


Gasification Project Development …Progress and Challenges

William Rosenberg

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Gasification Development Team

- Leucadia
  - Fortune 500 NYSE company
  - Providing equity for project development
  - Maintains full-time development team that includes financial, technical, construction and operating experts based in Houston, TX
- E3 Gasification
  - Headed by William Rosenberg who has 30+ years experience with public and private finance and energy and environmental policy. He formerly served as Assistant Administrator of EPA; Assistant Administrator of the Federal Energy Administration; and Chairman of the Michigan Public Service Commission.
- Johnston Development Company
  - Headed by former Senator Bennett Johnston who served 24 years in the U.S. Senate. As a member of the Senate Committee on Energy and Natural Resources from its creation, and as its Chairman and Ranking Member for much of that time, Senator Johnston was either directly or indirectly responsible for all energy legislation considered by the Congress between 1973 and 1996.

3Party Covenant Structure

- Federal Guarantee: Low cost financing to benefit consumer, not transfer of risk to the Federal Government
- Creditworthy Off-take: 30 year contract with state entity, utilities or creditworthy industrial customers
- Owner/Operator: Development capital; equity investment; development and operational knowhow

Project Portfolio

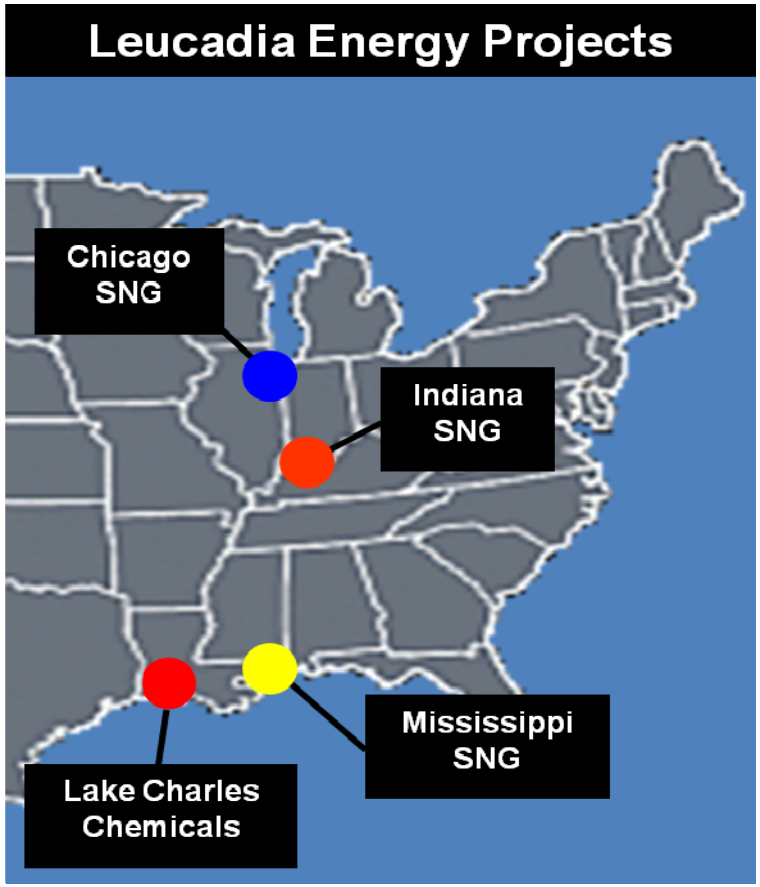
- Initiative includes four solid fuel gasification projects to produce substitute natural gas (SNG) and chemicals

  -- Rockport, IN (Coal to SNG)

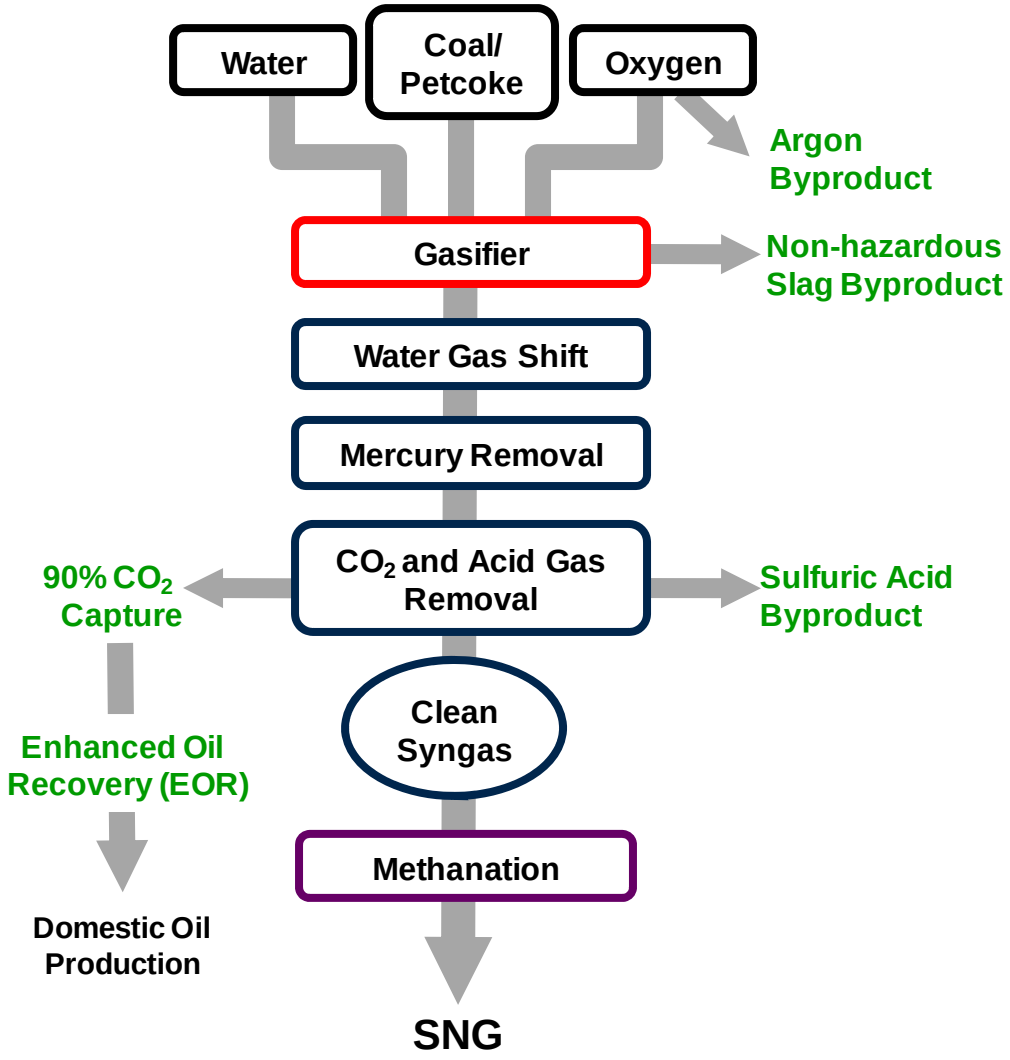
  -- Moss Point, MS (Petcoke to SNG)

  -- Lake Charles, LS (Petcoke to methanol)

  -- Chicago, IL (Coal/Petcoke to SNG)



SNG Technology



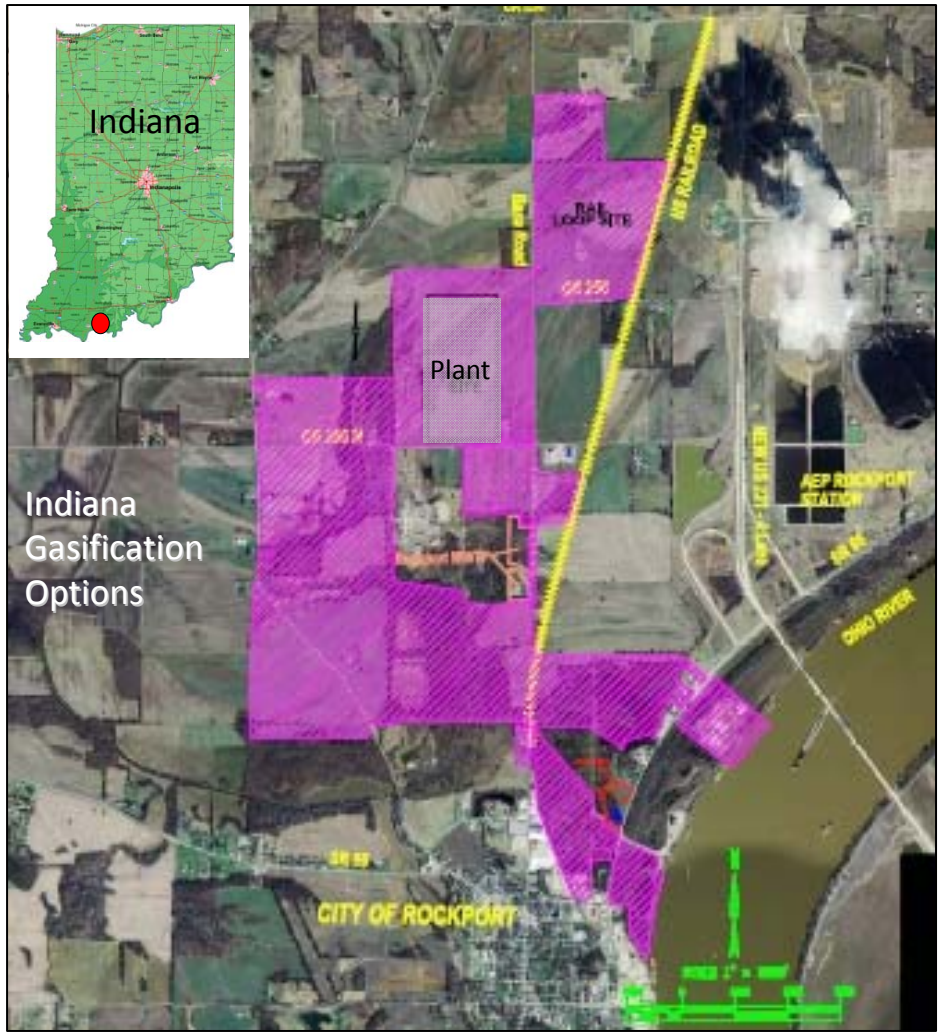
- Gasification technologies have been used in the chemical, refining, and fertilizer industries for over 50 years
- There are more than 140 gasification plants operating worldwide (19 plants in U.S.)
- Process converts coal or petcoke into natural gas substitute (SNG) saleable through interstate pipelines.
- Produces marketable argon, CO_2, inert slag and sulfuric acid byproducts.

Business Model Fundamentals

- 3Party Covenant
  - Assured revenue from long-term contract
  - Federal Guarantee
  - Equity investment and knowhow
- First mover opportunity for advantaged financing and incentives
- Strong environmental profile
  - Capture about 90% of CO_2 for use in enhanced oil recovery (EOR)
  - Low criteria pollutant emissions
  - Low water effluent and solid waste production
- Economies of scale in development, construction & operations
- Consistency with national energy and environmental policies

Indiana SNG Project Example

- **Project Company:** Indiana Gasification, LLC (IG)
- **Location:** 1,300 acre site in Spencer County Indiana northeast of Rockport on the Ohio River
- **Fuel:** 3.5 million tons/yr Illinois Basin coal from barge, rail or truck (possible petcoke blends)
- **Production:** ~40 billion cubic feet (bcf) /year substitute natural gas (SNG) delivered to ANR and/or MGT pipelines
- **Off-take:** SNG sales to Indiana Finance Authority (IFA) under 30-year contract
- **Other products:** Sulfur or sulfuric acid, argon, power, additional SNG, CO_2
- **Technology:** GE Quench gasification



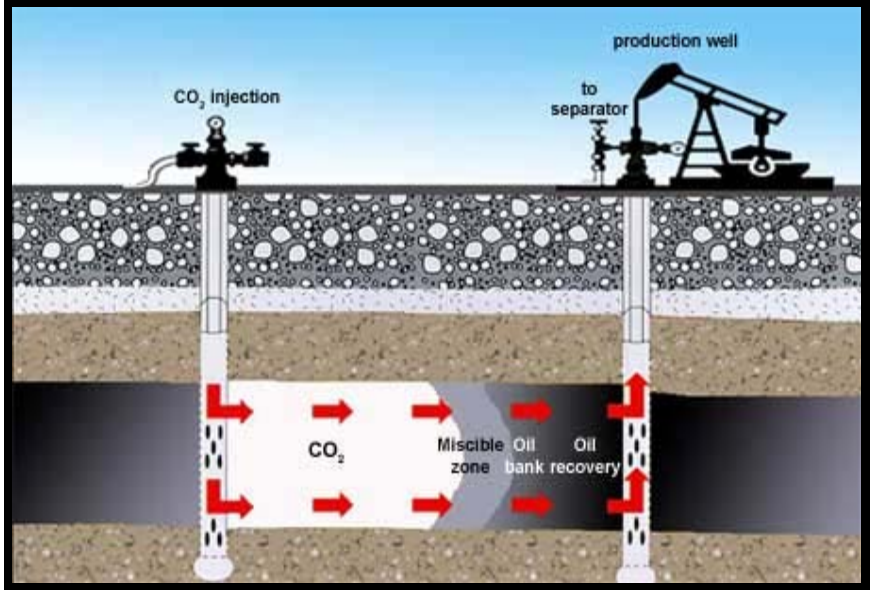
Indiana Legislation

- The legislation builds on “no look back” legislation that was approved overwhelmingly by the legislature in 2007 and affirmed and strengthened in 2008 to support the Project.
- Working with the Governor’s staff, Democratic House leadership, and Republican Senate leadership, a legislative approach was developed to enable the sale of SNG from the Project to a state entity, the Indiana Finance Authority (IFA).
- The Legislation was introduced in January 2009 and signed into law in March 2009. It creates a strong credit by empowering the IFA to become a load serving entity for SNG in the state and enabling the Project to rely on an assured revenue stream from ratepayers.
- The Legislation was amended in 2010 to allow for SNG purchase by IFA through natural gas swaps.
- Detailed term sheet has been signed with IFA and definitive contract is under negotiation.

CO_2 Sequestration through EOR

- The manufacture of SNG has an inherent advantage for mitigating CO_2 emissions because it recovers about 90% of the CO_2 produced as a concentrated stream.
- CO_2 capture provides for economic sale of the CO_2 for use in enhanced oil recovery (EOR).
- CO_2 EOR is a proven technique for increasing oil production at depleting oil fields and permanently storing the CO_2 to mitigate climate change concerns.

Enhanced Oil Recovery (EOR)

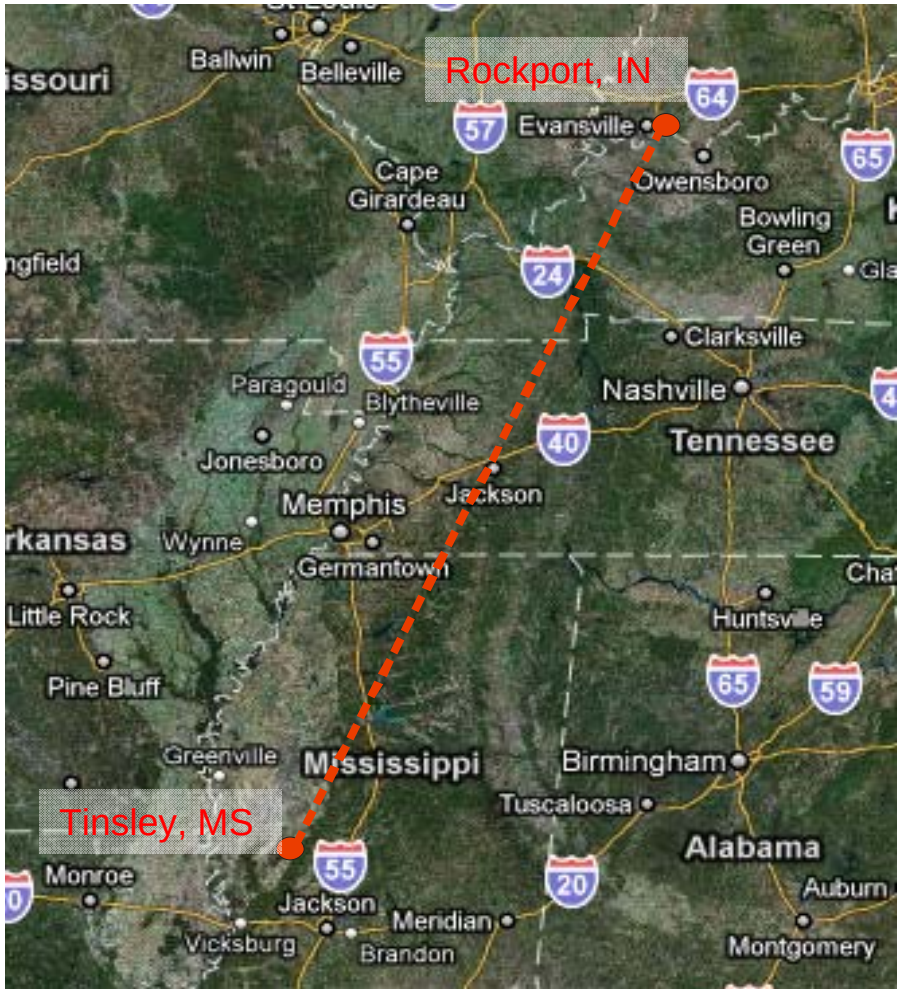


CO_2 is permanently sequestered when used for EOR because CO_2 that returns to the surface in produced oil is separated and re-injected. Ultimately, all of the CO_2 remains trapped in the depleted oil field. Terms of CO_2 sales contracts will require appropriate monitoring and verification by the EOR operator to ensure permanent sequestration.

Indiana CO_2 Plan

- Project will capture about 90% of its CO_2 in a concentrated stream.
- Indiana Gasification has signed a 15 year agreement with Denbury Onshore LLC to sell all of the CO_2 captured by the facility
- Denbury is proposing to construct a 500-700 mile CO_2 pipeline that would transport CO_2 from IG to Mississippi for use in its EOR operations.

Preliminary CO_2 Pipeline Route



Role of EOR in Addressing CO_2

Energy Facts

Tapping into Stranded Domestic Oil: Enhanced Oil Recovery with Carbon Dioxide Is a Win-Win-Win

Americans are demanding measures that will relieve the pain they are feeling at the pump today. The country has a significant, untapped win-win-win opportunity to stimulate our economy and reduce our dependence on imported oil while actually helping to protect wild places and reduce global warming pollution: a process known as carbon dioxide enhanced oil recovery (CO_2-EOR). According to industry research CO_2-EOR would give America access to large, domestic oil resources—potentially more than four times the proven U.S. reserves, or up to 10 full years of our total national consumption. But without the stimulus of climate protection legislation, CO_2 for oil recovery is likely to remain in short supply and most of this domestic oil resource will stay in the ground.

CO_2-EOR Can Produce More Oil Right Now

Enhanced oil recovery using carbon dioxide offers an immediate- to medium-term opportunity to produce more oil right here at home, from mature fields that have already been drilled and have much of the needed infrastructure already in place. CO_2 injection can increase oil production in as little as a few months to two years—a fraction of the time needed to discover, further explore, and develop a viable new oil field. And in the EOR process, large quantities of CO_2 from industrial sources can be sequestered underground rather than emitted to the atmosphere, reducing global warming pollution.

"Stranded oil" is oil that is left in the reservoir after conventional recovery techniques have been completed. Injecting CO_2 mobilizes the stranded oil, driving it to the wellbore and making it recoverable. This CO_2 "flooding" used for enhanced oil recovery can result in a recovery of up to 20 percent more of the original oil in place. Nationally, a massive 400 billion barrels of oil remains stranded, of which 85 billion barrels could be technically recoverable according to oil and gas industry research and consulting firm Advanced Resources International.[1] As much as 45 billion barrels of "stranded oil" from just over 1,000 existing fields would be economical to produce at a price equal to $70 per barrel.

For more information, please contact **George Peridas** at (415) 875-6181.

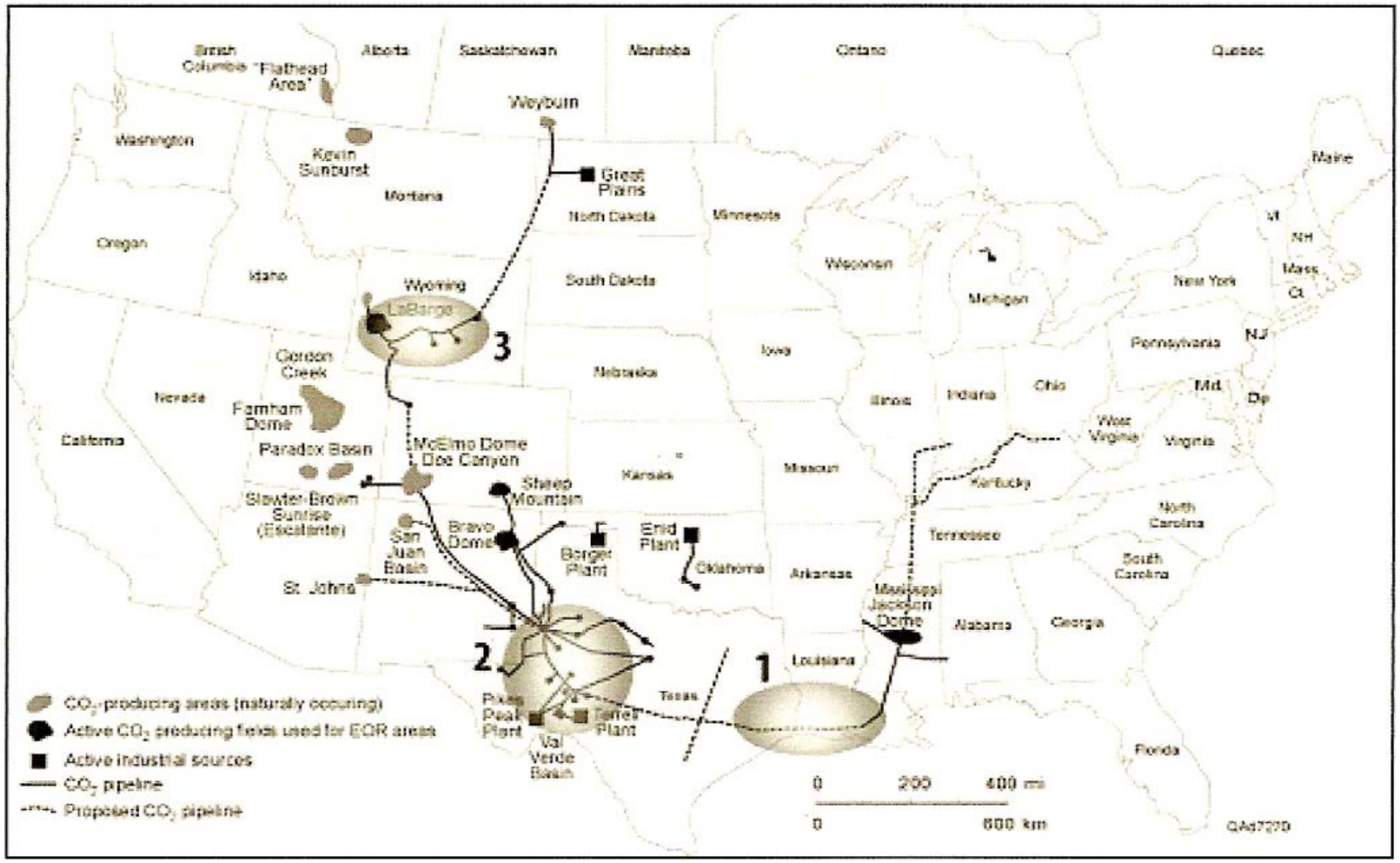
NRDC
The Earth's Best Defense

www.nrdc.org/policy

July 2008

- CO_2 EOR recognized as potentially vital CO_2 mitigation strategy
  - Available today without legal or regulatory uncertainty
  - Sequester CO_2 in well understood formations
  - Increase onshore domestic energy production
- Recent research has significantly increased estimates of EOR CO_2 storage potential
  - Evaluation of residual oil zones (ROZs) in addition to main pay zones (MPZs) has significantly increased storage estimates
  - 6-8 billion tons of potential storage (Ming & Melzer July 2010)
  - Enough to store all of CO_2 likely to be captured at industrial facilities?
- Role of EOR may be determined by whether it is accepted as "Sequestration"
  - NRDC and others support EOR…
  - But MMV requirements may be more than EOR industry can stomach

CO_2 "Horseshoe Pipeline"



Reproduced from paper by C Michael Ming and L. Stephen Melzer, CO2 EOR: A Model for Significant Carbon Reductions, presented at the MIT Energy Initiative Symposium on the Role of EOR in Accelerating the Deployment of CCS, July 23, 2010.

Conclusions

- Gasification offers a unique clean domestic energy investment opportunity that achieves economic development, energy diversity and environmental protection/climate objectives.
- Business model is centered on 3Party Covenant financing concept with federal financing support and creditworthy long-term off-take contract
- Critical to development of coal/petcoke gasification is ability to address CO_2 emissions *right now*
- CO_2 EOR offers an opportunity for economic CO_2 mitigation right now
- Acceptance of CO_2 EOR as sequestration (with MMV requirements that can be accepted by EOR industry) is critical for near-term project development and near term commercial CO_2 sequestration.