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CO2 Pipelines and EOR in the US - Regulatory Issues and Opportunities

Lawrence J. Wolfe
lwolfe@hollandhart.com

307-778-4218

Quick Reference Sources



- Regulation of CO2 Sequestration Pipelines: Jurisdictional Issues (CRS Report to Congress, April 15, 2008)
- CO2 Pipelines for Carbon Sequestration: Emerging Policy Issues (CRS Report to Congress, January 17, 2008)
- Third Annual Wyoming CO2 Conference.
<http://eori.gg.uwyo.edu/>
- From EOR to CCS: The Evolving Legal and Regulatory Framework for Carbon Capture and Storage. P.M. Marston and P.A. Moore, 29 Energy Law J. 421(2008),
www.marstonlaw.com

Siting Not Regulated by Federal Agencies



- Siting of new CO2 pipelines is not regulated by any Federal agency. Both FERC and the STB (and predecessor agency ICC) have declined jurisdiction over CO2 pipelines.
- Siting is currently left to the States.
- Rates charged by CO2 pipelines are not regulated by any Federal agency, except the STB will hear complaints about rates.
- No Federal eminent domain for CO2 pipelines

Federal Permits Needed if Cross Federal Lands



- If pipeline crosses Federal land, permits from the Federal agencies will need to be acquired, and NEPA compliance undertaken, either an EA or EIS.
- BLM can regulate CO2 pipeline under the Mineral Leasing Act, as a commodity shipped by a common carrier. EOR pipelines are regulated under MLA; or
- BLM can regulate under FLPMA.

CO2 Pipeline Safety Regulation



- Interstate CO2 pipelines are regulated for safety by the DOT. 49 U.S.C Sec. 601.
- DOT regulates the design, construction, operation and maintenance, and spill response planning. 49 C.F.R. Sec. 190, 195-199).
- DOT applies the same safety requirements as to pipelines carrying crude oil, gasoline and anhydrous ammonia.

CO2 Infrastructure for EOR



- About 5800 Km (3600 miles) of CO2 pipelines currently. Compare to 800,000 km (500,000 miles) of natural gas and hazardous liquids pipes.
- Annual injection of CO2 is about 50 million metric tons. More than half of the injected gas remains in storage.
- About 6100 active CO2 injection wells. This injection makes possible the production of about 245,000 BBls of oil. Marston, page 424-426.

State Regulation - Wyoming



- Wyoming – Industrial Siting Act bars State agency from requiring permit. W.S. 35-12-119(c)(iii) – “The construction, operation and maintenance of the following activities are exempt from this chapter: (iii) All pipelines except coal slurry pipelines.”
- Wyoming Pipeline Authority – interested in “supersizing” pipelines to make CO2 available for old oil fields in Wyoming.

Montana



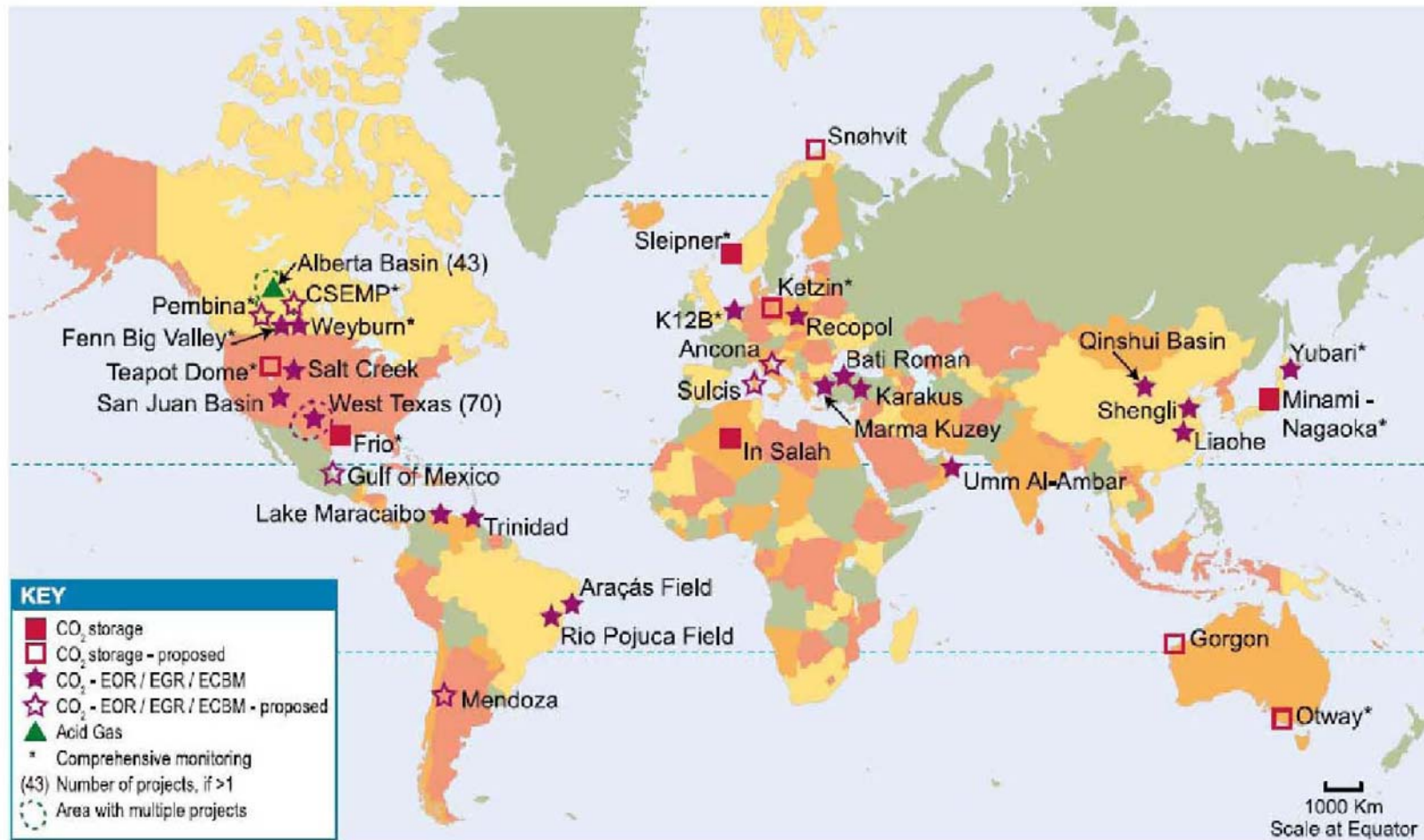
- H338 (2009) – Establishes common carrier status to pipelines moving CO2 produced in fuel combustion or gasification.
- S498 (2009) – Regulates CO2 injection wells. Notice, permit, regulation of CO2 injection wells
- Surface owner presumed to own reservoir if deeds do not clarify ownership
- Upon certification of completion of well, Board of Environmental Review transfers liability to the state
- Operators pay fees for administration of state's CO2 program and long term oversight.
- Unitization allowed. (Rewey, NCSL, 6/26/09)

The is a shortage of CO2 in the US



- Many old oil fields in the SE and Rockies that could benefit from CO2 flooding.
- Denbury has long term plans for floods in Wyoming, Montana and North Dakota that exceed 1 Billion cf/day.
- Present supplies in Wyoming are limited. New supplies are dependent on construction of coal gasification plants and power plant CO2 capture.

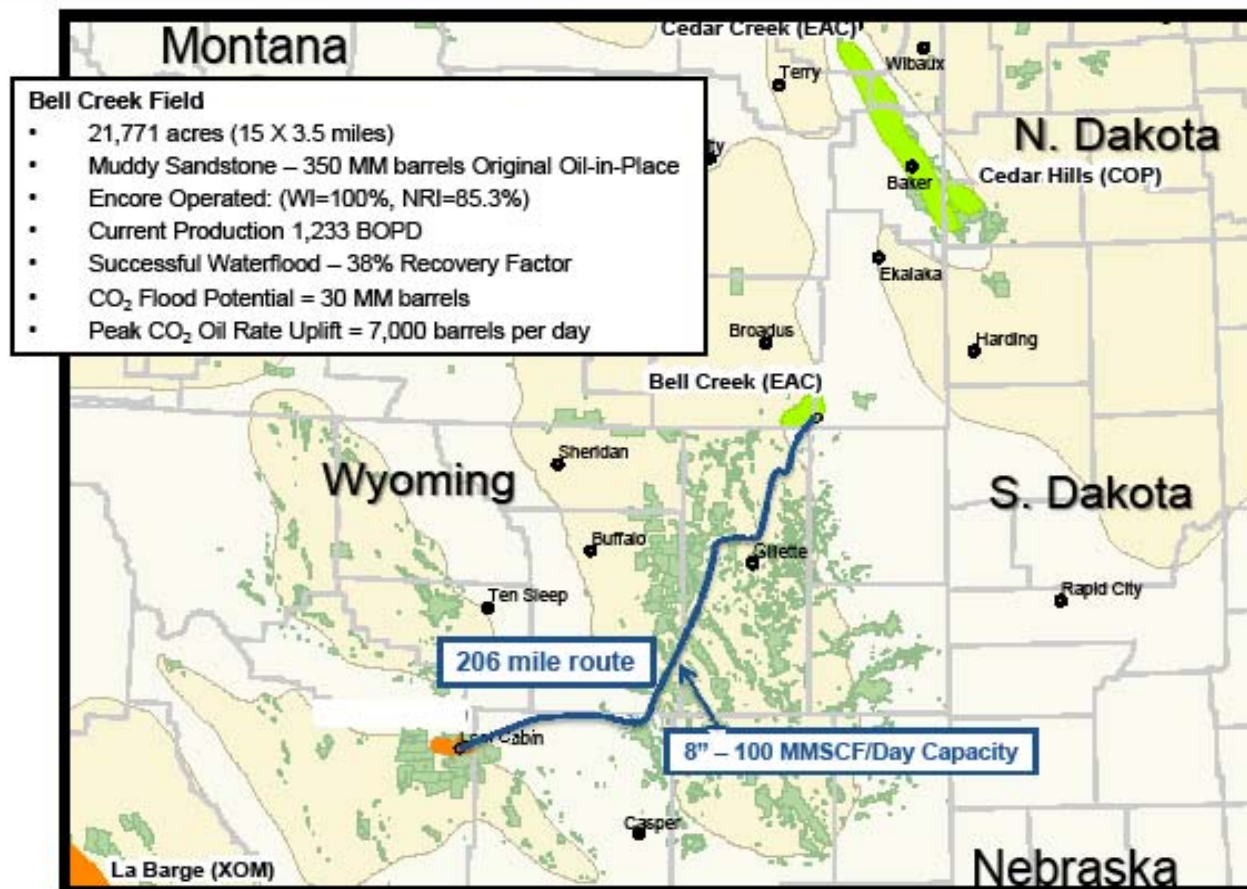
CO₂ Project Locations



Ref: IPCC Special Report on Carbon Dioxide Capture and Storage



Bell Creek CO₂ Project – Overview Map



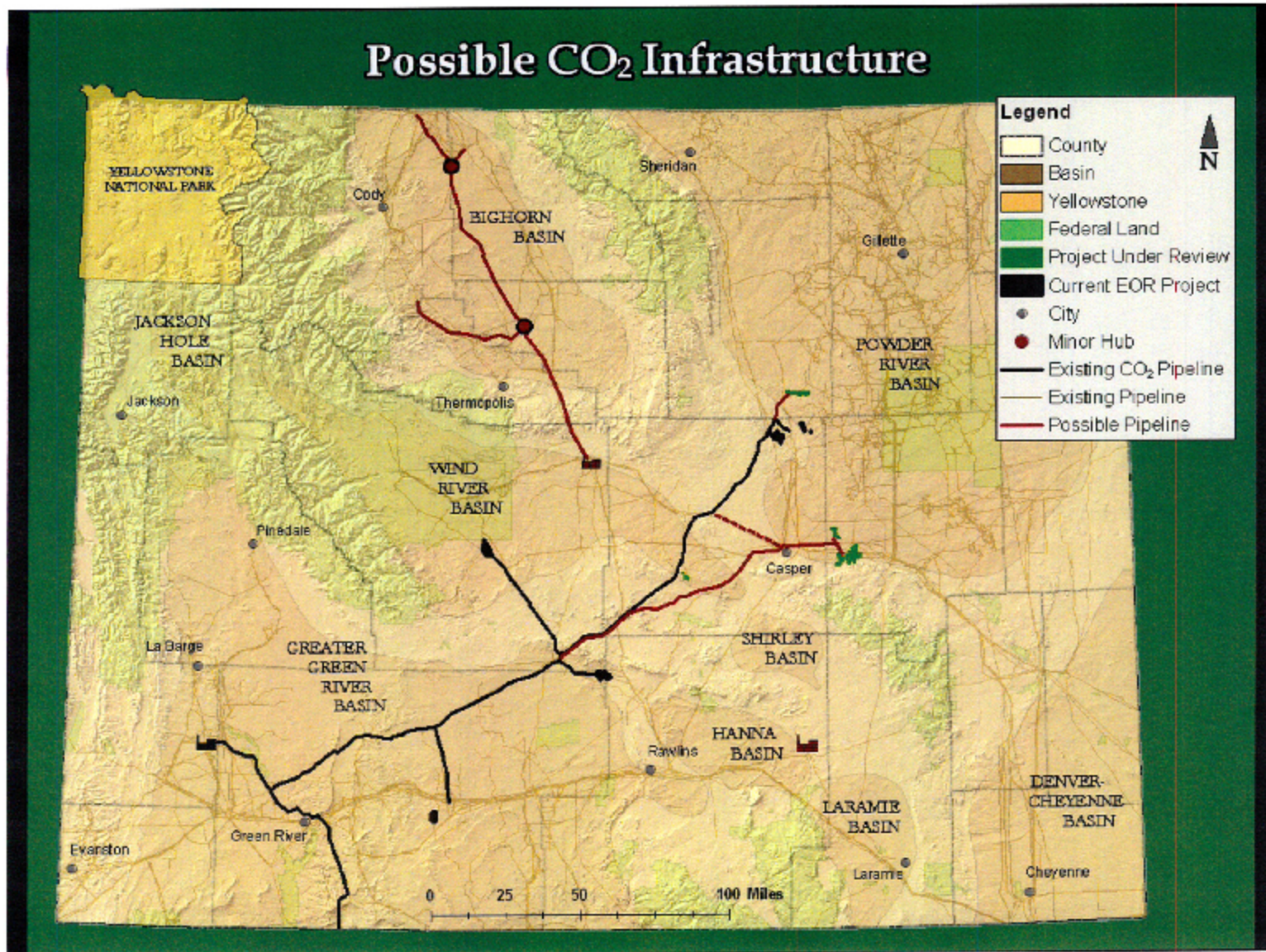
Bell Creek is a good stepping stone to Cedar Creek



- Encore will control the infrastructure in the Northern Powder River Basin into the Williston Basin.
- Bell Creek is an ideal project from an Original Oil-In-Place and reservoir characteristics standpoint.
- Encore will leverage our CO₂ knowledge and infrastructure into acquisition opportunities and expanding into our existing fields.
- The Cedar Creek Anticline is a 200 MM barrel CO₂ target.



Possible CO₂ Infrastructure



Medicine Bow - EOR Opportunities in Wyoming

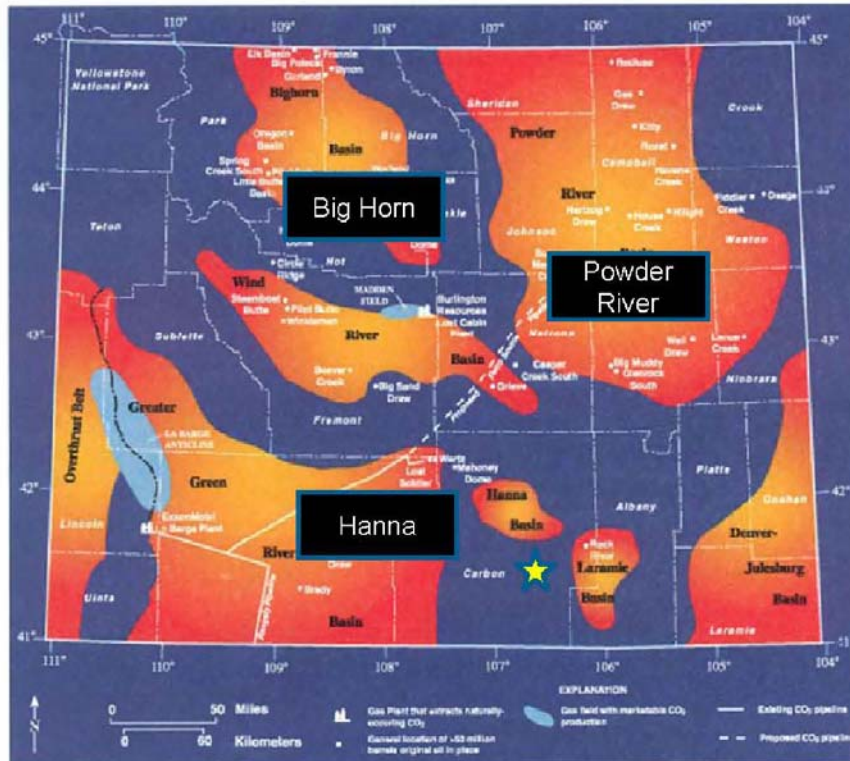


Figure 3. Fields and facilities in Wyoming related to carbon dioxide production, locations of current enhanced oil recovery operations that use carbon dioxide, and major oil fields that had 50 million or more barrels of original oil in place.

EOR Potential in WY

Reserves in Place = 8 bn bbls
 Recoverable w/ CO2 = 5%-15%
 Recoverable w/CO2 = .4-1.2 bn bbls
 CO2 @ 6mcf/bbl = 2.4-7.2 TCF



Medicine Bow Site



CO2 EOR Regions

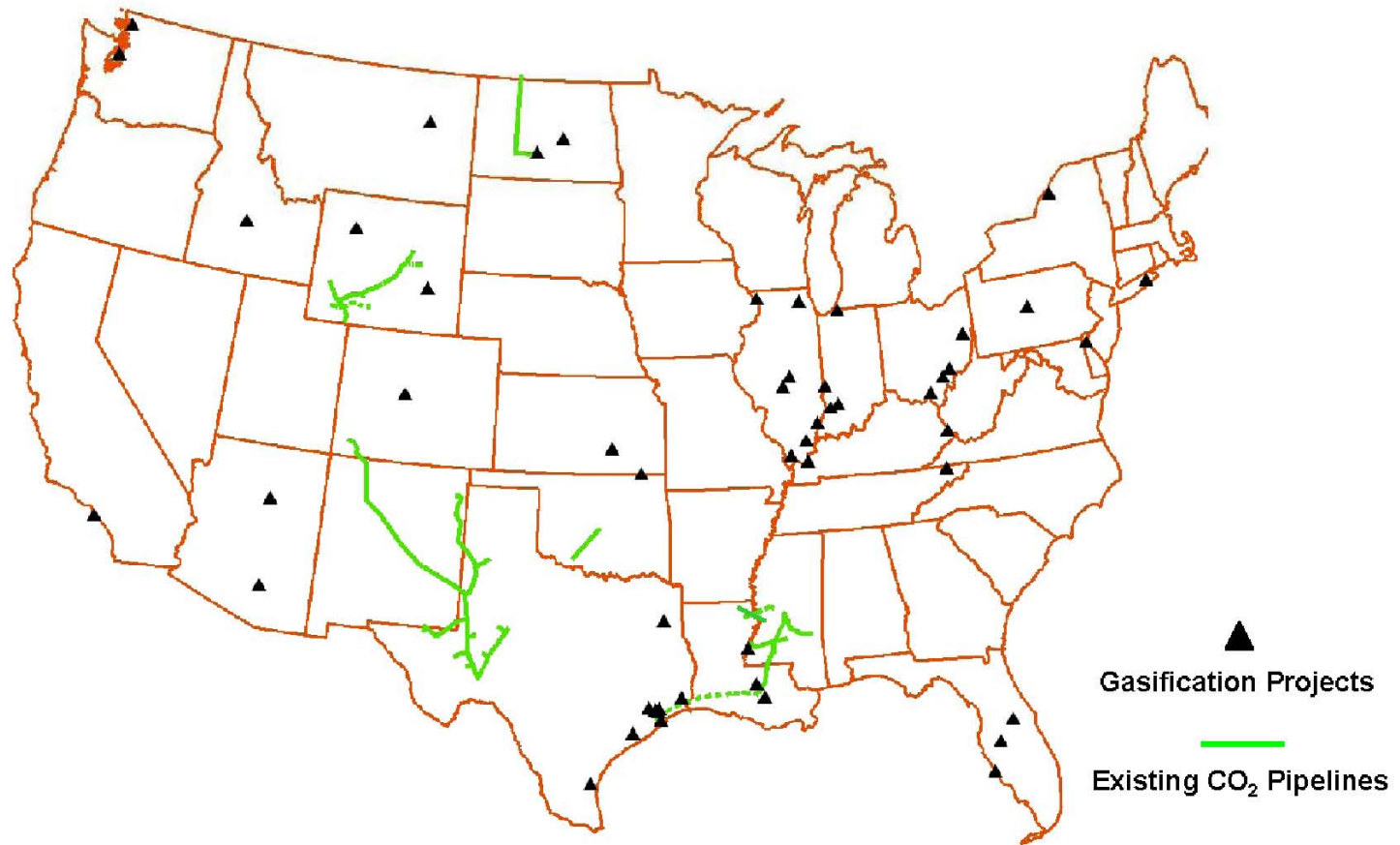
Source:

www.eori.uwyo.edu

www.fe.doe.gov/programs/oilgas/eor/

Site located near EOR and CCS opportunities

CO₂ Pipelines vs Proposed Gasification Projects

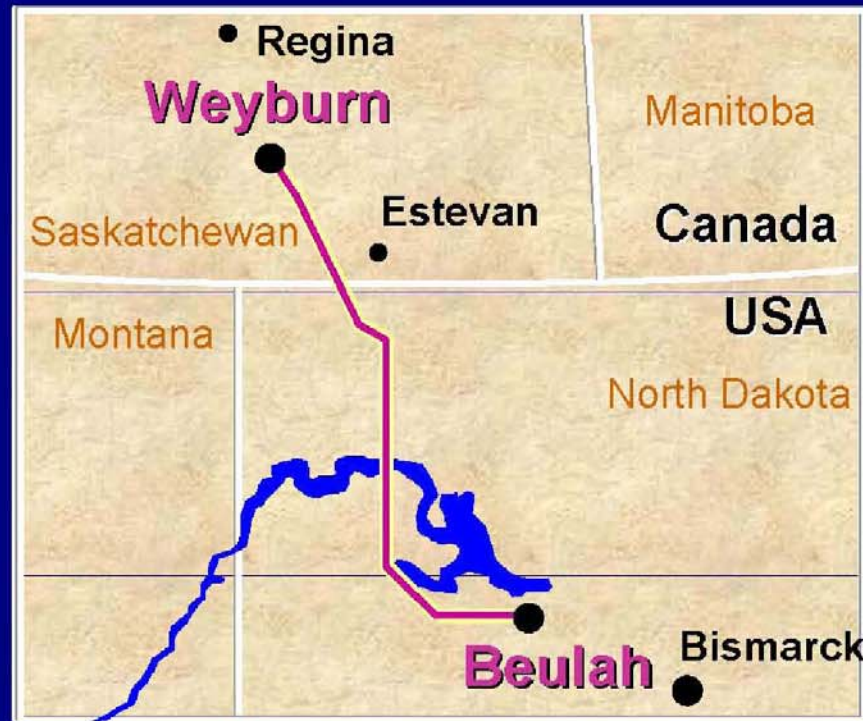




REGION OF INFLUENCE

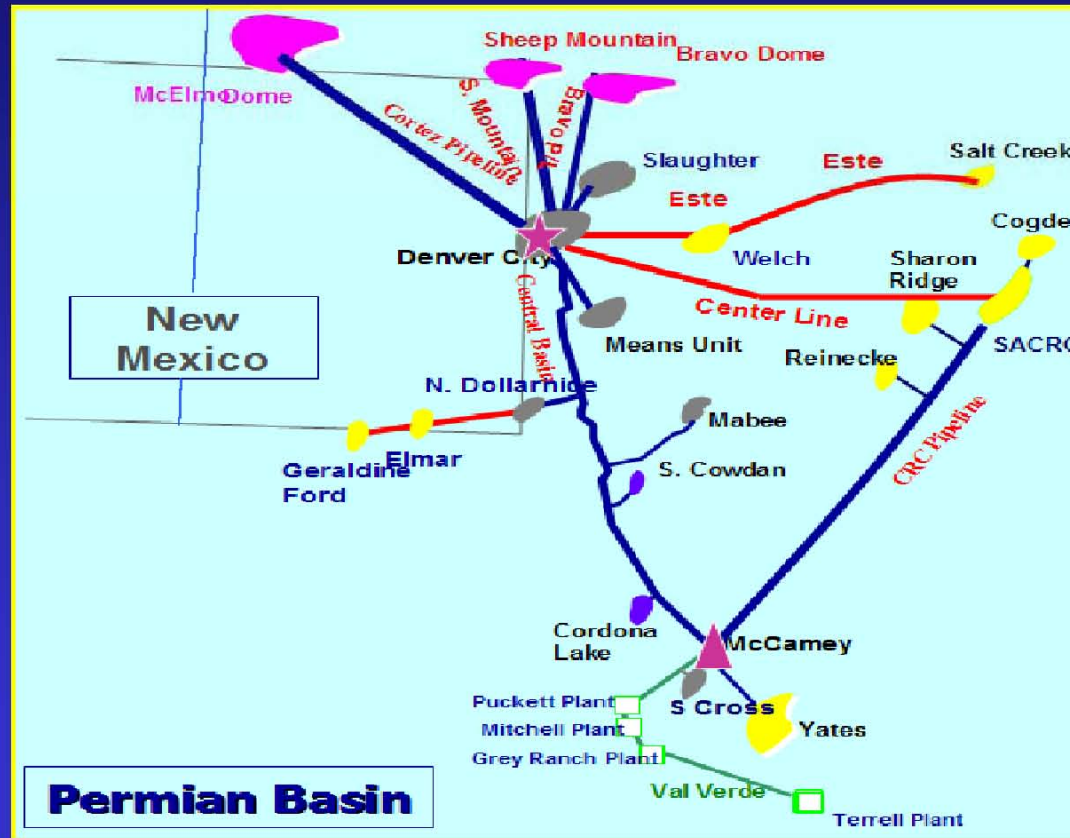


CO₂ Pipeline To Canada



THIS CO₂ EOR IS BIG BUSINESS*

Case History: Permian Basin Fields & Infrastructure

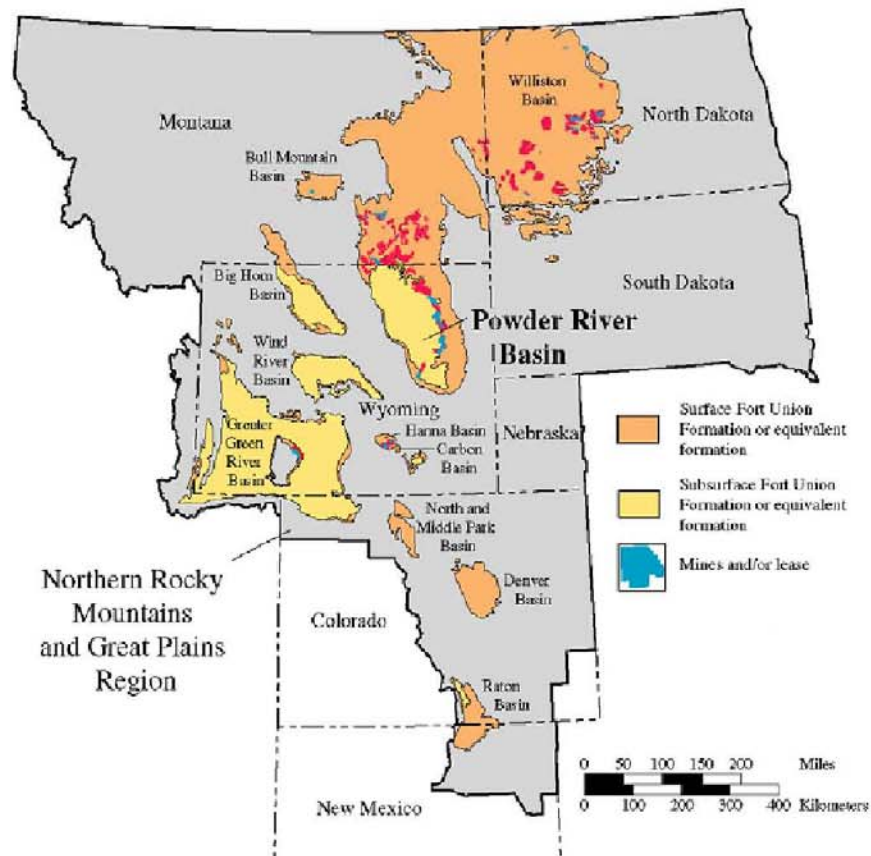


* Est. yearly PB figures:

- the 180,000 bopd is directly valued at \$3.3 billion (\$50/bbl)
- The 1.7 bcfd commodity CO₂ transaction value is ~\$400 million

And just the 2500 miles of CO₂ Pipelines themselves are conservatively worth over \$2 billion

Powder River Basin



From GasTech 2008
EORI Presentation

THE COMING PARADIGM ...*

- Networks of anthropogenic sources will be connected via pipelines in a hub & spoke arrangement
 - ✓ *Such networks are already being built*
- To the extent feasible and relevant, industrial facilities will be collocated with CCS-suitable geologic reservoirs
 - ✓ *This is already being done (FutureGen, ethanol plants, etc.)*
- CO₂ will be purchased, traded and used as a commodity, not regulated as a pollutant
 - ✓ *"Memo to Rest of the World: This has been done successfully in the U.S. for the past 30+ years"*
- Petroleum professionals will play an integral role in these new industries
 - ✓ *i.e., Where and where not to put the CO₂ underground*
 - ✓ *"Memo to listeners: Update your resumes and keep 'em handy"*

* 2006, Kipp Coddington (North American Carbon Capture and Storage Association)

CCS – a promising option



Storage Options for CO₂

