Natural Gas Technology:
Investing in a Healthy U.S. Energy Future

Plenary Panel: Balancing the Technology Role

It's Gonna be Gas: Let's Make it a Smooth Ride

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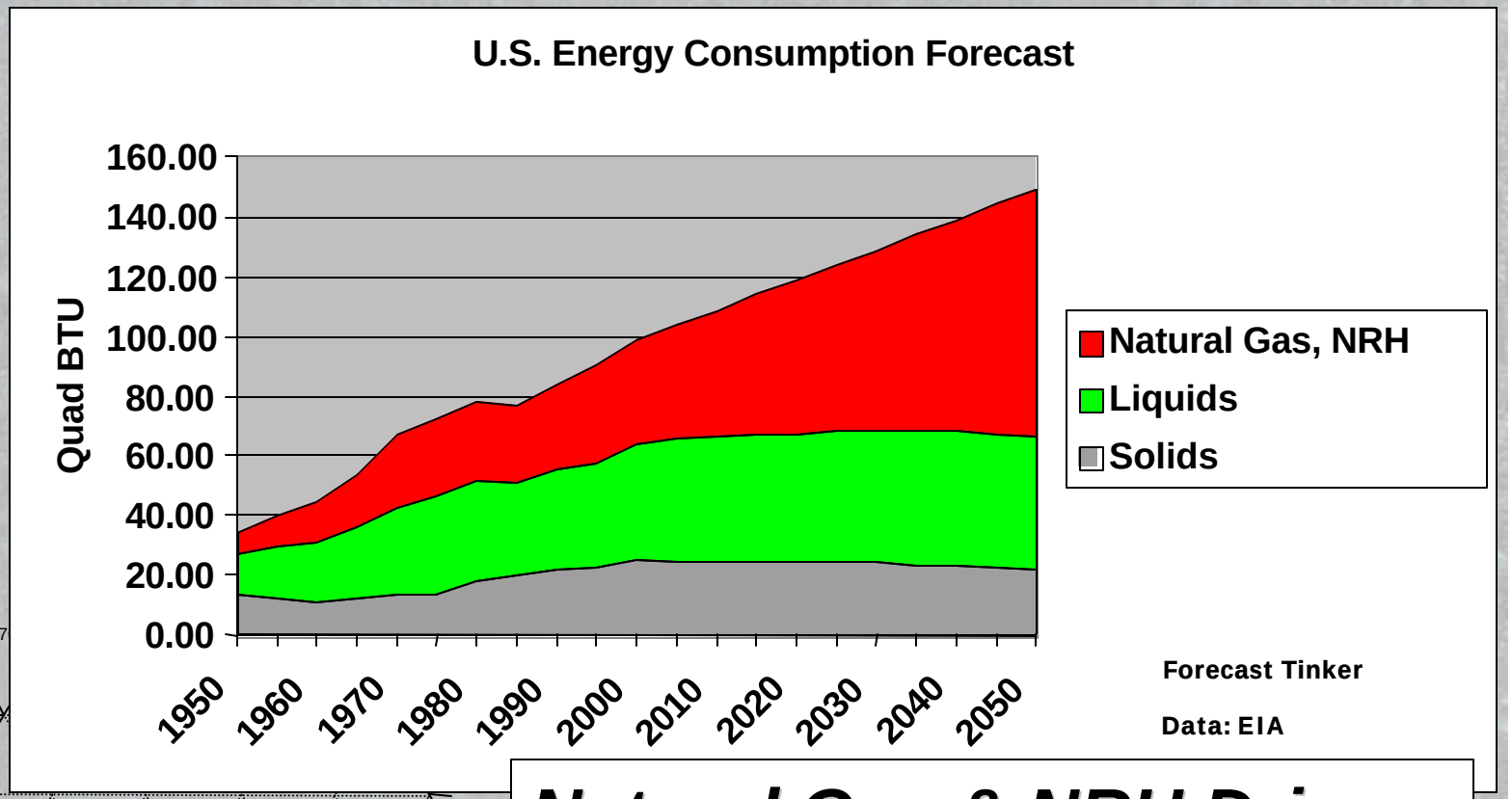
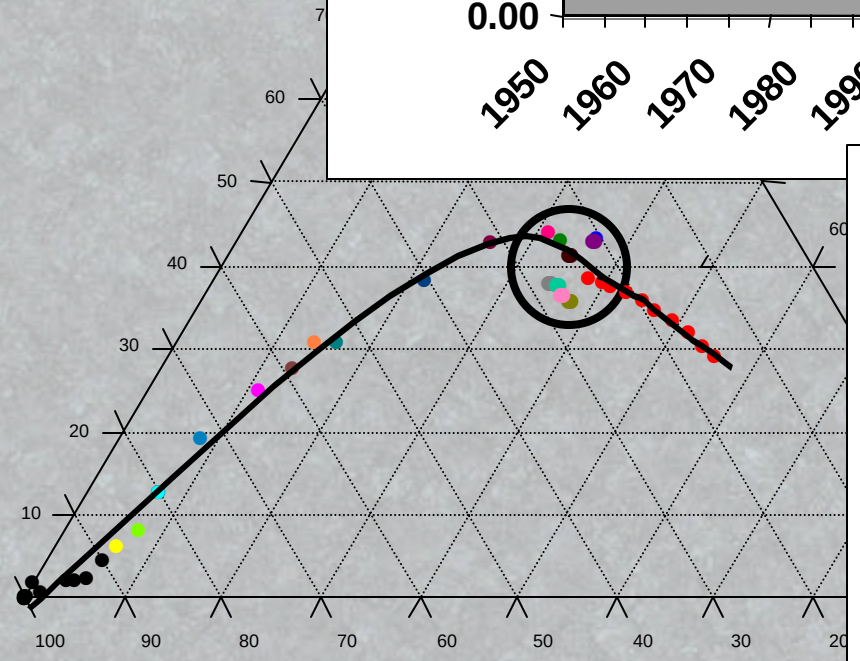
Bureau of Economic Geology
John A. and Katherine G. Jackson School of Geosciences
The University of Texas at Austin

QAd1023





Natural Gas & NRH Drivers

- Efficiency
- Economic Stability
- Economic Well Being
- Environmental Quality
- Resource Availability

Solids (Wood, Coal)

Gases (Natural Gas, Nuclear, Renewables, Hydrogen)

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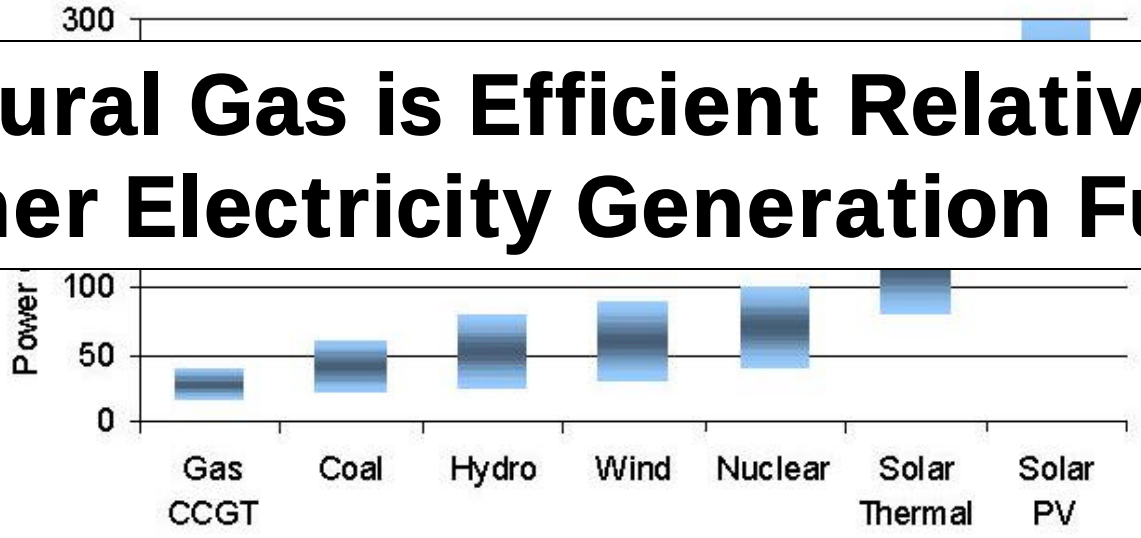
Efficiency

More New Baseload Electric Plant Costs

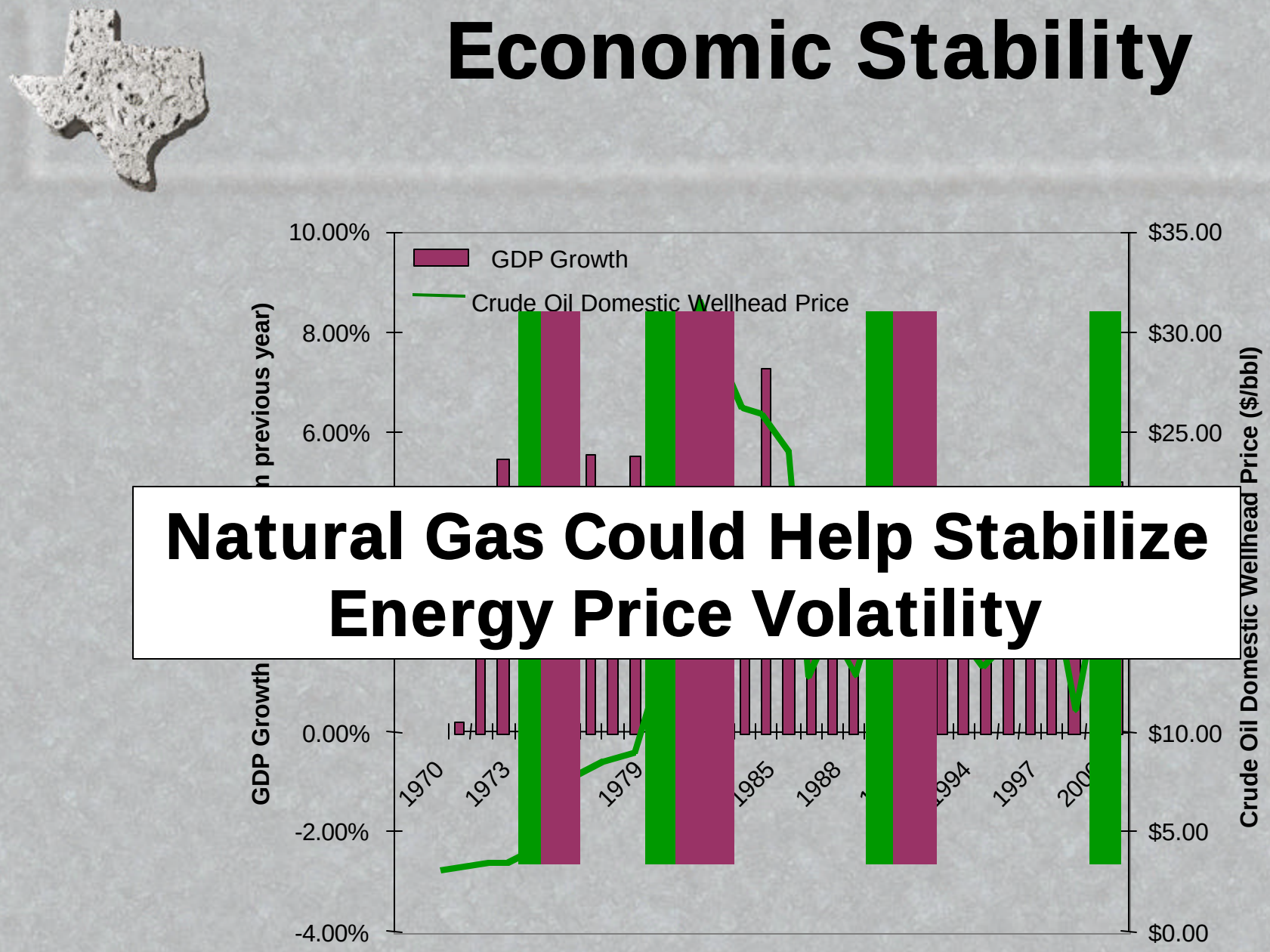
…combined cycle gas technology is still the preferred choice



Source: ExxonMobil; Deutsche Bank

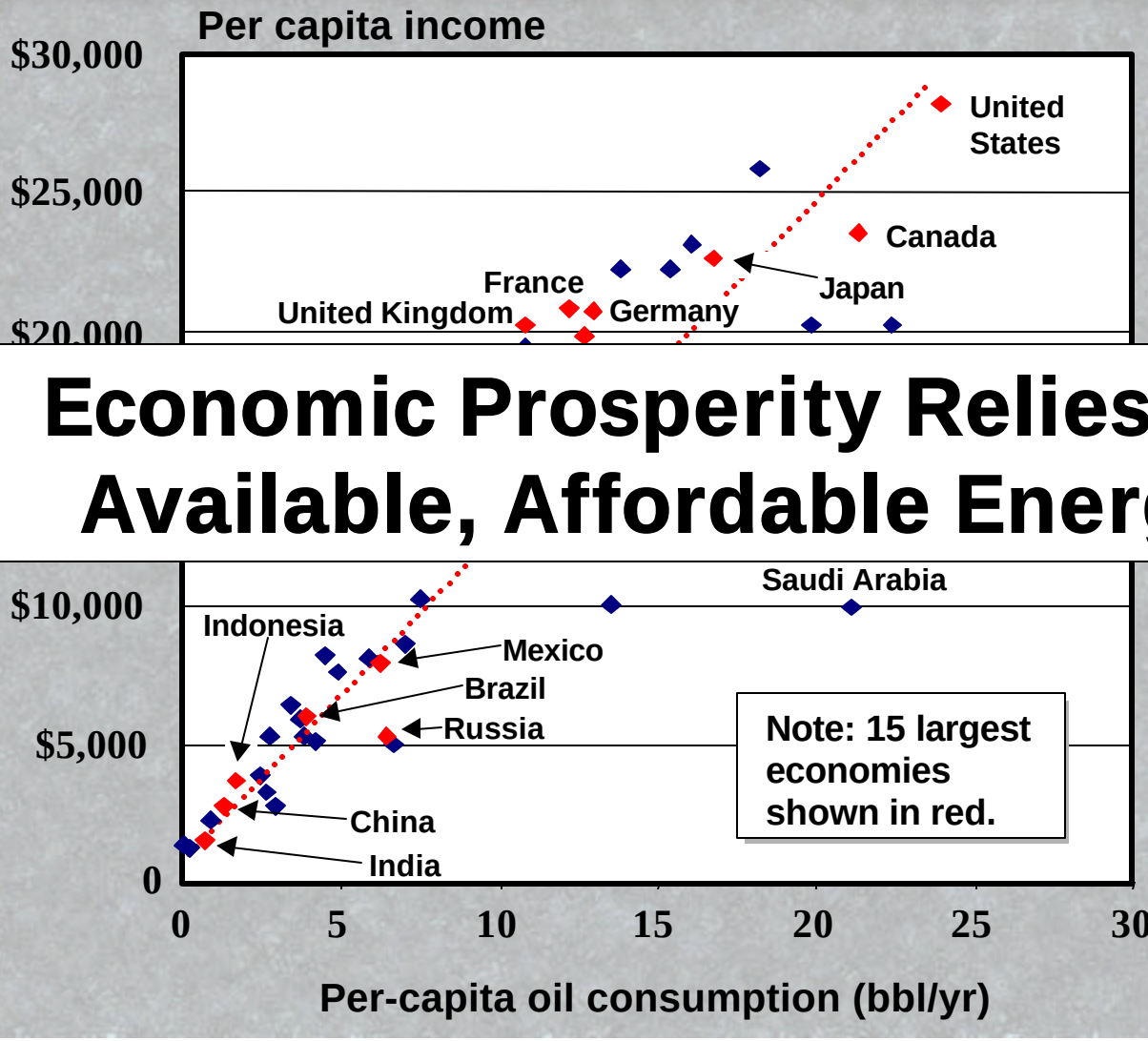
Natural Gas is Efficient Relative to Other Electricity Generation Fuels

Economic Stability



Natural Gas Could Help Stabilize Energy Price Volatility

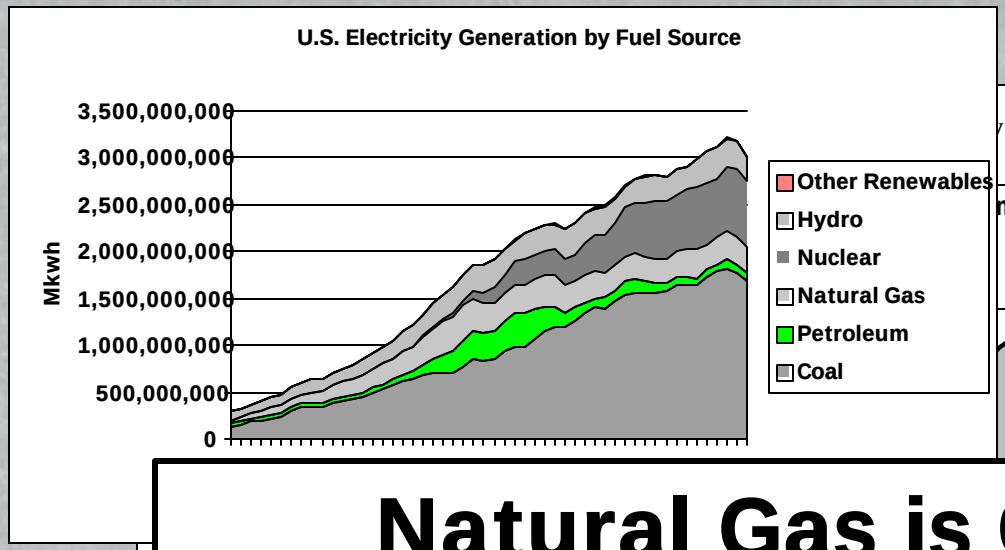
Economic Well-Being

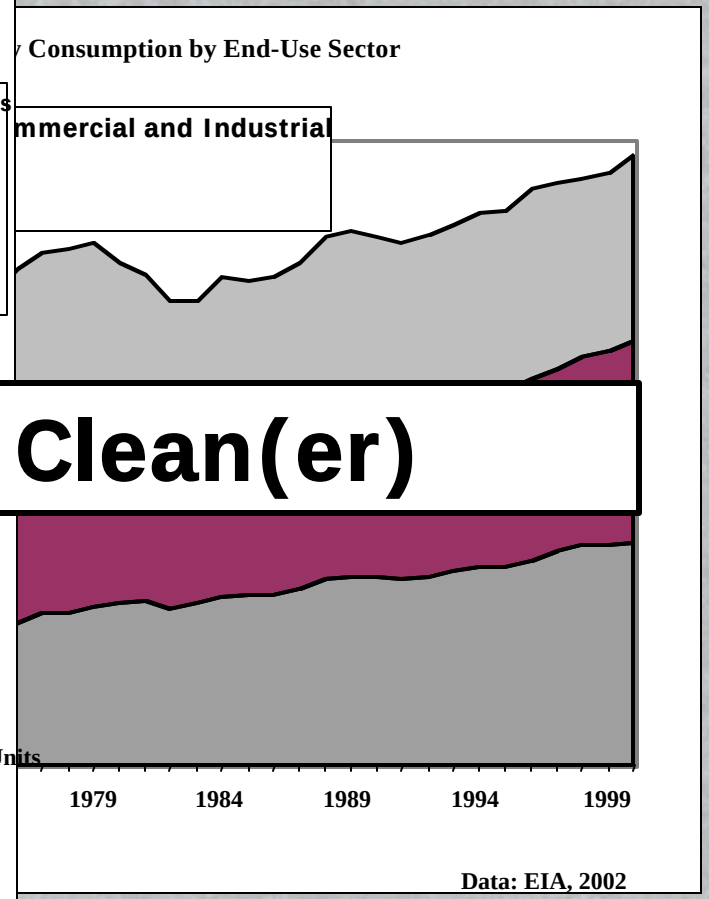


Economic Prosperity Relies on Available, Affordable Energy

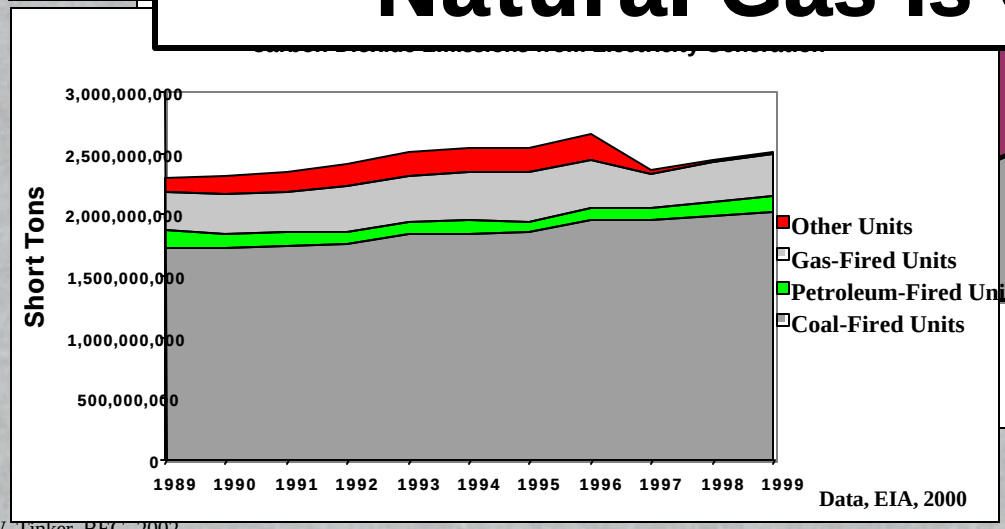
Source: JPT, May 2001

Environmental Quality





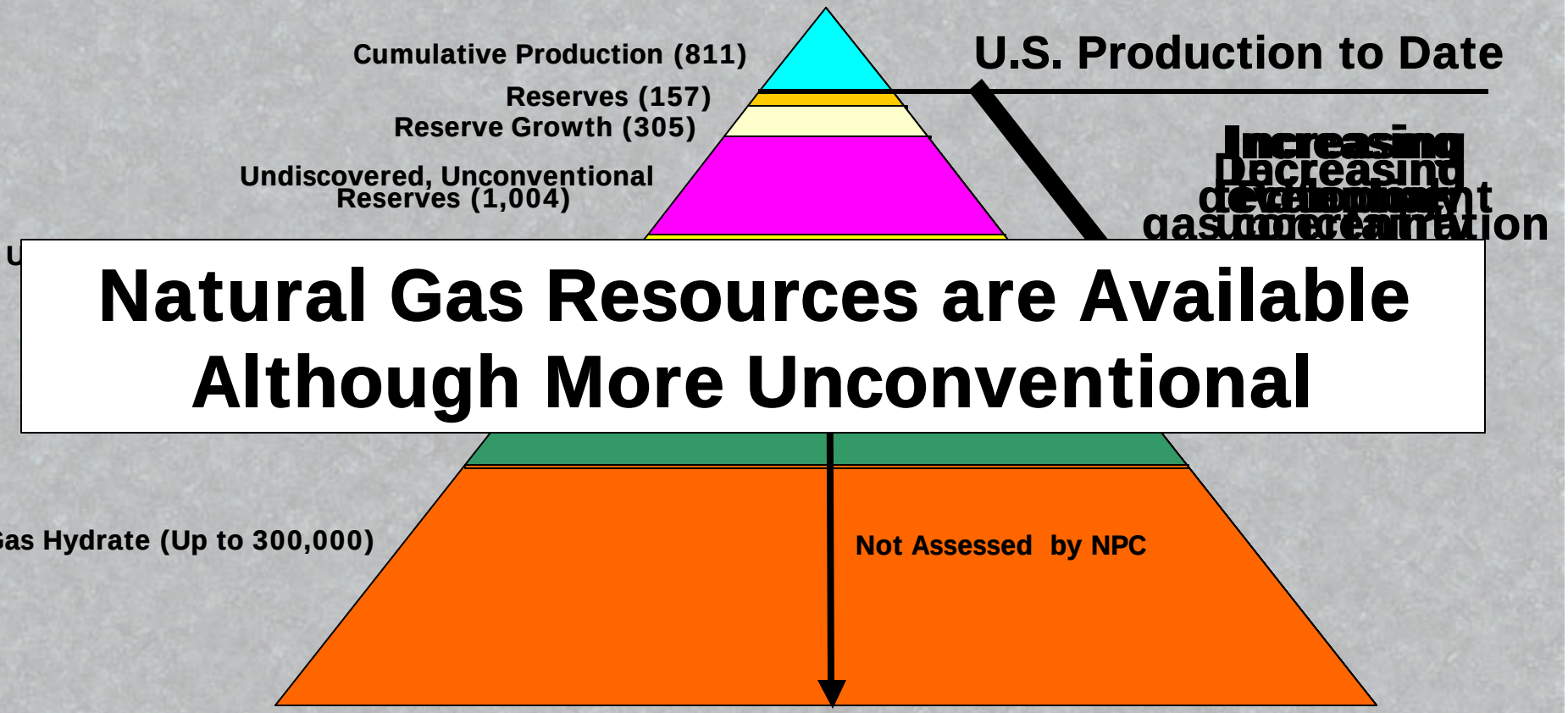
Natural Gas is Clean(er)



Resource Availability & Sustainability

1999 NPC Study (NPC, 1999b)

Recoverable Portion of In-Place Gas Resource (Tcf)



Natural Gas Resources are Available Although More Unconventional

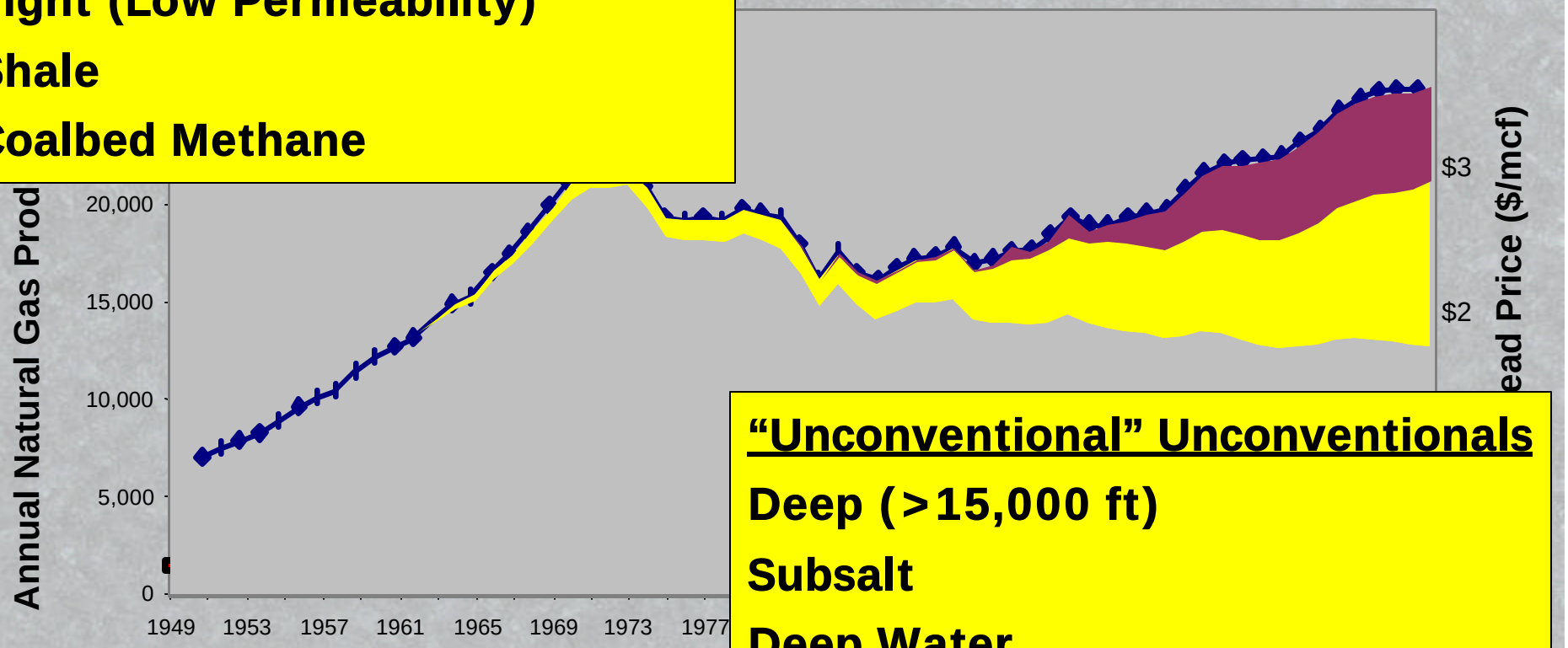
U.S. Natural Gas
An Unconventional Future

“Conventional” Unconventionals

Tight (Low Permeability)

Shale

Coalbed Methane



“Unconventional” Unconventionals

Deep (>15,000 ft)

Subsalt

Deep Water

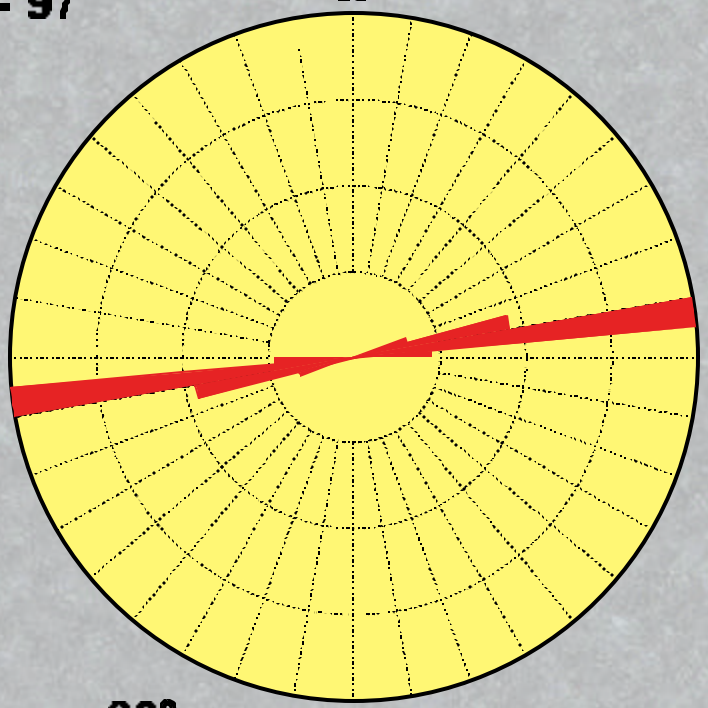
Methane Hydrates

EIA (1949-1990) and NPC (1991-2015)

Tight Gas, Shale Gas, CBM

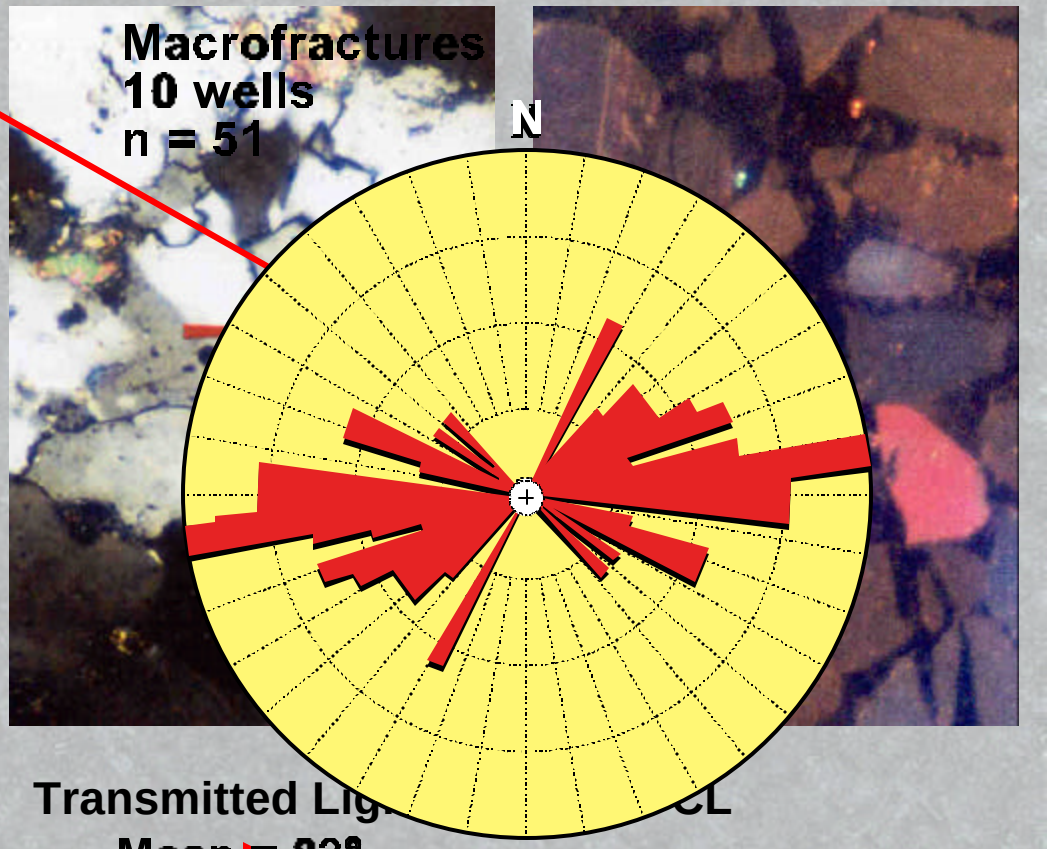
Fractures

Microfractures
Depth -9781 ft
n = 97



Mean = 80°

Macrofractures
10 wells
n = 51



Transmitted Lig CL

Mean = 82°

Match point

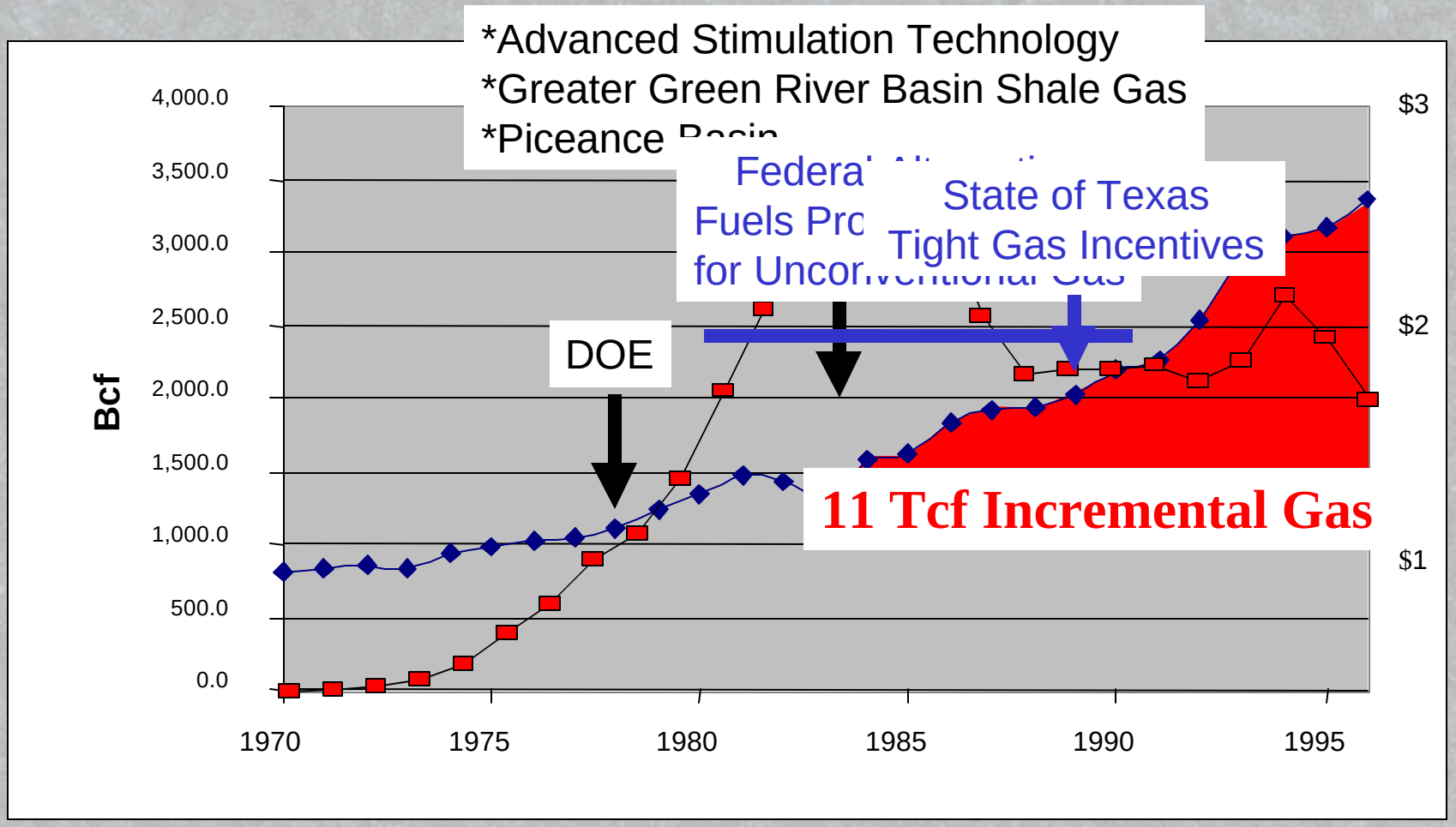
QAb694c

Fracture Strike

East Texas, Travis Peak Formation

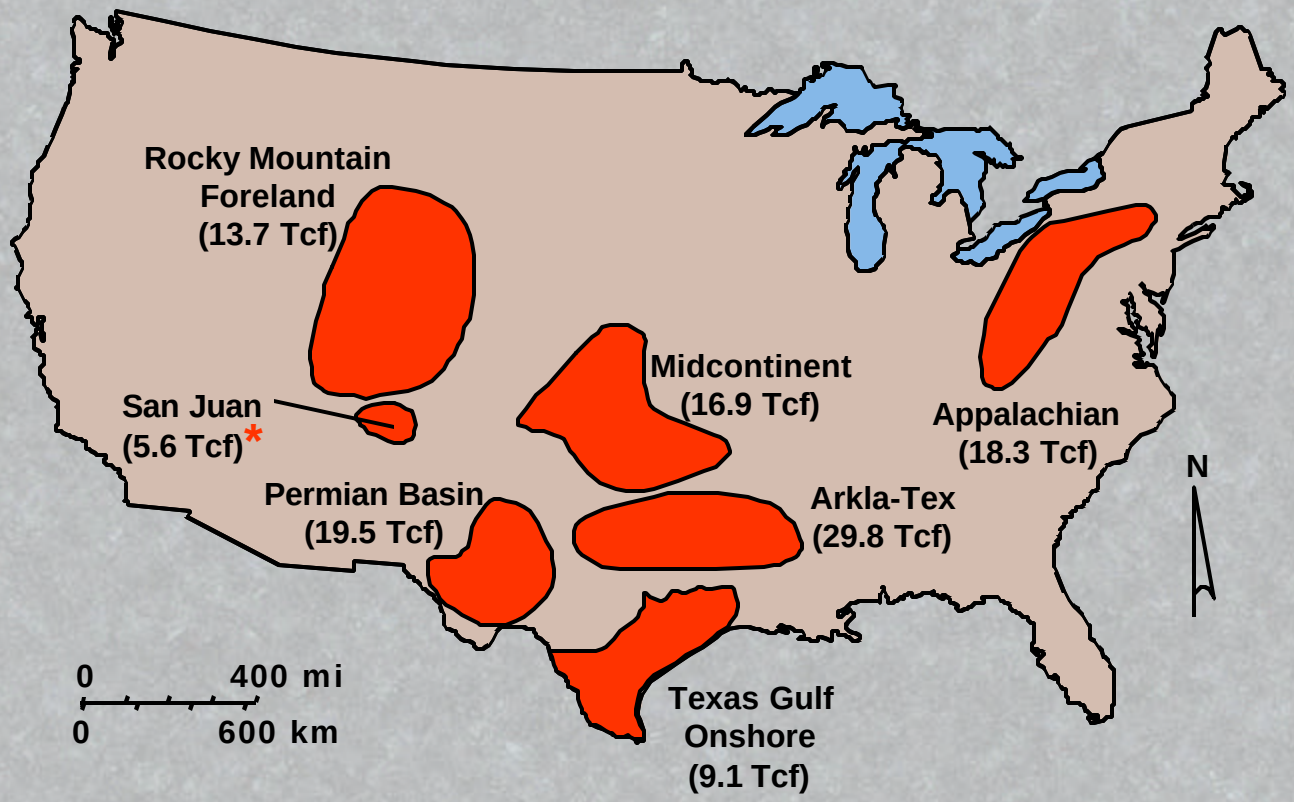
Laubach et al., 2000, The Leading Edge
Laubach, 1997, AAPG Bulletin

Policy & Investment
Tight Gas Resources



GRI, 1999, GRI's Gas Resource Database. DOE personal communication.

MAJOR PRODUCTIVE TIGHT GAS BASINS
(Technically Recoverable Resources)



78 Tcf

Bureau of Economic Geology

Data: NPC (2000), * Based on estimates of NPC (1993),

QAc9715c

San Juan Basin tight gas resource included with oil field reserve appreciation and new fields in NPC (2000)

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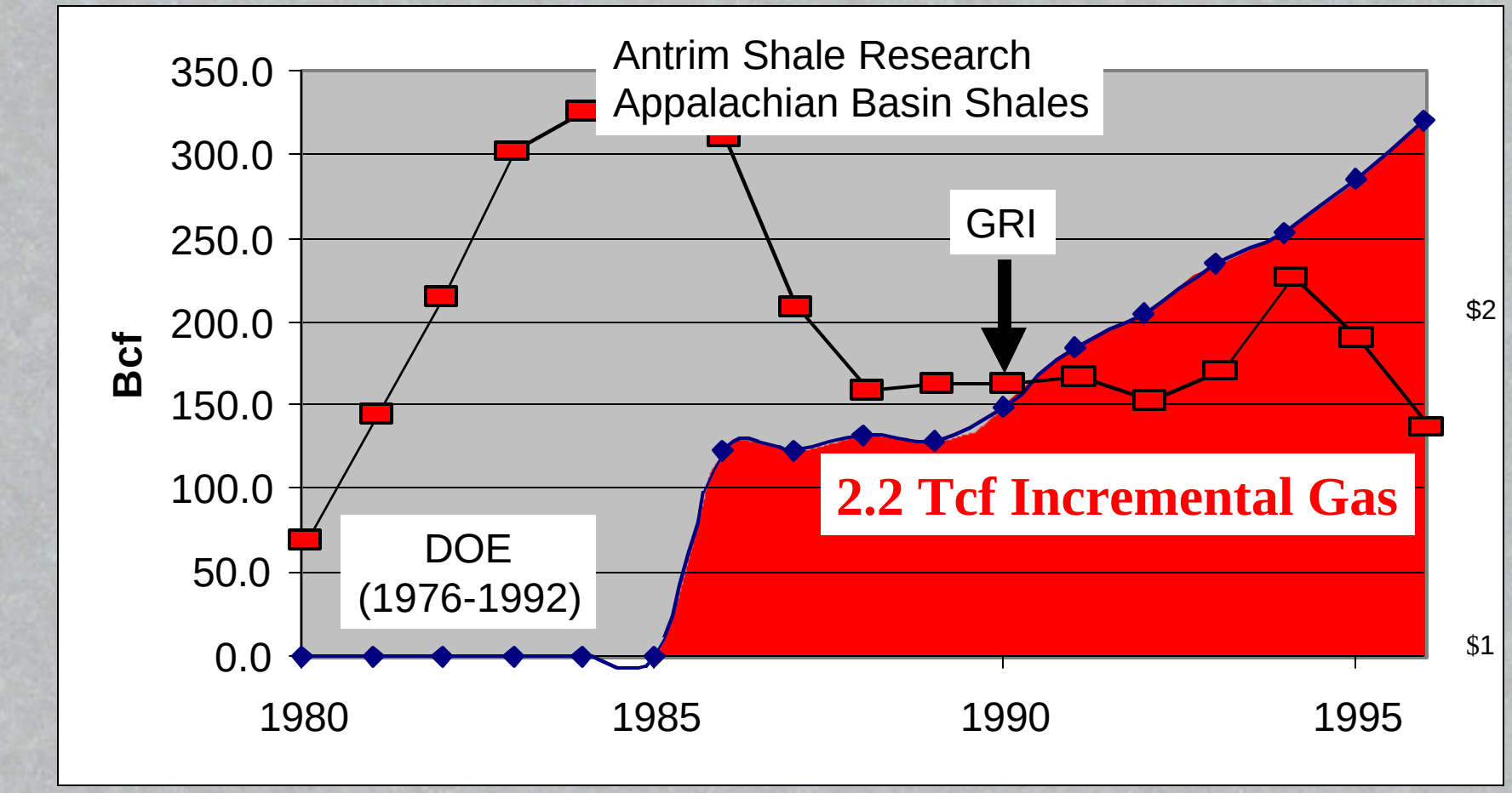
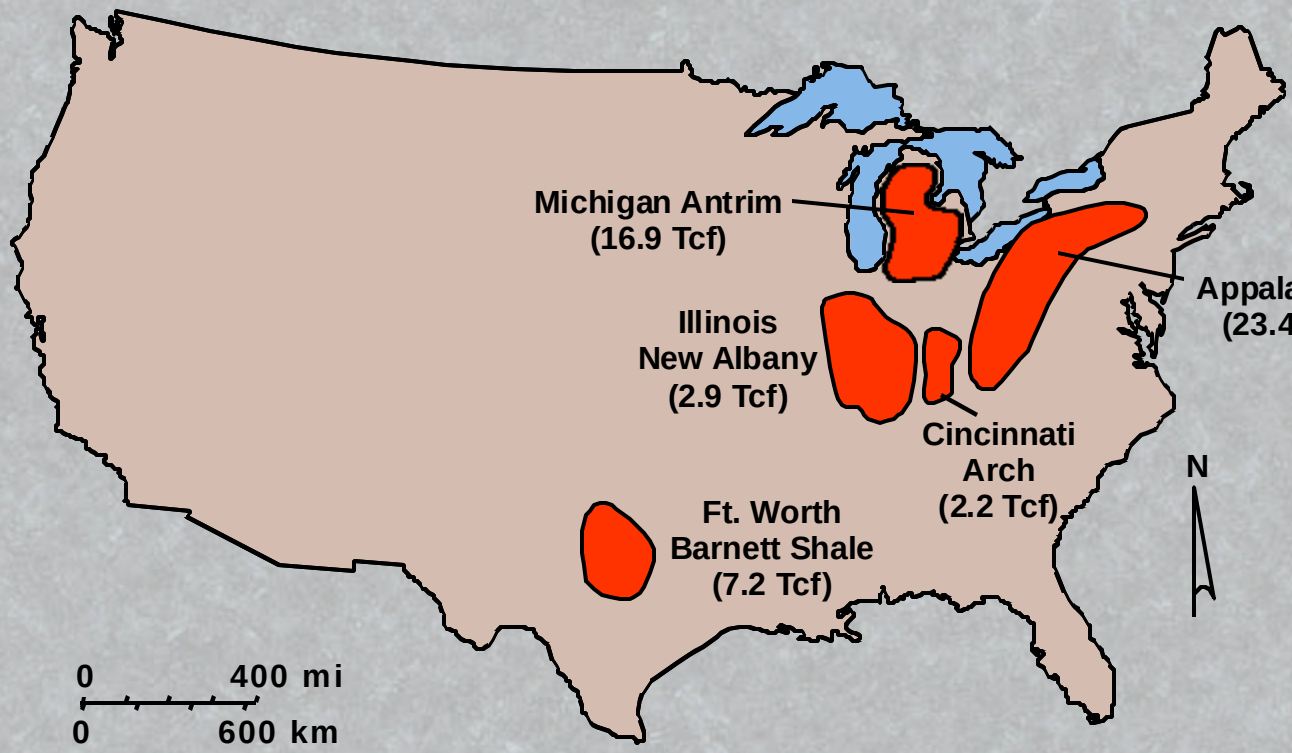
Policy & Investment
Shale Gas Resources



GRI, 1999, GRI's Gas Resource Database. DOE personal communication.

MAJOR PRODUCTIVE DEVONIAN SHALE BASINS
Technically Recoverable Resources



40 Tcf

Bureau of Economic Geology

Data: NPC (2000)

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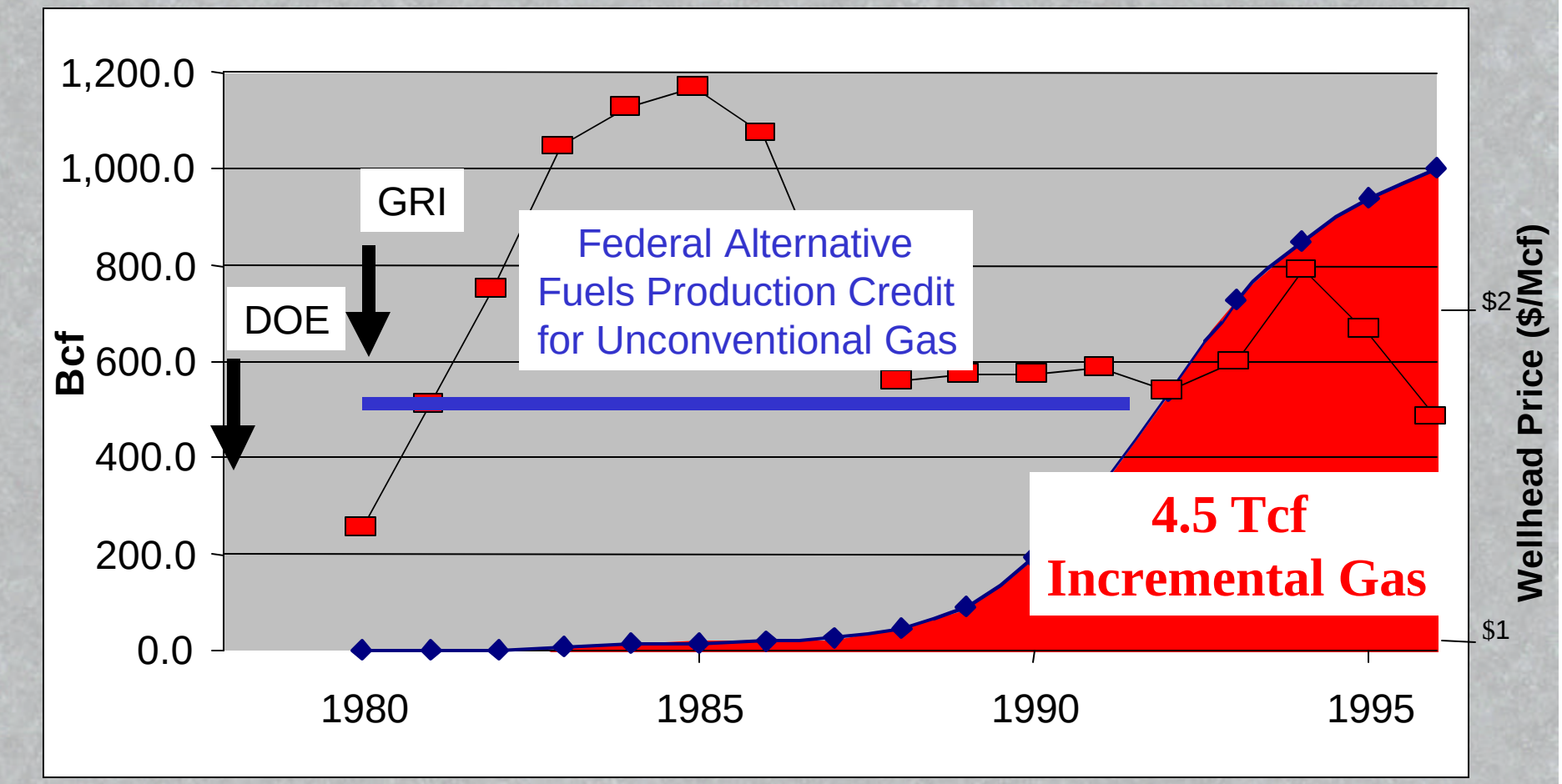
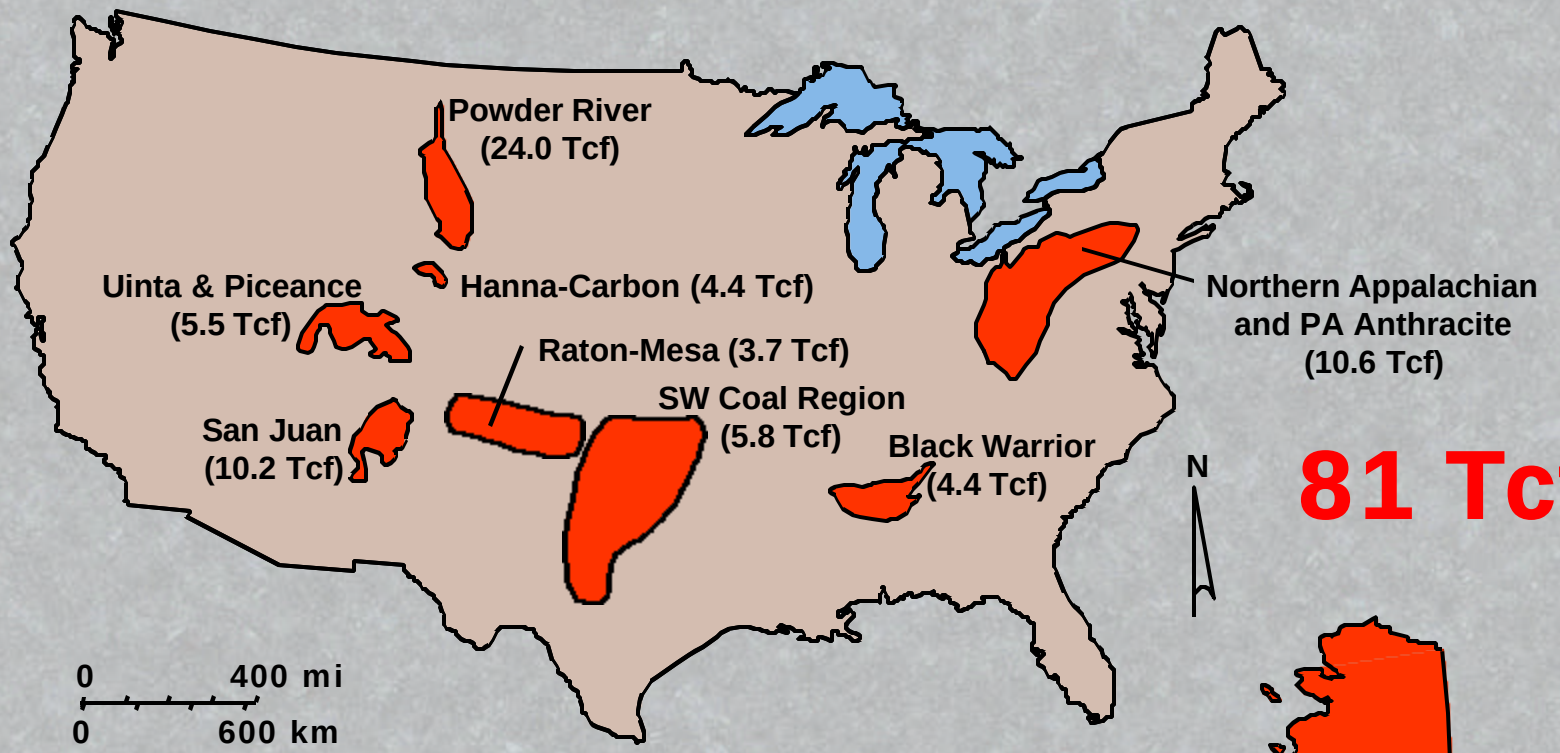
Policy & Investment
Coalbed Methane Resources



GRI, 1999, GRI's Gas Resource Database. DOE personal communication.

MAJOR PRODUCTIVE COALBED METHANE BASINS
(Total Most Likely Resources)



81 Tcf

Alaska
(Bering River, North Slope,
Chignik and Herendeen Bay)
(57.0 Tcf)

Bureau of Economic Geology

Data: PGC (2001)

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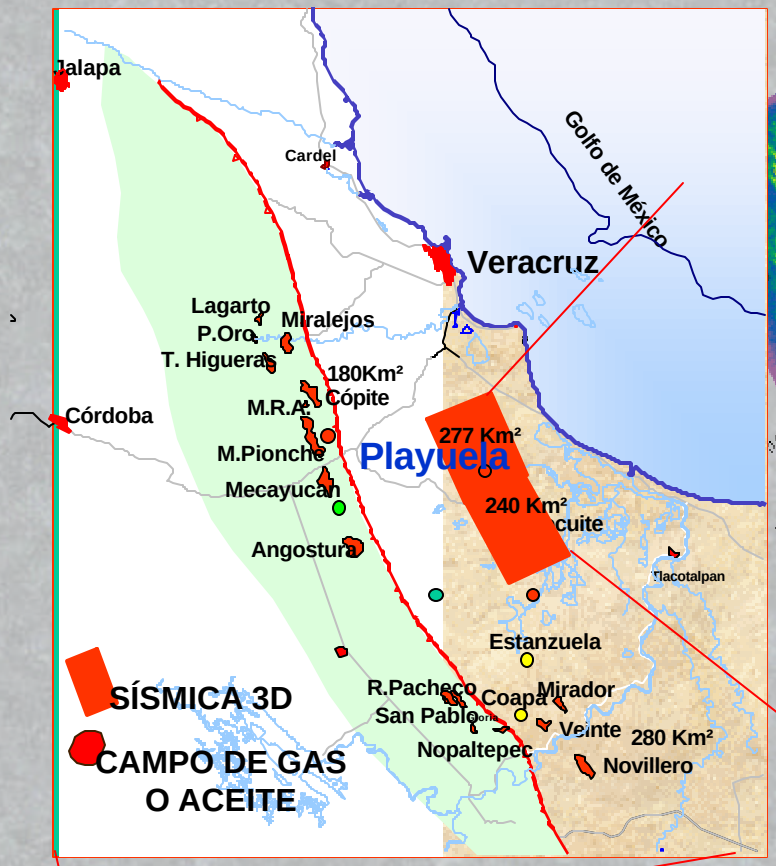
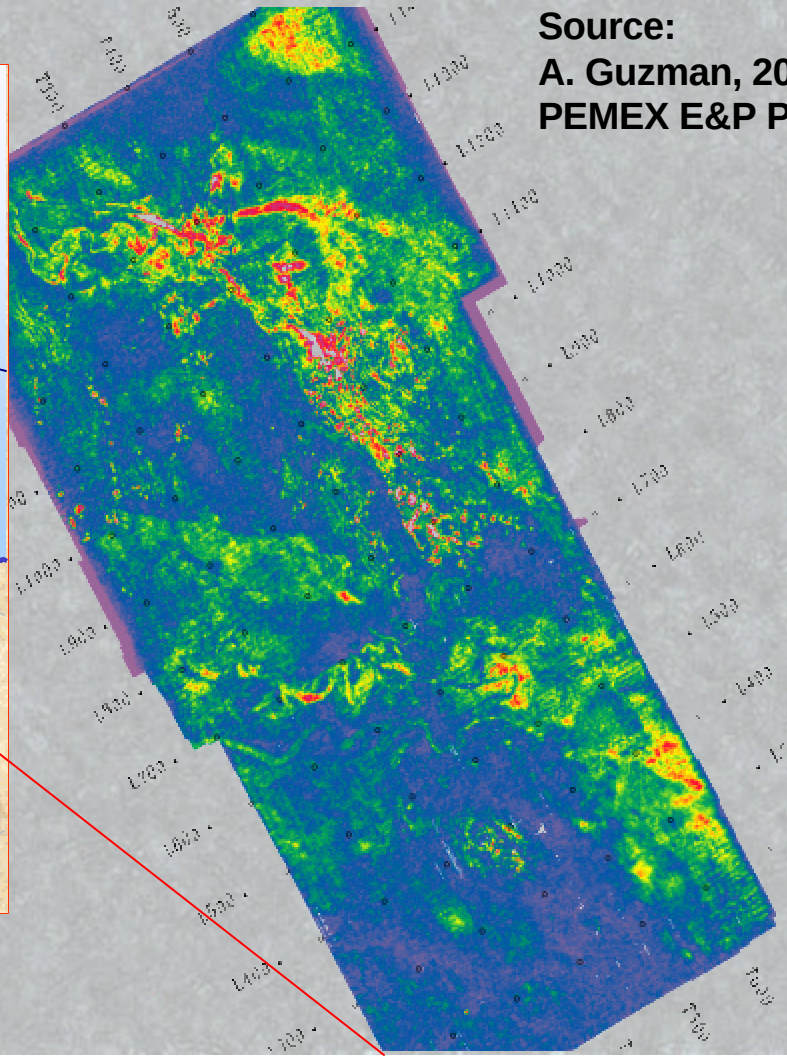
Deep Gas

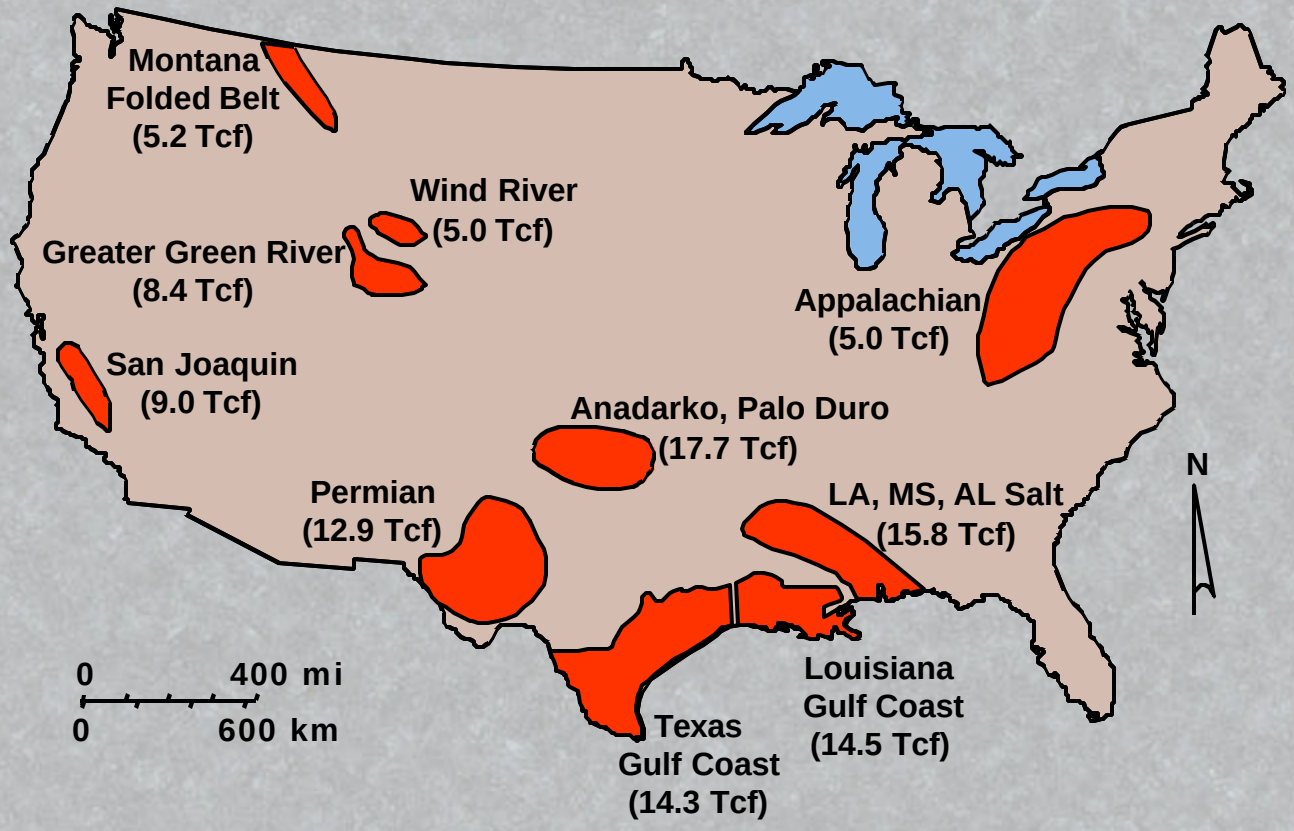
Seismic Attribute Analysis





Source:
A. Guzman, 2001, HGS
PEMEX E&P Planning

MAJOR PRODUCTIVE DEEP (>15,000 FT) GAS BASINS
(Total Most Likely Resources)



62 Tcf

Bureau of Economic Geology

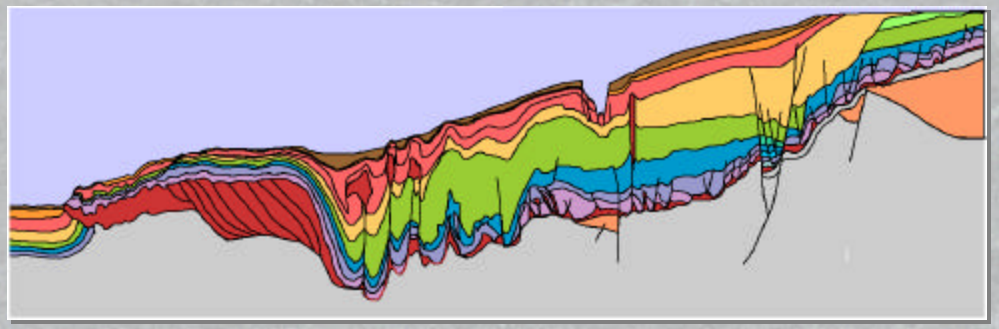
Data: PGC (2001)

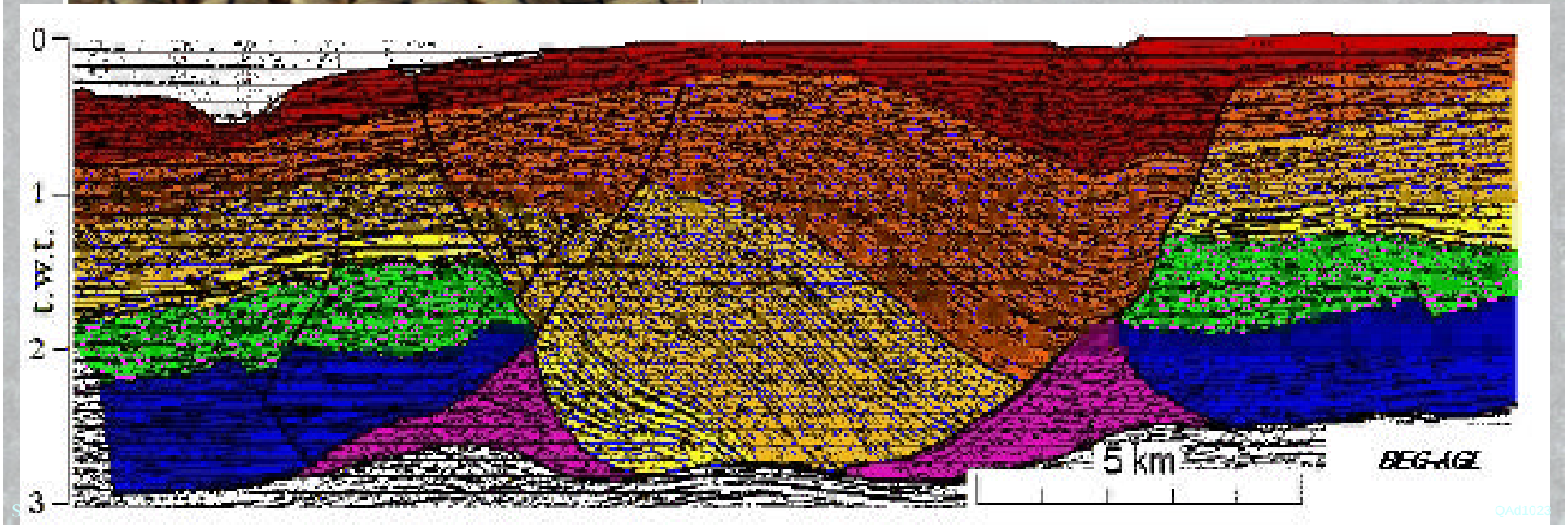
QAc9713c

Deep Water Gas
Salt Tectonics

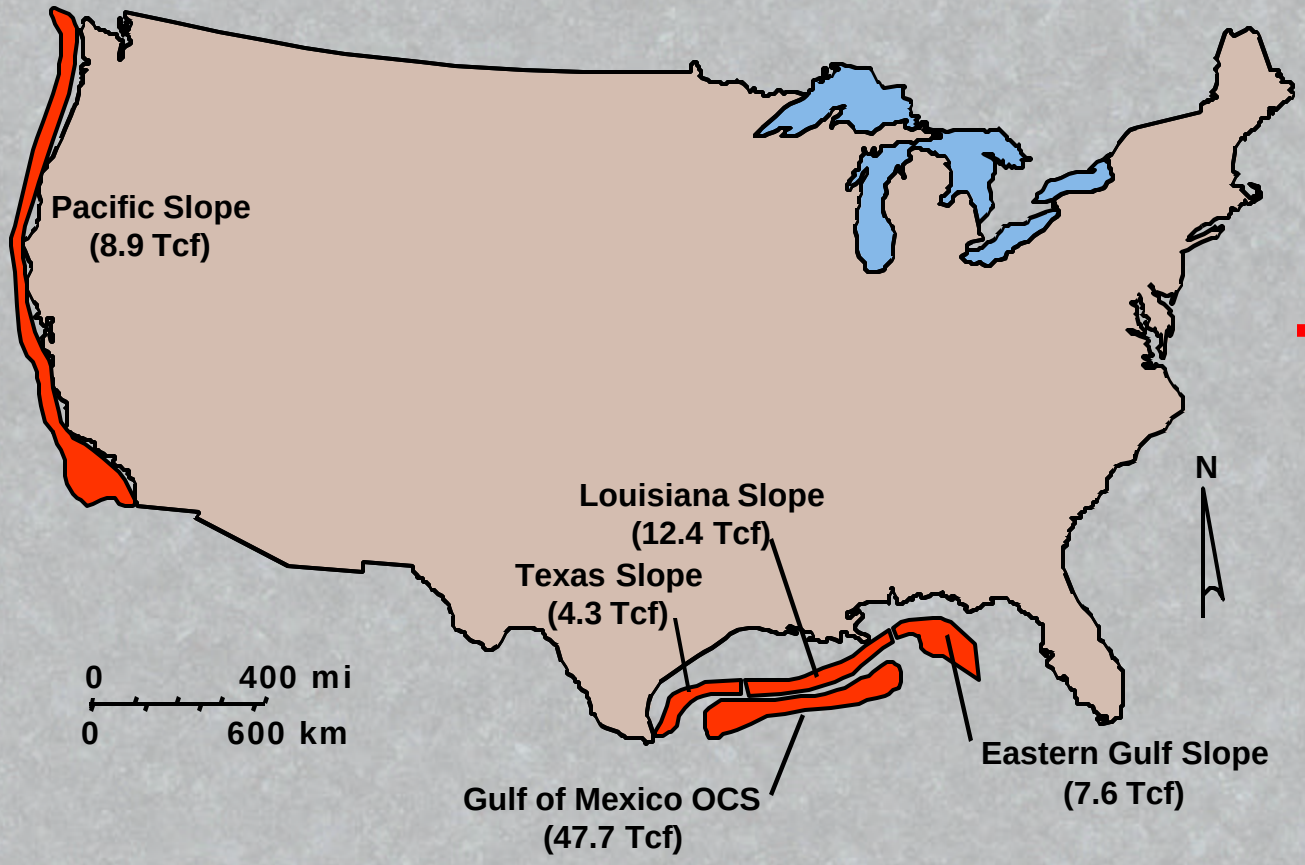
Physical Models

Seismic Studies





MAJOR PRODUCTIVE DEEP-WATER GAS BASINS
(Total Most Likely Resources)



71 Tcf

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Data: PGC (2001)

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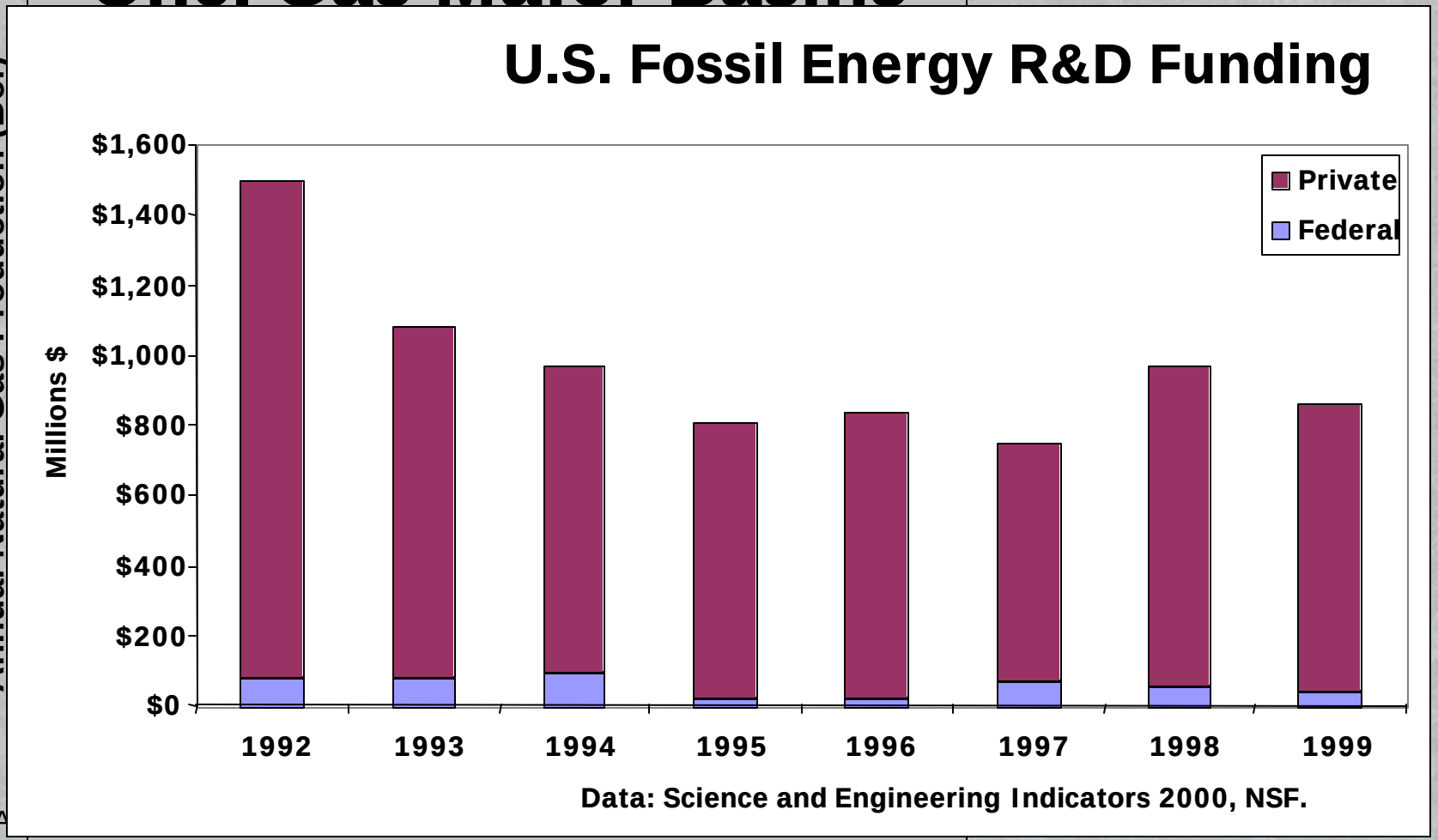
Policy & Investment

Creating Unconventional Resources

Unc. Gas Major Basins



Annual Natural Gas Production (Bcf)

EIA

Summary

Efficiency, economy, environment and resource availability all point towards a natural gas future.

Natural gas will come increasingly from "unconventional sources", and history shows that a balance between production incentives and technology investment will result in the creation of new unconventional natural gas resources.

The Federal/Private research and technology investment ratio needs to be increased if the U.S. transition to natural gas is to be smooth.

Thank you!