DOE, NETL

Pittsburg, PA. ***May, 2007***

Dr. Scott W. Tinker
Director

Acknowledgments

- US Department of Energy
- FutureGen Alliance
- FutureGen Texas Team
- Governor Perry and Commissioner Williams
- BEG Gulf Coast Carbon Center Researchers
- GCCC Member Companies
- BEG Global Collaborators

Outline

- The Gulf Coast Carbon Center
- Texas and FutureGen
- FutureGen Texas Sites
- FutureGen Like

The GCCC

The GCCC will create and provide basic data to bring science, industry, academia, decision makers, and NGOs together to create a sequestration industry in the Gulf of Mexico, and beyond.

The GCCC


FutureGen
TEXAS


Gulf
Coast
Carbon
Center


bp


Chevron


Entergy
THE POWER OF PEOPLE™


KINDER MORGAN


MARATHON


NRG


PRAXAIR


THE UNIVERSITY OF TEXAS AT AUSTIN
JACKSON
SCHOOL OF GEOSCIENCES

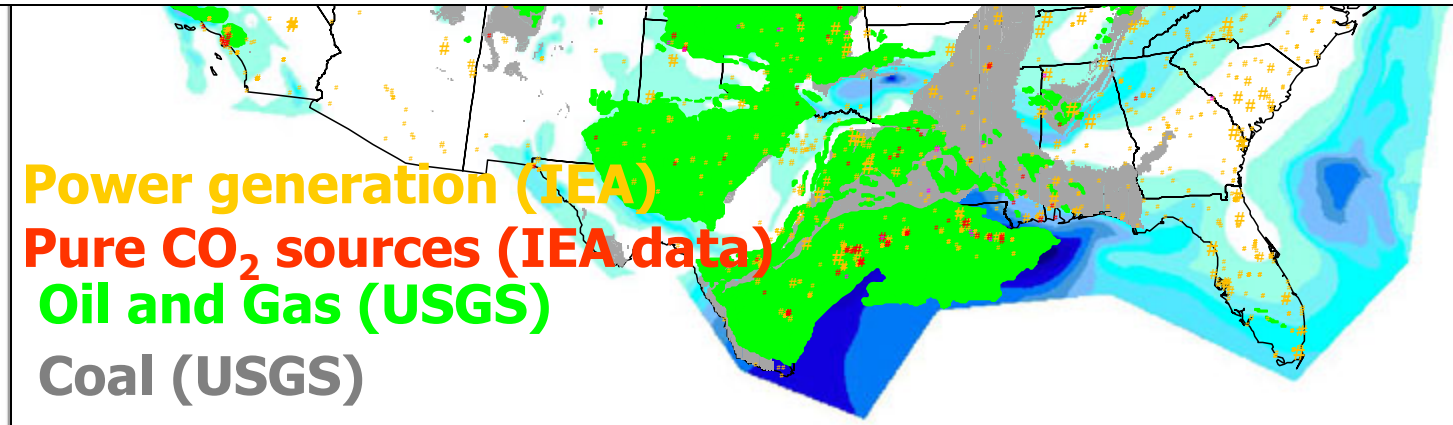

BUREAU OF ECONOMIC GEOLOGY


Schlumberger


Shell

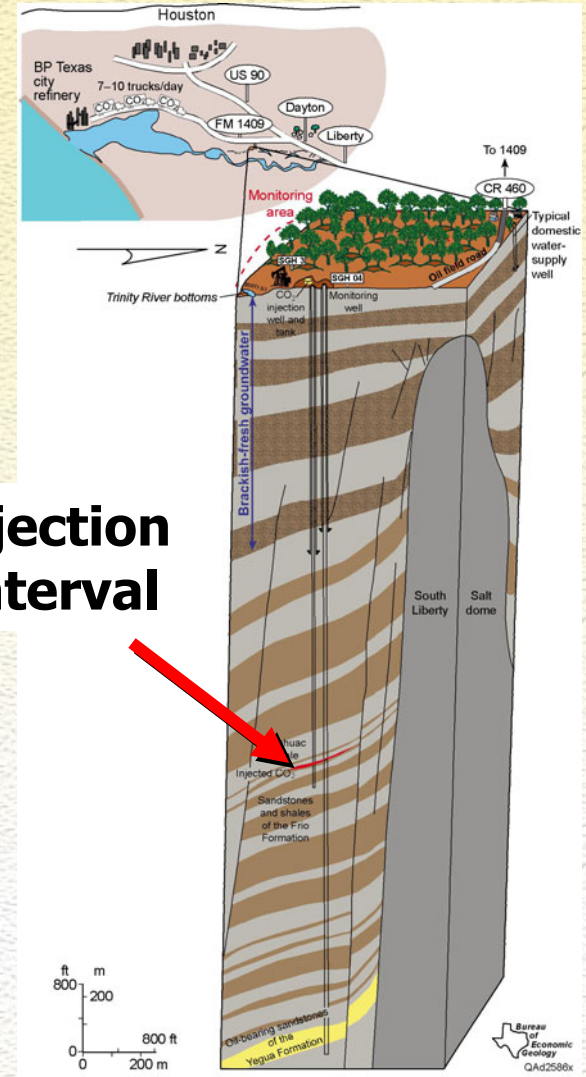
CO2 Sources and Sinks

- Global ~ 26 Gt of CO2 annually
- U.S. ~ 6 Gt of CO2 annually
- Texas ~ 700 MMt of CO2 annually
- Gulf Coast ~ 220 GT storage

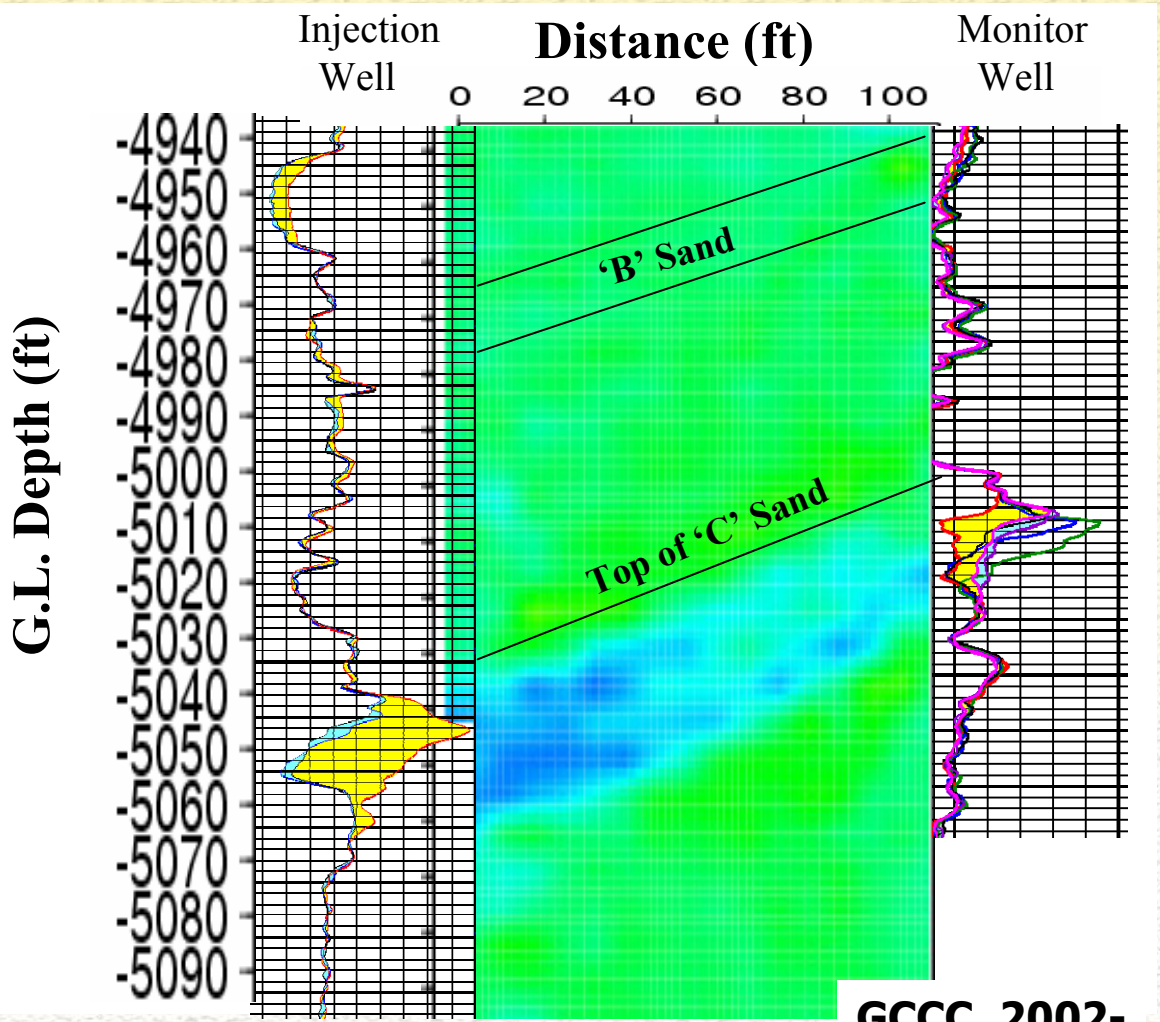


BEG, 2001

Frio I and II

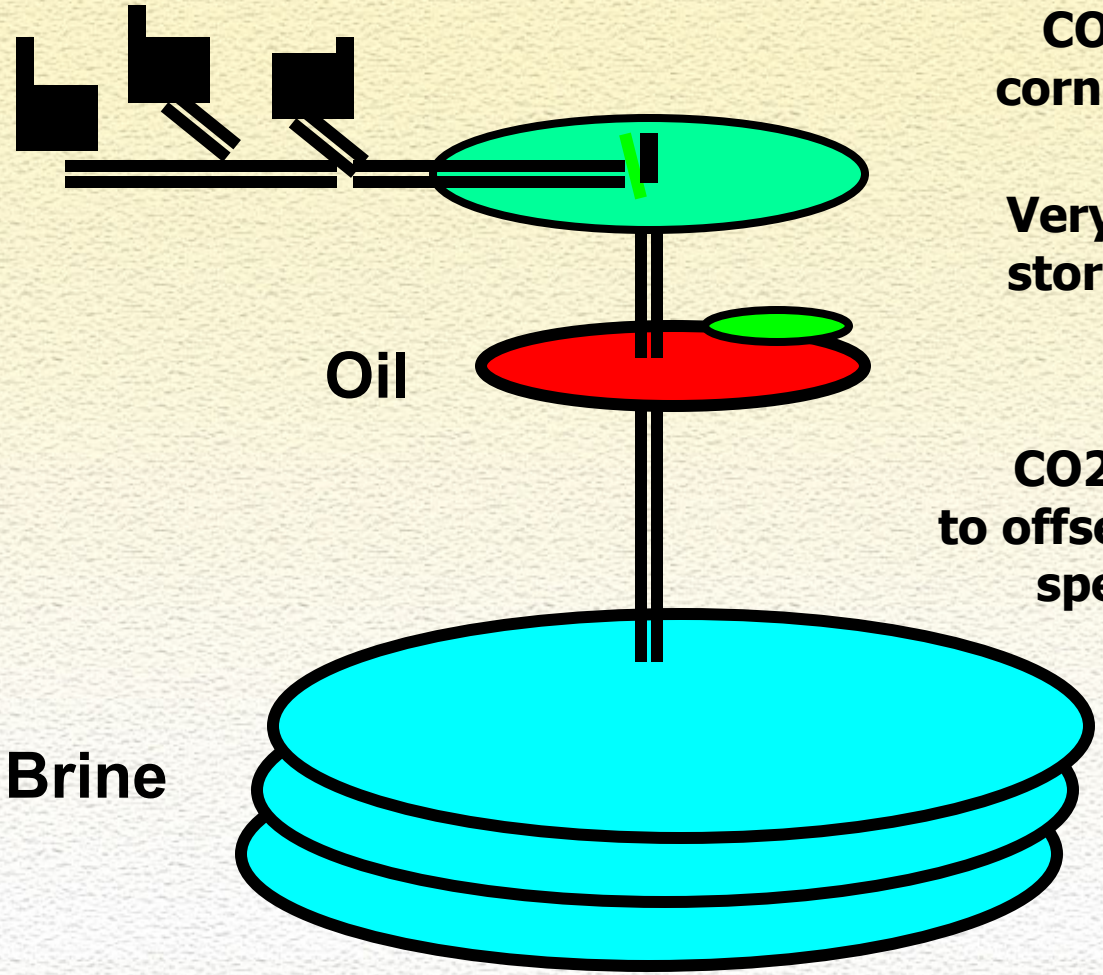


Injection interval



GCCC, 2002-

Stacked Sinks



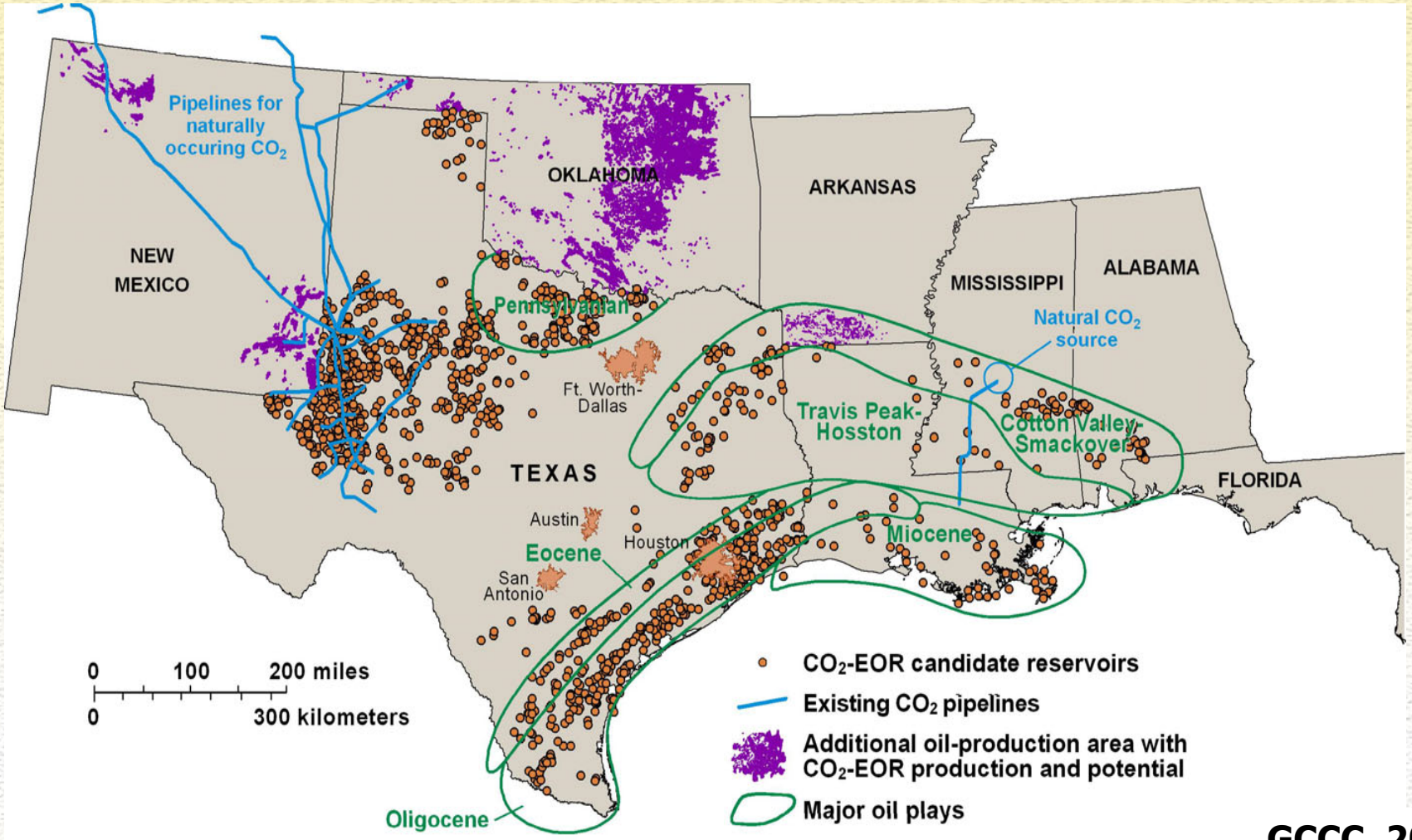
CO2 sequestration is a cornerstone of FutureGen.

Very large volume of CO2 storage potential in brine formations.

CO2 will be used for EOR to offset development cost and speed implementation.

GCCC, 2003

Inventory of Sinks with Economic Offset (EOR)



GCCC, 2004

The EOR Win-Win

Texas has been injecting CO_2 for EOR safely in West Texas for over thirty years.

- **EOR re-energizes depleted fields**
- **CO_2 changes the viscosity of the oil**
- **EOR recovers 10% + of additional oil**
- **An extensive pipeline network exists in West Texas and is coming to East Texas**

GCCC, 2005

1993 !

Holtz, M. H., Nuñez-Lopez, Vanessa, and Breton, C. L., **2005**, Moving Permian Basin technology to the Gulf Coast: the geologic distribution of CO2 EOR potential in Gulf Coast reservoirs, *in* Lufholm, Peter, and Cox, Denise, eds., Unconventional reservoirs technology and strategies: alternative perspectives for the Permian Basin: West Texas Geological Society Fall Symposium, October 26–28, Publication #05-115, CD-ROM [10 p.].

Holtz, M. H., Nance, P. K., and Finley, R. J., **2001**, Reduction of greenhouse gas emissions through CO2 EOR in Texas: Environmental Geosciences, v. 8, no. 3, 187-199.

Holtz, M. H., Nance, Peter, and Finley, R. J., **1999**, Reduction of greenhouse gas emissions through underground CO2 sequestration in Texas oil and gas reservoirs: The University of Texas at Austin, Bureau of Economic Geology, final report prepared for the Electrical Power Research Institute (EPRI), EPRI Technical Report No. WO4603-04, 68 p. + figures.

Beike, Dieter, and Holtz, M. H., **1996**, Integrated geologic, engineering, and financial assessment of gas displacement recovery: Society of Petroleum Engineers, SPE Paper No. 35167, p. 1–7.

Holtz, M. H., Beike, Dieter, and Nance, P. K., **1993**, Characteristics and future potential of gas displacement recovery in Texas (abs.), *in* Proceedings, 1993 SPE Gulf Coast Area Meeting and Exhibition: Society of Petroleum Engineers, Gulf Coast Section, p. 114–115.

EOR and the Economy

EOR recovery in Texas outside of the Permian Basin is estimated at 4-6 bbo, using ~ 700 MT CO_2

At $60 oil, 5.7 bbo generates:

- **wellhead value: $342 billion**
- **wellhead taxes: $30 billion**
- **other taxes: $22 billion**
- **economic activity: $498 billion**

EOR helps finance the infrastructure!

Tinker, Texas CO2 Conf, 2004

A Sensible Approach
DOE/BEG/GCCC Activities

Rome was not built in a day…

…nor was West Texas.

Hurried decisions, when consequences are global, are rarely wise.

- ***Technology (IGCC and beyond)***
- ***"Bill-ology" (Legislation: 14 S, 10 H)***
- ***Geology (ccS)***

Technology in Action!


MICHAEL LONG
TRUCK & CRANE HIRE


MICHAEL LONG
TRUCK & CRANE HIRE


MICHAEL LONG

Outline

- The Gulf Coast Carbon Center
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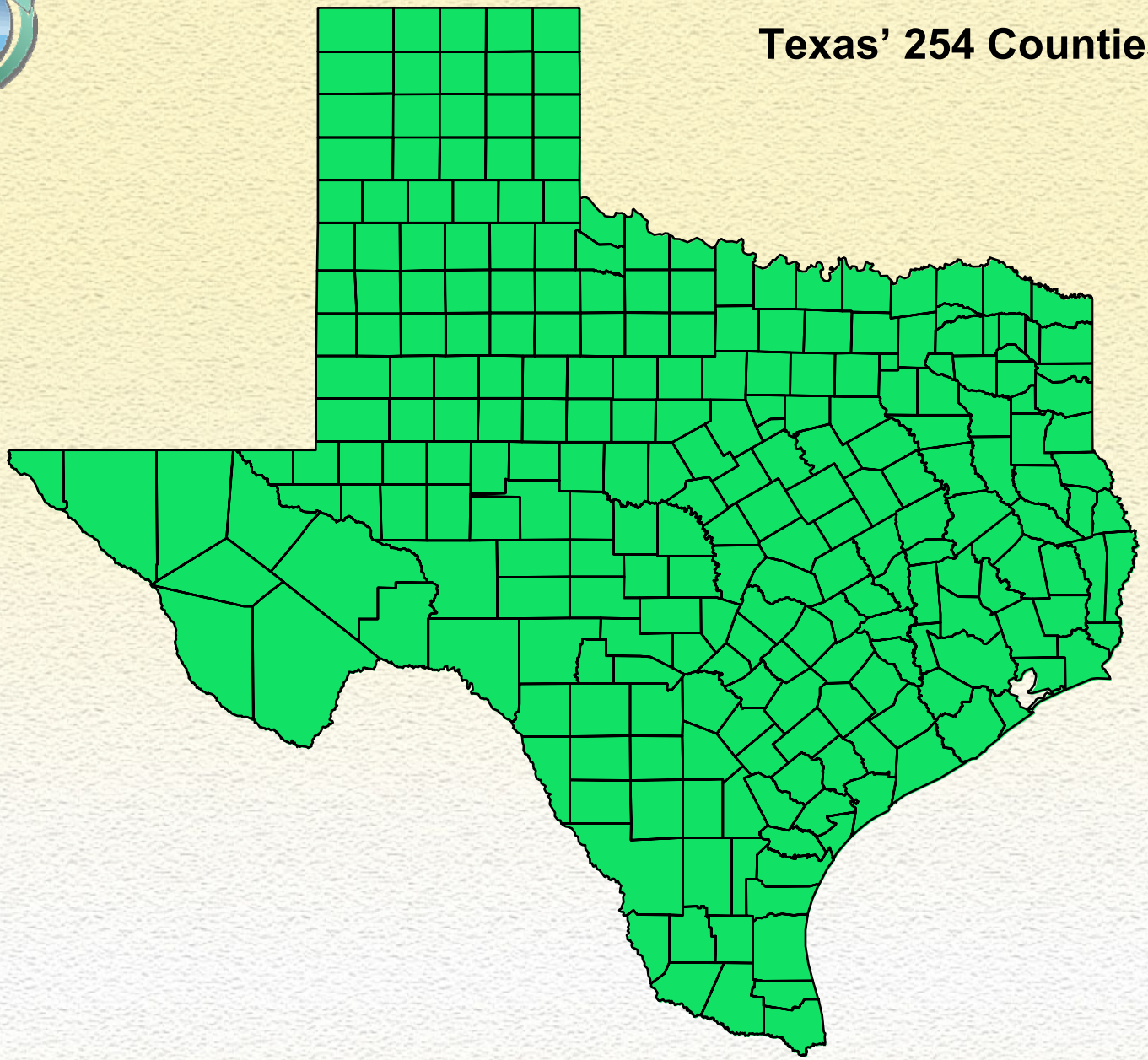
- FutureGen Texas Sites
- FutureGen Like

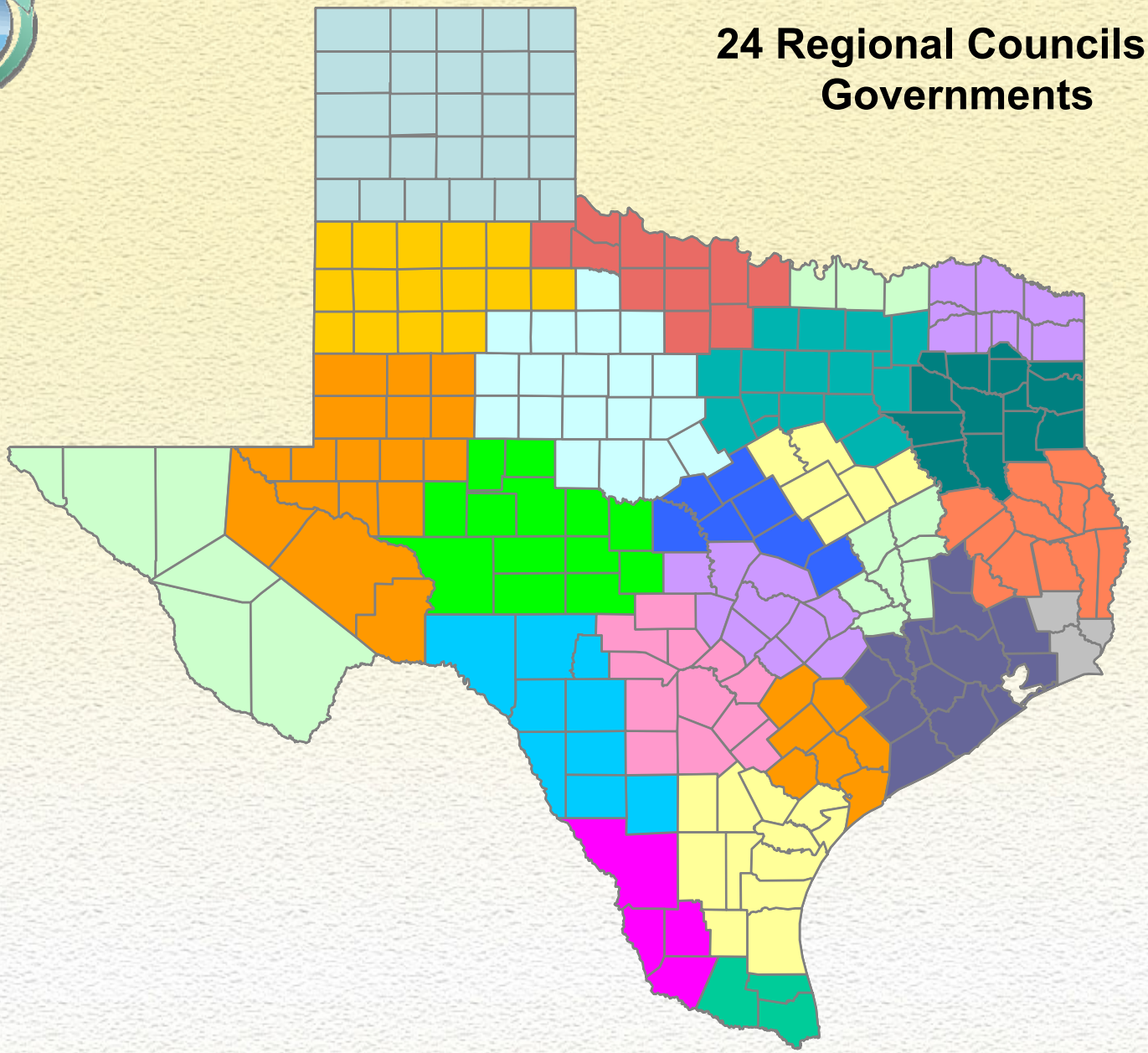
Texas

- The #1 producer of energy
- The #1 consumer of coal
- The #5 producer of coal (200 year supply)
- The #1 producer of power
- The #1 producer of oil
- The #1 producer of natural gas
- The #1 producer of wind
- The #1 consumer of hydrogen
- The #1 injector of CO_2

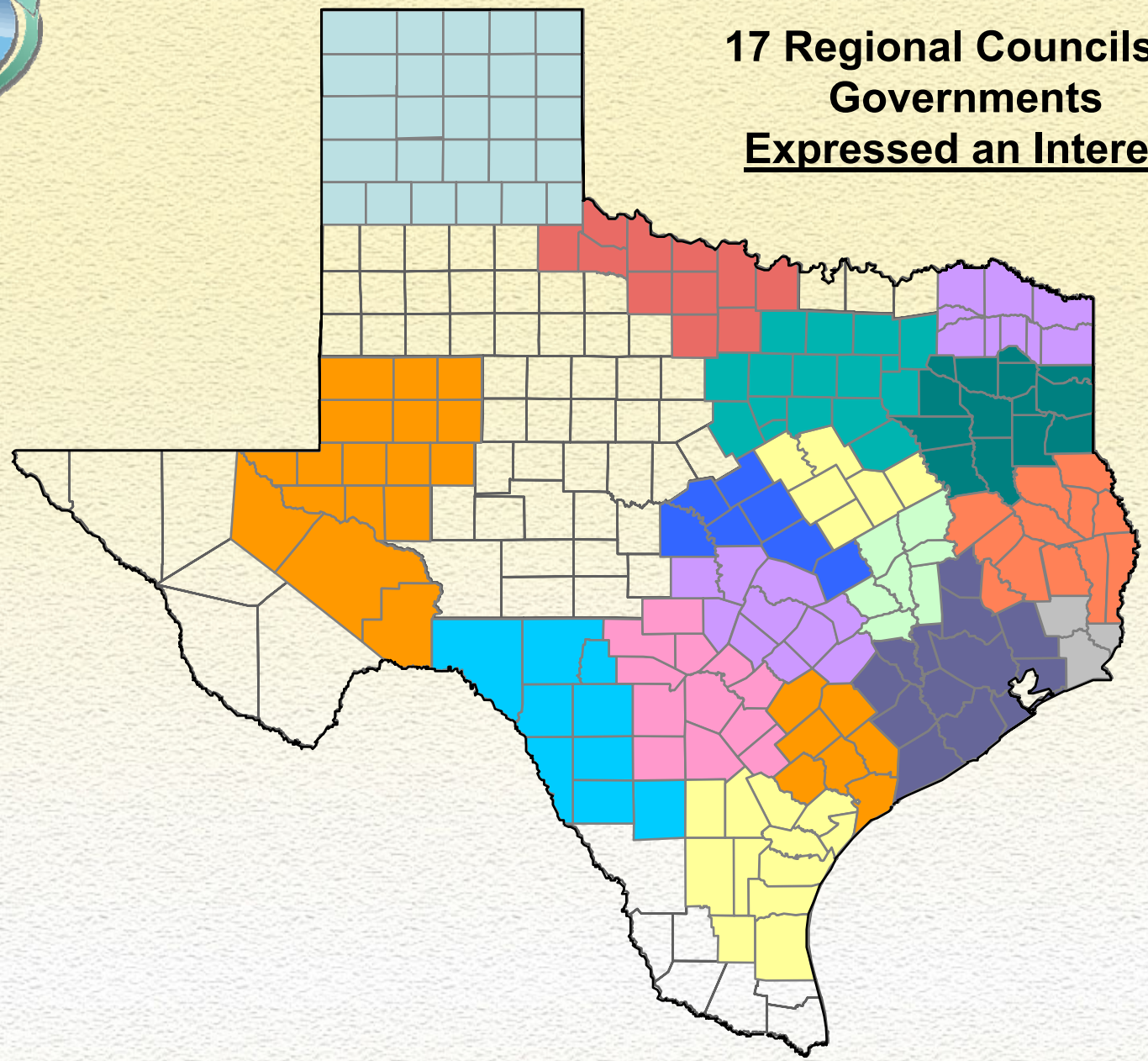
Site Selection Process

1. Get the public involved
2. An open and fair competition
3. A business and technical decision
4. Meet anticipated FutureGen criteria
5. Believe that competition is healthy
6. Plan to be good sports (when we win!)

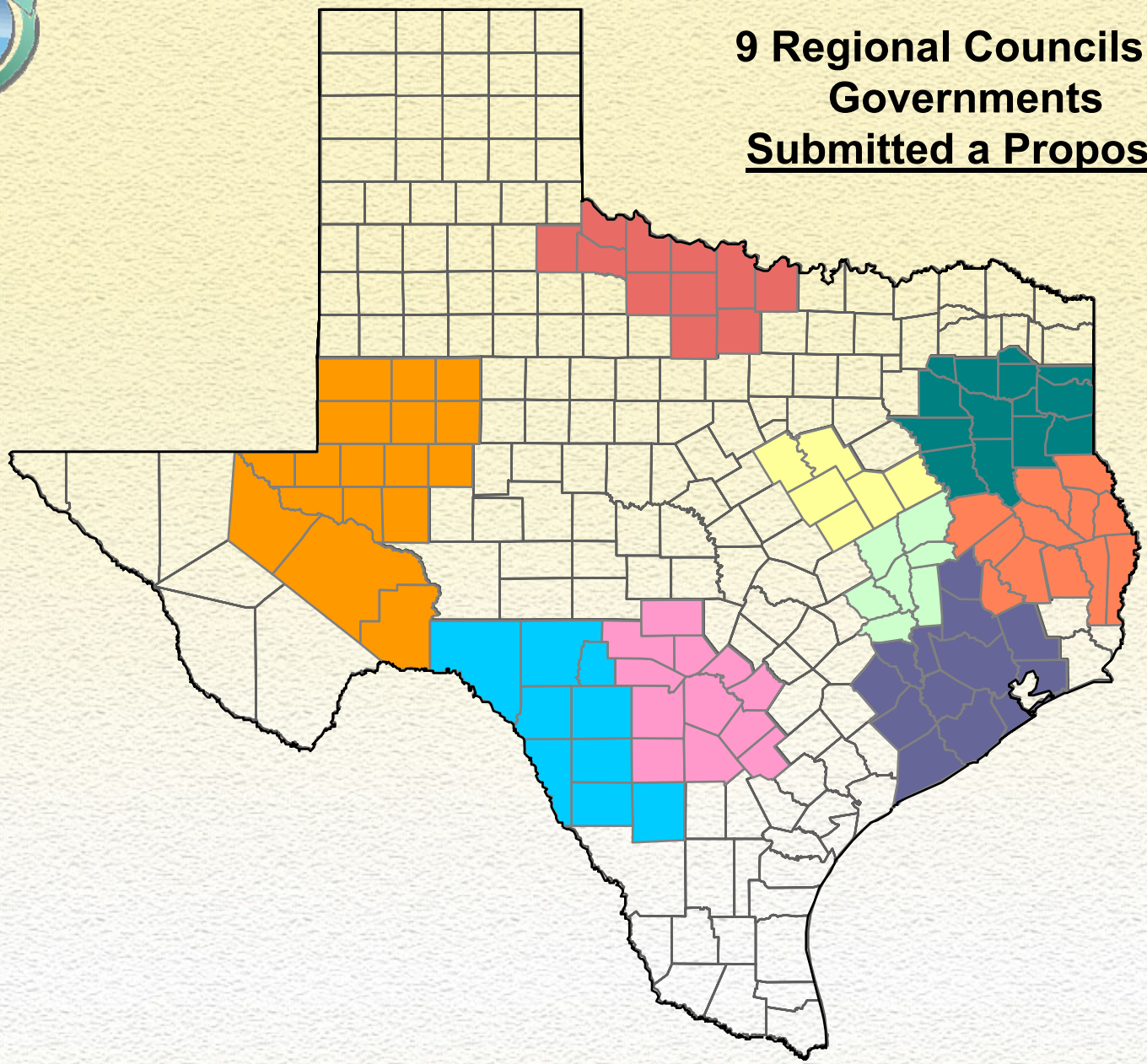

Texas' 254 Counties



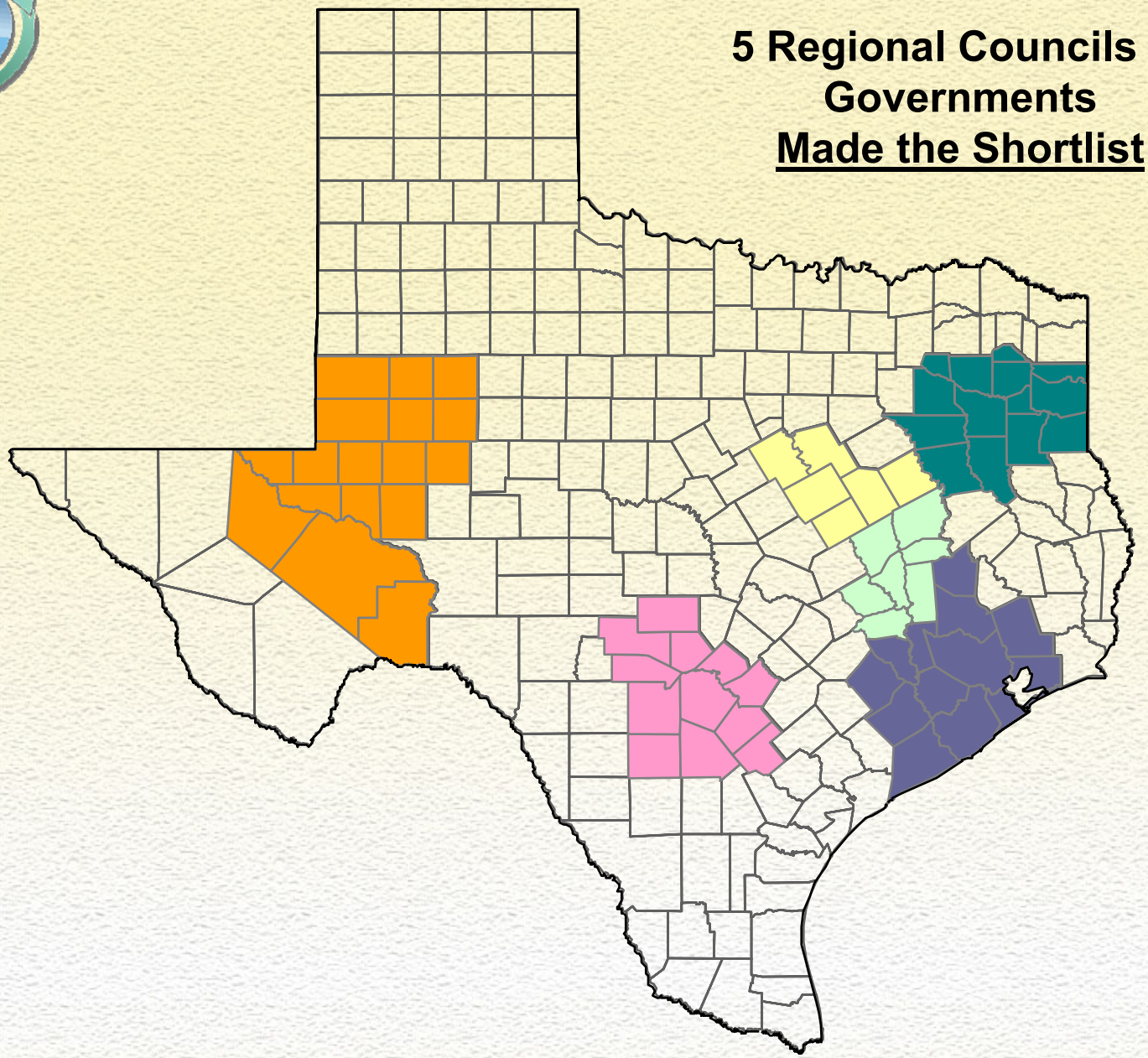
24 Regional Councils of Governments

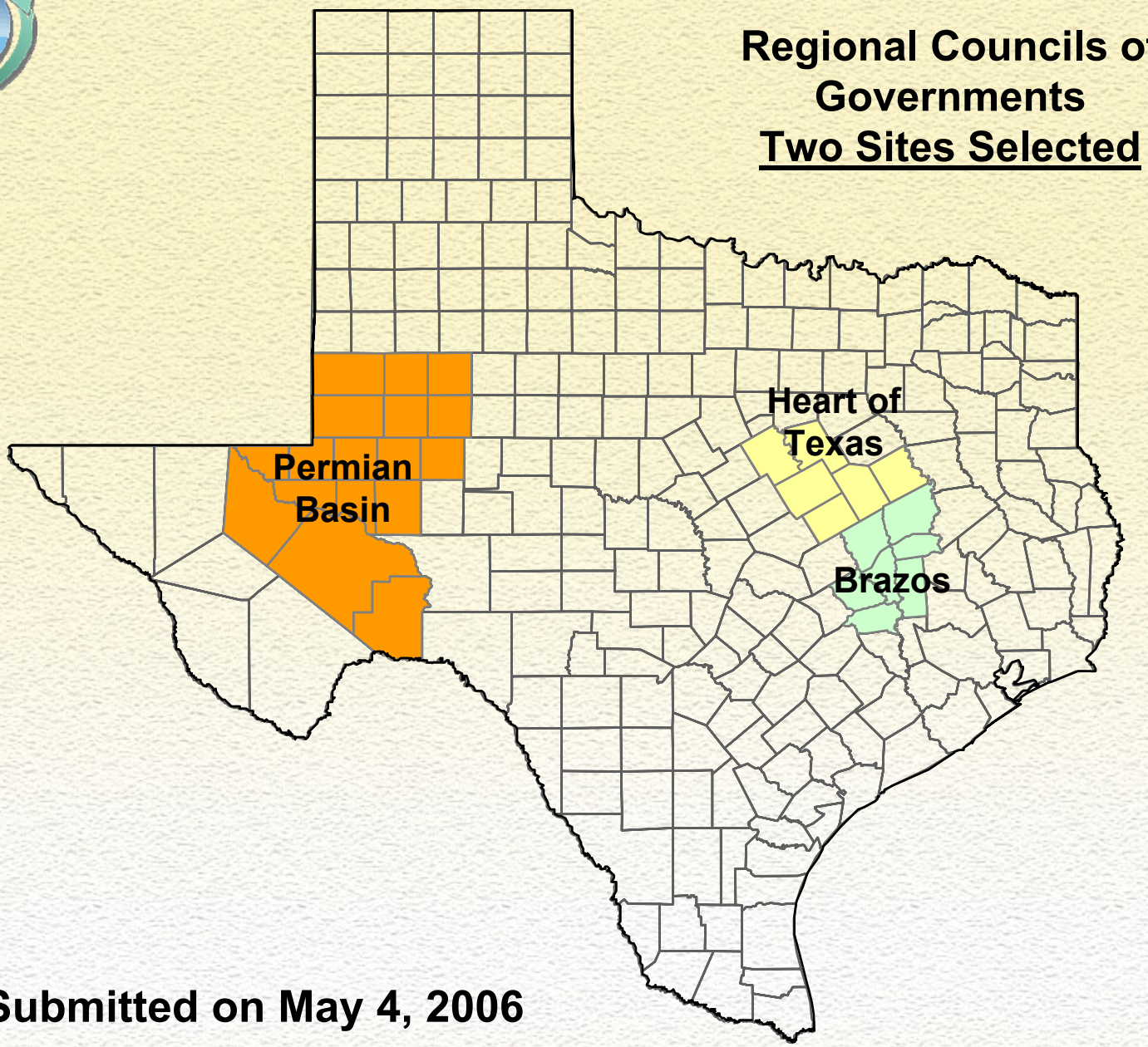

17 Regional Councils of Governments
Expressed an Interest

9 Regional Councils of Governments
<u>Submitted a Proposal</u>



5 Regional Councils of Governments Made the Shortlist





Proposals Submitted on May 4, 2006

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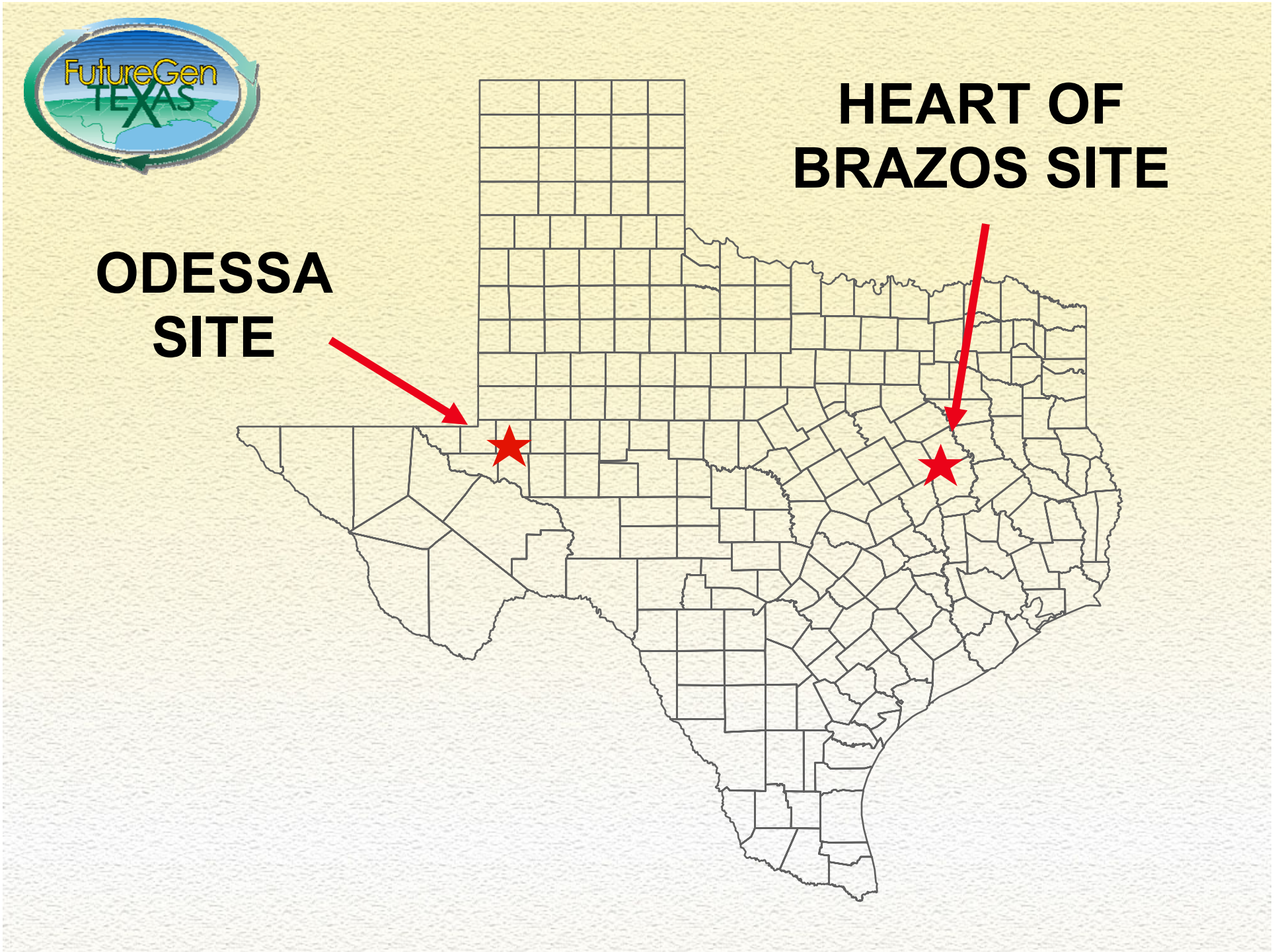
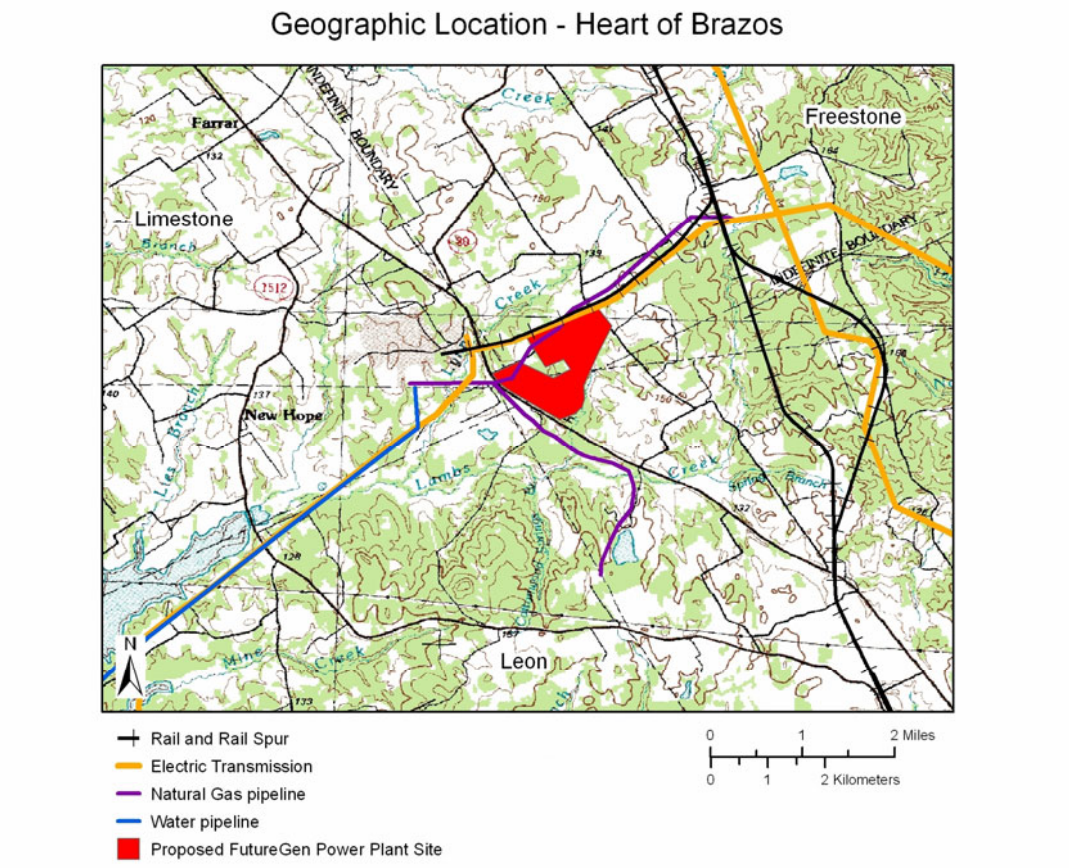

FutureGen
TEXAS
HEART OF
BRAZOS SITE
ODESSA
SITE

Heart of Brazos
Site Attributes

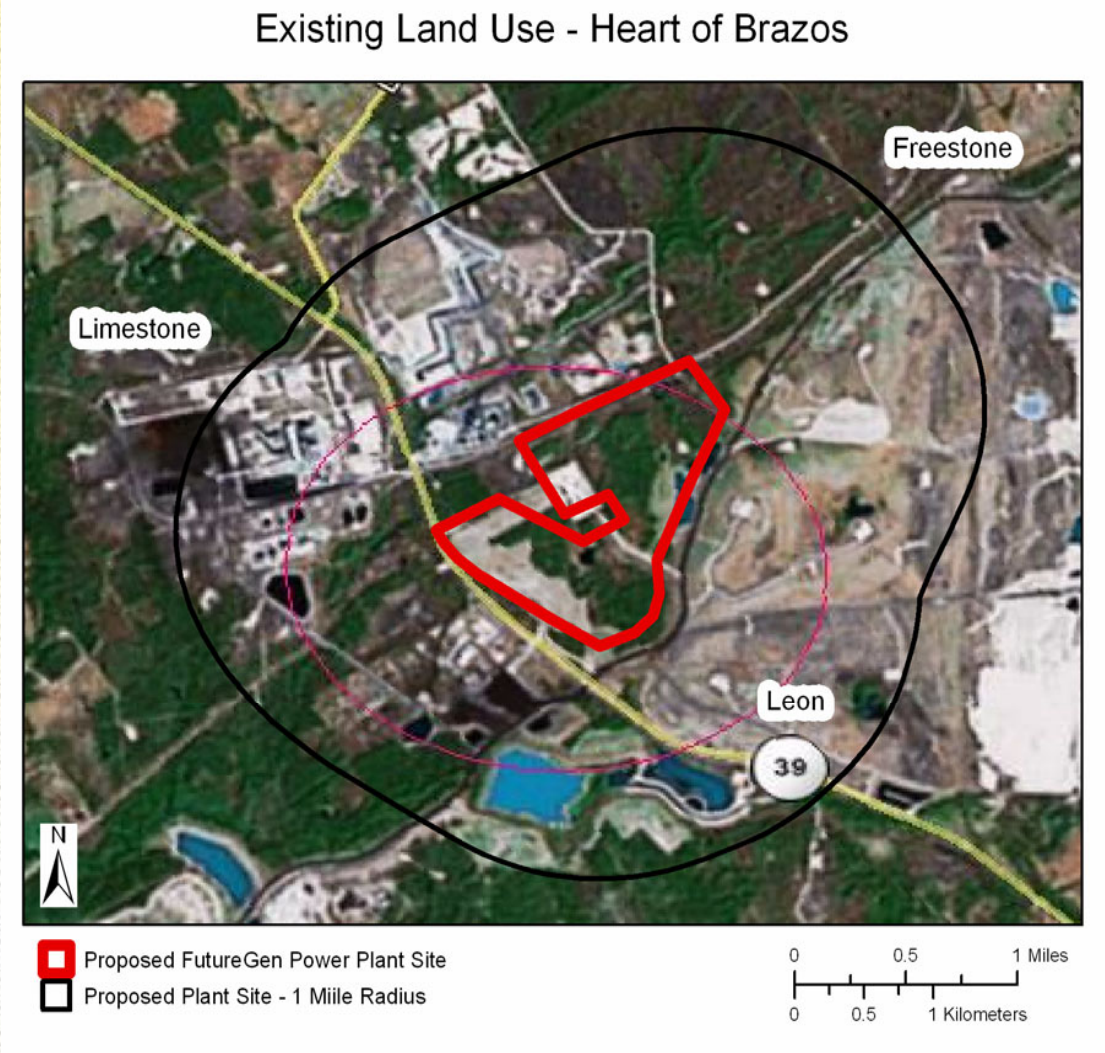
Power Plant Site and Primary Injection Target

Lies along U.S. Highway 79 and Farm Road 39, north of Jewett, Leon, Limestone, and Freestone counties, Texas.

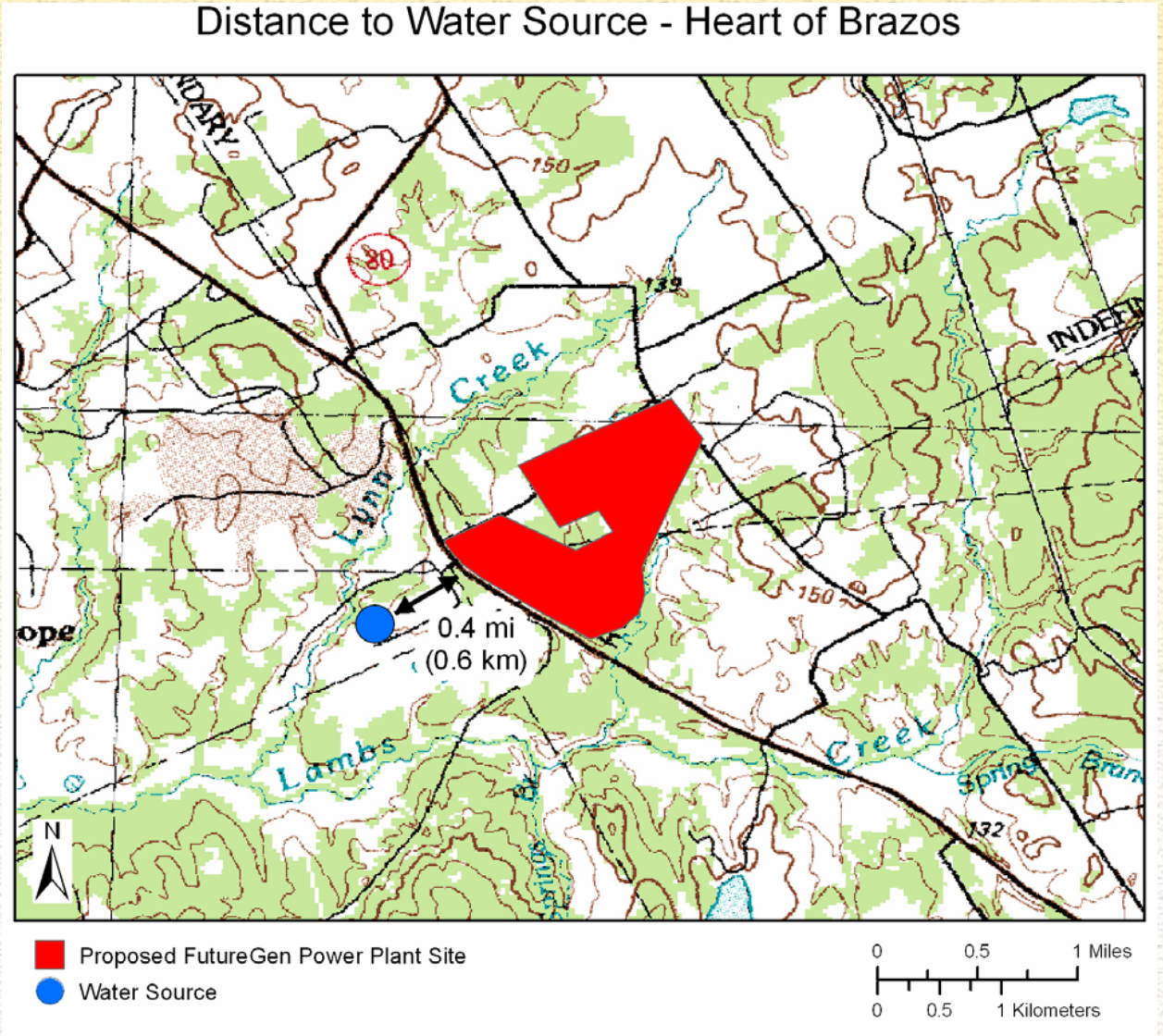


Existing Land Use

Compatible with existing land use.

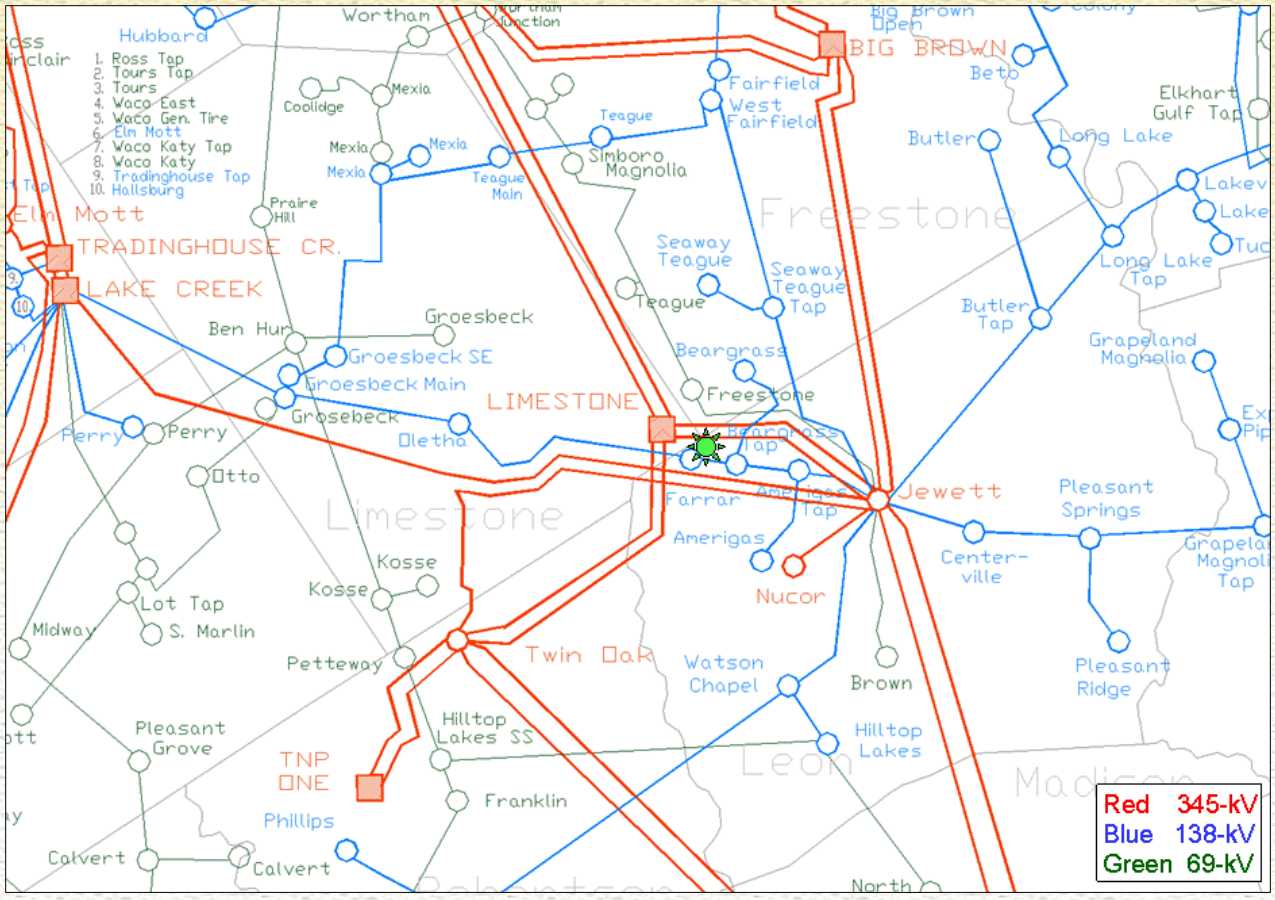


Water Sources



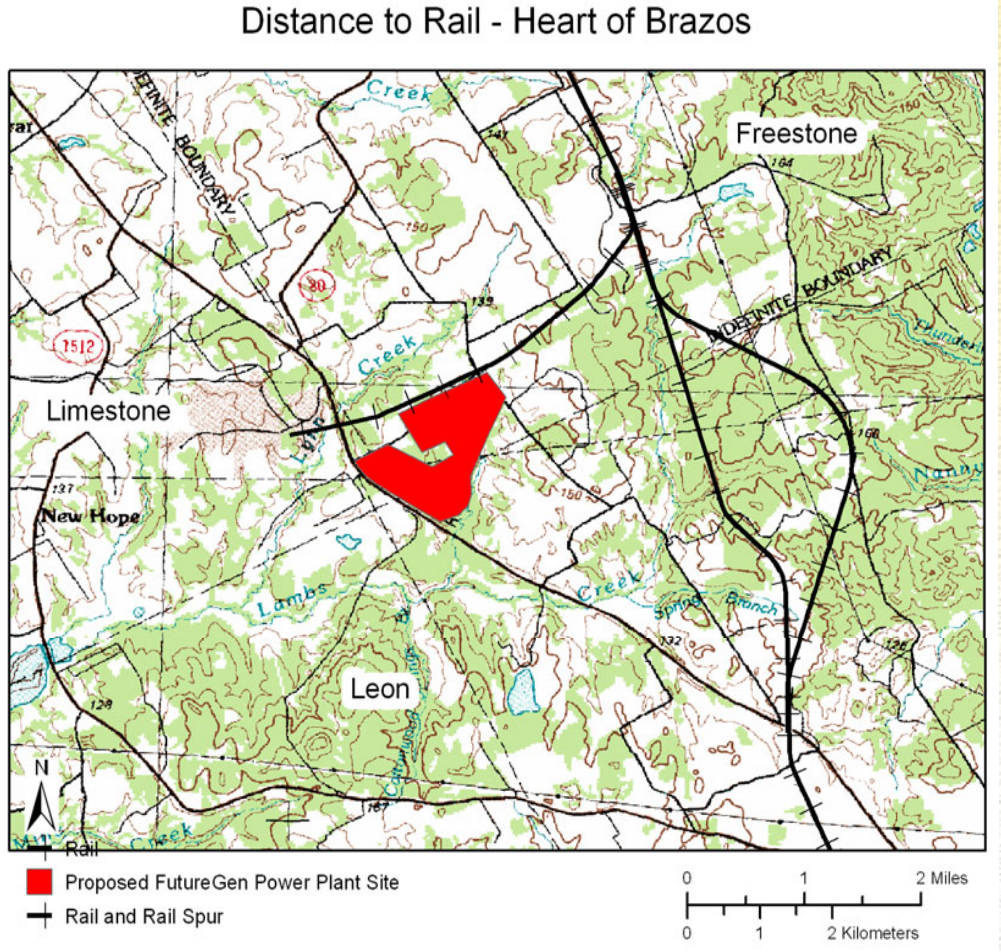
Transmission Lines

Dual circuit 345-kV transmission line forms the northwest boundary. The interconnection will require only the construction of a substation.

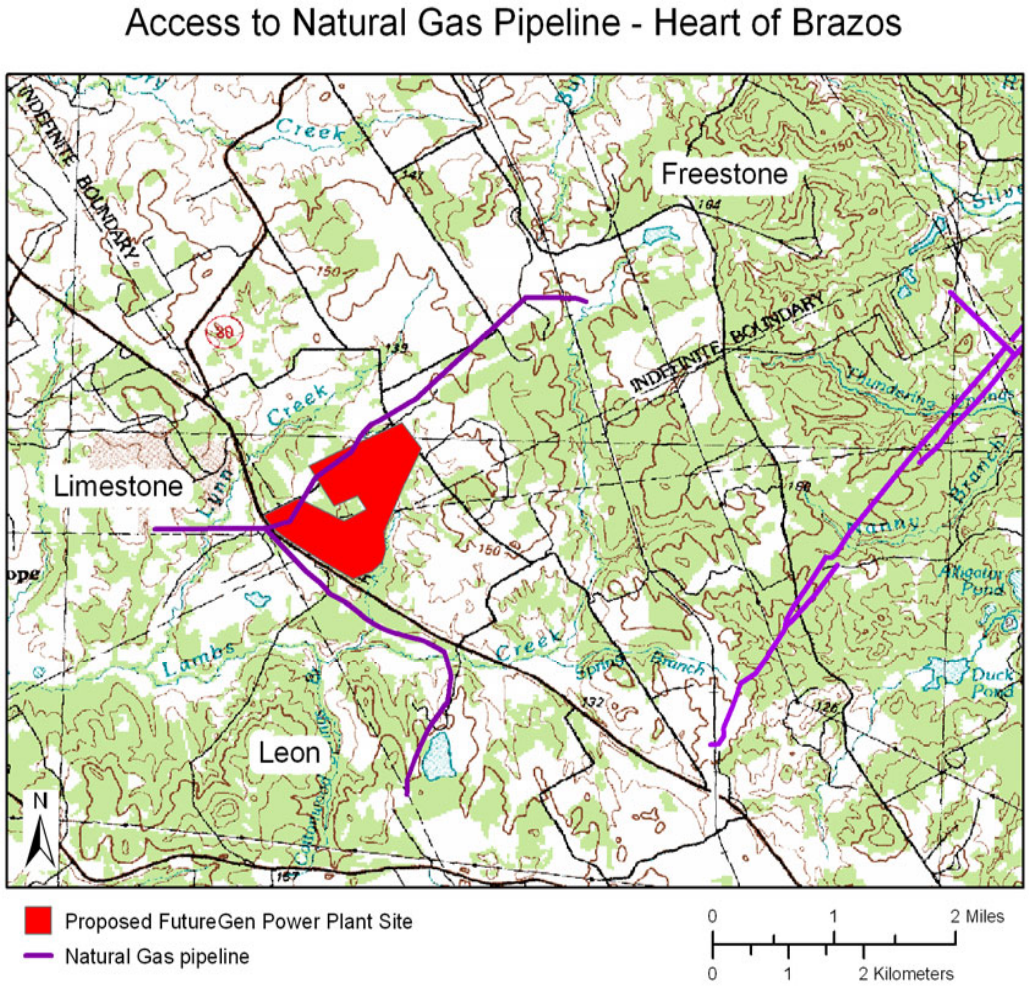


Rail Lines

The Burlington Northern Santa Fe Railway line runs along the northern border.

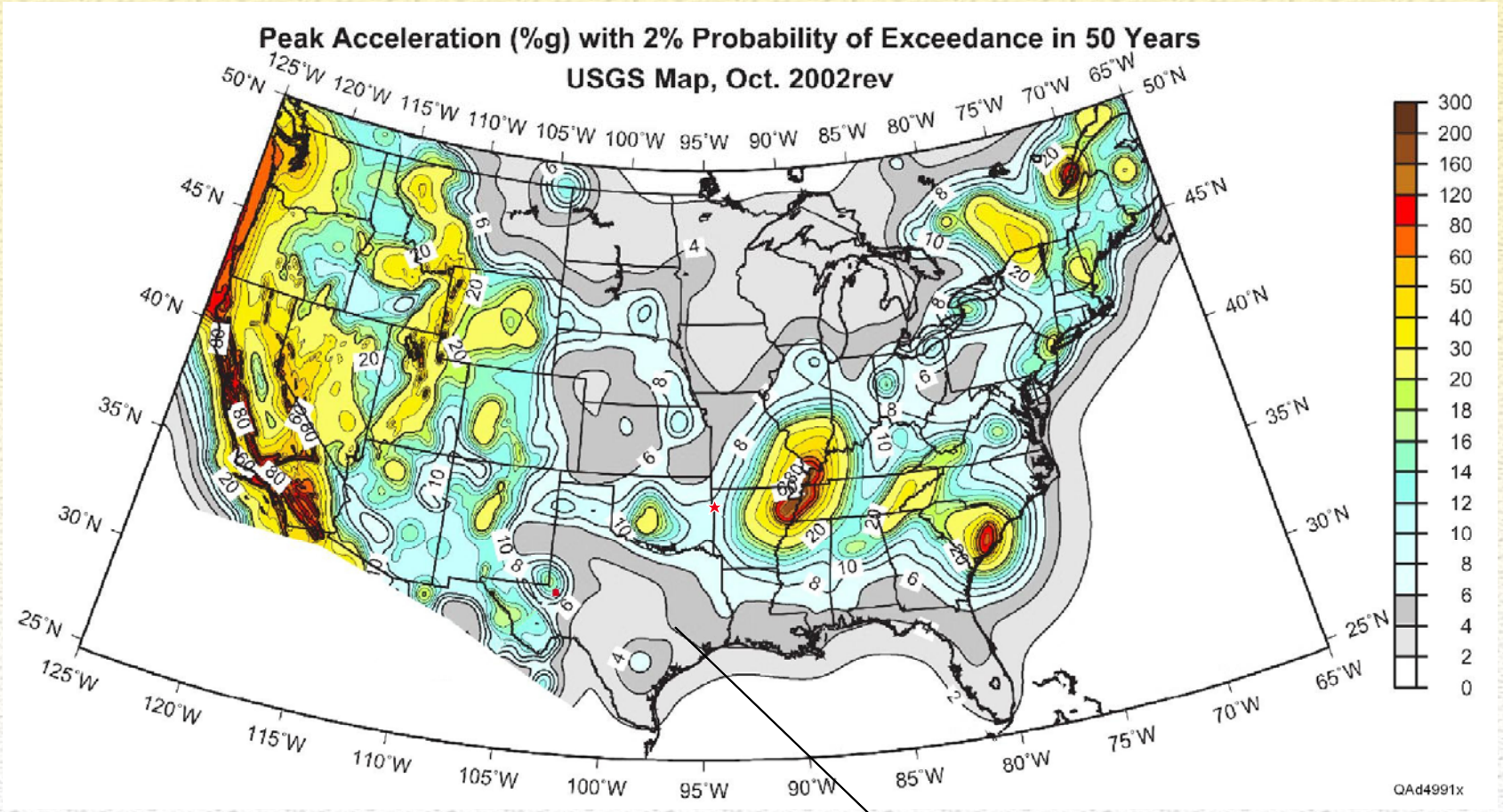


Natural Gas Pipelines



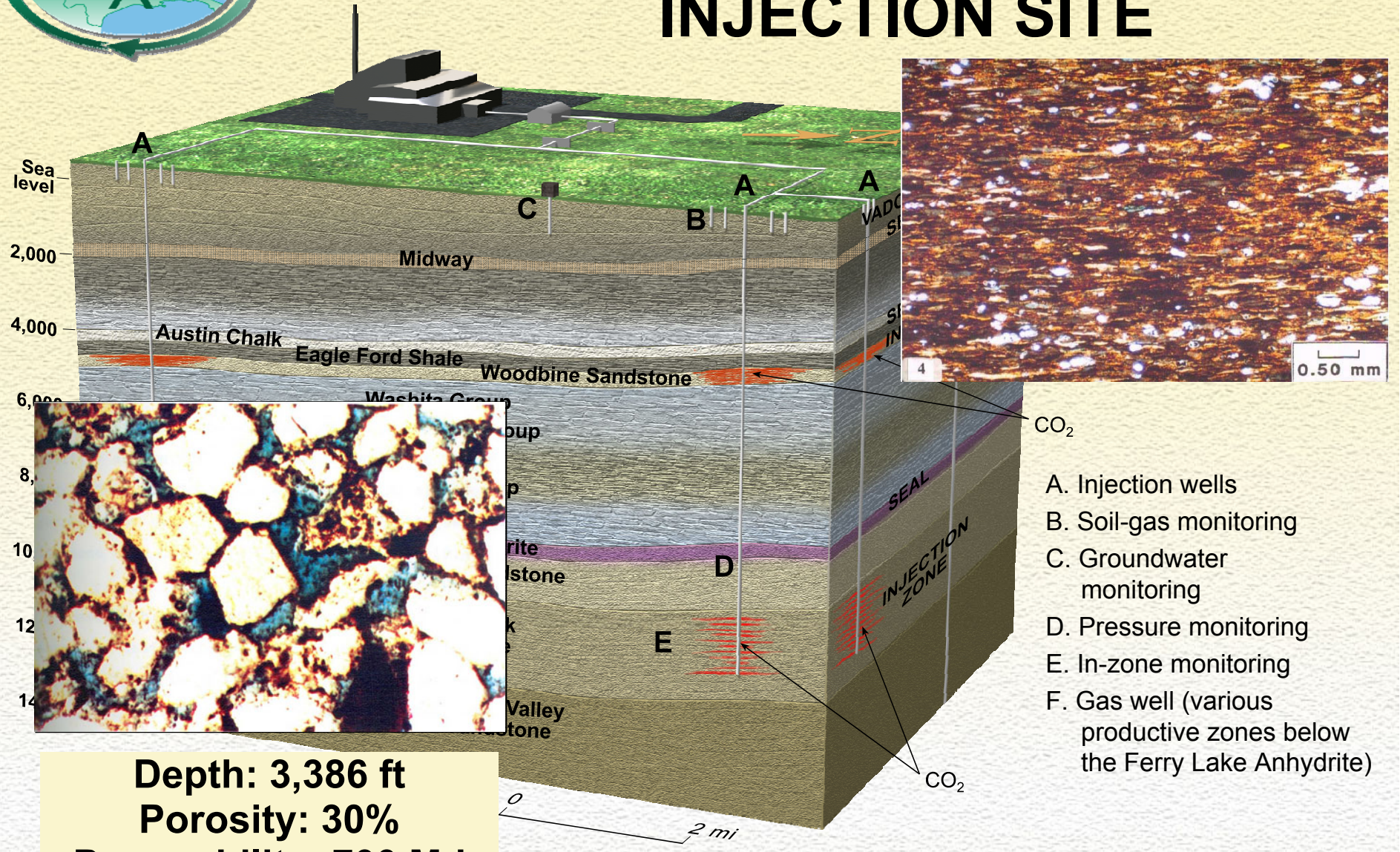
Existing natural gas pipeline owned and operated by Energy Transfer Corporation that enters the site at its northwest corner.

PEAK SEISMIC RISK



Heart of Brazos site

HEART OF BRAZOS INJECTION SITE

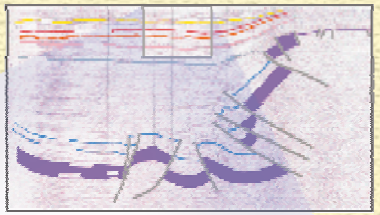


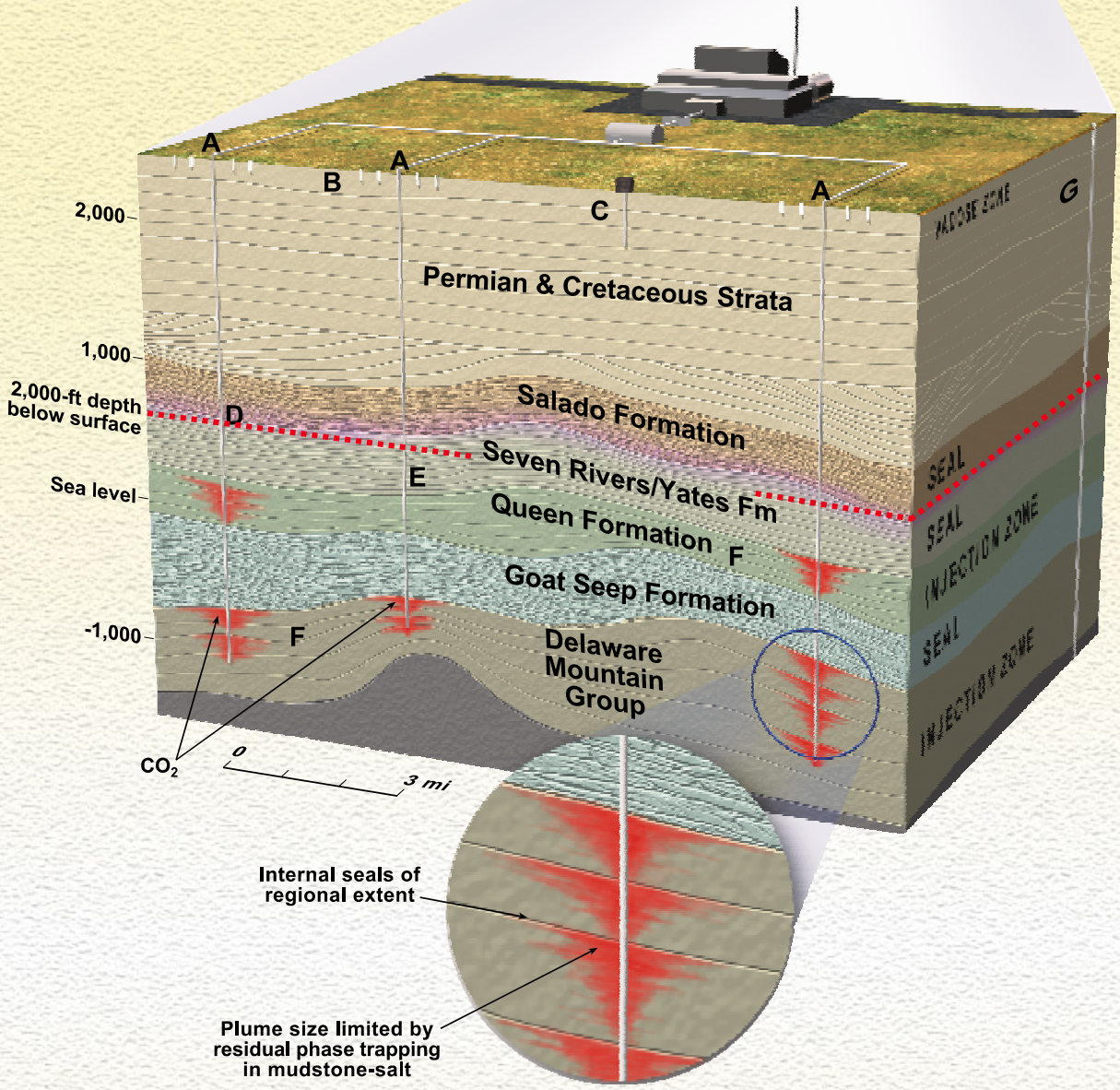
Depth: 3,386 ft
Porosity: 30%
Permeability: 700 Md

A. Injection wells
B. Soil-gas monitoring
C. Groundwater monitoring
D. Pressure monitoring
E. In-zone monitoring
F. Gas well (various productive zones below the Ferry Lake Anhydrite)


Odessa

ODESSA INJECTION SITE





A. Injection wells
B. Soil-gas monitoring
C. Groundwater monitoring
D. Pressure monitoring
E. Any bleed-off of CO_2 is trapped in Yates
F. In-zone monitoring
G. Few plugged wells

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FutureGen Like

To succeed, FutureGen must propagate many FutureGen like facilities in the near term.

FutureGen Like Forming a CO2 Industry

- Climate changing
- Anthropogenic CO2 partially responsible
- CO2 is a commodity
- Government jump start industry
- Commerce takes over
- Energy/Environment/Economy benefit

Tinker, SPE, 2005

Governments

- Reward Innovation
  - Incentives
  - Clean power credits
  - Co-fund R&D
- Assume liability
- Streamline permitting/EIS
- Share infrastructure costs
- Don't Overreact

Tinker, SPE, 2005

Dongying, China

Tinker

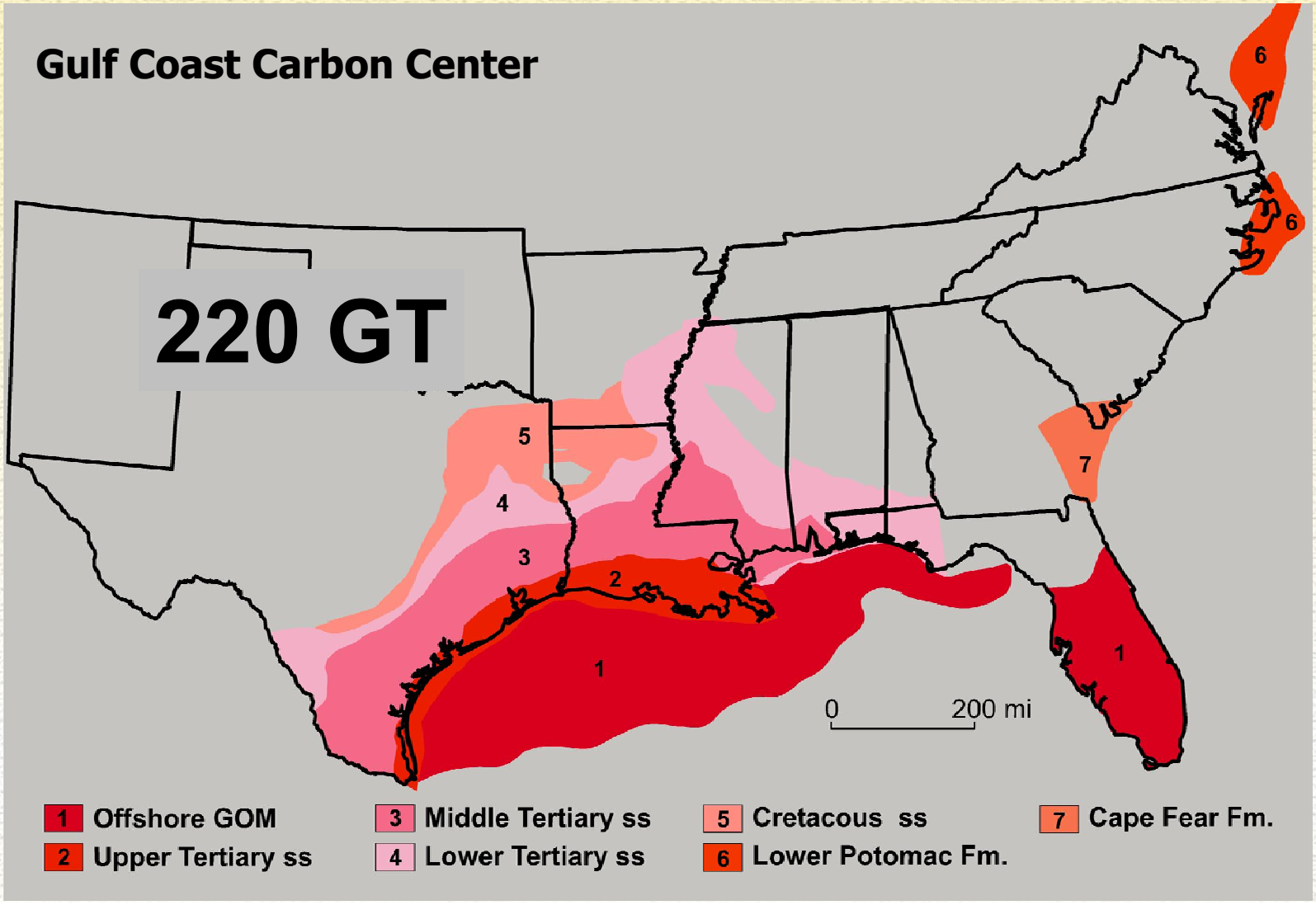
April. 2007

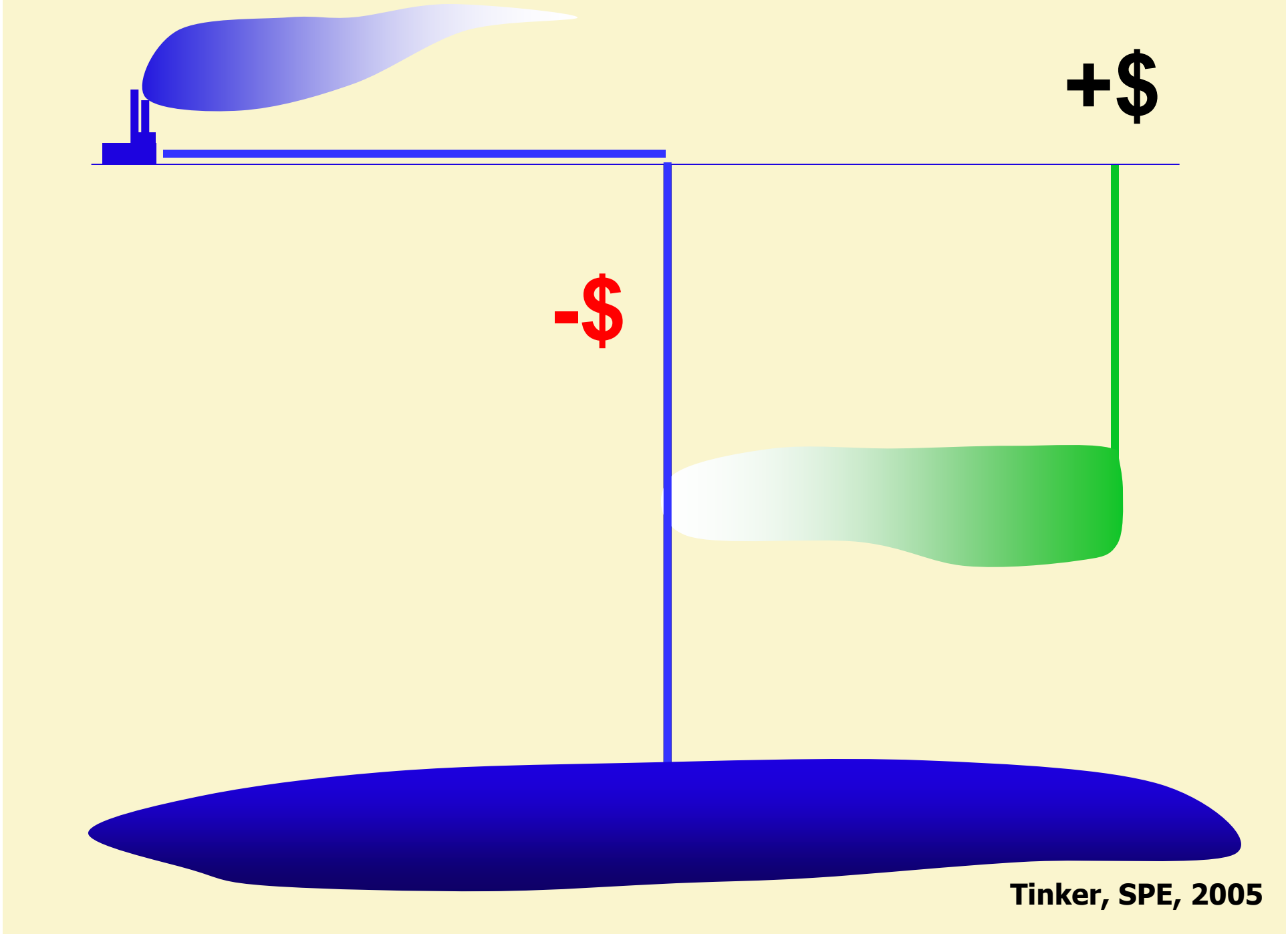
Industry

- Seek "fit-for-purpose" sites
- Innovate and invent
- Invest in infrastructure and talent
- Commercialize and compete
- Quit talking, and start doing!

Tinker, SPE, 2005

FutureGen Like: SE US

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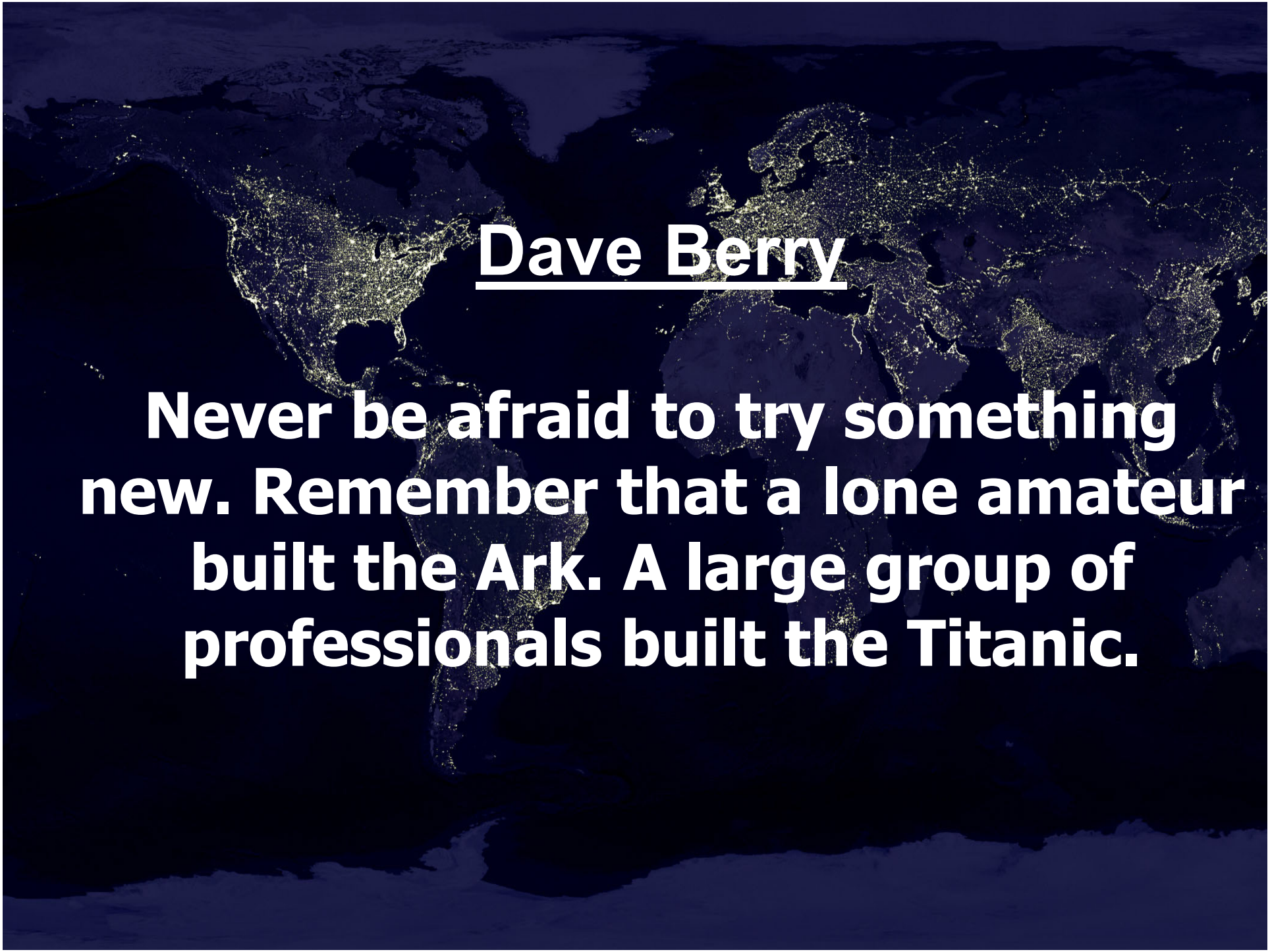
Tinker, SPE, 2005


Dave Berry
Never be afraid to try something new. Remember that a lone amateur built the Ark. A large group of professionals built the Titanic.