California Energy Commission

Title: Winter Storm Uri – Impacts of the Polar Vortex

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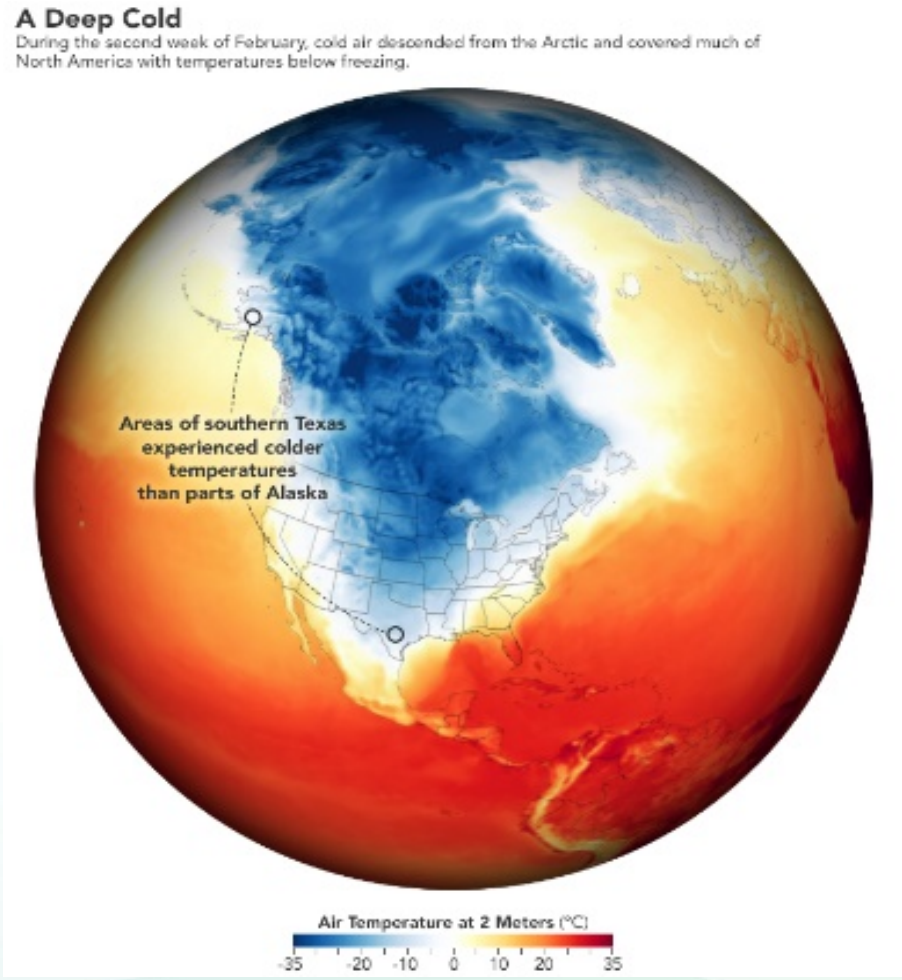
Winter Storm Uri – Impacts of the Polar Vortex

Winter Uri Overview

- Extreme polar vortex that lasted February 13 through 17, 2021
- Emergency Event- Greater magnitude than previous polar vortex events
- Extended from Canada to Gulf of Mexico
- Record cold temperatures



Reliability Impacts of Winter Storm Uri

Severe impacts on natural gas/electricity reliability due to:

- Energy infrastructure shutdowns/disruptions
- Natural gas production losses
- Skyrocketing demand
- Rolling blackouts and load shedding
- Natural gas and electricity price shocks

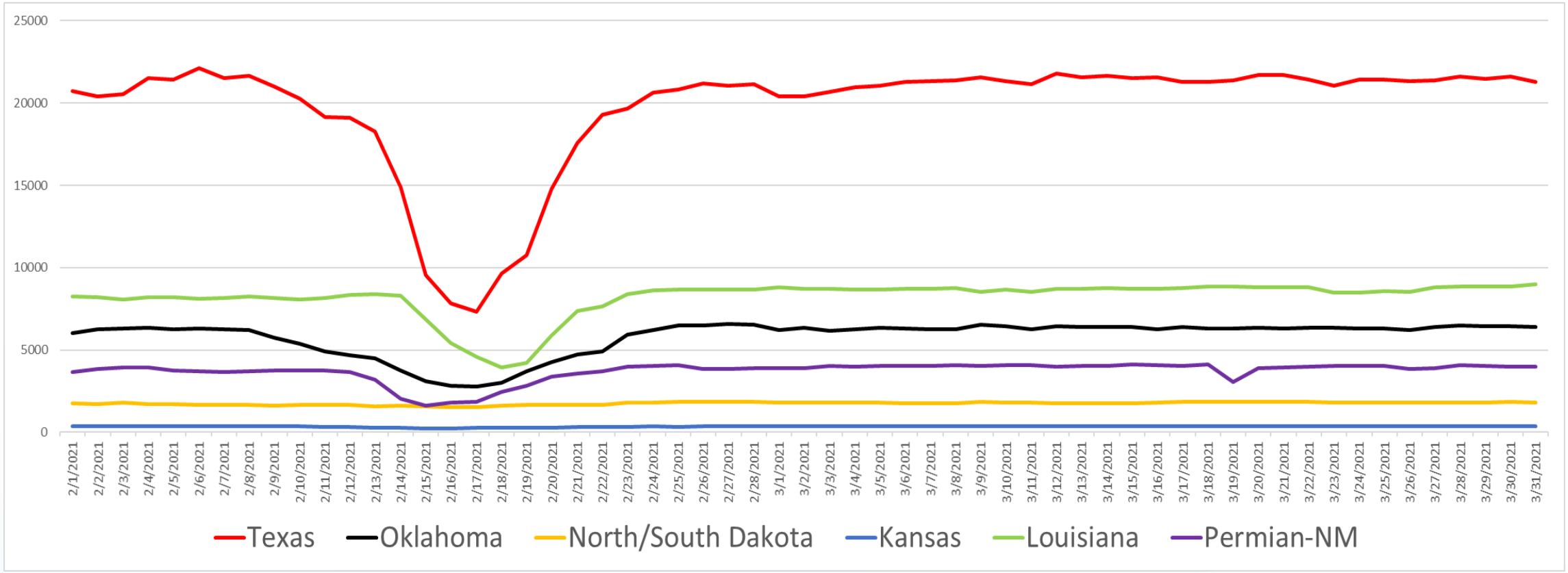
Effects on Energy Infrastructure

- Electricity and natural gas infrastructure shut down due to loss of natural gas supplies, power outages, and frozen equipment
  - Well freeze-offs
  - Gathering lines and valves froze
  - Gathering and processing plants shut down
- Wind turbines froze
- Loss of solar output
- Nuclear plant reactor shut down

Temperature Comparisons

Pricing Hub	Average February Temperature	Minimum Temperature February 11-19	Departure from Average
Algonquin Citygate	29.5	12	-17.5
Cheyenne	21.6	-16	-37.6
Chicago Citygates	21	-3	-24
CIG Mainline	22	-8	-30
Dawn	23.5	-5	-28.5
El Paso, Permian	43.2	4	-39.2
El Paso, San Juan	34.7	13	-21.7
GTN, Kingsgate	26.2	-3	-29.2
Henry Hub	50.5	18	-32.5
Houston SC	53.6	15	-38.6
Lebanon	26.2	1	-25.2
Leidy	27.4	11	-16.4
Malin	32.6	21	-11.6
NBPL-Ventura	9.9	-20	-29.9
ONEOK	31.5	-13	-44.5
Opal	18.2	-10	-28.2
PG&E Citygate	55.7	41	-14.7
PG&E Topock	53.2	34	-19.2
SoCal Border	59.8	39	-20.8
SoCal Citygate	60.5	47	-13.5
Sumas	37.6	20	-17.6
TCPL AECO-C	8.6	-28	-36.6
Transco 6, New York Citygate	33.2	19	-14.2

Effects on Natural Gas Production



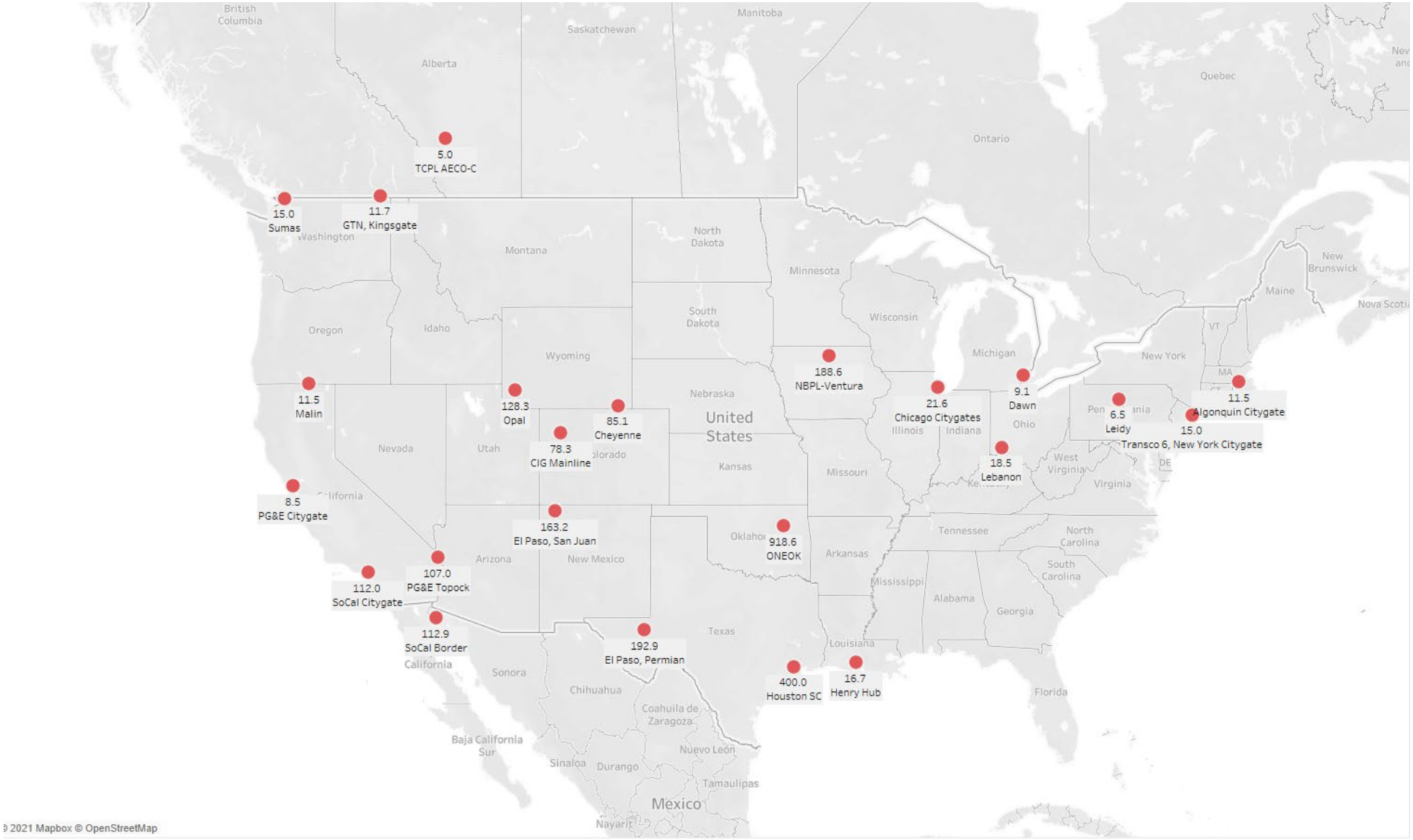
Source: PointLogic Energy an IHS Company

- February 13-17: Production severely plummets in Texas; dips in Louisiana and Oklahoma
- No loss of production in North/South Dakota, Kansas due to winterization
- No loss of production from San Juan Basin, New Mexico

Effects on Natural Gas Prices

- Several states/regions, including Southern California, saw price spikes
- Direct price impacts to customers:
  - Natural gas is main fuel source for heating and cooking
- Indirect price impacts:
  - Natural gas prices affect electricity prices

February 17, 2021, Prices



Winter Storm Uri and California

- California – Potential supply interruptions
  - End of the interstate natural gas pipelines
  - Polar Vortex events: February 2021, January 2014, February 2011
  - Heat waves: August 2020, June 2021
- Low demand and mild temps during storm (Feb 12-17)
  - PG&E: NG demand a little over average
  - SoCalGas: NG demand was lower than average
- Utilities and market participants – Relied on natural gas storage

Winterization – A Solution

- Cost to permanently winterize oil and gas wells - between $20,000 and $50,000 per well*
- Federal Reserve Bank of Dallas estimated losses $4.3 billion just in Texas (gas and electricity)
- Temporary measures – Equipment rental/less costly
- If event like Uri happens once in 10 years, cost to winterize less than losses from storms
  - Concern events like Uri could happen more frequently

* FERC/NERC *Report on Outages and Curtailments During the Southwest Cold Weather Event of February 1-5, 2011*, Appendix: GTI Report

New Mexico- Case Study

Polar Vortex - February 2011

- Approximately 32,000 homes and businesses without natural gas for several days
- State of Emergency
- Opened warming centers
- National Guard to help relight pilot lights

New Mexico- Case Study *(cont'd)*

Lessons Learned:

- New Mexico utilities contracted for more natural gas and fuel oil and took other power options from the open market
- New Mexico Gas Company shifted away from the Permian Basin natural gas to the San Juan Basin because San Juan basin was not forecasted to experience freeze-offs
- El Paso Electric contracted with fuel oil suppliers for their Montana plant (El Paso County, Texas)
- The Public Service Company of New Mexico also took numerous power options from the Western grid
- The New Mexico Gas Company and El Paso Electric improved/winterized their electric and natural gas infrastructure

Summary

- Texas Governor Abbott signed Senate Bill 3
- California end of the natural gas line
  - Susceptible to extreme events outside California
- Concern over possible natural gas curtailments over loss of supplies along El Paso pipeline
- Significant price and rate impacts
- Reliance on natural gas storage to mitigate extreme events
- Current Pacific Northwest heatwave

Thank You!

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