

## DOCKETED

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# North American Natural Gas Macro

California Energy Commissioner Workshop  
on Natural Gas Market Trends and Outlook  
October 9<sup>th</sup>, 2017

# Cautionary Language

## Regarding Forward-Looking Statements

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This presentation contains forward-looking statements. These forward-looking statements are identified as any statement that does not relate strictly to historical or current facts. In particular, statements, express or implied, concerning future actions, conditions or events, future operating results or the ability to generate revenues, income or cash flow or to make distributions or pay dividends are forward-looking statements. Forward-looking statements are not guarantees of performance. They involve risks, uncertainties and assumptions. Future actions, conditions or events and future results of operations of Kinder Morgan Energy Partners, L.P., Kinder Morgan Management, LLC, El Paso Pipeline Partners, L.P., and Kinder Morgan, Inc. may differ materially from those expressed in these forward-looking statements. Many of the factors that will determine these results are beyond Kinder Morgan's ability to control or predict. These statements are necessarily based upon various assumptions involving judgments with respect to the future, including, among others, the ability to achieve synergies and revenue growth; national, international, regional and local economic, competitive and regulatory conditions and developments; technological developments; capital and credit markets conditions; inflation rates; interest rates; the political and economic stability of oil producing nations; energy markets; weather conditions; environmental conditions; business and regulatory or legal decisions; the pace of deregulation of retail natural gas and electricity and certain agricultural products; the timing and success of business development efforts; terrorism; and other uncertainties. There is no assurance that any of the actions, events or results of the forward-looking statements will occur, or if any of them do, what impact they will have on our results of operations or financial condition. Because of these uncertainties, you are cautioned not to put undue reliance on any forward-looking statement.

# Agenda

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- North American Overview
- Power Generation & Renewables
- Impacts to Pipeline Deliverability

# Kinder Morgan Asset Map

- **Largest natural gas network in North America**

- Own or operate ~70,000 miles of natural gas pipeline
- Connected to every important natural gas resource play in the U.S.

- **Largest independent transporter of petroleum products in North America**

- Transport ~2.1 MMBbl/d(a)

- **Largest transporter of CO2 in North America**

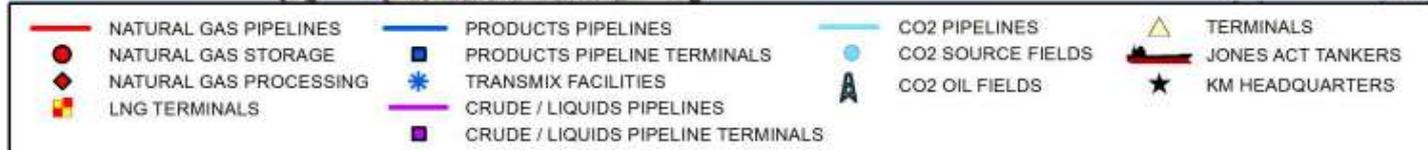
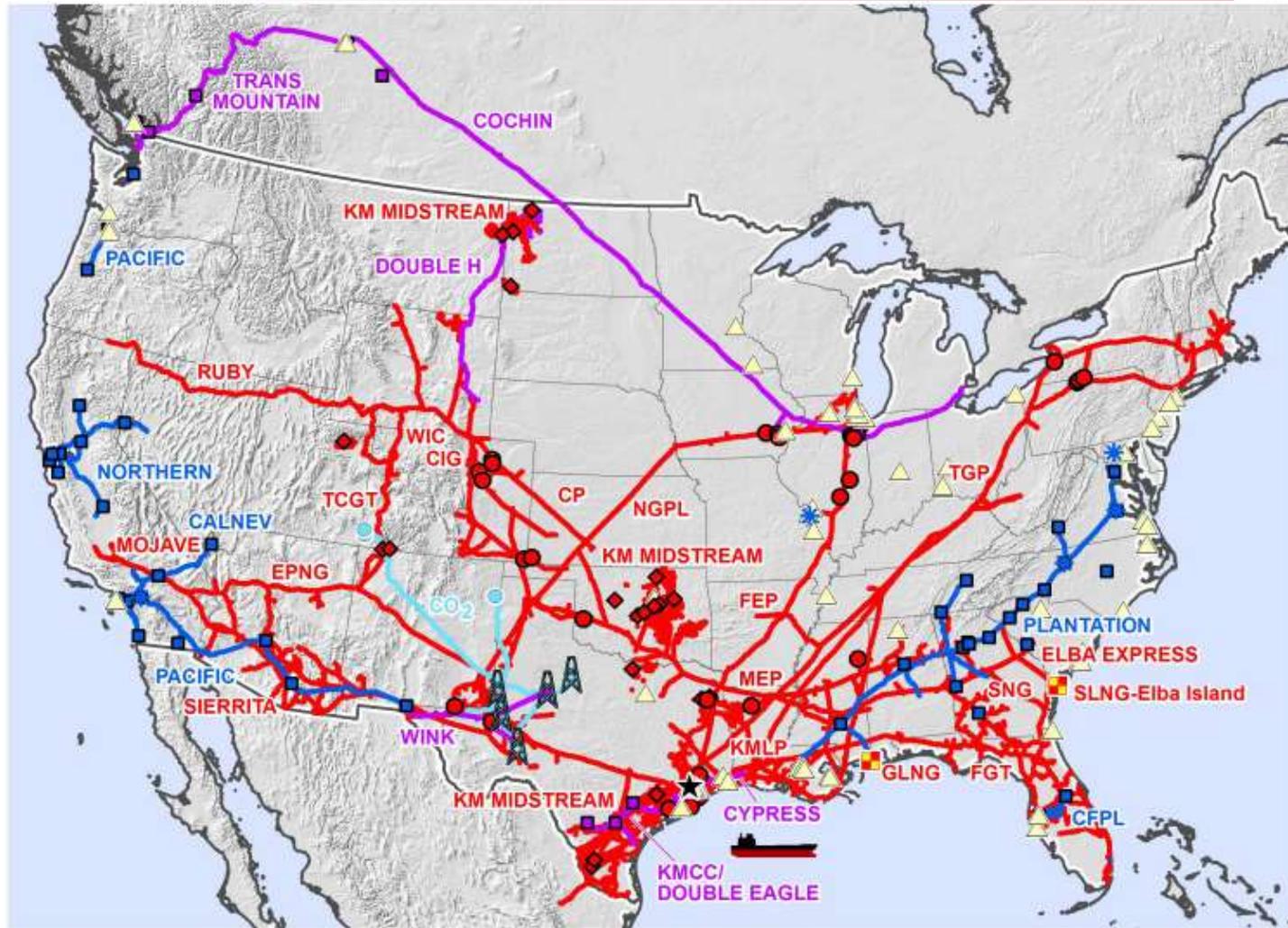
- Transport ~1.3 Bcf/d of CO2(a)

- **Largest independent terminal operator in North America**

- Own or operate ~155 terminals
- ~152 MMBbls liquids capacity
- Handle ~53 MMtons of dry bulk products(a)
- Own 16 Jones Act vessels (including 2 under construction)

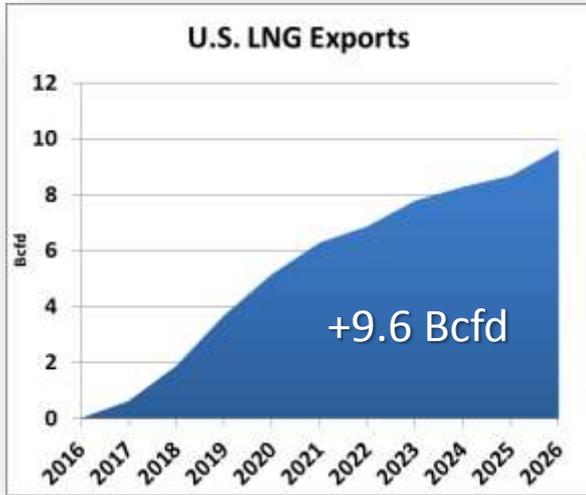
- **Only Oilsands pipeline serving the West Coast**

- Transports ~300 MBbl/d to Vancouver / Washington State; planned expansion takes capacity to 890 MBbl/d

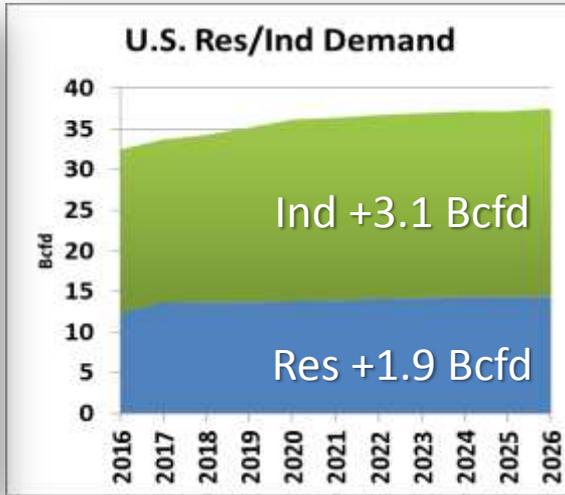


(a) 2017 Budget

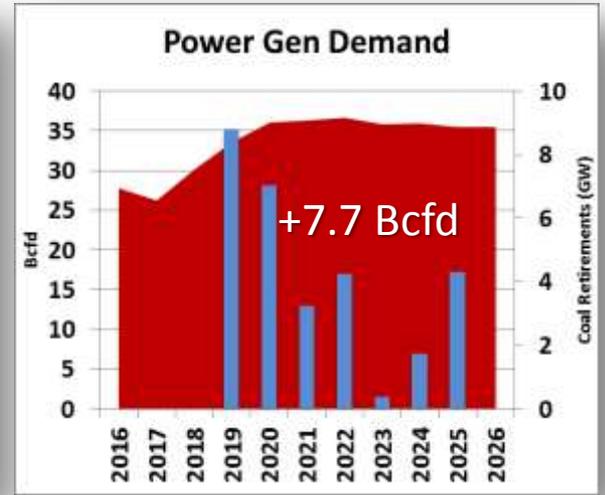
# Current Key Trends



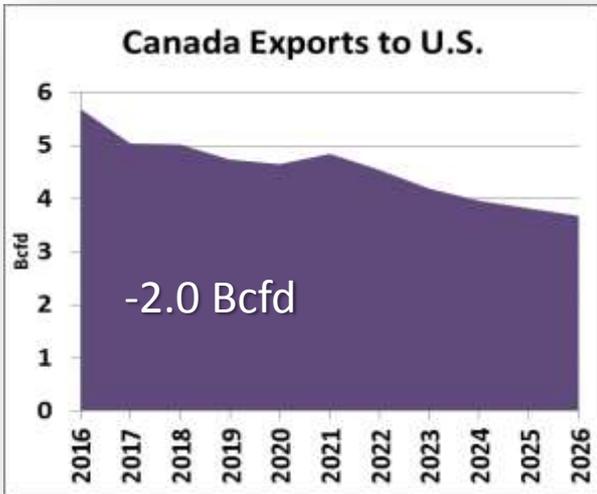
**U.S. becomes net exporter**



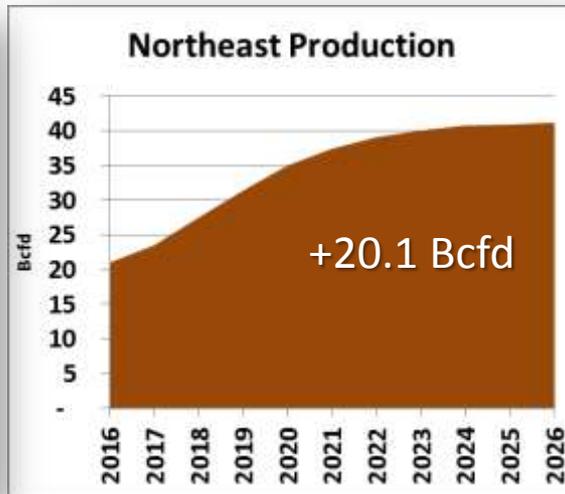
**Industrial demand growth**



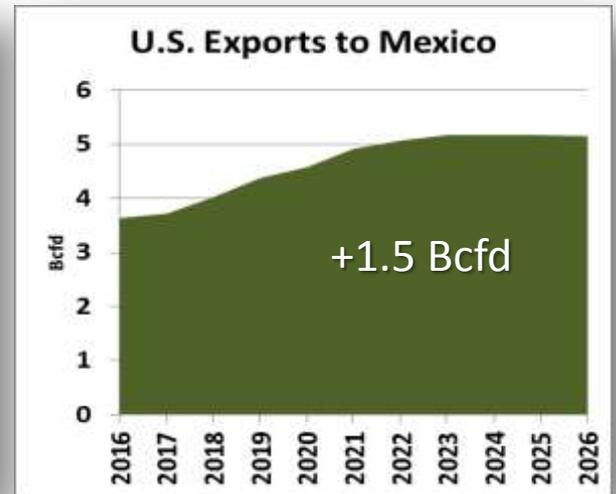
**Gas-fired generation increases**



**Less Canadian Exports to U.S.**



**Continued supply increases**

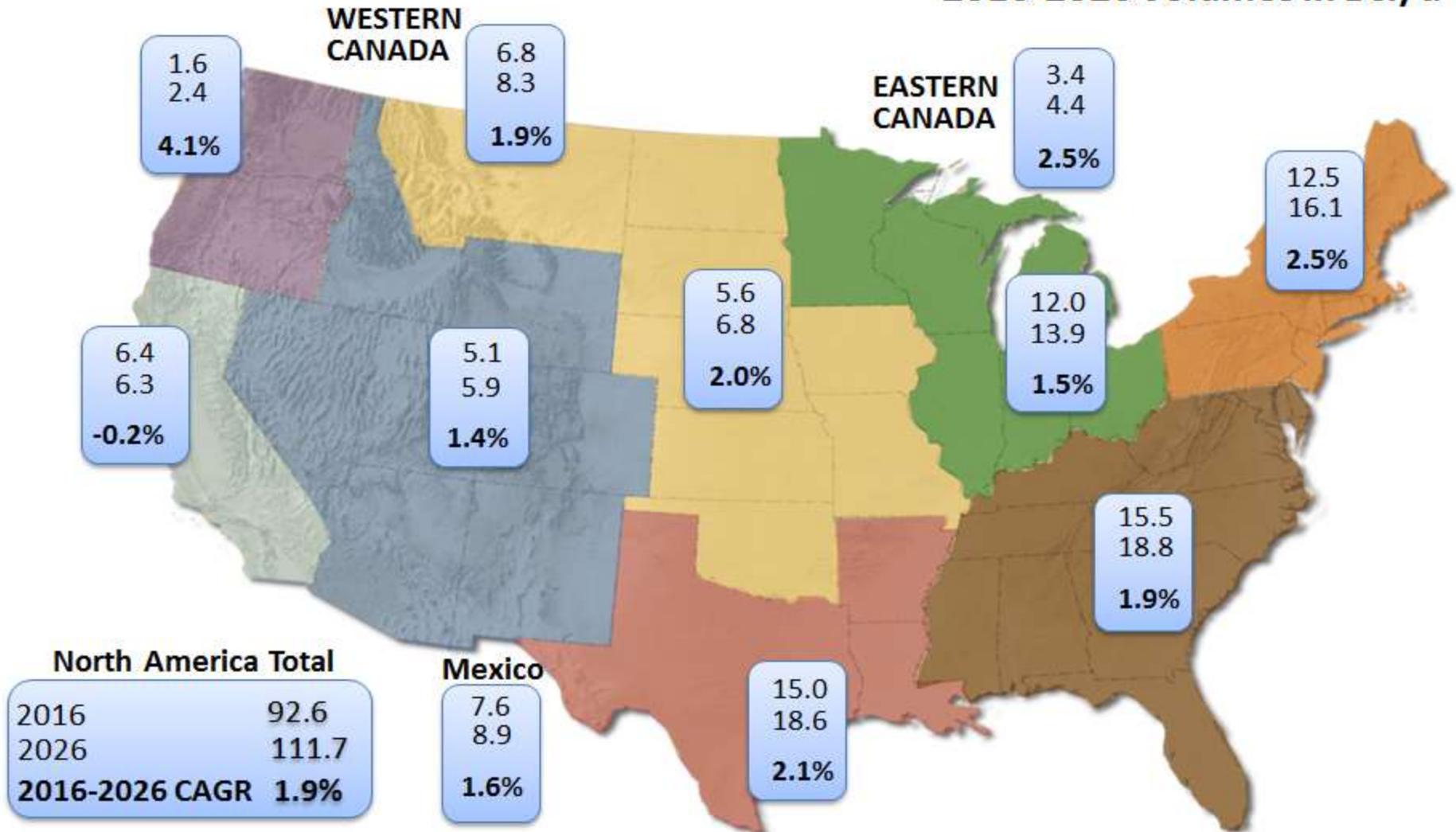


**More U.S. Exports to Mexico**

# Demand

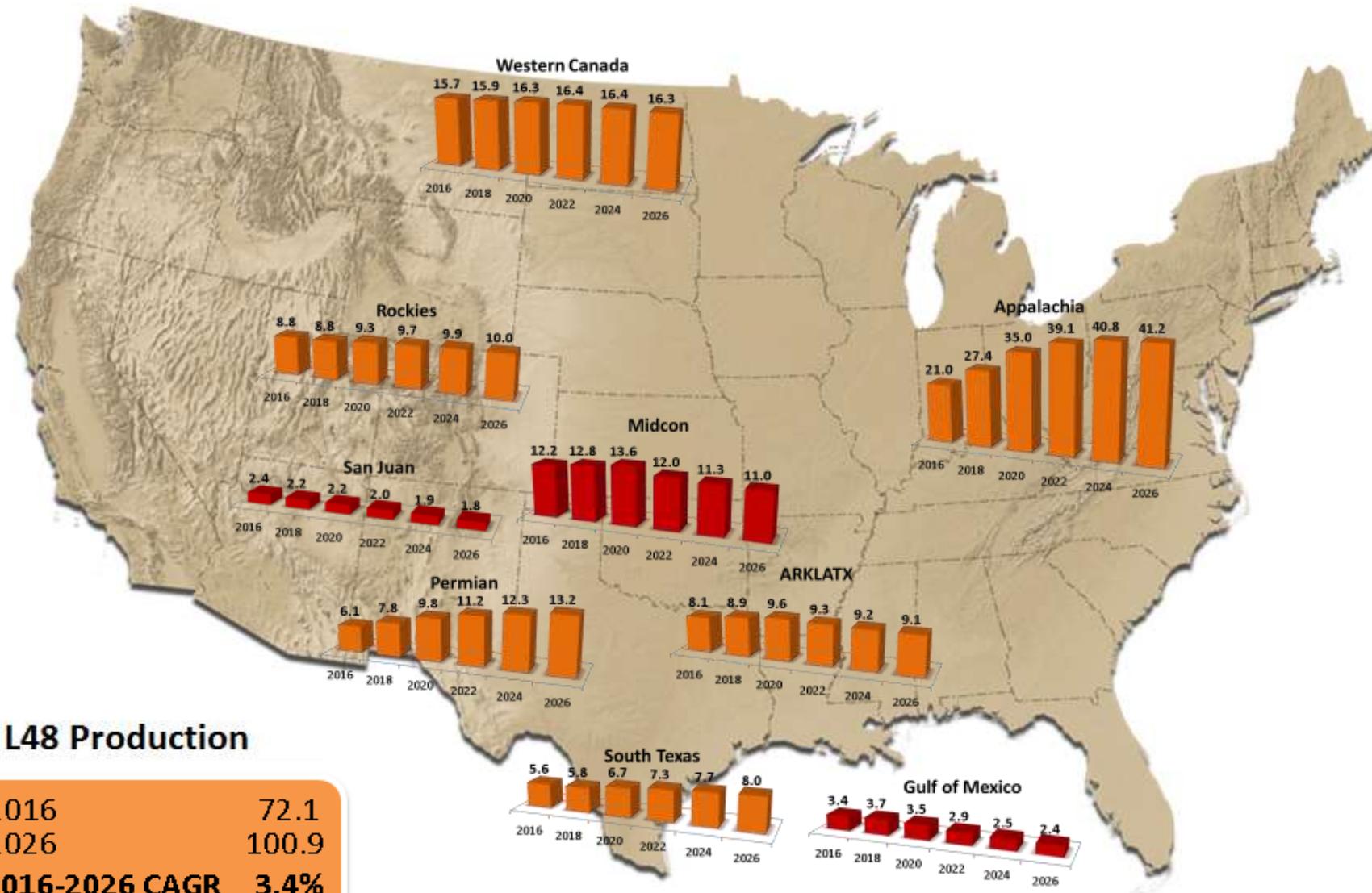
(Not Including Exports)

2016-2026 Volumes in Bcf/d



# Supply

(Dry Gas – Bcf/d)



## L48 Production

2016	72.1
2026	100.9
<b>2016-2026 CAGR</b>	<b>3.4%</b>

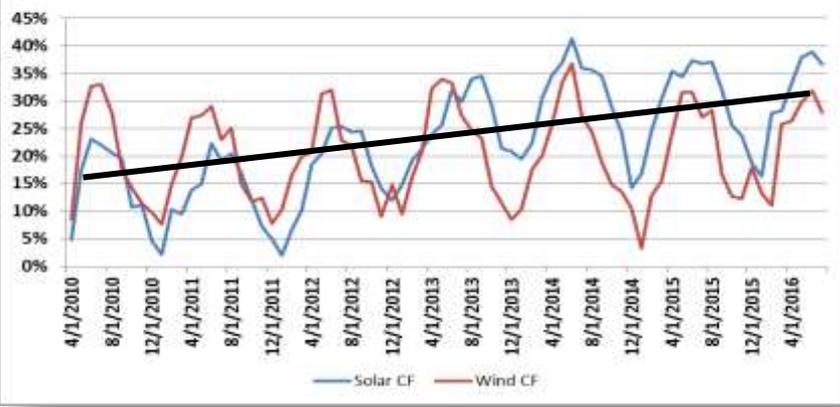


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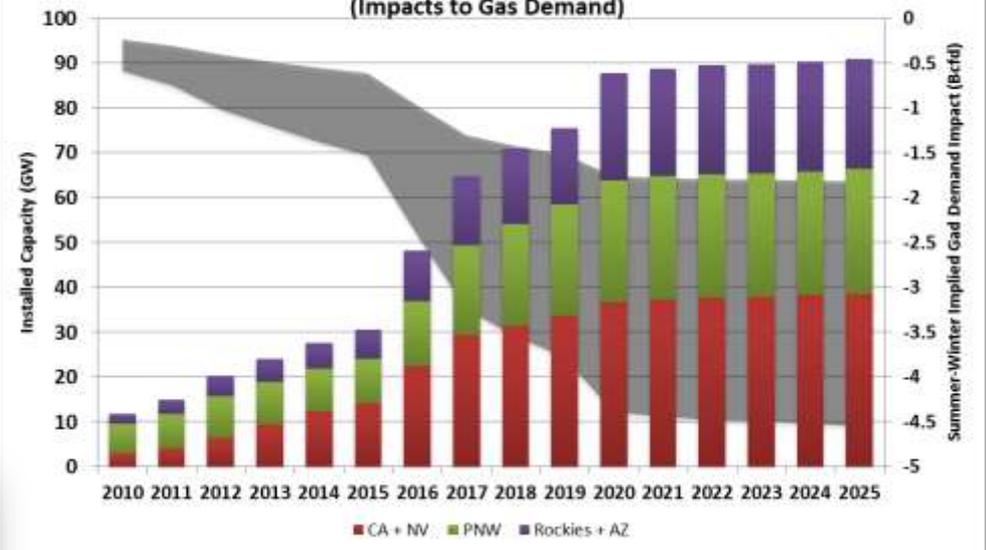
# Power Generation

# Renewable Growth

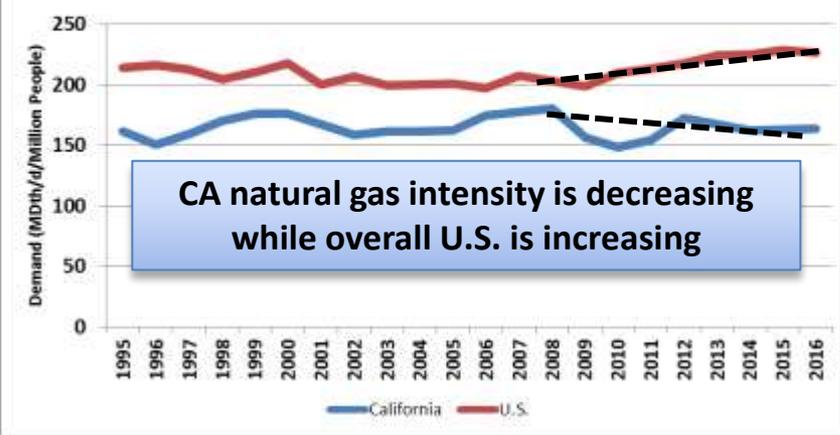
CAISO Wind and Solar Capacity Factor



Wind and Solar Power (Impacts to Gas Demand)



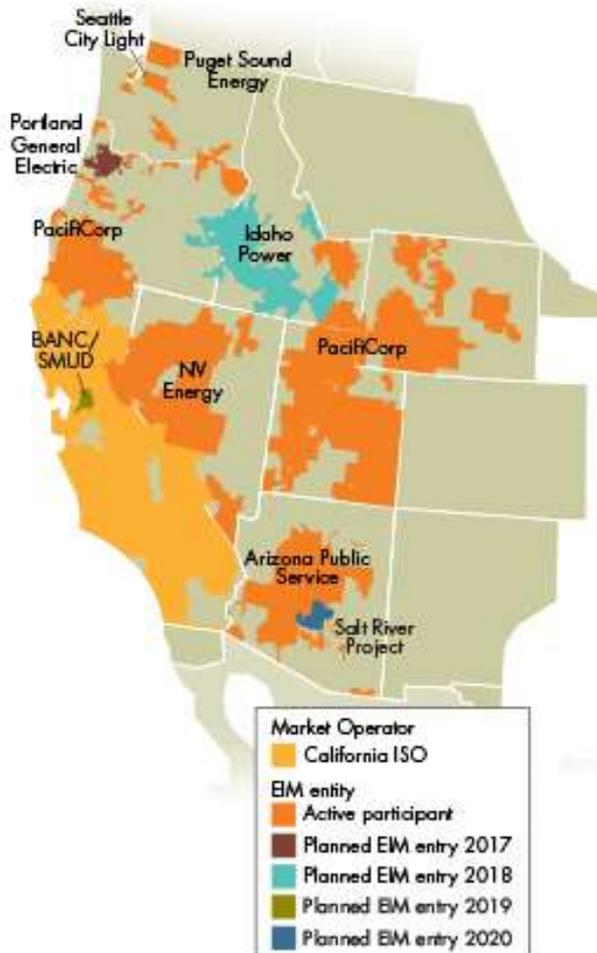
U.S. L48 vs CA Population Weighted Natural Gas Demand



Source: Existing to planned capacity from Velocity Suite; Gas demand impacts derived from ICF International generation forecast data

Given the projections for existing and new renewable power, the West Region may see a maximum demand destruction in power gen of 3.2 Bcfd (1.8 winter to 4.5 summer) by 2025.

# Energy Imbalance Market (EIM)



The EIM seeks to optimize generation resources across a broad power market region to reduce costs and emissions:

- ✓ Minimizes sub-hourly dispatch
- ✓ Reduces reserve capacity requirements
- ✓ Reduces renewable generation curtailments

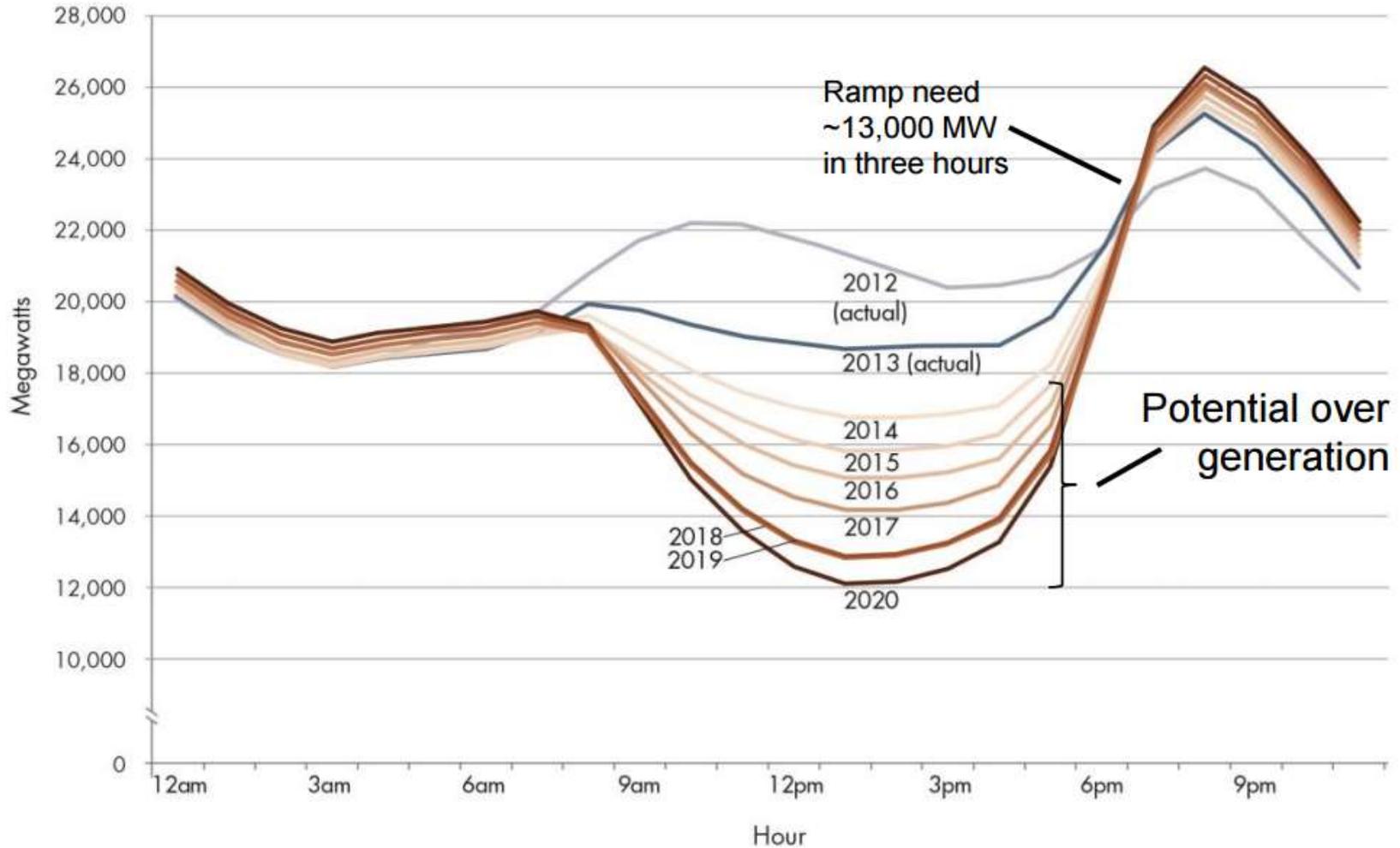
Seattle City Light, Portland General Electric, Idaho Power, and Salt River Project will also join the EIM

100-200 MMcfd net reduction to WECC region gas demand

Since its inception, EIM has saved \$146 MM and averaged 5 MMcfd of reduced gas-fired generation demand in 2016

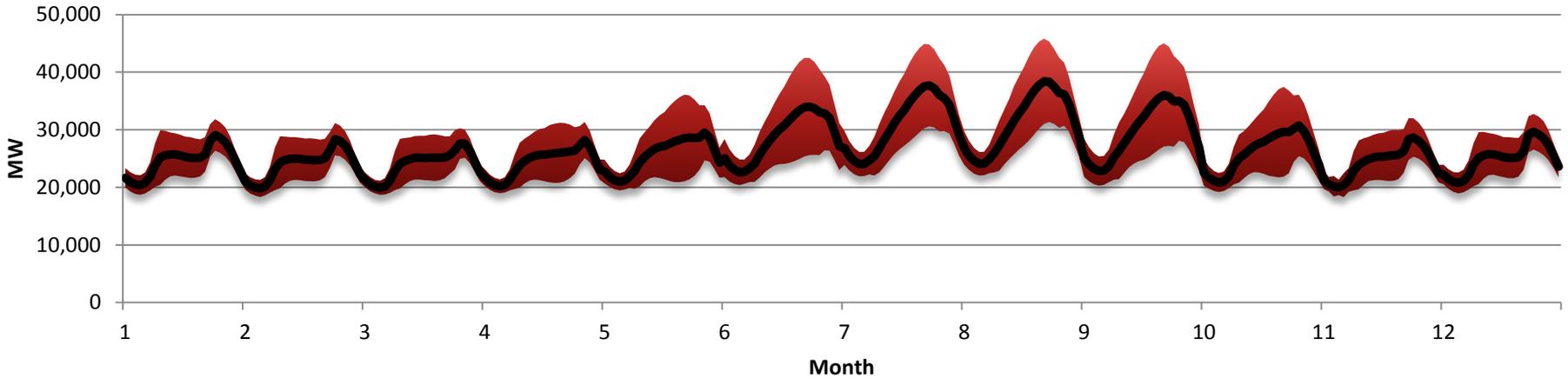
# California ISO "Duck Curve"

Net load - March 31

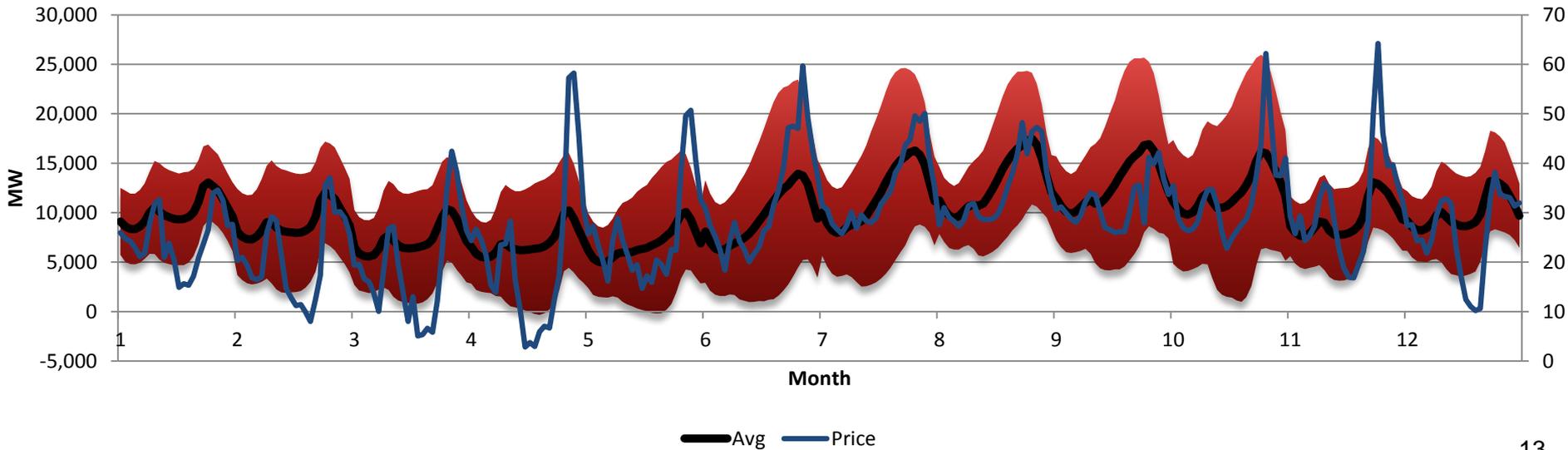


# CAISO Load & Thermal Generation

## CAISO Monthly Avg. Hourly Total Load

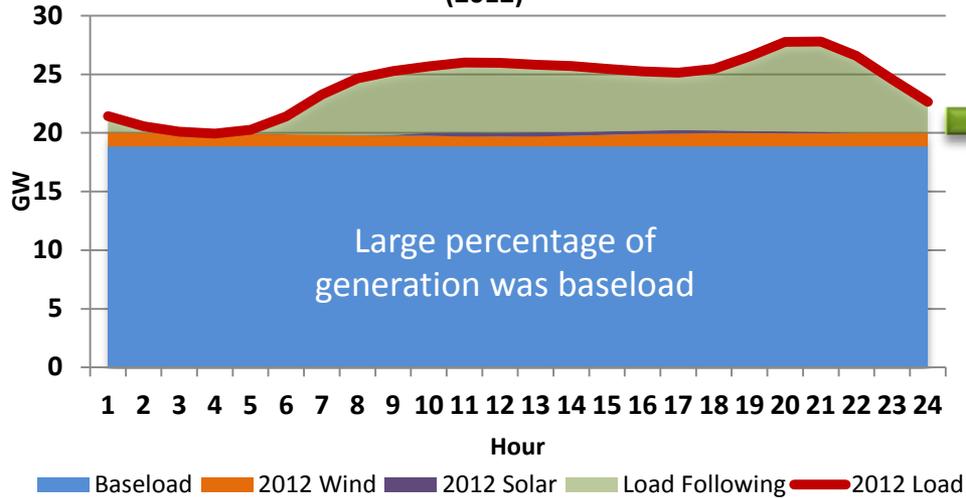


## CAISO Monthly Avg. Hourly Thermal Generation

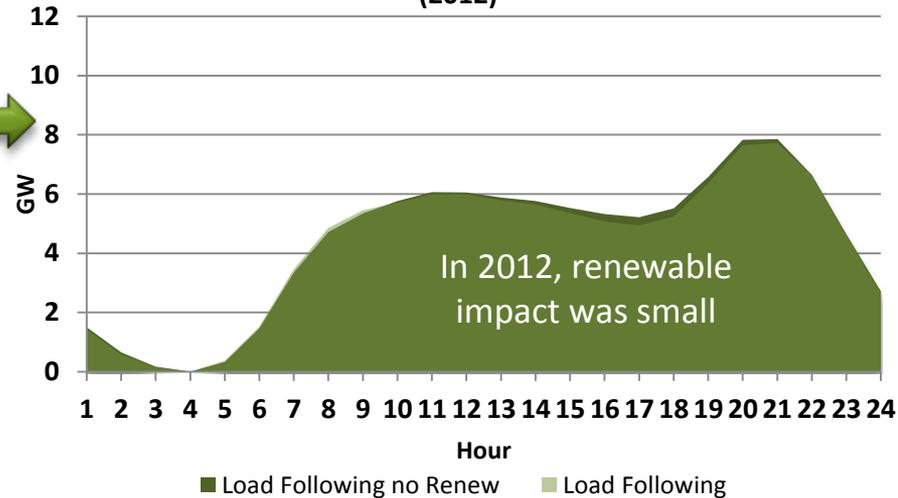


# CAISO Renewables 2012 to 2017

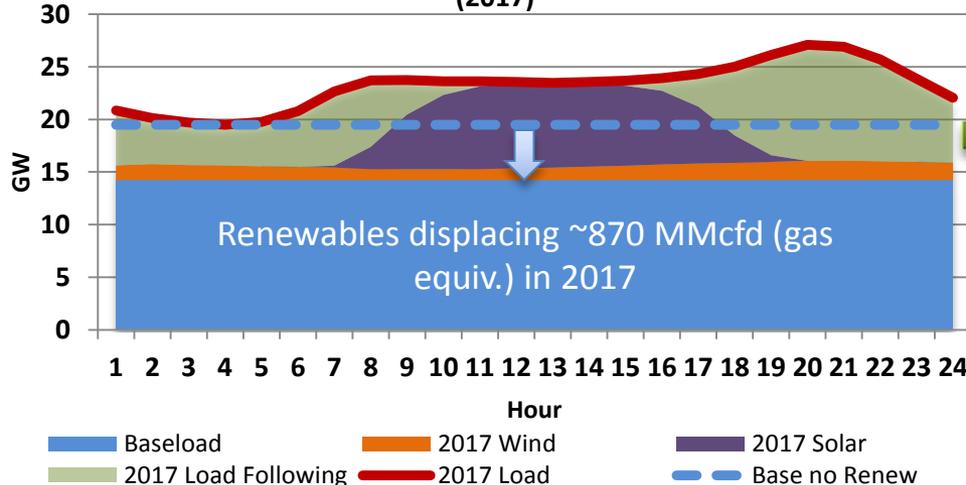
CAISO Avg. Load & Generation (2012)



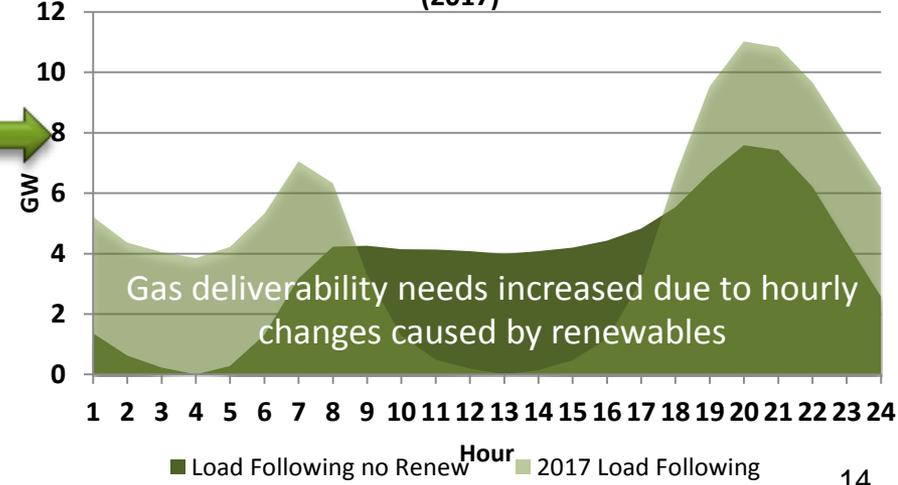
CAISO Avg. Load Following (2012)



CAISO Avg. Load & Generation (2017)

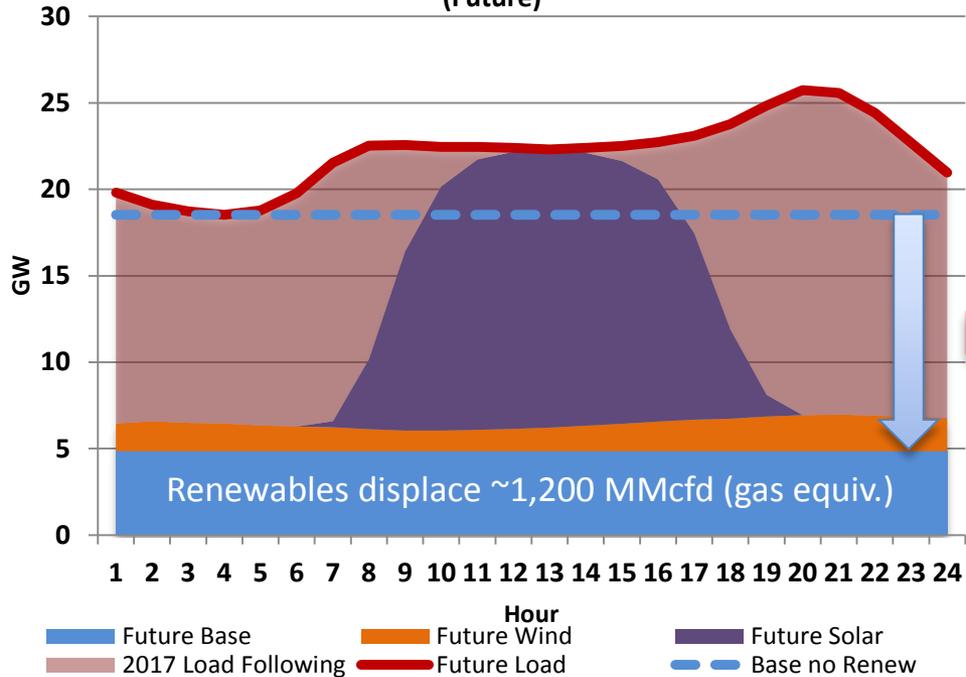


CAISO Avg. Load Following (2017)

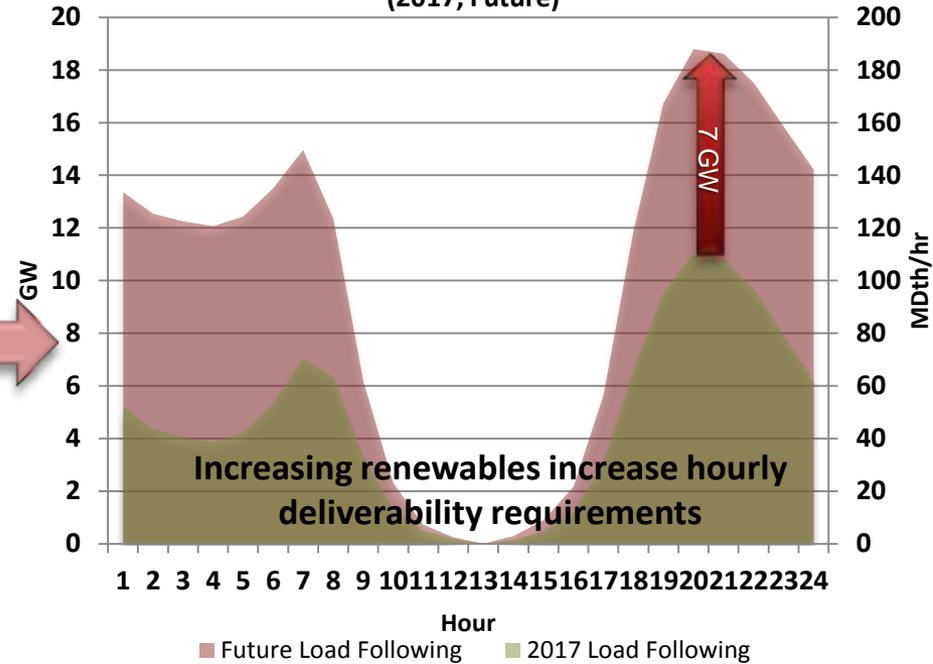


# CAISO Future Generation

CAISO Avg. Load & Generation (Future)



CAISO Avg. Load Following (2017, Future)

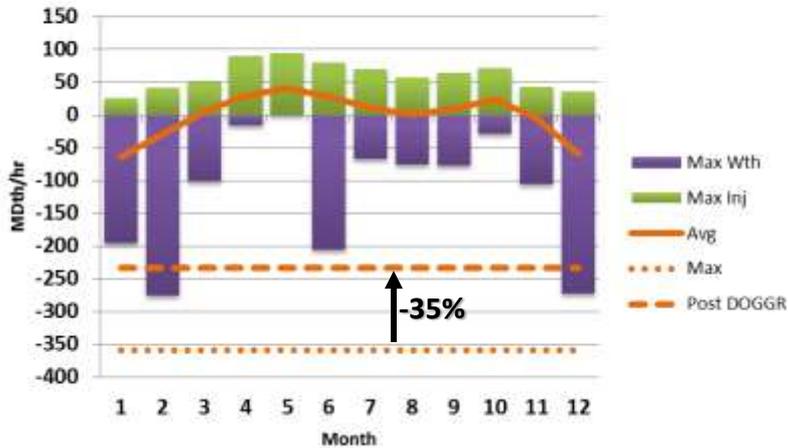


Higher solar generation pushes out more baseload generation leading to a reduction of ~300 MMcfd in gas equivalent generation compared to 2017 (1.2 Bcfd reduction compared to no renewables case)

Gas-fired hourly peaking grows by 7 GW<sup>1</sup> or a 70 MDth/hr increase<sup>1</sup>; 19 GW total or 190 MDth/hr during peak.  
190 MDth/hr × 24 = 4.6 Bcfd

# California Gas Deliverability (2012 to 2017 YTD)

**California Storage  
(Hourly Avg Deliverability)**



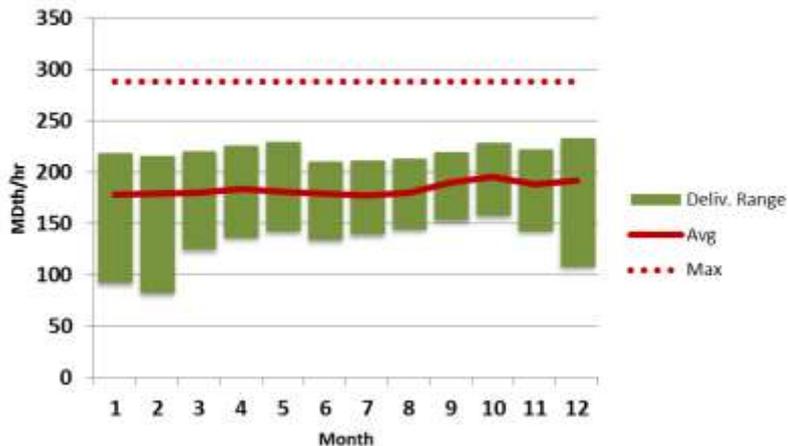
Historical average and peak storage withdrawal demand has been within California's storage withdrawal capability. Future storage limitations may impact peak day deliverability.

Hourly deliverability needs based on renewable firming may put pressure on overall California deliverability, requiring greater pipeline delivery flexibility.

Increasing renewables and DOGGR storage rules reduce the deliverability margin in California.

More detailed in-state deliverability analysis is needed as power generation peaking needs could disrupt the current allocation of storage and pipeline capacity.

**Pipeline Deliverability to California  
(Hourly Avg.)**



# Linepack and Hourly Flexibility

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- Load variability versus rates of delivery is a major issue for all pipelines
  - Rates of receipt and delivery rarely equal
- Pipelines must manage linepack to achieve delivery flexibility
  - Achieve **daily** and **hourly** quantities **AND**
  - Meet all contractual pressure requirements
- Linepack is derived from pipes and compression
  - Linepack Function of: pipe size (length, diameter) and operating pressures
  - Useable linepack is also a function of pipeline capacity load factor
    - Higher load factors equals less useable linepack

# Summary

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- North American demand growth continues
  - LNG exports and Power Generation are primary sources of demand growth
  - Low gas prices incentivize Industrial and Residential growth
- Renewables (wind and solar), because of their intermittent nature, are impacting gross natural gas demand and deliverability needs.
  - Less gas-fired generation for baseload in regions with growing renewables
  - More gas-fired generation will be required for renewable firming
  - Growing demand for hourly natural gas deliverability
- Pipelines must manage linepack to achieve scheduled daily and hourly quantities AND meet all contractual pressure requirements.
  - In certain regions or market areas, this may require more pipe, compression, pipeline or storage services.