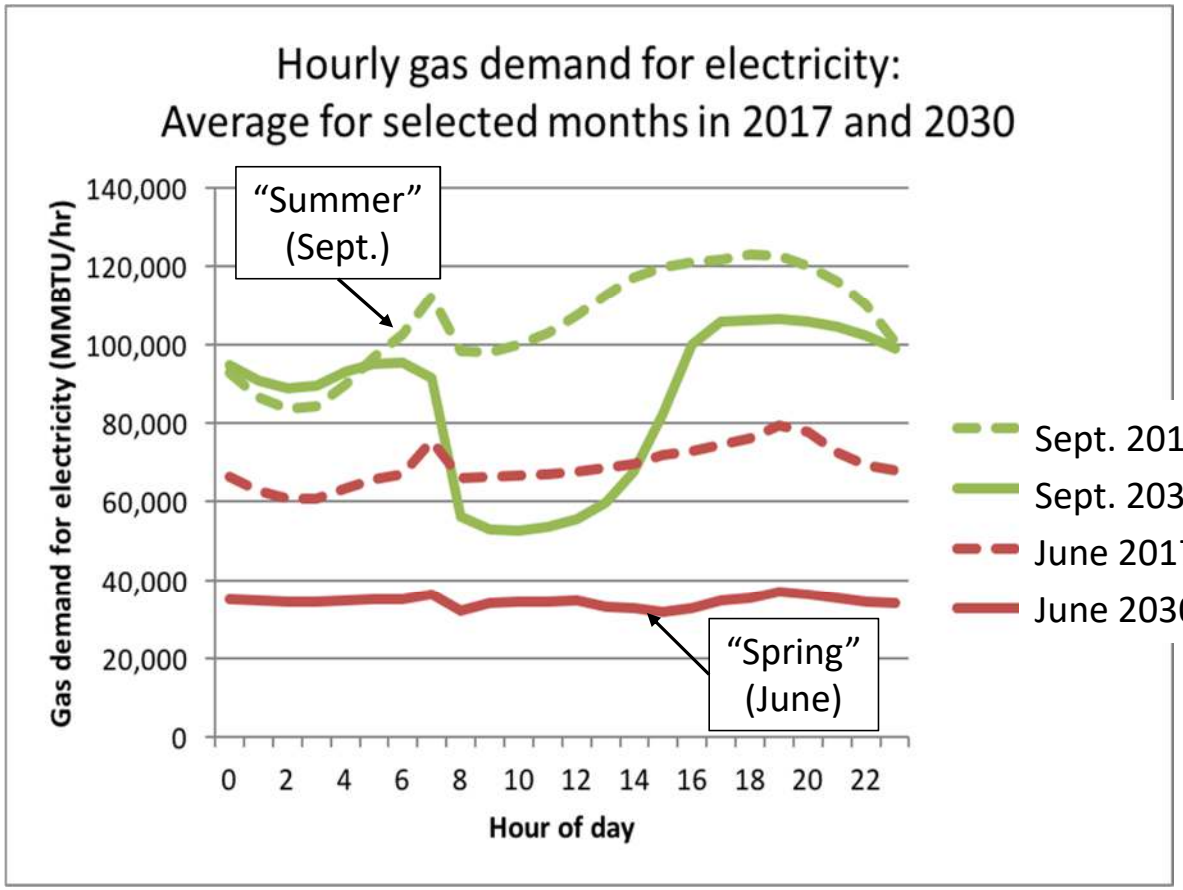
- Total gas demand peaks in winter, driven by gas heating demand
- Demand for gas-fired electricity peaks in summer
- All gas uses expected to reduce somewhat in 2030, but timing of peaks will remain similar to today
- By 2050, gas demand for both electricity and heat could change significantly relative to today

Changes in hourly gas electricity use



- Reduction in natural gas use, directly or indirectly.
- However, changes do not necessarily reduce the need for underground gas storage (example: more intermittent renewable electricity).

CEC estimated Diurnal 1-in-2 year average monthly natural gas demand for electricity generation in California in 2017 vs. 2030. June and September averages shown.

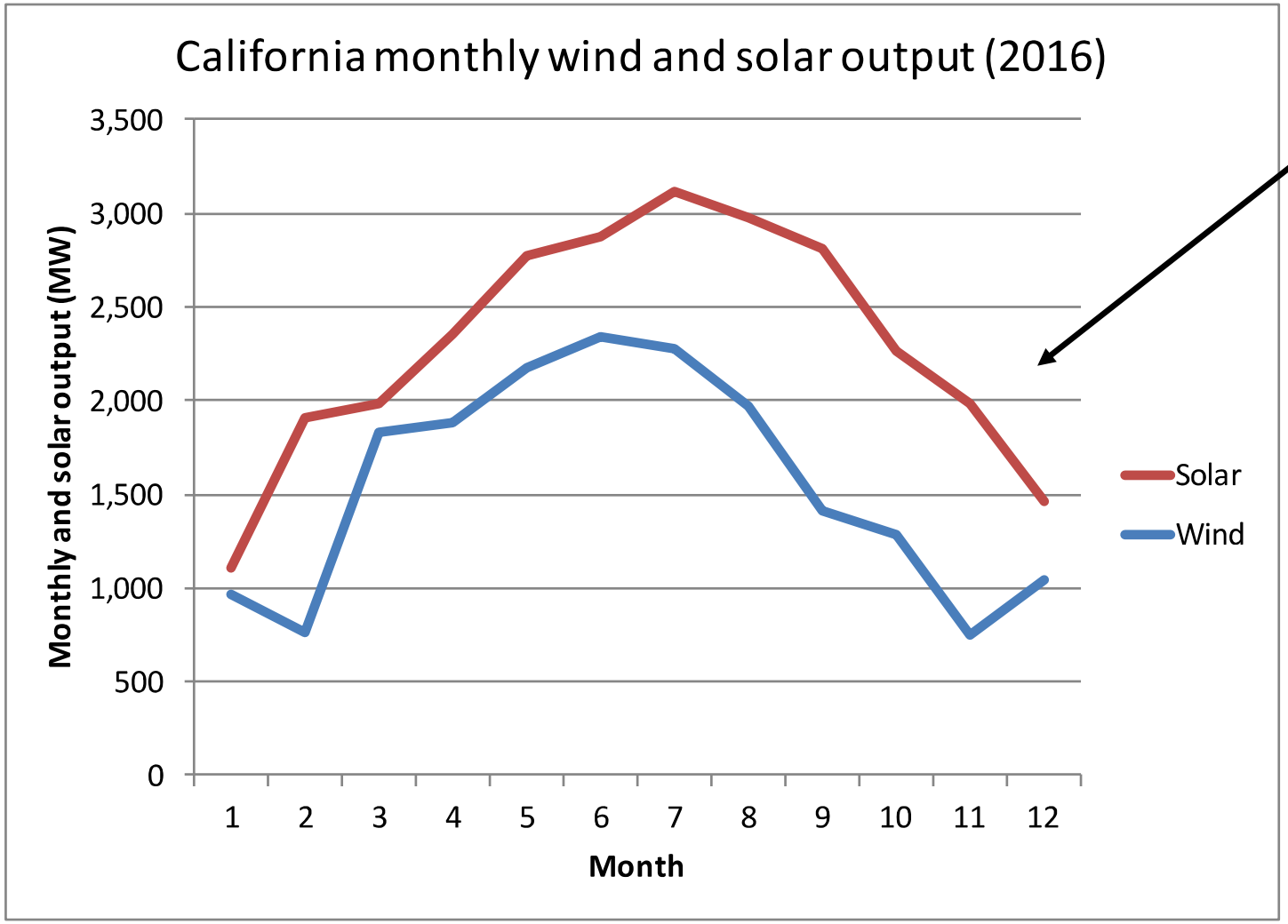


Figure 2. California monthly average wind and solar output in 2016. Reproduced from data in CAISO (2017a, Figure 1.8).

Demand for heat peaks in winter, when solar and wind outputs are minimal.

Electrified heat could be a key strategy in lowering emissions, but would further exacerbate supply-demand mismatch.

Required backup from gas equal to renewable energy capacity

Daily load balancing of electricity

- How to address *dunkelflaute* (“dark doldrums”) conditions?
- Peak electricity demand ~60,000 MW

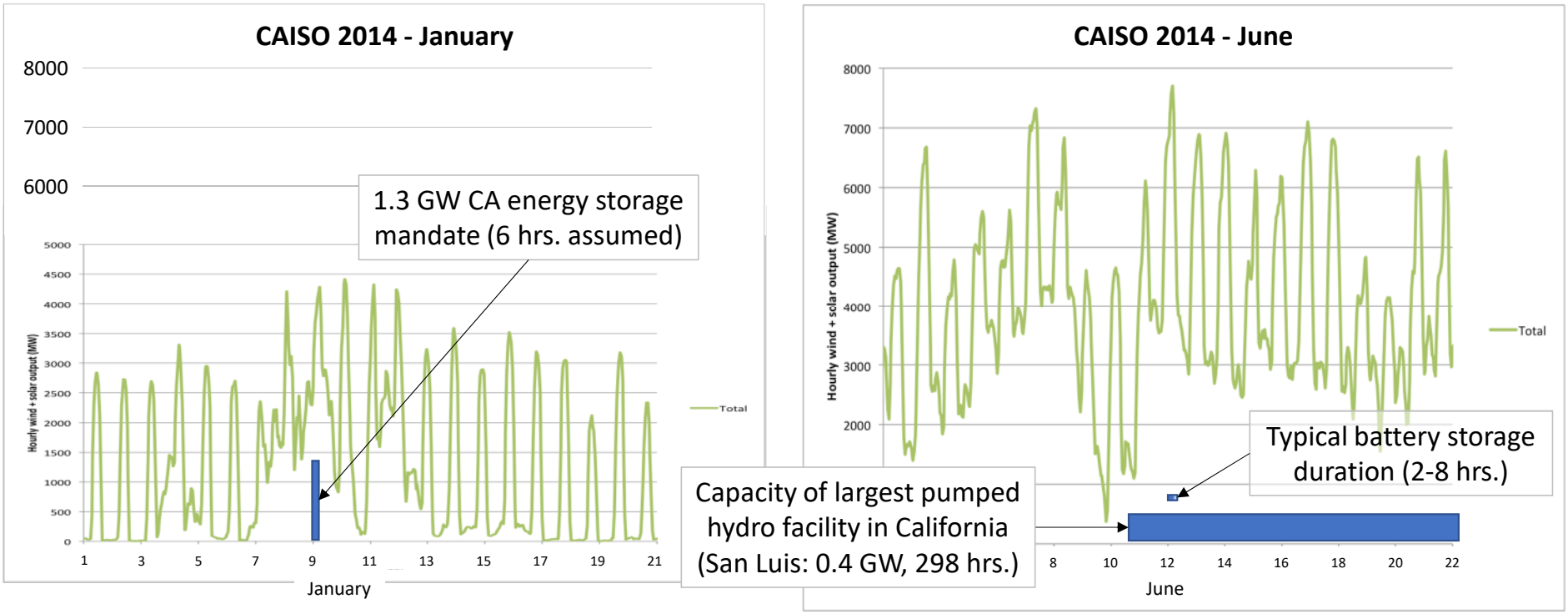


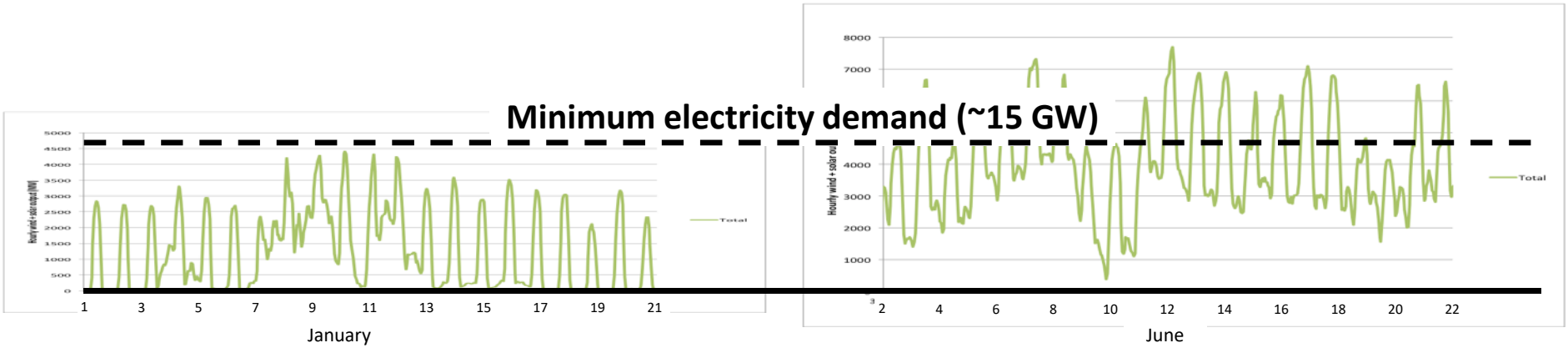
Figure ES-3.2. *Combined wind and solar output*

Projected 2030 electricity capacities

Peak electricity demand (~60 GW)

Average electricity demand (~35 GW)

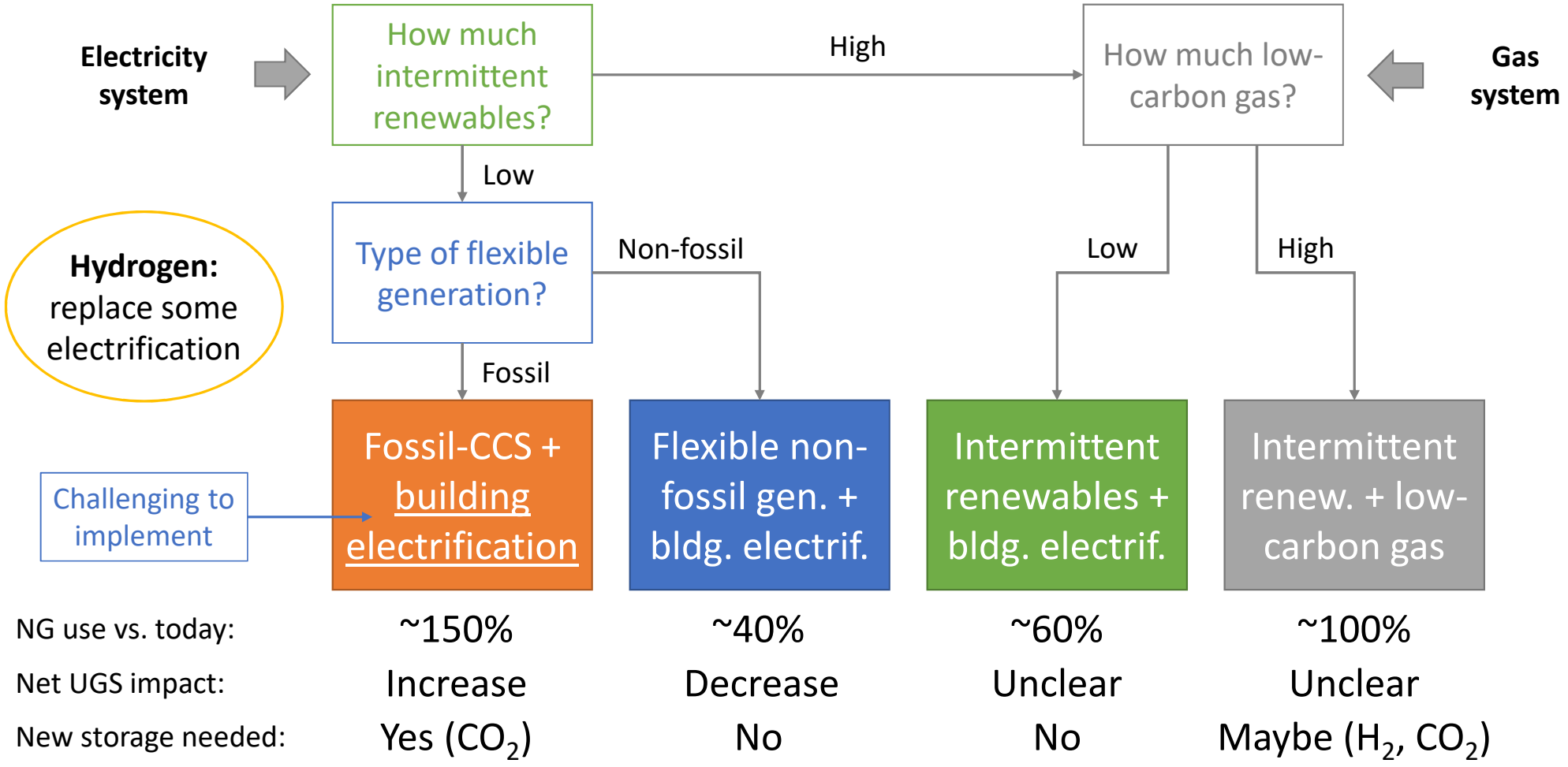
Minimum electricity demand (~15 GW)



Technology Assessment for 2030

- Intraday balancing—managing changes in gas demand over a 24-hour period—could possibly be addressed by various forms of energy storage, flexible loads or imports/exports
- Multiday or seasonal supply-demand imbalances must be addressed with low-GHG chemical fuels:
  - Examples: biomethane, synthetic natural gas, and hydrogen (H_2)
  - Have same storage challenges as natural gas
  - May introduce new constraints (e.g., H_2 or CO_2)
- The total amount of UGS needed unlikely to change by 2030

Logic diagram for 2050 scenarios



Conclusions and Recommendations

Flexible, non-fossil generation might minimize reliability issues currently stabilized with natural gas generation.

There are widely varying ideas about energy systems that might meet the 2050 climate goals. Some of these would involve some form of gas (methane, hydrogen, CO_2) infrastructure including underground storage, and some may not require as much UGS as in use today.

California should evaluate the relative feasibility of achieving climate goals with various reliable energy portfolios, and determine from this analysis the likely requirements for any type of UGS in California.

Conclusions and Recommendations

California needs a plan for energy that accounts for both capacity and reliability at all time scales.

California should evaluate the relative feasibility of achieving climate goals with various reliable energy portfolios, and determine from this analysis the likely requirements for any type of UGS in California.

Take Away Messages: Key Question 3

- Energy storage, flexible loads, and imported (or exported) electricity could play a role in firming intermittent renewable energy.
- Only chemical energy storage—which requires UGS—can supply power in *dunkelflaute* conditions for multiple days and seasonally.
- Electrification of heat could increase electricity demand in winter at the same time that solar and wind output declines.
- More flexible, non-intermittent or baseload low-GHG resources (e.g. geothermal, CCS, nuclear, WY wind, wave power, etc.) could reduce UGS use significantly.
- California needs a plan for energy that accounts for both capacity and reliability at all time scales.

Concluding Remarks

- With appropriate regulation and oversight, the risks associated with underground gas storage can be managed and and mitigated.
- California's energy system currently *needs* natural gas and gas storage to run reliably.
- California's current energy planning does not include adequate feasibility assessments of the possible *reliable and low carbon* future energy system configurations.

CALIFORNIA HYDROGEN BUSINESS COUNCIL

Gas System Reliability

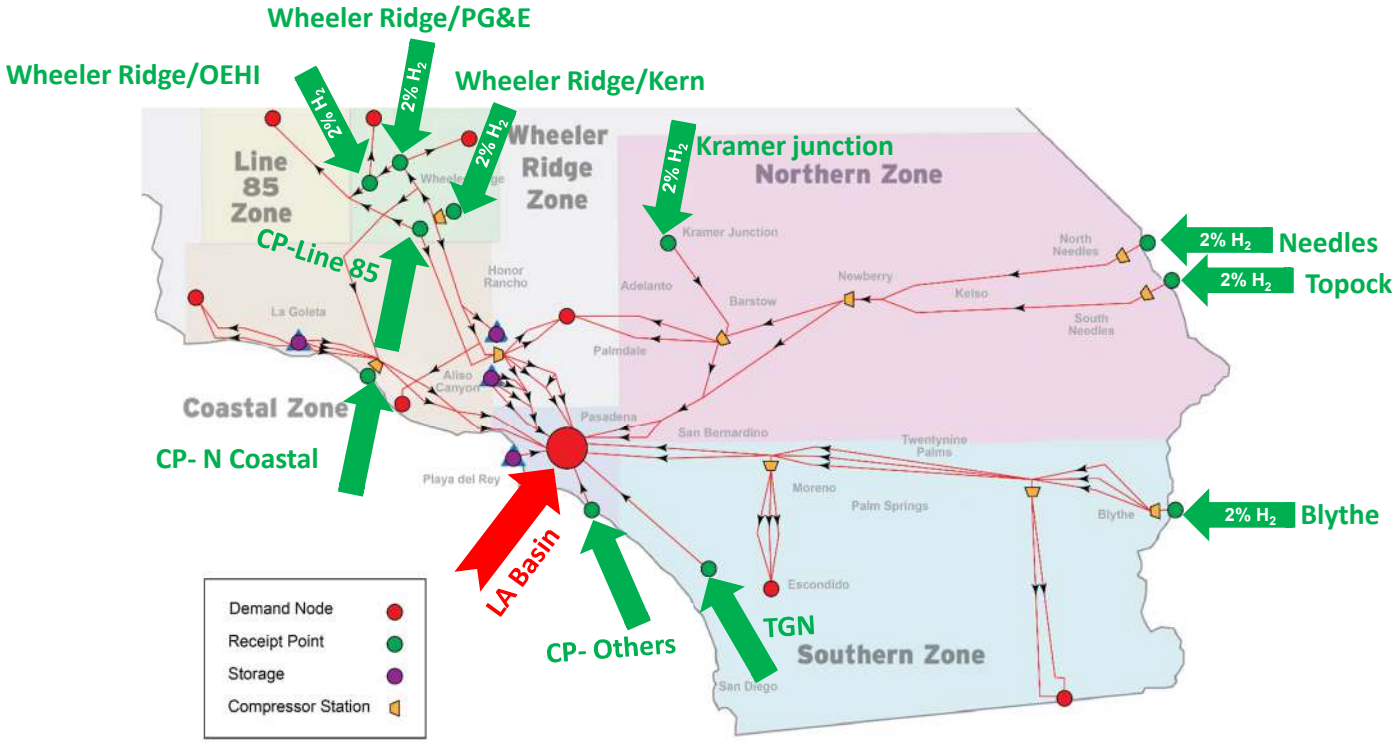
Track 1B Workshop – July 21, 2020

Jeffrey Reed
Chief Scientist – Renewable Fuels and Energy Storage
Advanced Power and Energy Program, UC Irvine
CHBC Executive Committee Member

Implications of Electrolytic H2/CH4 and Fuel Cells for Gas System Reliability

- Electro-fuels (hydrogen and methane) injected onto the gas grid are a new source of in-state supply and are not dependent upon interstate pipeline capacity
- Electrolyzers are a flexible load that can reduce the ramp rate by turning down or off in the later-afternoon/early evening
- Fuel Cells are modular and their siting flexibility is such that they can be located to alleviate system constraints – installations of 1 MW to 50 MW are in service today
- Track 1A and 1B data gathering and analysis related to gas system capacity should anticipate introduction of hydrogen blends beginning within the next 2 – 3 years

Implications of Electrolytic Hydrogen and Fuel Cells for Gas System Reliability



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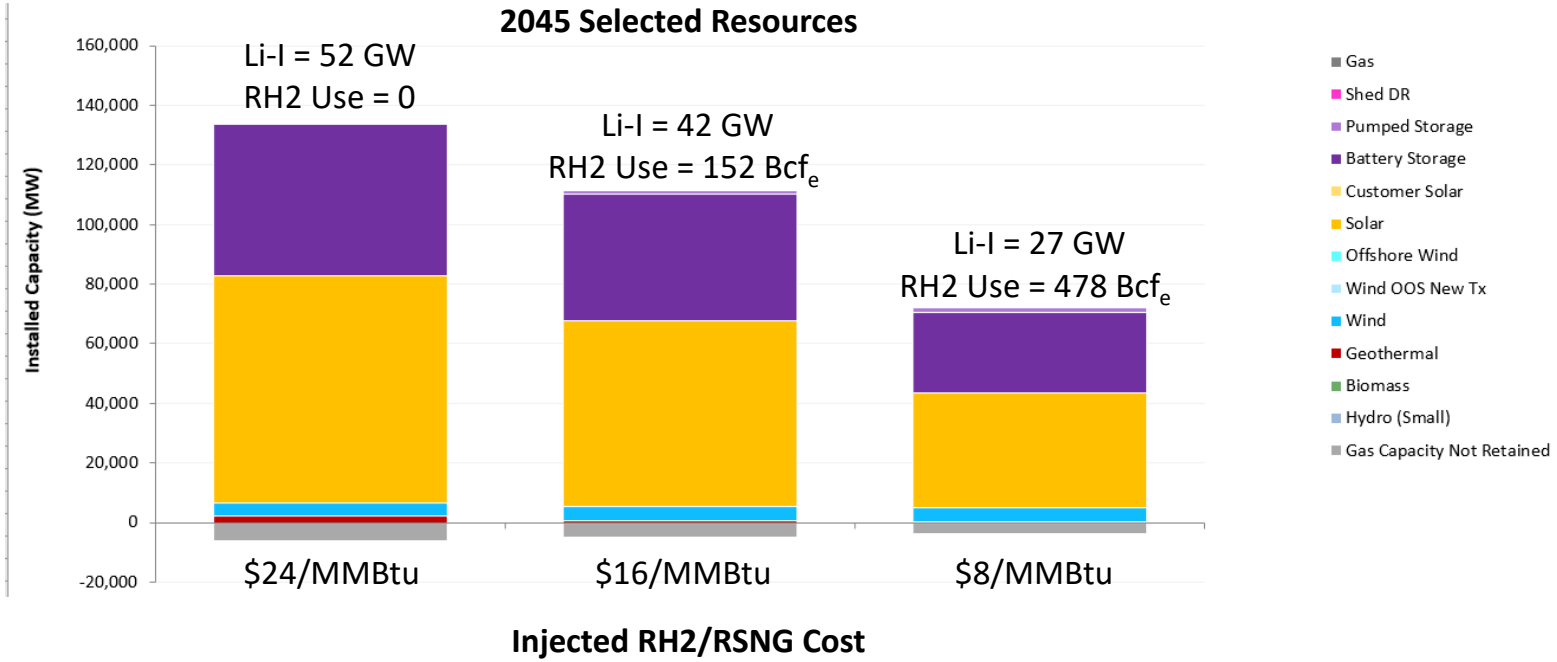
2045 Resource Mix vs. RH2 Cost

Preliminary Results

- **Biomethane resource in RESOLVE used as a proxy for injected hydrogen and synthetic methane**
- **Making low-cost hydrogen available for use in thermal resources reduces the need for storage and reduces the amount of thermal capacity that is retired**
- **Curtailment is also reduced substantially**



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Stationary Fuel Cells

- **High conversion efficiency, zero emissions**

- High efficiency
- No pollutant emissions
- Acoustically benign
- High quality heat
- No water consumption
- Reliable, 24-7 operation
- Power quality
- Biogas
- Renewable hydrogen

Meeting Interday and Intraday Needs: Examining Likelihood and Alternatives

California Environmental Justice Alliance

CALIFORNIA ENVIRONMENTAL JUSTICE ALLIANCE

- Statewide, community-led alliance working to achieve environmental justice.
- Represents an alliance of ten members and partners representing environmental justice communities throughout California.

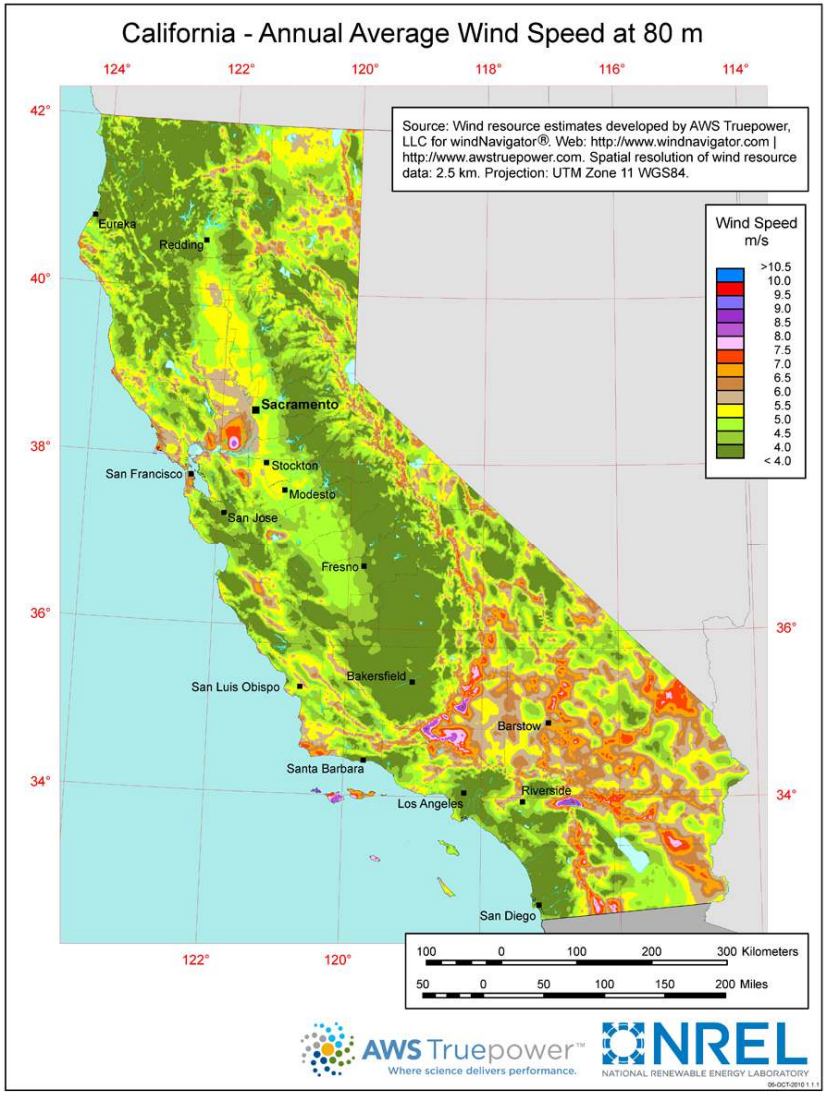
Defining the Problem: How Often Are There Multiple Days with Little or No Solar and Wind

- Factors:
  - Efficiency of Solar Panels on Cloudy Days;
  - Likelihood of Low Solar for Multiple Days in the State;
  - Likelihood of Wind Being Below 10mph in State for Multiple Days;
  - Likelihood of Low Solar and Wind Occurring on the Same Days and
  - Diversity of Solar and Wind Resources in State.

Defining the Problem: California Cities Have Some of the Highest Solar Penetration in the Country.

City	Solar Penetration as % of Time Out of Possible Hours
Redding	Sunshine 88% of time
Los Angeles	Sunshine 73% of the time
Sacramento	Sunshine 78% of the time

California Has High Average Windspeeds in Locations Throughout the State.



Analysis of Potential "Dark Doldrums" in California

- "To have a similar situation as in the Dark Doldrums, an extensive period of low solar production (less than 25% relative to normal) would be required. Based on the 2018-19 winter season, the initial analysis indicates that this would be a relatively rare occurrence as most storm events did not have sufficient impact to reduce solar production by that much." SCE Pathways 2045, Appendix.

Reasons Why Continued Reliance on Natural Gas Is Not Answer for Extraordinary Event

- Statutory and Policy Reasons
  - SB 100 requires moving beyond fossil fuels.
  - California has committed to decarbonize by 2045.
  - SB 350 requires minimization of air pollution, with a priority on disadvantaged communities.
- Greenhouse Gases (from combustion and methane leakage)
- Air Pollution
- Economic Considerations
  - Costs of keeping older, cycling plants online;
  - Gas infrastructure and gas price fluctuations; and
  - Energy affordability.

Some Solutions To Explore

- Forecasting extraordinary events in advance will ensure additional tools can be utilized.
- Demand-Side Management:
  - Shift power usage to other times;
  - Increased reliance on efficiency, demand response;
  - Plan ahead for demand response for extraordinary events;
  - Utilize technologies such as heat pumps, EVs to shift demand.
- Energy storage
- Hydro, geothermal
- Diversity of solar and wind resources
- Solar technologies that increase efficiencies on cloudy days


Questions or comments?
Submit questions in the chat or raise your hand


RELAX
REFRESH
RECHARGE
Notes
Lunch ends at 1:35

Gas System Constraints and Electric Price Volatility: Potential Solutions

CPUC R.20-01-007 Track 1B Workshop

N. Jonathan Peress and Michelle Dandridge

July 21, 2020

SoCalGas

A Sempra Energy utility®

Glad to be of service.®

Purpose

Participants will discuss whether the CPUC, the CAISO, or market participants themselves should establish new contracts, rules, or tariffs to decrease the risk of electric price volatility in the wake of recent gas supply issues.

Contributing Factors for Electric Price Volatility

- Capacity constraints (gas pipelines and storage)
- Gas supplies not matching gas demand
  - Operational Flow Order (OFO)
  - Ratable gas supplies not matching non ratable gas takes, unexpected ramps on gas system
- Market forces
  - Holders of backbone transportation service (BTS) capacity allocating their supply based on willingness to pay
    - Those with BTS capacity not necessarily those who have demand on the gas system
    - Exacerbated by electric DAM dispatch after Cycle 1
    - Inaccurate electric demand forecast causing intraday shortfall

Causes of Constraints

- Infrastructure limitations
  - Outages
  - Operational restrictions imposed by regulatory bodies
  - Regulatory challenges that affect the construction or repair of infrastructure
- Inaccurate forecast exceeding gas system capacity
- Unexpected ramps due to forecast or system conditions (esp. EG customers)

Background - Regulatory Policy Considerations

- Core / Non-core load profiles
  - Core: Predictable daily and hourly takes for which supply arrangements and system are designed to provide
  - Non-core: Intraday variability is increasingly more volatile and less predictable

Resolving Intraday Variability

- Gas market presumes ratable supply receipts and non-core takes (e.g., 1/24th of daily quantity per hour), matching hourly burn to hourly supply

- Load Balancing service for Non-core
  - Non-core customers burning more or less than their 1/24th supply are able to do so because of SoCalGas's supply contracts plus on-system assets (e.g., storage, line pack and draft) enable ramp up and ramp down to occur - even though their supply (or their marketer's supply) into SoCalGas's system is 1/24th (i.e., ratable)

- Under current cost allocation principles, a majority of system costs are allocated to Core customers, including the assets relied upon by Non-core customers to resolve intraday variability

Tariff Rule No. 30 – Implications to Volatility

- Rule No. 30, Transportation of Customer Owned Gas, Section B. Quantities
  - 1. “The gas to be transported hereunder shall be delivered and redelivered as nearly as practicable at uniform hourly and daily rates of flow.”

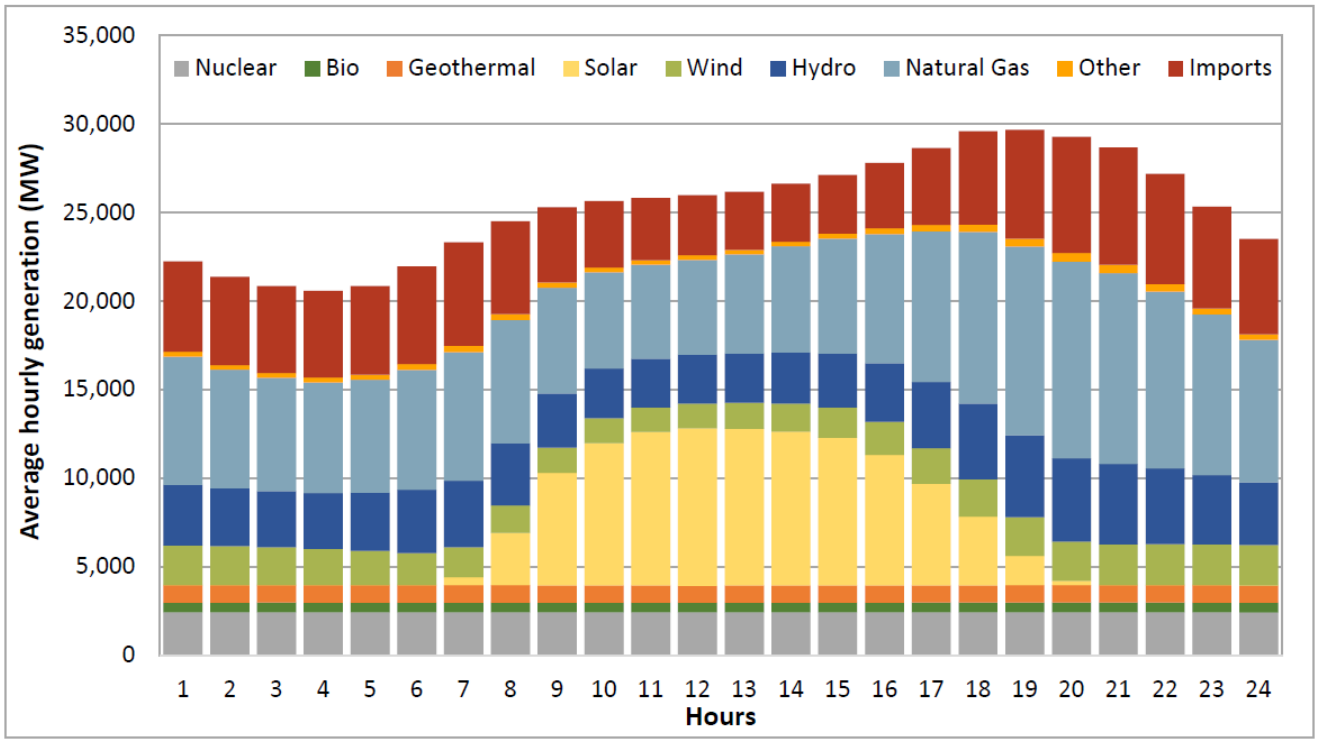
- Because receipts into the SoCalGas system are ratable, more variable (non-ratable) takes by non-core customers require a more capable gas system to balance receipts and deliveries

- The gas system’s capability to smooth volatility (i.e., manage ramp ups and ramp downs) as EG takes fluctuate to balance the power grid requires infrastructure

EG Takes – Less Predictable; More Volatile

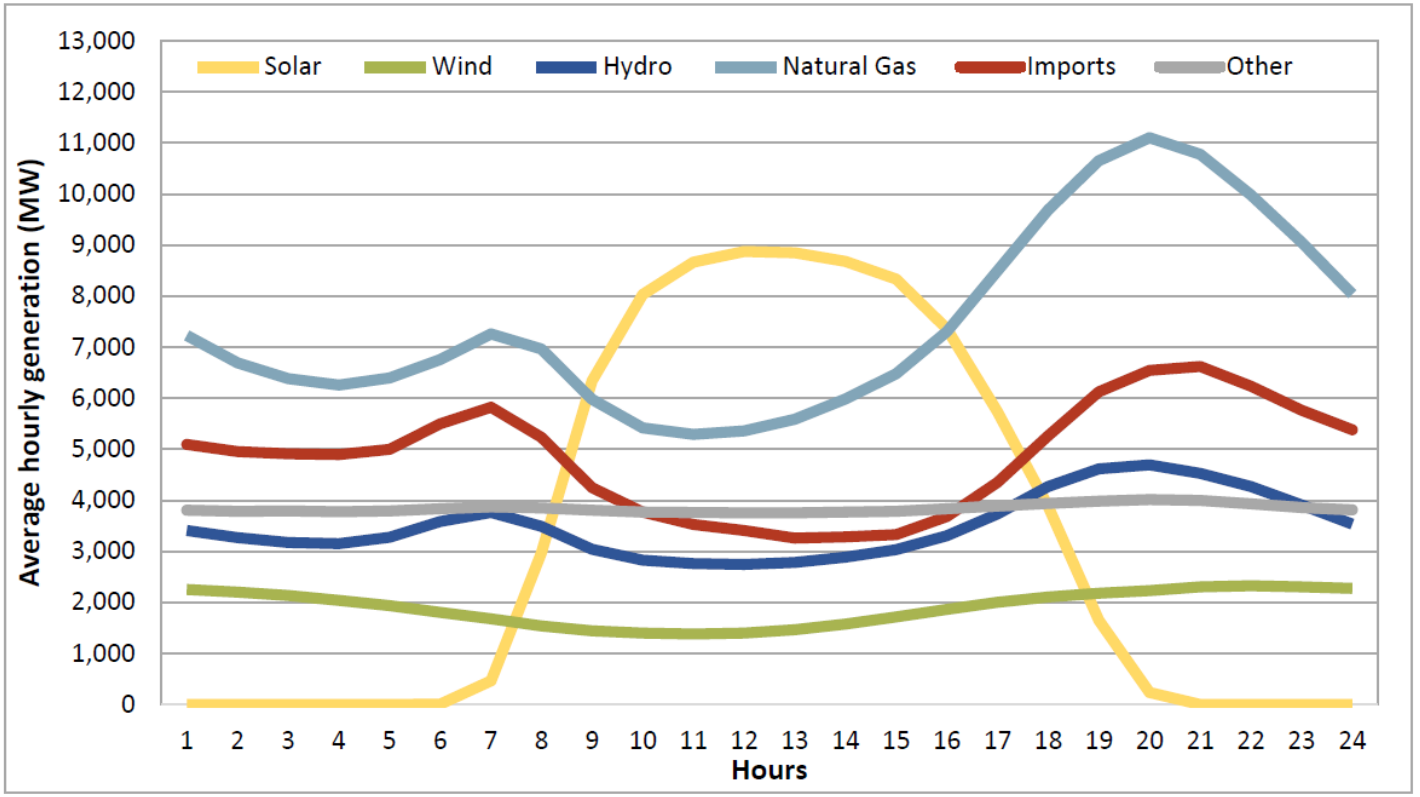
- To maintain reliability with increased renewable deployment, intraday variability on the gas system is increasing
- In effect, intraday variability and more unpredictable use of the gas system (i.e., more ramp up and ramp down) increases as reliance on variable/intermittent resources increases
- Capabilities of the gas system to manage ramp ups and ramp downs provide integrated energy system benefit and value
- Key takeaway from the data: *peak hour takes* by EGs require maintaining the hourly capability of the gas system

2019 Average Hourly Generation by Fuel Type



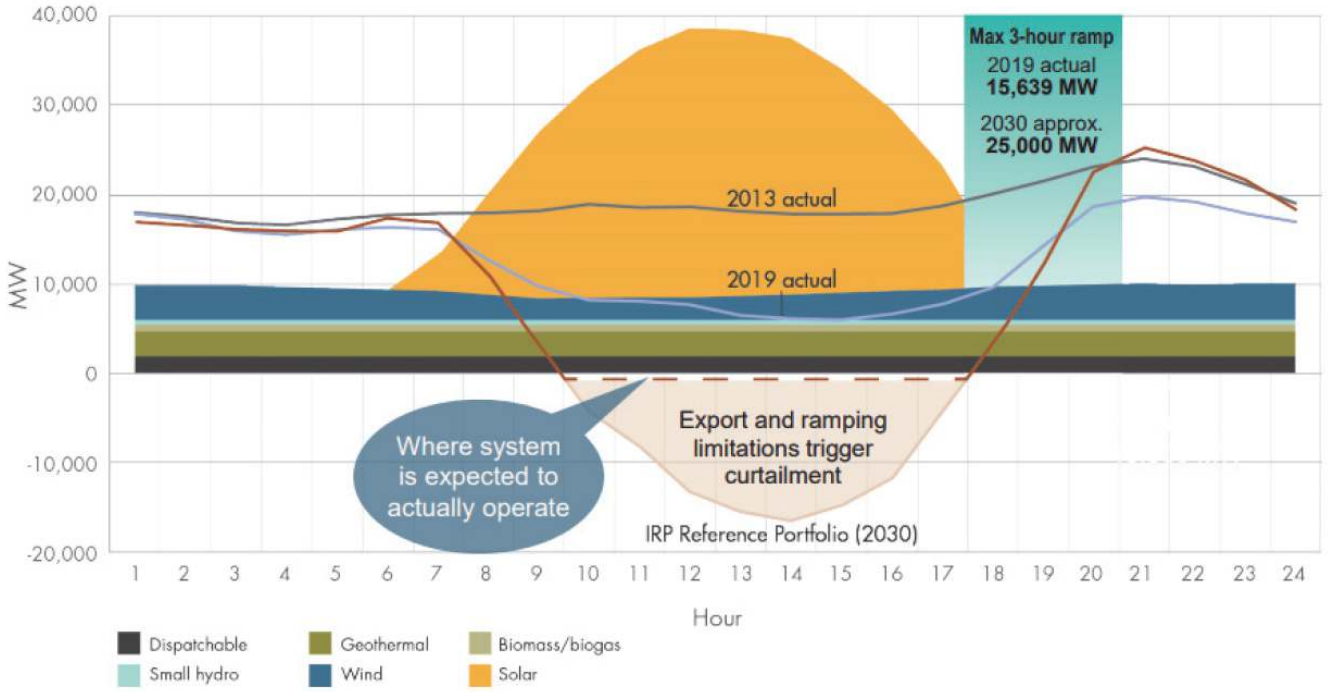
CAISO 2019 Markets Report

2019 Hourly Variation in Generation by Fuel Type



CAISO 2019 Markets Report

CAISO Actual and Projected Maximum Three Hour Ramp



Deliveries to SoCalGas and SDG&E Electric Generators

Year	Max Volumes (Dth/Hr)	Equivalent Daily Capacity of SCG Backbone to provide the Hourly Capacity (Dth per Day)	Category	Season
2017	147,583	3,541,997	Deliveries to Electric Gen	Summer
2018	120,552	2,893,247	Deliveries to Electric Gen	Summer
2019	118,304	2,839,298	Deliveries to Electric Gen	Summer
2017	63,604	1,526,493	Deliveries to Electric Gen	Winter
2018	53,461	1,283,053	Deliveries to Electric Gen	Winter
2019	62,724	1,505,369	Deliveries to Electric Gen	Winter

EGU Non-ratable takes 2017-19

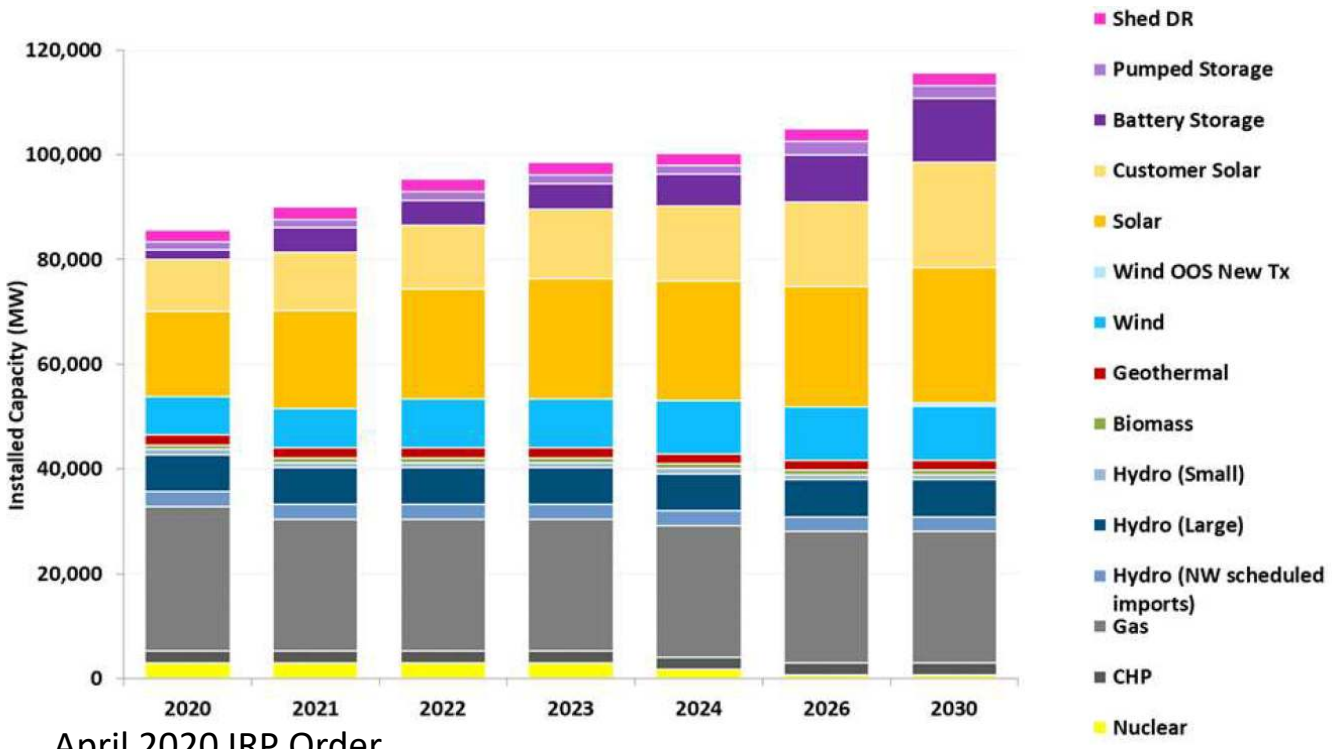
Year	Number	Category
2017	594	Plant-Days where 100% of Day's Gas Burned in 1 Hour
2018	508	Plant-Days where 100% of Day's Gas Burned in 1 Hour
2019	540	Plant-Days where 100% of Day's Gas Burned in 1 Hour
2017	31,516	Plant-Hours of where Burn exceeds 10% of Daily Qty (includes 100% Hrs)
2018	26,578	Plant-Hours of where Burn exceeds 10% of Daily Qty (includes 100% Hrs)
2019	24,328	Plant-Hours of where Burn exceeds 10% of Daily Qty (includes 100% Hrs)
2017	57,836	Plant-Hours of where Burn exceeds 6% of Daily Qty (includes 10% & 100% Hrs)
2018	47,810	Plant-Hours of where Burn exceeds 6% of Daily Qty (includes 10% & 100% Hrs)
2019	42,894	Plant-Hours of where Burn exceeds 6% of Daily Qty (includes 10% & 100% Hrs)

"Plant Days/Hours" aggregate the approximately 80 EGs connected to the SoCalGas system.

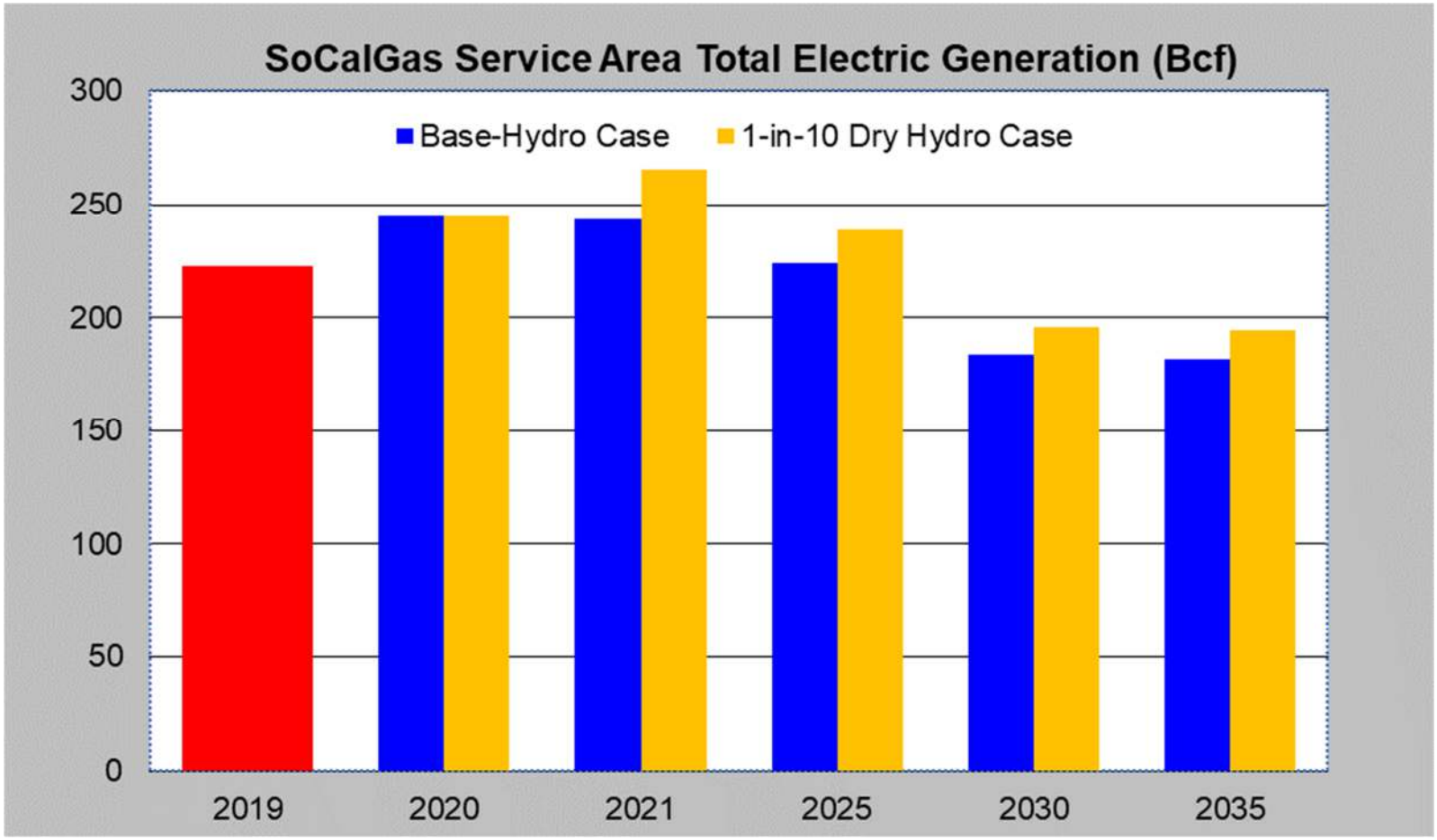
Ramp Down Utilization of System Capacity

Year	Hours of Down-Ramp Exceeding Los Alamos Modeled Max Hourly Injection at non-Aliso Fields	Category/Season
2017	28	Total
2018	8	Total
2019	11	Total
2017	27	Summer
2018	7	Summer
2019	6	Summer
2017	1	Winter
2018	1	Winter
2019	5	Winter

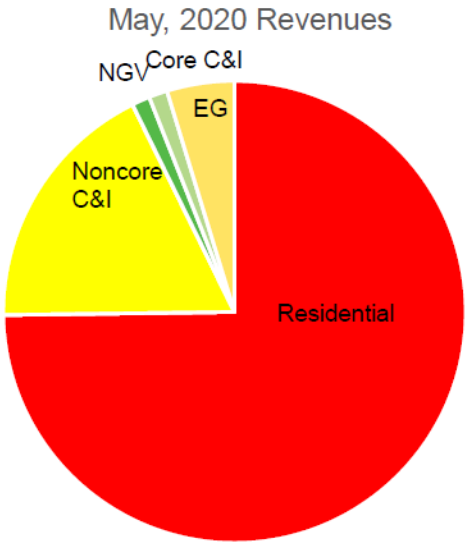
CPUC IRP Reference Portfolio
Cumulative Quantities of All Resources



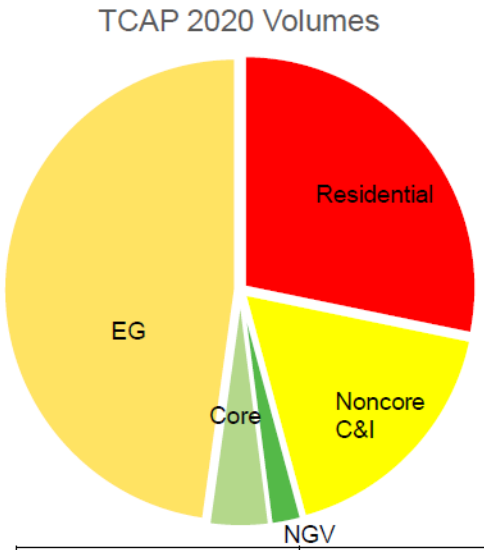
April 2020 IRP Order


SoCalGas Service Area Total Electric Generation (Bcf)
300
250
200
150
100
50
0
Base-Hydro Case
1-in-10 Dry Hydro Case
2019
2020
2021
2025
2030
2035

SDG&E Share of Gas Volume & Rev. Req. By Customer Class

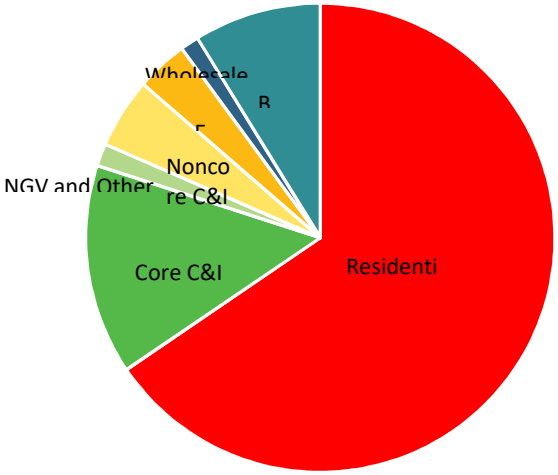


Class	% Total
Residential	75%
Core C&I	18%
NGV	1%
NonCore C&I Class	1%
EG	5%

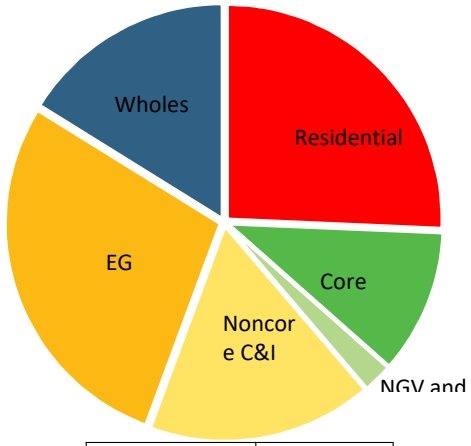


Class	% Total
Residential	28%
Core C&I	18%
NGV and Other Core	2%
NonCore C&I Class	4%
EG	48%

Share of Gas Volume & Rev. Req. By SoCalGas' Customer Class



Class	% Total
Residential	65%
Core C&I	14%
NGV and Other Core	2%
NonCore C&I Class	5%
EG	4%
Wholesale	1%
BTS	9%



Class	% Total
Residential	26%
Core C&I	11%
NGV and Other Core	2%
NonCore C&I Class	17%
EG	28%
Wholesale	16%

Concluding Thoughts

- Renewable integration and decarbonization of the energy grid (including electrification):
  - Increases unpredictability to both the gas and electric grids (which are increasingly operatively interconnected)
  - Increases the need for and value provided by gas grid receipt, storage, and delivery services
  - Focuses on peak hour capability (ramp up and ramp down)
- Compels new tariff structures to internalize the value of the gas system (RBS – renewable balancing service)
- OIR underpinnings raise equitable cost allocation considerations
  - Do core gas customers cross subsidize electric customers?

CPUC Gas OIR Track 1B Workshop: Gas-Electric Coordination

Southern California Edison

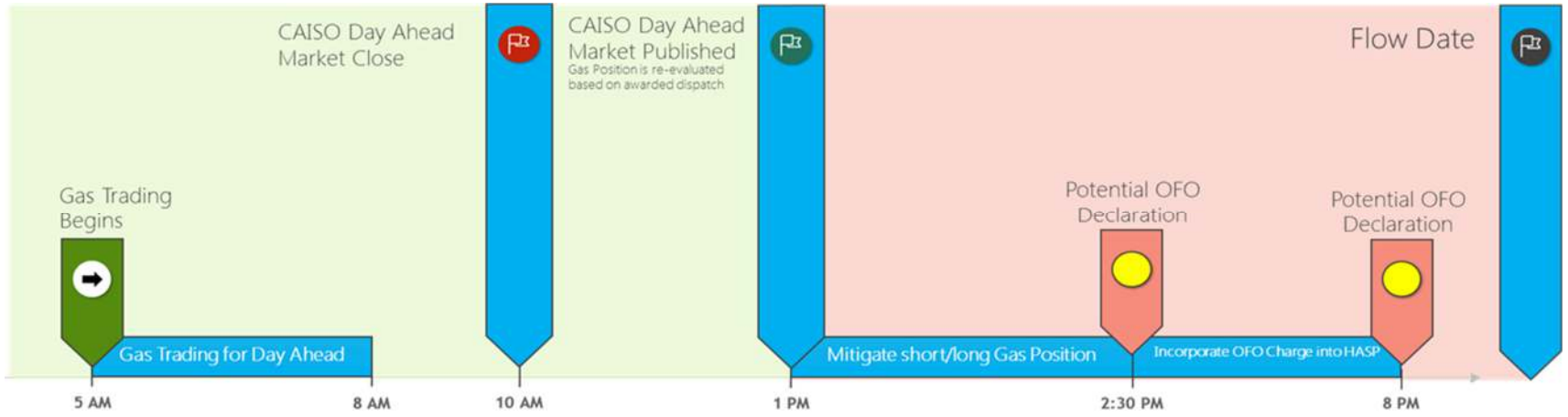
July 21, 2020

Recommendations to achieve electric reliability and lower cost volatility caused by potential gas supply issues

- Better align electric market timelines with the Gas schedule timelines
- Gas-electric reliability and lower cost volatility can be achieved through a full requirements, cost-based natural gas supply procurement tariff for CAISO-connected Electric Generators
- Extend interim SoCalGas OFO Penalty reduction ($5 vs. $25/MMbtu)

Electric market timelines should be better aligned with the Gas schedule timelines

- Gas and power market scheduling practices exacerbate gas supply and pricing uncertainty for CAISO-connected Electric Generators (EGs) because >90% of gas supplies are procured before electric generation schedules are known
- Current timelines were reconsidered in 2015 in response to FERC 809, prior to Aliso Canyon and gas pipeline outages



Cost-based natural gas supply procurement tariff for CAISO-connected Electric Generators

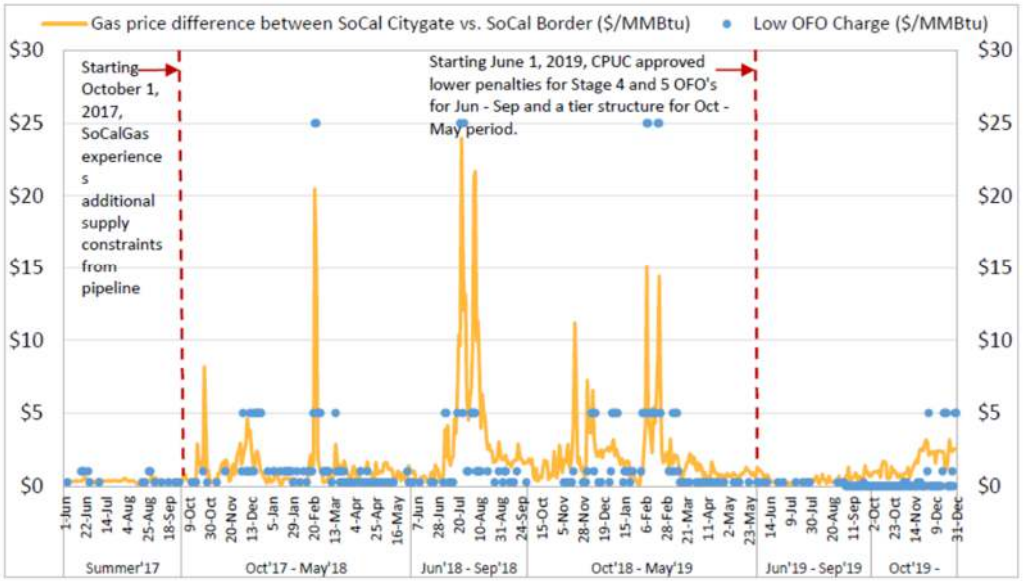
- Allows gas utilities to optimally plan its daily pipeline and storage operations and establish the cost of gas for electric generators
  - EG gas use is 'lumpy' throughout the day and expected to shift more and more towards evening ramps
  - Gas utilities are in the best position to balance risk and manage gas imbalances, for example SoCalGas has access to storage assets not available to non-core

- While the amount of Gas Fired Generation will be reduced, the state will continue to depend on it to integrate renewables and support reliability
  - Most CAISO-connected gas-fired EGs do not have economic incentive to procure firm gas supplies
  - A tariff would give gas utilities broader visibility to total gas requirements and ensure that gas supplies needed for power generation are available

Pipeline operating procedures for curtailments and OFOs should be uniform across the state

- Electric generation prices are set on a marginal cost basis and gas price spikes in one part of the state can impact prices across the CAISO market.
- The interim OFO measures should be extended until the gas system, including implementation of new reliability standards, is in a fully operational state.

Figure 1.30 Impact of potential low OFO noncompliance charges on next-day SoCal Citygate prices



Source: Department of Market Monitoring's 2019 Annual Report on Market Issues & Performance

California ISO

Gas System Constraints and Electric Price Volatility: Potential Solutions

Delphine Hou
Director, California Regulatory Affairs

Presented at California Public Utilities Commission R.20-01-007 Track 1B Workshop: Market Structure and Regulations
July 21, 2020

Scoping memo issue

- Issue 2: During 2017 and 2018, the higher than average gas prices at SoCal Citygate caused the price of wholesale electricity to significantly increase. Should the Commission establish contract or tariff terms and conditions or new rules to attempt to decrease the risk of electricity price volatility caused by potential gas supply issues? If so, what terms, conditions or new rules should be considered?
  - *Ensure penalty or scarcity pricing actually send useful signals*
  - *Consistency across different footprints*
  - *Parties should seek out mechanisms that will help balance out more volatile gas usage in future years*

Statement of UCAN in Stage IB of the California Public Utility Commission's Gas OIR

R. 20-10-007

Dr. Eric C. Woychik

On behalf of UCAN

21 July 2020

Re. Q1: Whether Demand/Supply Fluctuations Pose Risks to Pipeline Capacity?

- UCAN answers in the affirmative, as conditions have changed.
  - The Commission should direct gas utilities, pipelines, and storage providers (UPSP) to specifically define how fluctuations in gas demand will affect pipeline capacity and gas-on-gas competition going forward.
- Re. Q1a: *What measures can be taken to ensure interstate pipeline transportation capacity reliability?*
  - UCAN recommends that UPSP further develop a "map" of expected gas delivery needs, in order to assess whether gas supply contracts are needed to ensure pipeline capacity services.

UCAN
UTILITY CONSUMERS' ACTION NETWORK
San Diego's Utility Watchdog

UCAN Recommends an "And" Strategy: Direct Actions in the Demand and the Supply Sides

- UCAN supports an "and" strategy, thus, use DERs, electrification, curtailment of retail gas use, refined gas system analysis, and gas supply contracts.
- This is in recognition that any one approach, such as with gas supply contracts, will likely create a focus that magnifies the use of market power.
- A more comprehensive demand and supply approach can mitigate exercise of market power and reduce the likelihood of repeating the gas-electric gaming that resulted in 2018.

UCAN
UTILITY CONSUMERS' ACTION NETWORK
San Diego's Utility Watchdog

UCAN Recommendations on Demand-Side Measures

- UCAN recommends that the subjects, Distributed Energy Resources (DERs), and service to retail gas customers, be included in this Rulemaking.
- UCAN asks the Commission to accelerate electrification of buildings and transportation to directly reduce gas demand (and meet GHG goals), focused where gas supply constraints are likely to occur.
- UCAN specifically asks the Commission to accelerate DERs, including customer-side battery storage.
  - Develop large scale DER programs, integrated and optimized with CAISO.
  - Use the Distribution System Operator (DSO) approach to ensure local and CAISO electric system reliability.

UCAN
UTILITY CONSUMERS' ACTION NETWORK
San Diego's Utility Watchdog

UCAN Recommendations on Supply-Side Measures

- UCAN recommends that the Commission consider curtailment of new residential gas hookups on the SoCal Gas and SDG&E systems.
- UCAN recommends that the Commission remove the GCIM.
- UCAN recommends that a working group be used to develop gas supply contacts where gas-on-gas competition is lacking.
  - Define contracts to hedge supply deficiencies but avoid long-term overhang.
  - This may include “back-to-back” gas and electric supply contracts for selected generators, not unlike prior use of reliability-must-run (RMR) contracts.
  - We also recommend that the Commission require gas storage minimums for intraday fluctuations and low renewable days, and purchase this low-cost gas during price dips to stabilize prices.

UCAN
UTILITY CONSUMERS' ACTION NETWORK
San Diego's Utility Watchdog

UCAN Recommends that Aliso Canyon be Closed Given its Risks and Likely Costs

- UCAN has these concerns about the costs and performance of Aliso:
  - Aliso will require more money to maintain safe operations;
  - Aliso's authorized operating storage capacity remains significantly reduced;
  - Aliso represents the single largest gas related environmental disaster in North America and maybe the world.
- Accordingly, dependency on Aliso should be eliminated to remove California's dependence on this critical facility for uninterrupted grid operation, and to avoid future gas emissions.

UCAN
UTILITY CONSUMERS' ACTION NETWORK
San Diego's Utility Watchdog

Re. Uniform Pipeline Operating Procedures?

- Two different sets of pipeline operating procedures enable "regulatory arbitrage"; this portends to spill over to electricity markets, which with less gas-on-gas competition increases the potential for market gaming.
- Current circumstances suggest, however, that uniform California pipeline operating orders are not feasible or desirable at this time.
- SoCal Gas pipeline operating orders need to be further updated and revised to ensure adequate gas is available when renewables are unavailable, such as during the rainy season, while recognizing the potential for regulatory arbitrage.

UCAN
UTILITY CONSUMERS' ACTION NETWORK
San Diego's Utility Watchdog


Questions or comments?
Submit questions in the chat or raise your hand

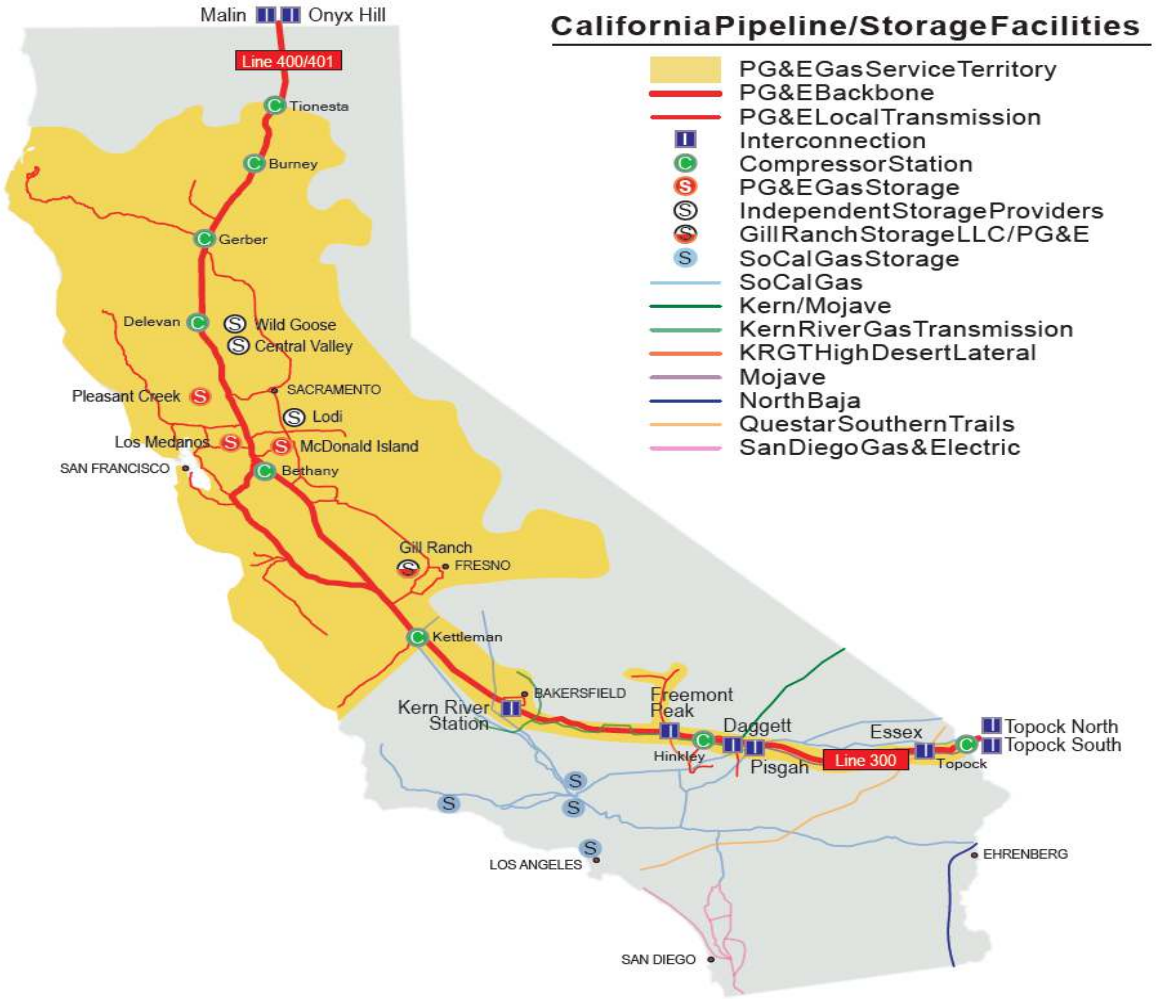

BREAK
TIME !!
10 minutes, return at 3:00

Gas System Planning OIR (R.20-01-007) Market Structure and Regulations Track IB - Workshop

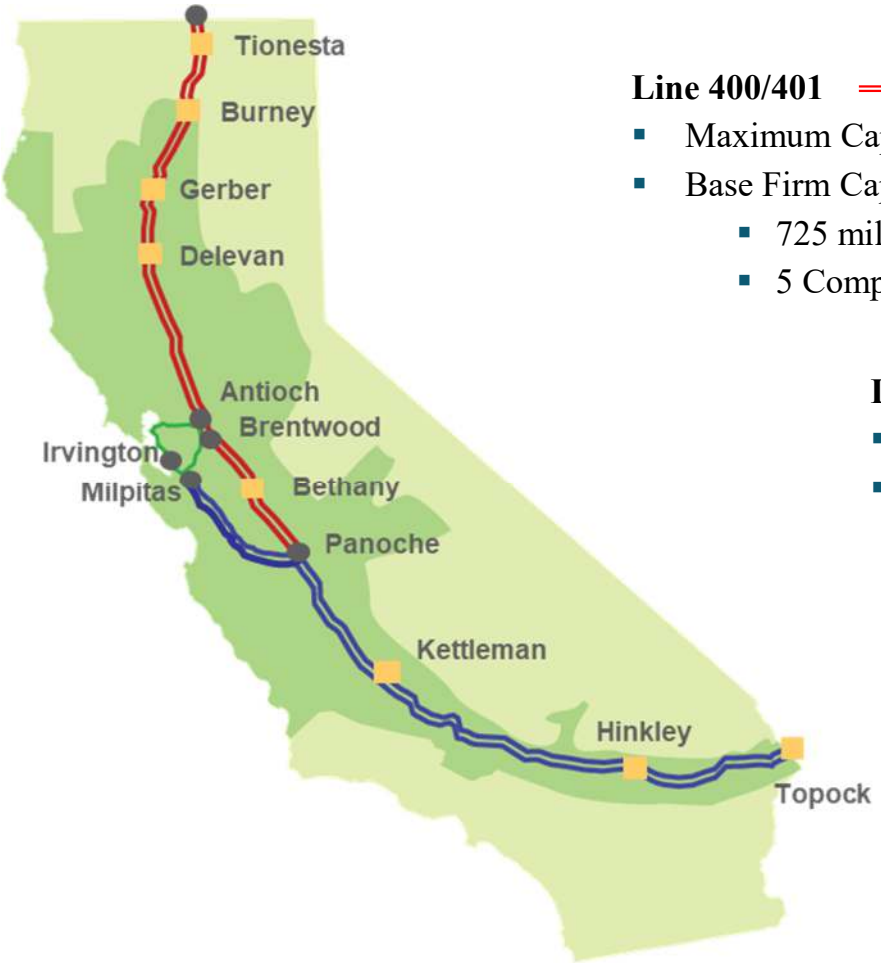
Presented by Roger Graham

July 21, 2020

PG&E Gas Transmission System



PG&E Backbone Transmission System Capacity



Line 400/401

- Maximum Capability = ~ 2,200 MMcfd
- Base Firm Capability = ~ 2,060 MMcfd
  - 725 miles of 36/42" dia. pipeline
  - 5 Compressor Sta. 110,000 HP

Line 300

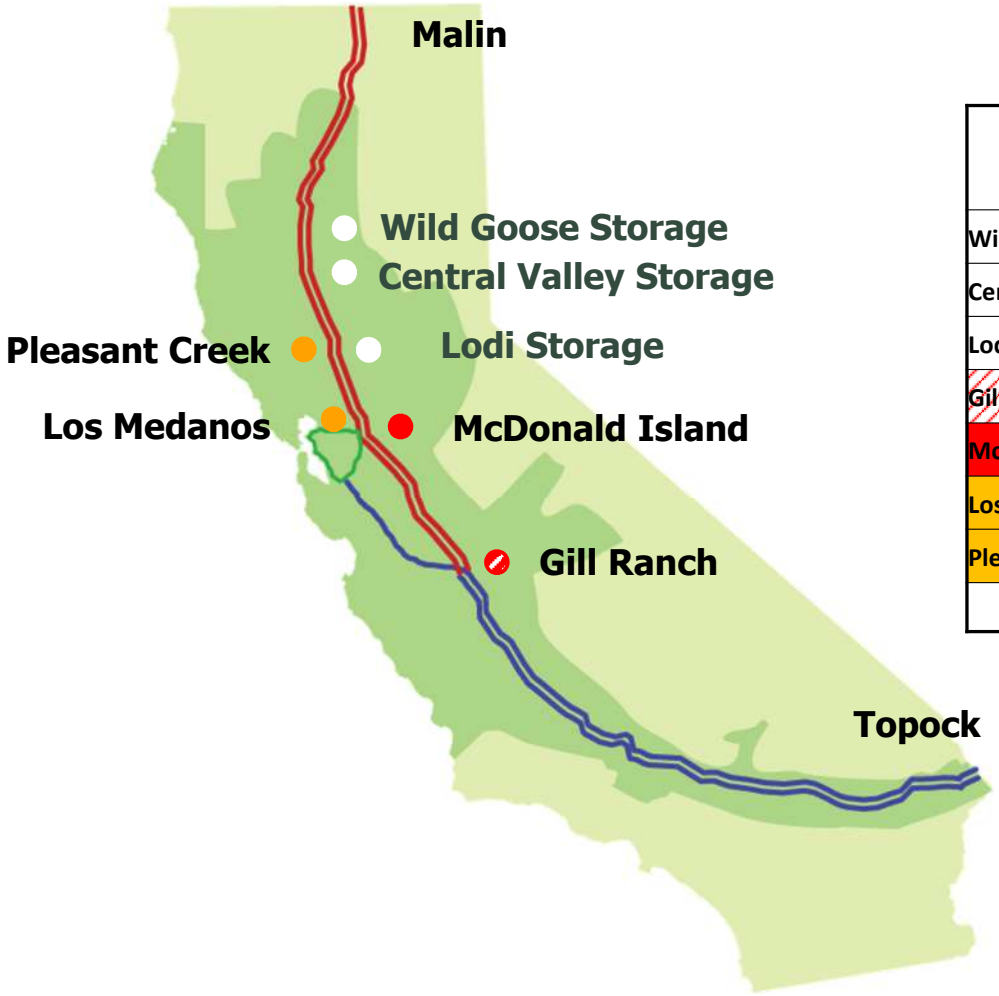
- Maximum Capability = ~ 1,000 MMcfd
- Base Firm Capability = ~ 960 MMcfd
  - 1000 miles of 34/34" dia. pipeline
  - 3 compressor sta. 95,000 HP

Silverado

- Historic flow = ~ 35 MMcfd

Total System Capacity = ~ 3,055 MMcfd

Northern California Storage Field Capacities



Gas Storage Field	Withdraw MMcfd	Injection MMcfd	Inventory Bcf
Wild Goose	960	525	75.0
Central Valley	300	300	32.0
Lodi	750	650	11.0
Gill Ranch	400	240	20.0
McDonald Island	757	295	10.0
Los Medanos (to be Retired)	250	0	14.8
Pleasant Creek (Retired)	0	0	0.0
Total	3417	2010	162.8

Issue 3

Should pipeline operating procedures, such as those for curtailments and operational flow orders, be uniform across the state? Would there be any market and reliability impacts if pipeline operating procedures were not uniform?

GAS NOMINATIONS AND PG&E'S SYSTEM

Nomination Process – how gas gets on the system

- Marketers and Shippers nominate gas quantities on PG&E's electronic nomination system, "INSIDE*tracc"* and on upstream pipelines' nomination systems, e.g., El Paso, SoCal Envoy.
- INSIDE*tracc* checks contract Maximum Daily Quantity (MDQ), shipper's credit, and pipeline capacity, then Confirms quantity to flow
- INSIDE*tracc* shakes hands with upstream pipelines to agree on daily Scheduled quantity to flow
- The receipt point quantity less Shrinkage[1] is the Scheduled quantity Delivered to the specified destination

[1]The pipeline takes some (~1%) of the scheduled gas for Gas Department Usage (GDU) and Lost and Unaccounted For (LUAF), called in-kind Shrinkage

FIVE GAS NOMINATION CYCLES

Cycle	Due	Confirmed	Scheduled	Flow will be effective
TIMELY	11:00 a.m. day before	by 2:30 p.m.	by 3:00 p.m.	7:00 a.m. next day
EVENING	4:00 p.m. day before	by 6:30 p.m.	by 7:00 p.m.	7:00 a.m. next day
INTRADAY 1	8:00 a.m. gas day	by 10:30 a.m.	by 11:00 a.m.	12:00 p.m. the same day
INTRADAY 2	12:00 p.m. gas day	by 3:00 p.m.	by 3:30 p.m.	4:00 p.m. the same day
INTRADAY 3	5:00 p.m. gas day	by 7:30 p.m.	by 8:00 p.m.	8:00 p.m. the same day

- In the intraday nomination cycles, customers are not able to reduce scheduled volumes below the amount that has already flowed (EPSQ)

BALANCING SUPPLY AND USAGE

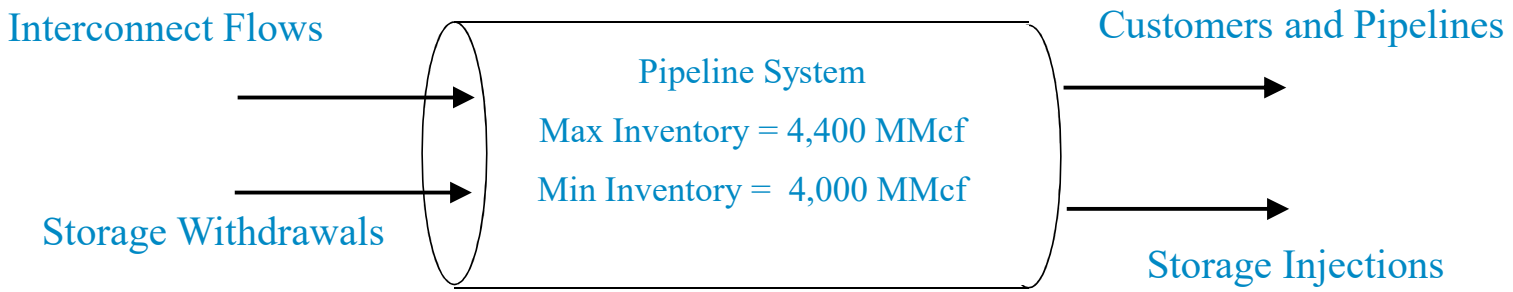
- An imbalance occurs when there is a difference between the amount of gas scheduled and the amount of gas burned.
- Customers are permitted to balance supplies and usage on a monthly basis – volumes exceeding the 5% tolerance band will need to be resolved in the following month.
- Customers are expected to balance supply and usage daily, but there are no noncompliance charges for daily imbalances except for OFO days.
- Excessive imbalances can cause the pipeline system inventory to exceed or fall below acceptable levels.

PLANNING AND FORECAST PROCESS

- PG&E's Senior Gas Transmission Coordinator forecasts the inventory to assure the safe operation of the pipeline
  - Supply – Demand = Imbalance
  - Imbalance => Change in Inventory
- The pipeline inventory plan is posted by the Senior five times per day (or 1,825 plans a year).
- This information is shown on the ***Pipe Ranger Operating Data*** page.
- Customers can view the Operating Data and identify when the inventory is trending toward an Operational Flow Order.

BALANCING AND INVENTORY MANAGEMENT

- Pipeline system inventory is a key management tool used by PG&E's Gas Control.
  - Too much inventory => maximum pressures are approached and compressors shut down.
  - Too little inventory => inadequate pressure to serve all loads.



- Interstate pipelines respond to demand changes more slowly than does on-system storage.

OPERATIONAL FLOW ORDERS (OFO)

- PG&E's objective is to keep inventory levels within a safe operating range.
- OFOs are PG&E's main tool to remedy high or low inventory conditions.
- An OFO is called based on supply forecast of scheduled volumes, interconnect capacity, outage schedules and historical patterns.
- The Lower and Upper Pipeline Inventory Limits may be revised as needed by PG&E to maintain the safety and reliability of the pipeline system.

Total Demand Forecast	**Pipeline Inventory Limits**	
	Lower Limit	Upper Limit
Demand > 2800 MMcf	4100 MMcf	4500 MMcf
Demand < 2800 MMcf	4000 MMcf	4400 MMcf

OPERATIONAL FLOW ORDERS (OFO)

- Tolerance band decreases with stages
- Noncompliance charge increases with stages
- OFO (with noncompliance charge) can be called until 6 p.m. Pacific Time prior to OFO event

	Tolerance Band	Noncompliance charge per DTH
Stage 1:	up to +/-25%	$0.25
Stage 2:	up to +/-20%	$1.00
Stage 3:	up to +/-15%	$5.00
Stage 4:	up to +/-5%	$25.00
Stage 5:	up to +/-5%	$25.00 plus DCI*

*The Daily Citygate Index (DCI) is the PG&E Daily Citygate Index Price as published in *Gas Daily*, rounded up to the next whole dollar.

HIGH-LEVEL COMPARISON BETWEEN PG&E AND SCG OFO RULES

PG&E's System (Gas Rule 14)	SoCalGas' System (Gas Rules 30/41)
5-stages OFO provision with multi- tolerance bands and noncompliance charge structure Stage 1: up to +/-25% $0.25/Dth Stage 2: up to +/-20% $1.00/Dth Stage 3: up to +/-15% $5.00/Dth Stage 4: up to +/-5% $25.00/Dth Stage 5: up to +/-5% $25.00/Dth plus DCI**** **** The DCI is the PG&E Daily Citygate Index Price as published in Gas Daily, rounded up to the next whole dollar. If the price is not published on a given day, the previous published price will apply.	Effective Oct 1 – May 31: 8-stages OFO provision with multi-tolerance bands and noncompliance charges Stage1: up to +/-25% $0.25/Dth Stage 2:up to +/-20% $1.00/Dth Stage 3:up to +/-15% $5.00/Dth Stage 3.1:up to +/-15% $10.00/Dth Stage 3.2:up to +/-15% $15.00/Dth Stage 3.3: up to +/-15% $20.00/Dth Stage 4: up to +/-10% $25.00/Dth Stage 5: up to +/-5% $25/Dth plus G-IMB rate Effective Jun 1- Sep 30: 5-stages OFO provision with multi-tolerance bands and noncompliance charges Stage 1:up to +/-25% $0.25/Dth Stage 2:up to +/-20% $1.00/Dth Stage 3:up to +/-15% $5.00/Dth Stage 4:up to +/-5% $5.00/Dth Stage 5:up to +/-5% $5.00/Dth + G-IMB rate

HIGH-LEVEL COMPARISON BETWEEN PG&E AND SCG OFO RULES

PG&E's System (Gas Rule 14)	SoCalGas' System (Gas Rules 30/41)
OFOs based on PG&E's forecast of pipeline inventory for the Gas Day is either below the Lower Pipeline Inventory Limit or above the Upper Pipeline Inventory Limit. Balancing function: 5.0 bcf inventory; 200 MMcf/d Injection and 300 MMcf/d Withdrawal (effective April 1, 2020 – D.19-09-025)	OFO will be issued if the system forecast of storage withdrawal or injection used for balancing exceeds the withdrawal or injection capacity allocated to the balancing function. System linepack will not be part of the formula for Low OFOs. Balancing function: Effective May 1, 2020, there are specified percentages allocated to balancing based on ACWP Not Met and ACWP Met for Summer (Apr 1-Oct 31) and Winter (Nov 1-Mar 31) for High OFO (Injection) and Low OFO (Withdrawal)
Charges for the first day of the OFO event will not be imposed if notice is given after 6:00 p.m. Pacific Time the day prior to the start of the OFO event.	Charges for the first day of the OFO event will not be imposed if notice is given after 8:00 p.m.* Pacific Time the day prior to the start of the OFO event.

HIGH-LEVEL COMPARISON BETWEEN PG&E AND SCG OFO RULES

PG&E's System (Gas Rule 14)	SoCalGas' System (Gas Rule 30/41)
OFO noncompliance charge exemption per balancing agent is equal or less 1,000 Dth per OFO	OFO noncompliance charge exemption per balancing agent is equal or less 1,000 Dth per OFO →Two other waive OFO noncompliance charges provisions related to cuts to previously scheduled BTS noms and EG customers special provisions.
OFO Forum	Utility Customer Forum
Quarterly OFO Reports posted on Pipe Ranger	Post-Forum Annual Report

PG&E'S RULES FOR LOCAL CURTAILMENTS

- **Local Curtailments of noncore customers are used to resolve capacity constraints in localized sections of PG&E's pipeline system. A Local Curtailment may be implemented when local system temperatures are expected to drop below Cold Winter Day temperatures. Local noncore customers may be required to curtail gas usage to ensure local core demands are met.**
- **Normally due to high heating demand during cold weather**
- **Cold Winter Day (CWD) Planning Criteria**
  - PG&E maintains local system capacity so that all demands, core and noncore, are met during a CWD (1:2 year recurrence interval). The system weighted mean temperature for CWD is about 37 degrees Fahrenheit.
- **Abnormal Peak Day (APD) Planning Criteria**
  - PG&E maintains local system capacity so that all core demands are met during an Abnormal Peak Day (APD) (1:90 year recurrence interval). The system weighted mean temperature for APD is about 28 degrees Fahrenheit.

PG&E'S RULES FOR LOCAL CURTAILMENTS

- **There are three stages for Local Curtailments:**
  - Stage 1: Temperatures between CWD and near a Midpoint temperature halfway between an APD and a CWD.
  - Stage 2: Temperatures near a Midpoint temperature and near an APD.
  - Stage 3: Temperatures at or colder than APD or if local area operational problems occur.

- **Local systems have been divided into curtailment zones.**
- **The amount of required curtailment for each zone is calculated from the forecast temperature and demand.**
- **All customers within a zone are required to curtail an equal percentage of their typical winter demand.**
- **Local curtailment noncompliance charges equal to $50.00/Dth plus the Daily Citygate Index ($50 + DCI*) pursuant to gas Rule 14.**

***The Daily Citygate Index is the PG&E Daily Citygate Index Price as published in Gas Daily, rounded up to the next whole dollar.**

RESULTS OF LOCAL CURTAILMENTS

➢ Most recent local curtailments due to cold weather

EVENT DATE	IMPACTED CUSTOMERS	IMPACTED AREAS	DURATION (DAYS)	REASON
DEC 1998	75	VARIOUS AREAS	3	EXTREME COLD WEATHER
JAN 2007	86	SAN JOAQUIN	1	UNUSUALLY COLD WEATHER
DEC 2008	1	NORTH VALLEY	1	UNUSUALLY COLD WEATHER
JAN 2012	1	NORTH BAY	1	UNUSUALLY COLD WEATHER
DEC 2013	82*	SACRAMENTO AREA	4*	UNUSUALLY COLD WEATHER

* A total of 82 customers were curtailed over 4 days but the number curtailed each day was less than 82.

RESULTS OF OPERATIONAL FLOW ORDERS (OFO)

- **OFO Summary Table for 2018 through June 2020**

Stages Declared (High OFOS)	2018	2019	January-June 2020
Stage 1 @ $0.25/Dth	48	53	29
Stage 2 @ $1.00/Dth	16	12	0
Stage 3 @ $5.00/Dth	0	0	0
Stage 4 @ $25/Dth	0	0	0

RESULTS OF OPERATIONAL FLOW ORDERS (OFO)

- **OFO Summary Table for 2018 through June 2020**

Stages Declared (Low OFOS)	2018	2019	January-June 2020
Stage 1 @ $0.25/Dth	16	33	19
Stage 2 @ $1.00/Dth	14	12	0
Stage 3 @ $5.00/Dth	1	4	0
Stage 4 @ $25/Dth	0	5	0
Stage 5 @ $25+DCI/Dth	0	0	0

SHOULD OFO RULES BE CONSISTENT STATEWIDE?

- Current PG&E's OFO rules appear to be working effectively; however, PG&E is open to increasing the number of OFO stages for alignment with SCG winter structure.
- Limiting the OFO noncompliance charge to $5/Dth is not productive and potentially harmful. The gas system must be operated within safe maximum and minimum pressures. Other than storage, PG&E Gas Operations has zero control over the supplies nominated into the system; therefore, there must be sufficient economic signals for supplies to balance demands.
- PG&E's physical pipeline constraints and operating conditions are different than SCG; therefore, it makes sense for the OFO triggers to be different.
- PG&E Citygate has greater liquidity and the gas market has access to multiple storage service providers.
- OFO Day Scheduled Quantity Adjustments (SQA) have not been implemented on PG&E's system. PG&E customers have not been asking for such a tool.

Thank You

R.20-01-007 Track 1B Workshop

Potential Uniformity of Pipeline Operating Procedures

July 21, 2020

SoCalGas

A Sempra Energy utility®

Glad to be of service.®

Agenda

- Purpose
- Current Situation
- D.19-05-030
- D.19-05-030 Outcomes
- July 23 2019 Aliso Canyon Withdrawal Protocol (ACWP)
- ACWP Impact on Low OFOs

Purpose

- Participants will present on whether pipeline operating procedures, such as operational flow orders and curtailment rules, should be uniform across the state and whether lack of uniformity has the potential to cause market or reliability impacts

Current Situation

- Lack of uniformity between SoCalGas and PG&E exists due to different operational considerations and pipeline configurations
- Curtailment Rules have been dissimilar since the PG&E Gas Accord was implemented in 1998, and SoCalGas' additional changes in 2016 promoted increased gas-electric coordination
- Adoption of the SoCalGas low OFO procedures in June 2015 temporarily aligned balancing procedures, addressing observed reliability impacts to SoCalGas in previous years resulting from misalignment
- Changes to the OFO Stages and Noncompliance Charge structure adopted in the low OFO PFM (D.19-05-030) in June 2019 misaligned SoCalGas' ability to respond to supply shortages from PG&E

SoCalGas OFO Triggers

- A High OFO is declared if, on a day prior to this Gas Day, in the sole judgment of Gas Control, the system forecast of storage injection required for balancing exceeds the injection capacity allocated to the balancing function

- A Low OFO is declared if, on a day prior to this Gas Day, in the sole judgment of Gas Control, the system forecast of storage withdrawal required for balancing exceeds the withdrawal capacity allocated to the balancing function

- OFOs have stages and tolerance bands and are only declared on Evening (Cycle 2) and Intraday 1 (Cycle 3) by 8PM on the day prior to the Gas Day

D.19-05-030 Resolving Joint Petition for Modification of D.15-06-004 and D.16-06-039

- D.19-05-030 was issued on May 30, 2019. The decision granted in part and denied in part:
  - The August 15, 2018 petition for modification filed by Southern California Edison (SCE) and Southern California Generation Coalition (SCGC) of D.15-06-004 and D.16-06-039
  - The April 2, 2019 Settling Parties' Motion for adoption of the Settlement Agreement
  - The decision adopted the Settlement Agreement from October 1 – May 31 and the Petitioners' request for a $5/Dth cap on the OFO noncompliance charge for Stage 4 and Stage 5 Low OFOs from June 1 – September 30
  - This temporary structure is in place through October 31, 2021. However, extensions could be discussed at the Utility Customer Forums

D.19-05-030 Outcome

OFO Noncompliance Structure June 1 – September 30		
Stage	Daily Imbalance Tolerance	Noncompliance Charge ($/Dth)
1	Up to +/-25%	0.25
2	Up to +/-20%	1.00
3	Up to +/-15%	5.00
4	Up to +/-5%	5.00
5	Up to +/-5%	5.00 plus G-IMB daily balancing standby rate
EFO	Zero	50.00 plus G-IMB daily balancing standby rate

OFO Noncompliance Structure October 1 – May 31		
Stage	Daily Imbalance Tolerance	Noncompliance Charge ($/Dth)
1	Up to +/-25%	0.25
2	Up to +/-20%	1.00
3	Up to +/-15%	5.00
3.1	Up to +/-15%	10.00
3.2	Up to +/-15%	15.00
3.3	Up to +/-15%	20.00
4	Up to +/-10%	25.00
5	Up to +/-5%	25.00 plus G-IMB daily balancing standby rate
EFO	Zero	50.00 plus G-IMB daily balancing standby rate

Low OFO tolerances for all stages are capped at up to -5% until Aliso Canyon's withdrawal capacity is available without constraint to the System Operator for load balancing. The daily balancing standby rate is not applicable to High OFOs.

D.19-05-030 Outcome

- Prior to D.19-05-030, the OFO stages and noncompliance charges were identical for both SoCalGas and PG&E
- OFO triggering mechanisms are and remain dissimilar because of operational differences between the respective systems
- The adopted $5 per Dth ceiling on Summer Noncompliance charges has not been tested since implementation of the decision
  - The subsequent implementation of the revised July 23, 2019 ACWP has dampened low OFO activity and potential price spikes since its implementation

July 23, 2019 Aliso Canyon Withdrawal Protocol (ACWP)

- On July 23, 2019, the Commission's Energy Division issued a revised ACWP replacing the November 2, 2017 version in its entirety. The revised ACWP authorizes SoCalGas to withdraw gas from Aliso Canyon only if any of the following conditions are met:

1. Preliminary low Operational Flow Order (OFO) calculations for any cycle result in a Stage 2 low OFO or higher for the applicable gas day;
2. Aliso Canyon is above 70% of its maximum allowable inventory between February 1 and March 31; in such case, SoCalGas may withdraw from Aliso Canyon until inventory declines to 70% of its maximum allowable inventory;
3. The Honor Rancho and/or La Goleta fields decline to 110% of their month-end minimum inventory requirements during the winter season; and/or
4. There is an imminent and identifiable risk of gas curtailments created by an emergency condition that would impact public health and safety or result in curtailments of electric load that could be mitigated by withdrawals from Aliso Canyon

ACWP Impact on Low OFOs

» The ACWP probably helped SoCalGas and SDG&E customers avoid Low OFOs on 44 out of the 57 days it was implemented

	Aliso Canyon Withdrawal Protocol Events	Low OFO Declared
Condition Met	57	13
Condition 1 – Cycle 1	36	9
Condition 1 – Cycle 2	15	2
Condition 1 – Cycle 3	5	2
Condition 4	1	

» There were 13 ACWP event days when a Low OFO was not avoided
- For two of these events, a Low OFO had already been declared
- For the remaining 11 events, customer imbalances were too high to be fully mitigated by the availability of Aliso Canyon's withdrawal capacity

Conclusions

- Curtailment rules seek to respond to local supply issues and should remain utility-specific based on operational differences between the respective utility systems
- OFO rules exist to cause supply delivery in an open market and the utilities should have similar tools available to respond to market behavior
- The short-term evidence suggests the July 23, 2019 ACWP eliminated the need for many low OFOs, but the 2019 Summer was milder than 2018
- The temporary low OFO PFM rules adopted in the PFM decision have been unnecessary in light of the July 23, 2019 ACWP, could hinder SoCalGas' ability to cause deliveries during times of system stress, and should not be continued as a "price mitigation" tool

3. Should pipeline operating procedures, such as those for curtailments and operational flow orders, be uniform across the state? Would there be any market and reliability impacts if pipeline operating procedures were not uniform?

Norman Pedersen, Hanna and Morton, LLP, and
Catherine E. Yap, Barkovich & Yap, Inc.
on behalf of Southern California Generation Coalition
July 21, 2020

The PG&E and SoCalGas rules for Operational Flow Orders diverge.

PG&E's schedule of OFO tolerance bands and noncompliance charges:

	Tolerance Band as % of Usage	Noncompliance Charge $/Dth
Stage 1	up to +/-25%	$0.25
Stage 2	up to +/-20%	$1.00
Stage 3	up to +/-15%	$5.00
Stage 4	up to +/-5%	$25.00
Stage 5	up to +/-5%	$25.00 + Daily Citygate Index*

SoCalGas has two OFO schedules, one for summer, June 1 – September 30:

Stage	Daily Imbalance Tolerance	Noncompliance Charge ($/therm)
1	Up to +/-25%	0.025
2	Up to +/-20%	0.10
3	Up to +/-15%	0.50
4	Up to +/-5%	0.50
5	Up to +/-5%	0.50 plus Rate Schedule G-IMB daily balancing standby rate
EFO	Zero	5.00 plus Rate Schedule G-IMB daily balancing standby rate

The key difference between the PG&E year-round schedule and the SoCalGas summer schedule is that the SoCalGas noncompliance charge is capped at $5.00/Dth for OFO Stages 3, 4, and 5.

- However, the imbalance tolerance cap declines from 15% for Stage 3 to 5% for Stage 4, the same as for PG&E.

There is a reason for the $5.00/Dth cap on noncompliance charges for Stages 3, 4, and 5:

- The cap prevents market anticipation of high OFO penalties from being a driver of SoCalGas citygate prices for gas during the summer Electric Generation peak burn period.

SoCalGas has a second OFO schedule for winter months, October 1 – May 31:

Stage	Daily Imbalance Tolerance[1]	Noncompliance Charge ($/therm)
1	Up to +/-25%	0.025
2	Up to +/-20%	0.10
3	Up to +/-15%	0.50
3.1	Up to +/-15%	1.00
3.2	Up to +/-15%	1.50
3.3	Up to +/-15%	2.00
4	Up to +/-10%	2.50
5	Up to +/-5%	2.50 plus Rate Schedule G-IMB daily balancing standby rate
EFO	Zero	5.00 plus Rate Schedule G-IMB daily balancing standby rate

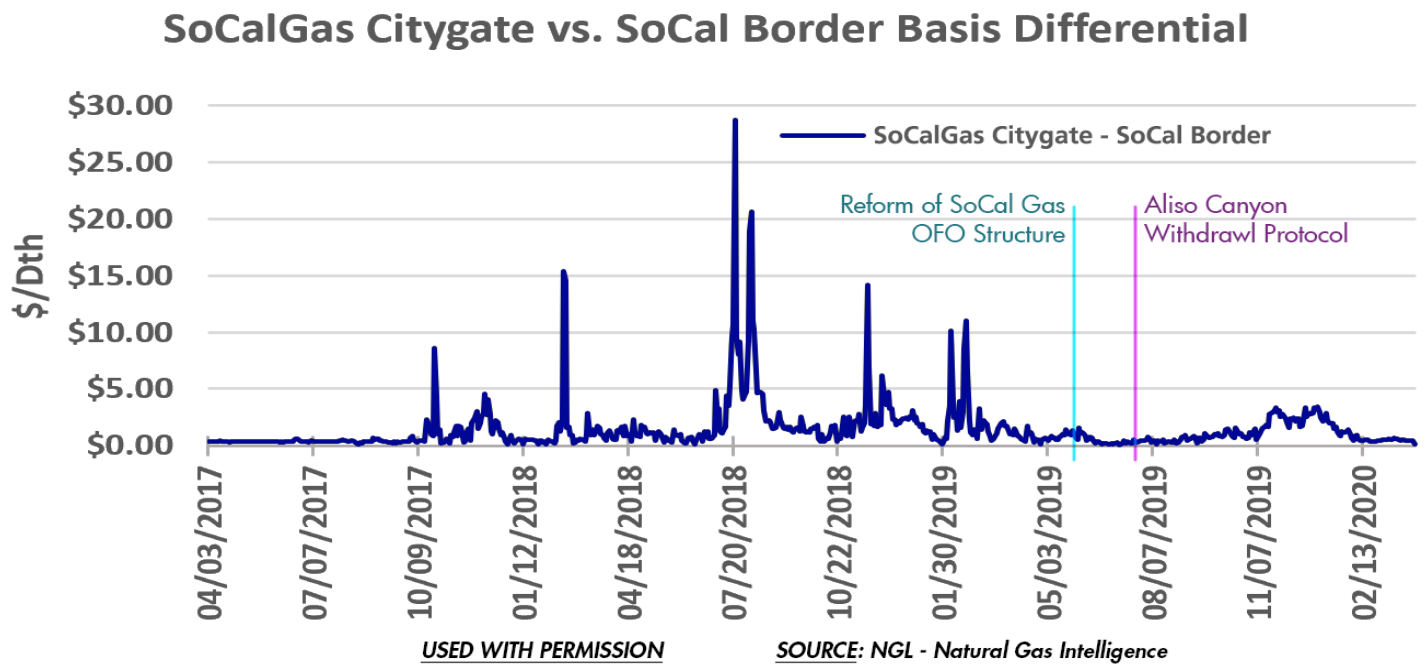
[1] Negative daily imbalance tolerances for all stages are capped at up to -5% until Aliso Canyon's withdrawal capacity is available without constraint to the System Operator for load balancing.

The noncompliance charges increase more gradually than PG&E's non-compliance charges.

The SoCalGas winter schedule's more gradual increase in noncompliance charges is preferable to PG&E's simplified schedule for SoCalGas.

- The purpose of a noncompliance charge is to give transporters an incentive to buy gas instead of incurring a non-compliance charge.
- The SoCalGas approach permits the utility to more precisely fit the noncompliance charge and the stage of the OFO to citygate market conditions.

SoCalGas citygate-border differential declined after the reform of the SoCalGas OFO structure and the adoption of the Aliso Canyon Withdrawal Protocol.



USED WITH PERMISSION

SOURCE: NGL - Natural Gas Intelligence

The evidence shows that the reformed OFO structure for SoCalGas has contributed to reducing citygate-border differential.

- If there is to be any change in OFO protocols, PG&E should move in the direction of SoCalGas's more graduated winter OFO schedule.

Thank you for your attention


Questions or comments?
Submit questions in the chat or raise your hand

Closing Remarks

- In September, a staff report will be published providing recommendations based on feedback and input from the workshops or, at a minimum, a range of options for resolving the issues. Parties will have an opportunity to provide comments on the staff report.
- Thank you!