

# Overview of Probable Market Regions: State Perspective

Presented By:  
Eugene Holubnyak and Scott Quillinan  
October 12, 2022

*Prepared for  
DOE FECM-CO<sub>2</sub> Freight Transport  
Workshop*

**October 12, 2022**

*THE WORLD NEEDS MORE COWBOYS.*



UNIVERSITY  
OF WYOMING

School of  
Energy Resources

# SER's Mission:

Energy-driven  
economic  
development for  
Wyoming



*BUCKING  
THE SYSTEM  
SINCE 1886.*

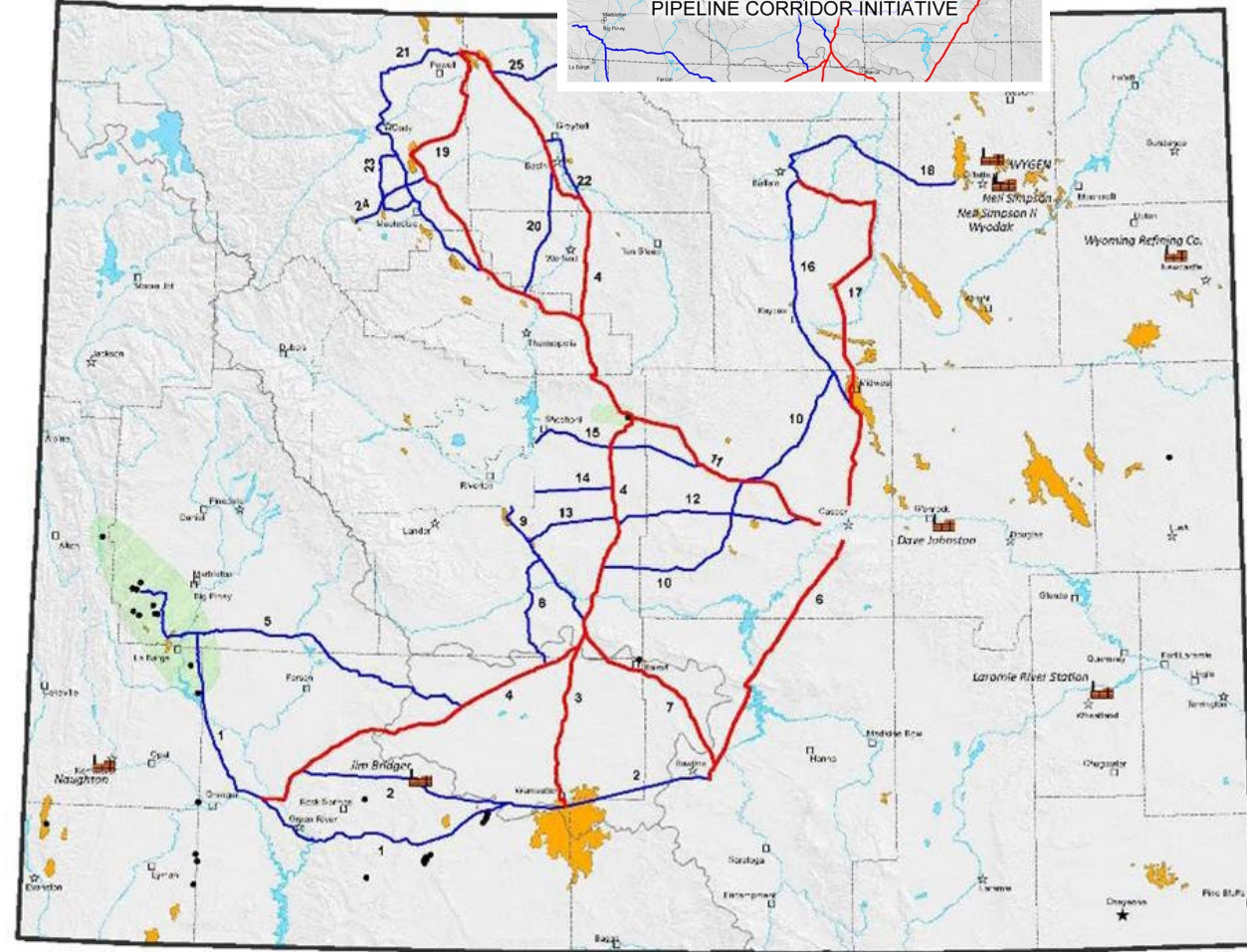
# Net-negative Challenge

“Many states talk about the importance of net zero carbon emissions. But, today, I challenge you to join me in making Wyoming net negative in CO<sub>2</sub> emissions. We have to take the lead, and not look back.”



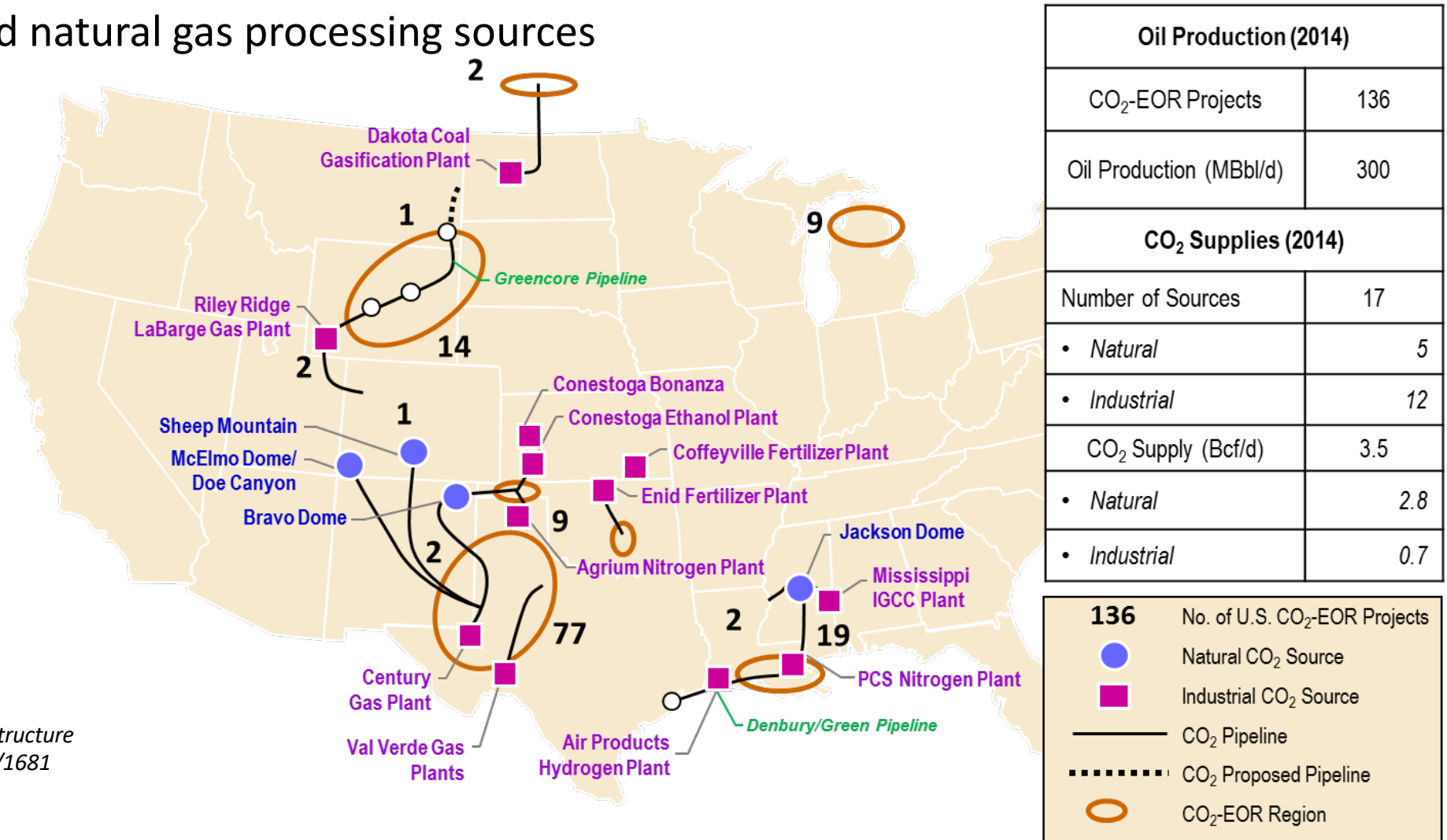
# Regional CO<sub>2</sub> Pipelines

Western North American Natural Gas Pipelines



# Regional CO<sub>2</sub> Pipelines and Hubs

- Natural/geological and natural gas processing sources
- Declining sources
- Limited availability

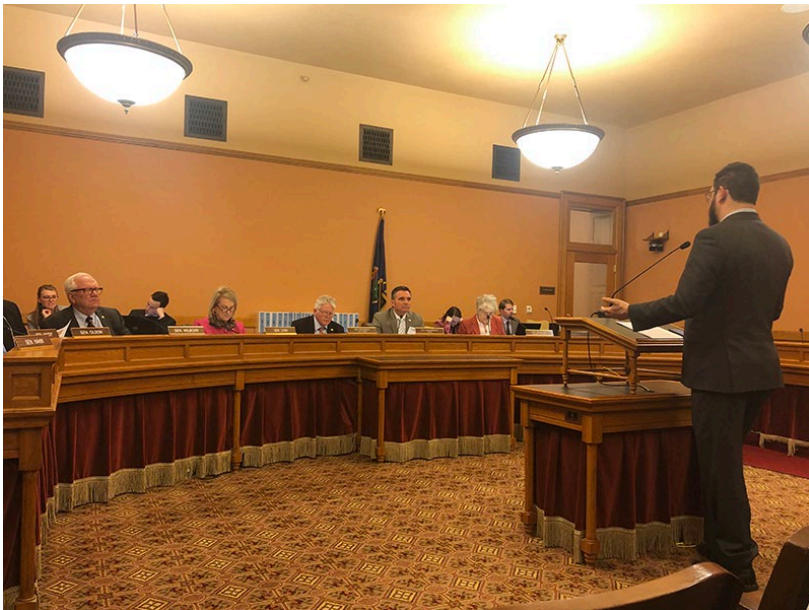


A Review of the CO<sub>2</sub> Pipeline Infrastructure in the U.S. (2015) DOE/NETL-2014/1681

Source: Advanced Resources International, Inc., based on Oil and Gas Journal, 2014 and industry sources.

# Regional CO<sub>2</sub> Pipelines and Hubs

- Neutral testimony for a bill regarding conduction of CO<sub>2</sub> in pipes for members of the Kansas Senate Utilities Committee (SB 395) on March 10, 2020.
- More information on the bill can be found at [http://kslegislature.org/li/b2019\\_20/measures/sb395/](http://kslegislature.org/li/b2019_20/measures/sb395/)



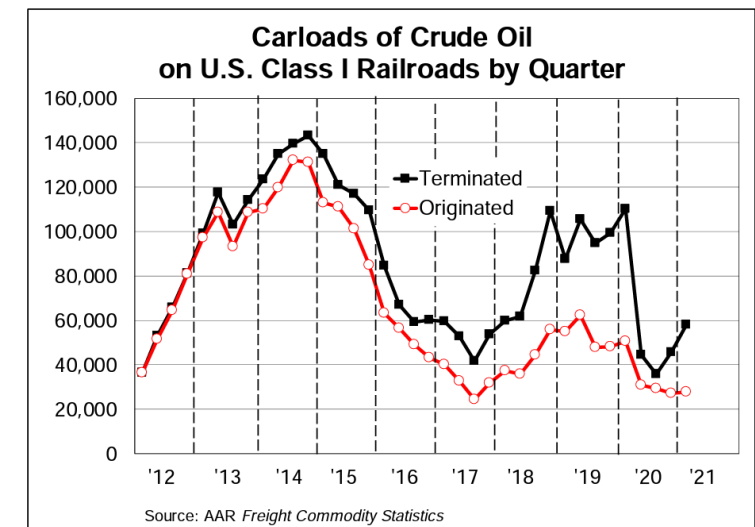
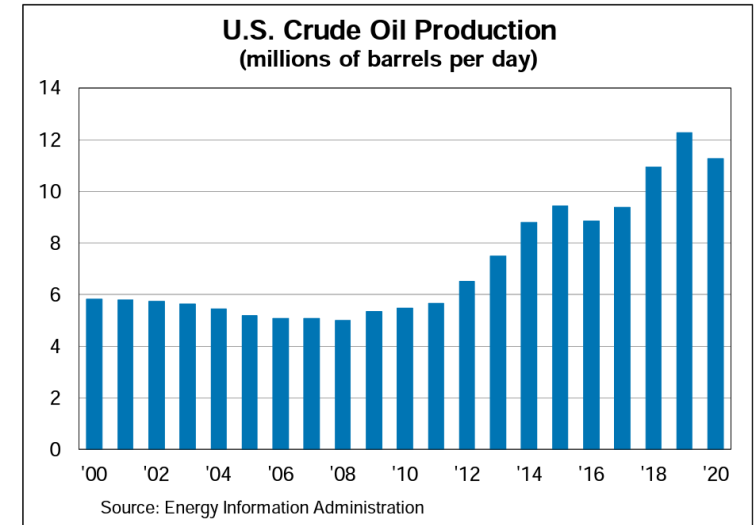
*Cushing is the North American Oil Hub*



- Challenging proposition for the eminent domain for states and regions
- Cost overruns and delays for construction

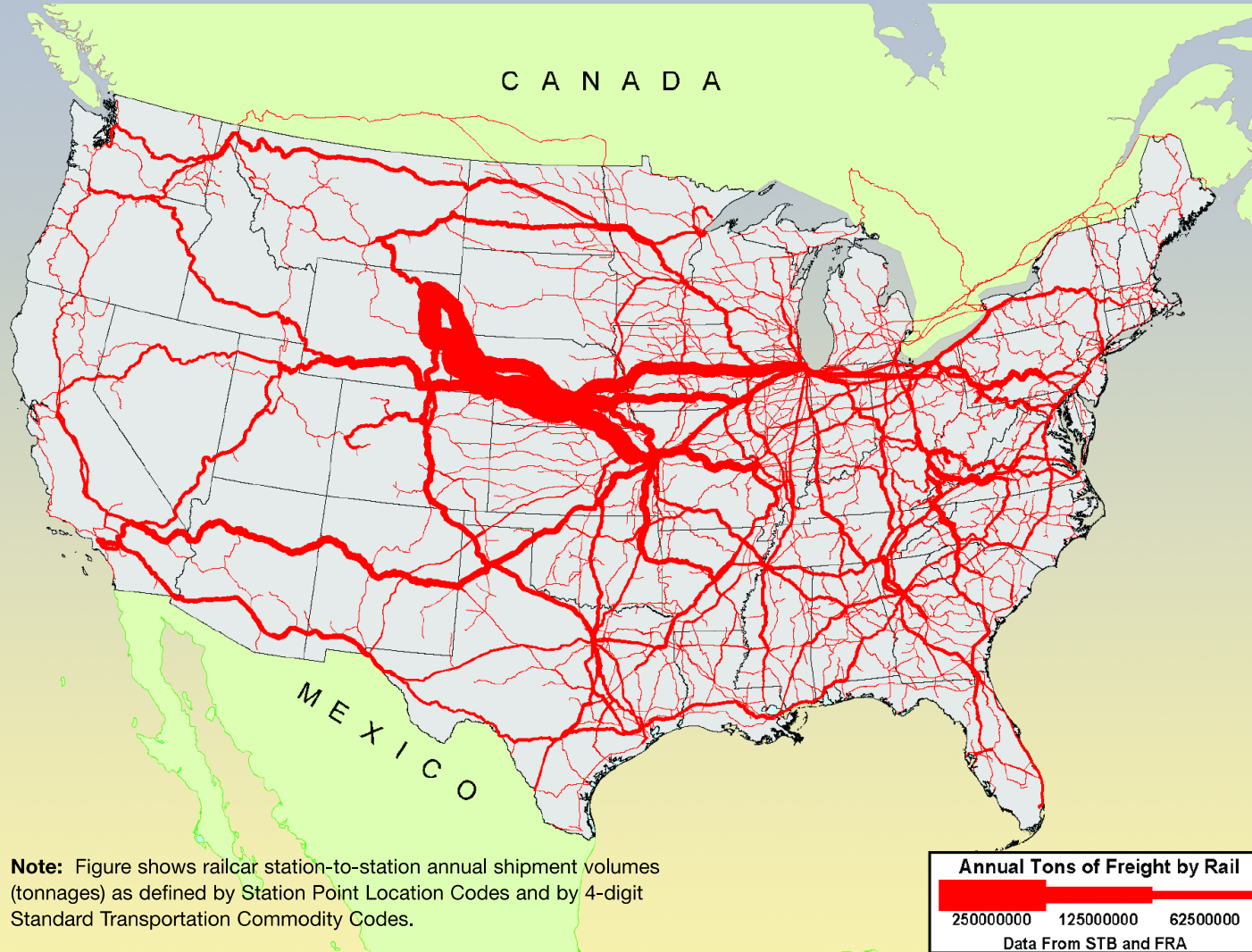
# AAR-Crude-Oil-Fact-Sheet

- 2008, railroads originated **9,500** carloads of crude oil
- 2014, shale revolution, peaked at **493,146** carloads, **52X**
- 2021, U.S. Class I railroads terminated **236,069** carloads of crude oil
  - A variety of factors affect rail crude oil volumes, including pipeline capacity and crude oil prices.
- More than 99.99% of all hazmat moved by rail reaches its destination without a release caused by a train accident.



# Rail freight tonnage

FIGURE 3-13. TONNAGE ON THE RAILROAD NETWORK: 2005



[https://ops.fhwa.dot.gov/freight/freight\\_analysis/nat\\_freight\\_stats/docs/07factsfigures/pdf/fig3\\_13.pdf](https://ops.fhwa.dot.gov/freight/freight_analysis/nat_freight_stats/docs/07factsfigures/pdf/fig3_13.pdf)



# CO<sub>2</sub> by Truck

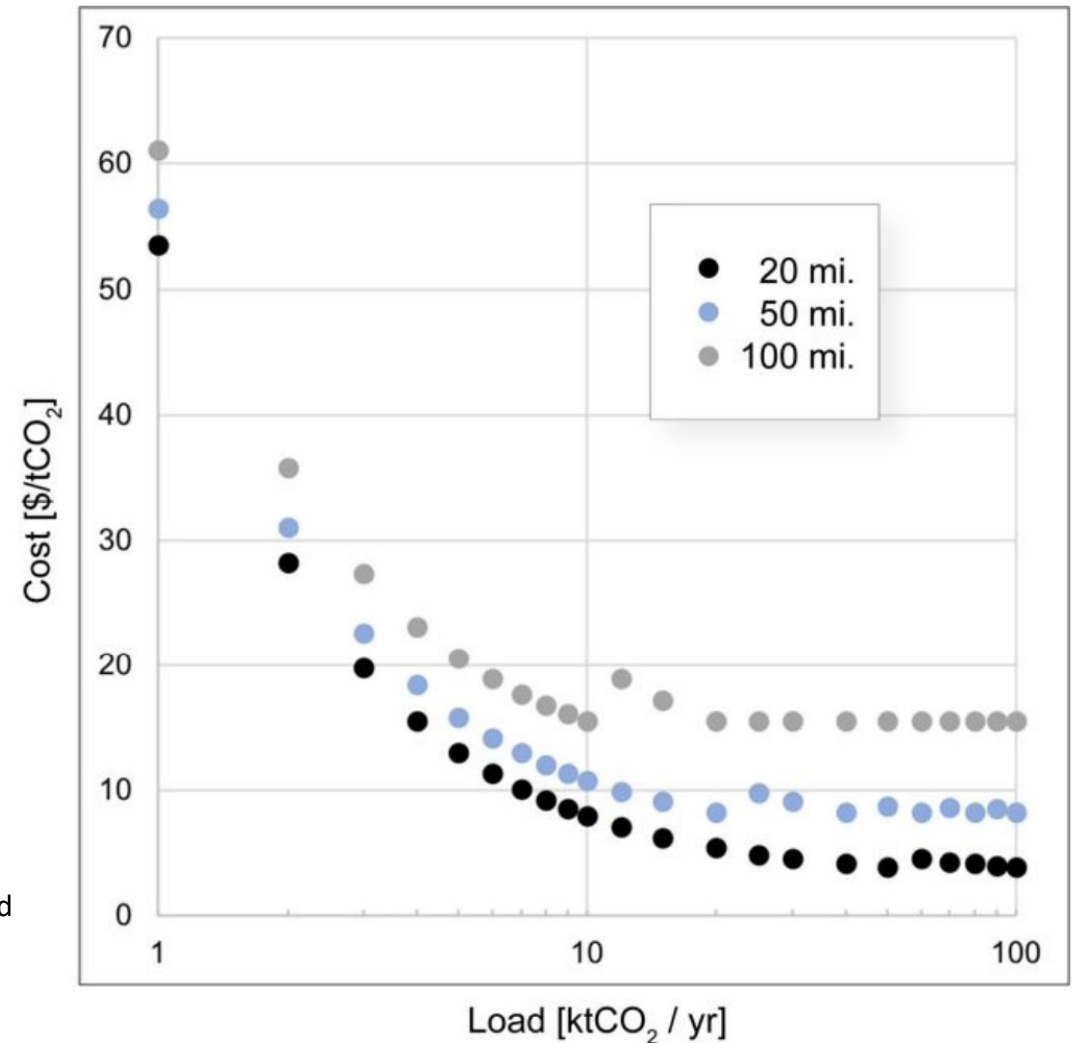


- **1,101 truckloads**, 21,784 US tons, 19,803 metric tons, average of **120 tonnes per day**, approximately 374,000 MCF of CO<sub>2</sub>
- Total expenditures for purchasing CO<sub>2</sub> were \$1,964,000. Our overall price for CO<sub>2</sub> was **\$90.16 per US ton** from *Linde Group*



# CO<sub>2</sub> by Truck

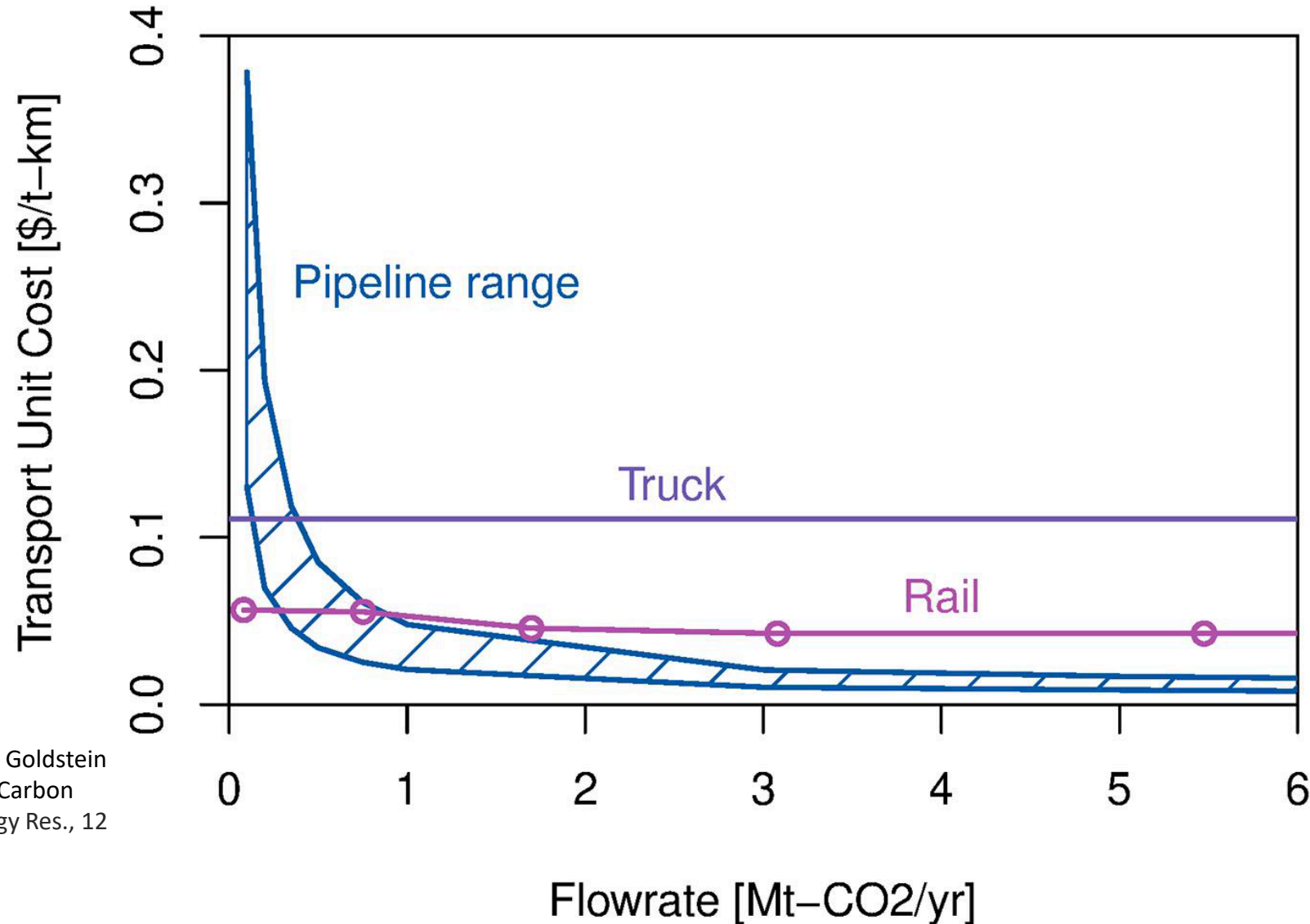
- At low volumes, costs are dominated by truck lease and purchasing
- Costs converge to a minimum as hauling approaches capacity
- Small cost bumps reflect the addition of trucks as justified by model constraints



Psarras, Peter, Jiajun He, H el ene Pilorg e, Noah McQueen, Alexander Jensen-Fellows, Kourosh Kian, and Jennifer Wilcox. "Cost Analysis of Carbon Capture and Sequestration from U.S. Natural Gas-Fired Power Plants." *Environmental Science & Technology* 54, no. 10 (May 19, 2020): 6272–80.

# Comparison of Transport Costs of CO<sub>2</sub>

- Comparison of transport costs of CO<sub>2</sub> by truck, rail, and pipeline as a function of flowrate. Costs are calculated for a distance of 200 km
- Costs in the range of \$20–40/t-CO<sub>2</sub>



# UW SCHOOL OF ENERGY RESEOURCES

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[eholubny@uwyo.edu](mailto:eholubny@uwyo.edu)



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