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Description:	By Melissa Jones
Filer:	Patty Paul
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California Energy Commission

Overview on California Gas Issues & Analysis

Melissa Jones, Senior Energy Policy Specialist, Principal on Natural Gas

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Goals for Today's Workshop

Gas Track for 2021 IEPR will address two key areas:

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

Today's Workshop focused on Gas Infrastructure topics:

- Hydraulic modeling of the gas system
- Gas system R&D

Anticipate future 2021 IEPR workshops on:

- Gas demand, price and rate forecasts
- Long-term demand scenarios
- Electricity and gas reliability
- Renewable gas and hydrogen

Need for Long-term Gas Planning

Natural gas issues are rapidly evolving – the state is at an inflection point:

- Building electrification likely to reduce the long-term gas demand over next few decades
- Decarbonization present new challenges for gas system planning
- Critical inter-dependencies between the natural gas and electricity systems call for more coordination
- Emergence of low carbon alternatives: renewable gas, hydrogen, and ECR
- Energy equity concerns and need to limit stranded costs

The transition away from fossil gas calls for a more proactive approach to planning the gas system that is both rigorous and transparent.

Overview of Natural Gas Trends

- CA second-largest gas-consuming state in the U.S
  - CA average gas use 5.5 Bcf per day
  - Can peak to 11 Bcf per day on a very cold day
- Gas system designed to serve residential peak load on cold winter day; cost allocation follows this design/use
- Wholesale gas prices set in unregulated, competitive market
- Gas utilities are common carriers
  - Purchase and deliver gas to core customers (residential and small commercial)
  - Transport-only for noncore customers (electric generators, large commercial and industrial, including refineries)
- Gas utilities have an obligation to hook-up customers and must continue service once started

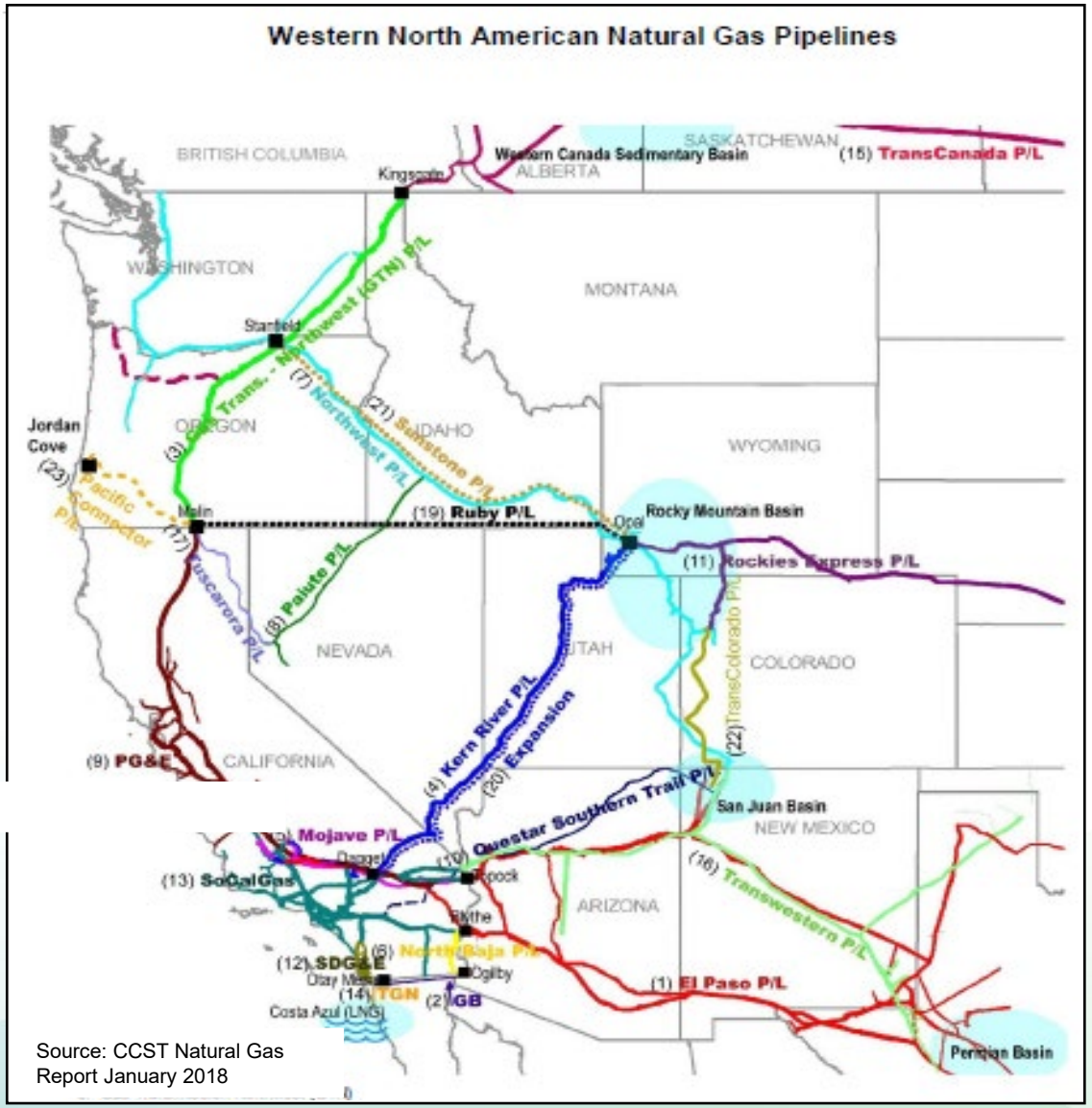
Gas Supply Trends

Out of State Gas Supplies ~ 90% Total

- 20% Alberta Canada
  - Via Gas Transmission Northwest
- 30% Southern Wyoming
  - Via Ruby Pipeline & Kern River
- 40% San Juan Basin (NW New Mexico)
  - Via El Paso Natural Gas & Transwestern Pipeline
- 10% Permian Basin (West TX& SE New Mexico)
  - Via El Paso Natural Gas & Transwestern Pipeline

In-State Supplies ~ 10% Total

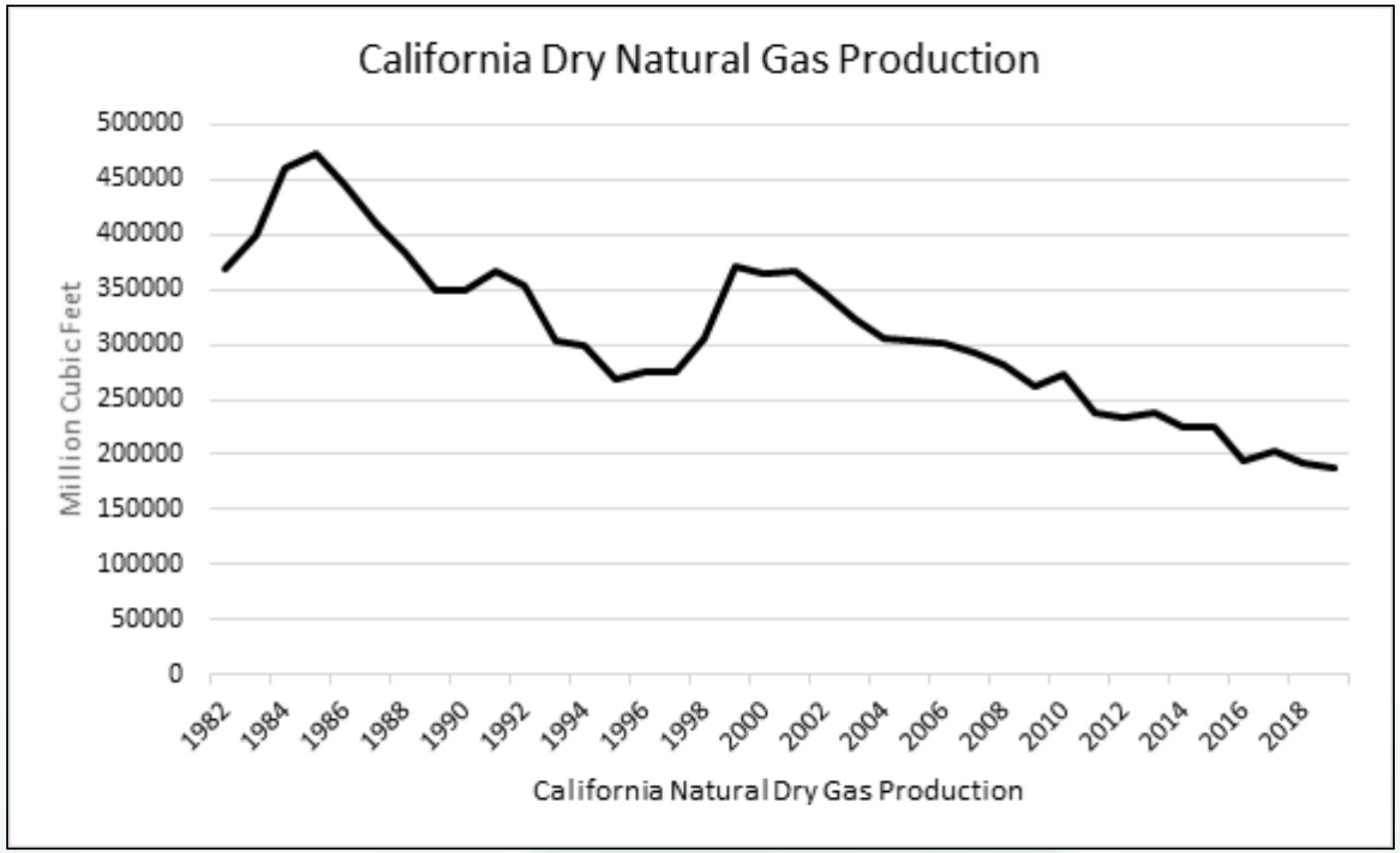
- Production Declining since 1980s



Source: CCST Natural Gas Report January 2018

California's Natural Gas Production

- CA gas less than 1% of total US gas reserves and production
- Fields located primarily in geologic basins in Northern Central Valley
- Some in Southern Central Valley, Northern CA Coastal areas and offshore Southern CA Coast
- CA gas production gradual declines since 1985 and further declines expected



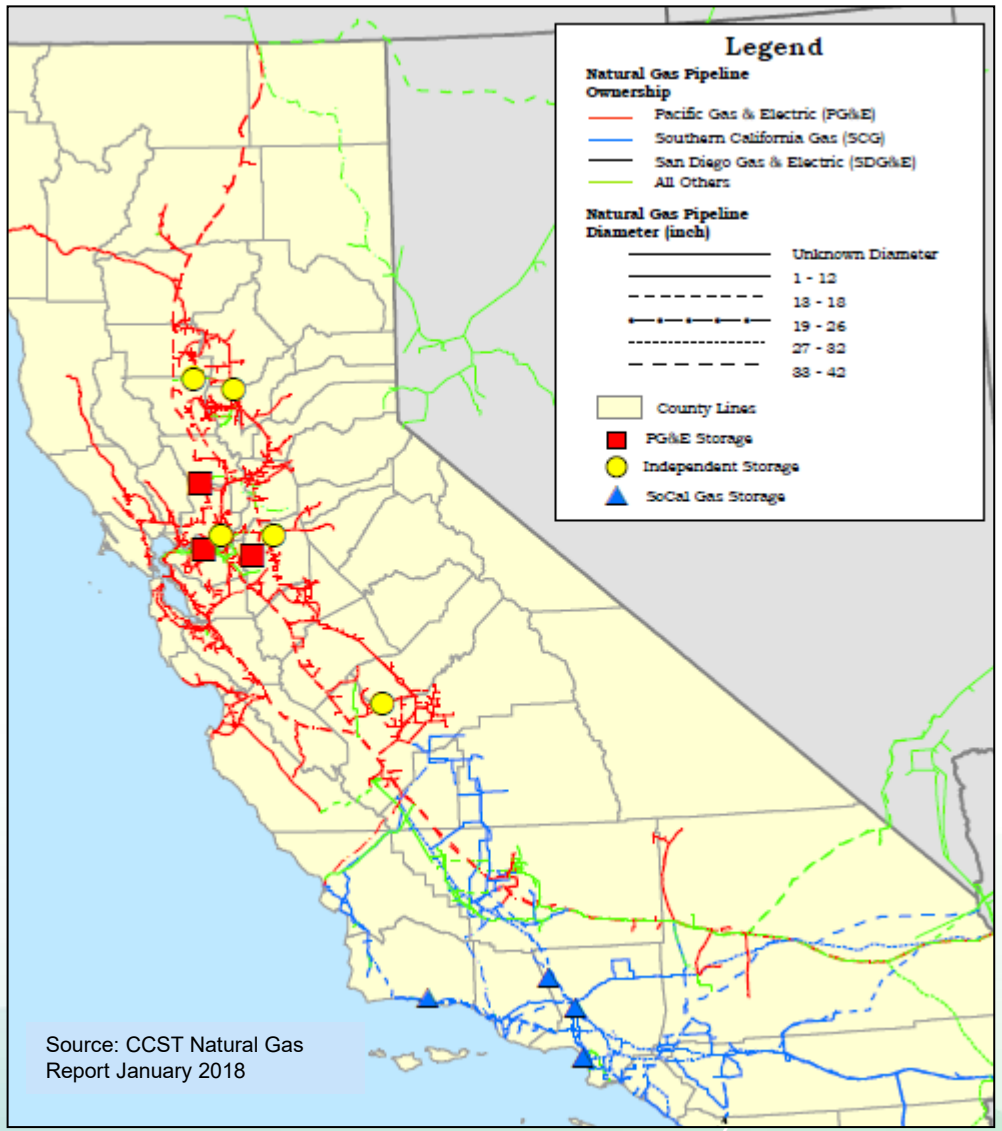
Natural Gas Storage & Pipelines

Gas storage Fields operated by:

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

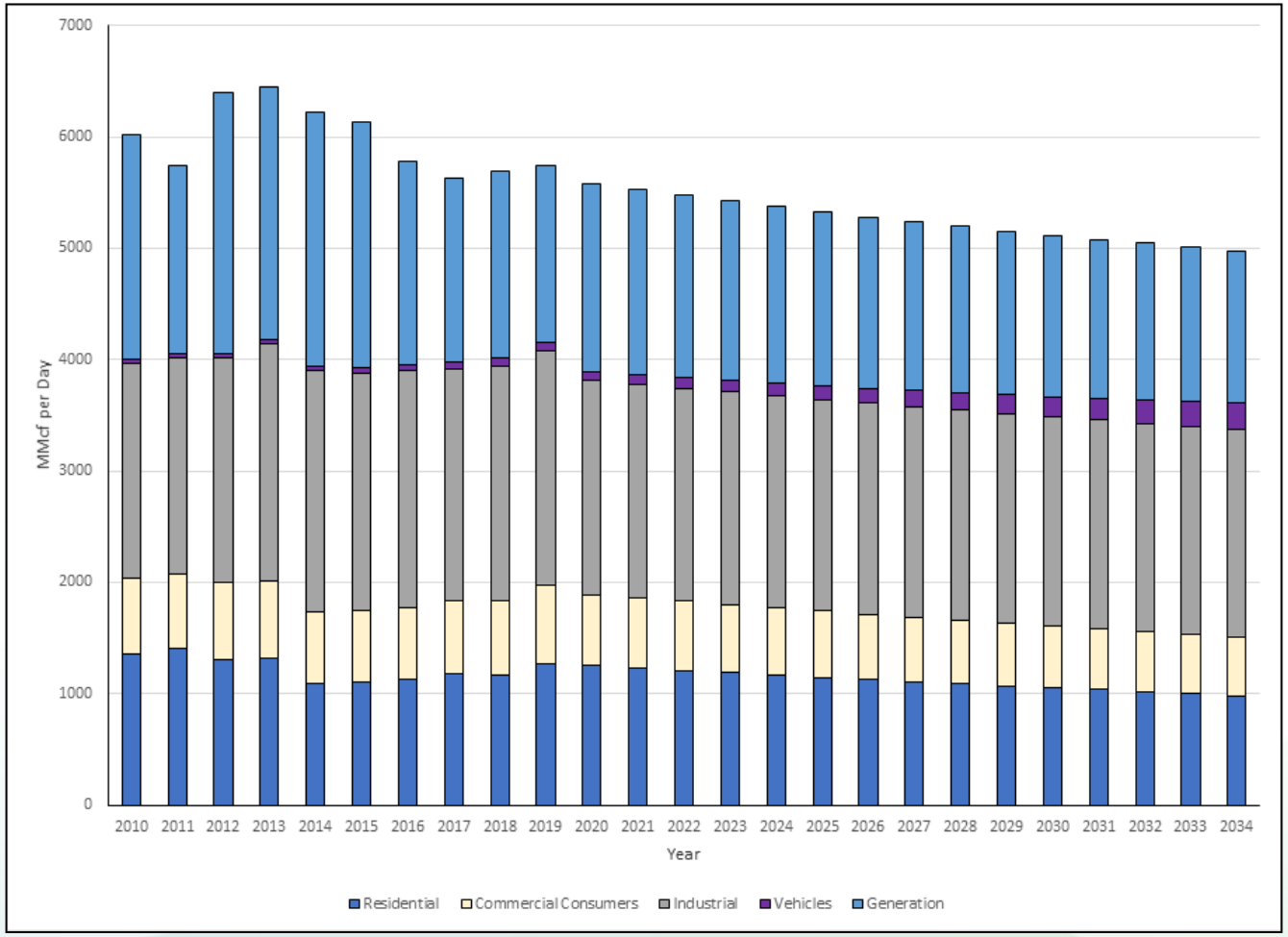
Intrastate Gas Pipeline:

- PG&E – Backbone & Local Transmission
- SoCalGas – Local Transmission & Distribution



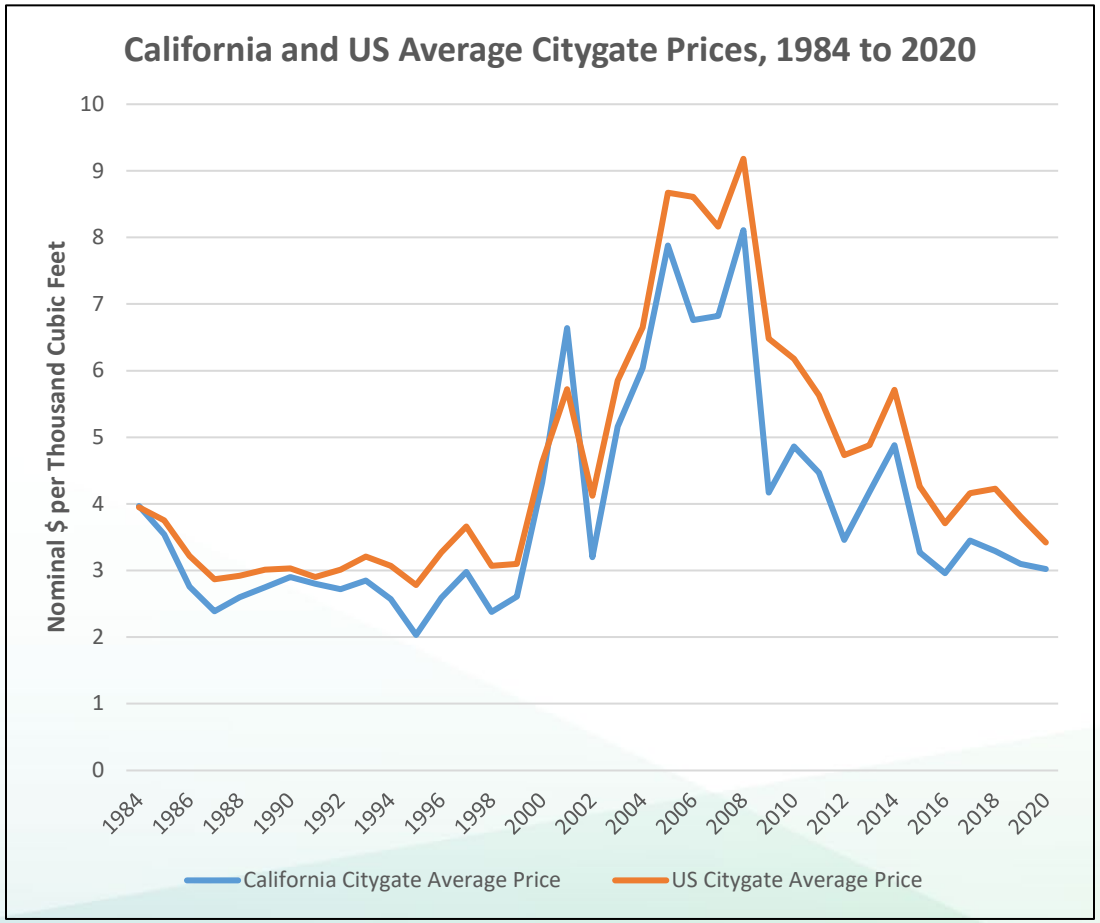
Gas Demand Trends

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



Gas Price Trends

- Gas prices were low from mid-1980s to 2000 and peaked in 2010
- Declining production in traditional gas basins drove up prices
- LNG facilities proposed and constructed to import gas
- Shale gas has produced low-priced gas replacing LNG imports
- California average Citygate Prices slightly lower than US



Reevaluating Natural Gas Analytics

Broader, more comprehensive assessment of natural gas will support important policy objectives:

- Ensure reliability for remaining customers and the electricity system
- Minimize ratepayer impacts and burdens on customers
- Provide for environmental sustainability

Analytical support for strategic planning of the state's clean energy system:

- Understand changing demand patterns and long-term demand scenarios
- Identify opportunities to downsize gas distribution infrastructure
- Assess how to adapt gas system reliability standards over time
- Develop ways to deal with financial implications of gas system costs spreads over fewer customers

Gas Modeling & Analytics

Gas Demand Forecasts

Various End-Use & Econometric Models

Modeling Inputs:

- Econ/Demo
- Gas Prices
- Electricity Prices
- Policy Goals

Modeling Outputs:

- Gas Demand by Sector
  - Res/Comm
  - Indust
  - Other)
- (EG Demand Separate)

EG Gas Demand

Production Cost Model (PLEXOS)

- EG Gas Demand

Gas Price Forecasts

NamGAS Model (Annual & Monthly)

- Gas Commodity (Trading Hub Prices)
- Burner-tip Prices (Hub + Transport)
- Gas Rates
- Market Dynamics

Infrastructure Assessment

Gas Balance & Hydraulic Modeling

- Reliability
- Operations
- Safety
- Asset Replacement

Policy Assessments

- GHG Emissions
- Equity & Workforce
- Role of Gas System
- RNG & H2

Long Term Infrastructure Planning

Various Tools & Models

- Prioritize Safety Investments
- Targeted Electrification
- Ratepayer Impacts
- Alternative Rate Designs
- Distribution Decommissioning
- Aging Infrastructure & AldyIA
- Utility Business Model
- Stranded Assets

QUESTIONS?