



Bureau of Economic Geology, The University of Texas at Austin



**Natural Gas Market, Technology Views**  
*Congressional Seminar, 9/28/09*

# Overall Perspectives

- 1970s & 1990s “redux” with regard to perceptions about reliability, deliverability
  - Similar policy/regulatory disconnects are happening now
- Even without GHG policy, gas “push” is inevitable
  - With GHG caps, low carbon technologies are immature, timing of deployment and cost highly uncertain
  - Even without caps, strategic opposition to electric power transmission hinders both coal and renewables
- Oil and gas tax policies impact development
  - IDCs are particular challenge for continued drilling and exploitation

# Conflicting Policy Views Persist

*Even with storage at historic highs...*

## “Gas Short”

- Prevailing political sentiment (state regulators)
- Unconventional plays are unsustainable
- Global competition for LNG disadvantages US
- Persistent high and “volatile” prices

## “Gas Long”

- Prevailing industry sentiment
- Unconventional plays are sustainable
- LNG will swing to US for storage, peak shaving
- Generally lower price deck but with price spikes

# “Gas Short” Implications

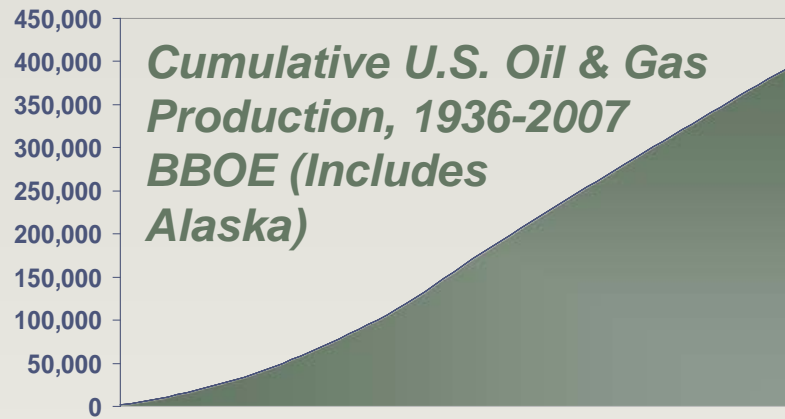
- Undermines critical assumption that gas will be available for balancing
  - Renewables dispatch sensitivity
- Limits gas to incremental use
- Used to block progress on key upstream and midstream initiatives
  - OCS and other moratoria/restrictions
  - ROW for midstream

# “Gas Long” Implications

- Gas can expand beyond “bridge fuel” assumptions
  - Persistent oil:gas price premium can support mixed end uses
  - Search for non-weather sensitive base load and cohesive commercial framework (policy/regulatory/market)
- Builds customer expectations regarding pricing and price risks
  - Search for strategies to dampen volatility, moderate prices, preserve margins for producers
- Adds to pressure on producers for value
- Discourages incremental LNG development near load centers

# Impact of Technology – Deferring Declines

*Oil & Gas Technology Pathway*



- Arctic?
- Hydrates?
- Offshore below **10,000ft**
- 4-d seismic, offshore below **5,000ft**

- 3-d seismic, horizontal drilling, measurement while drilling, offshore below **1,000ft**

- Pipeline trenching and welding, compression, pressure control, metering; national grid develops
- Directional drilling, offshore below **250ft** water depth

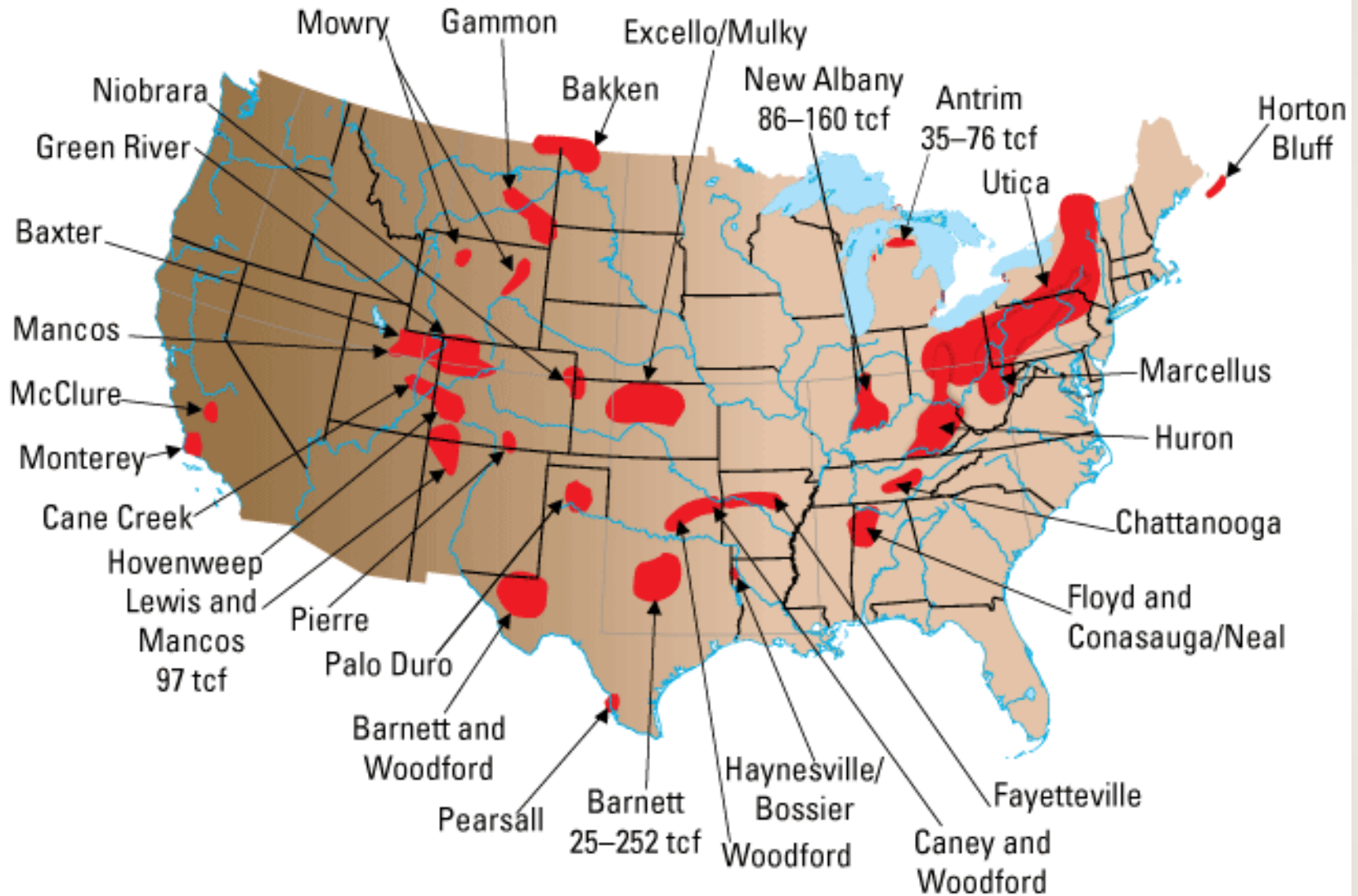
- Long-line pipeline transmission
- Advances in drilling, early seismic, shallow offshore E&P

•Oil discovered at Spindletop (Texas), 1901

•Oil discovered in Titusville, Pennsylvania, 1859; natural gas replaces town gas, 1870s



**Major US shale basins.**



# Barnett Shale

## Estimated ultimate recoveries per well:

“Sweet Spot”: 3.0 bcf plus

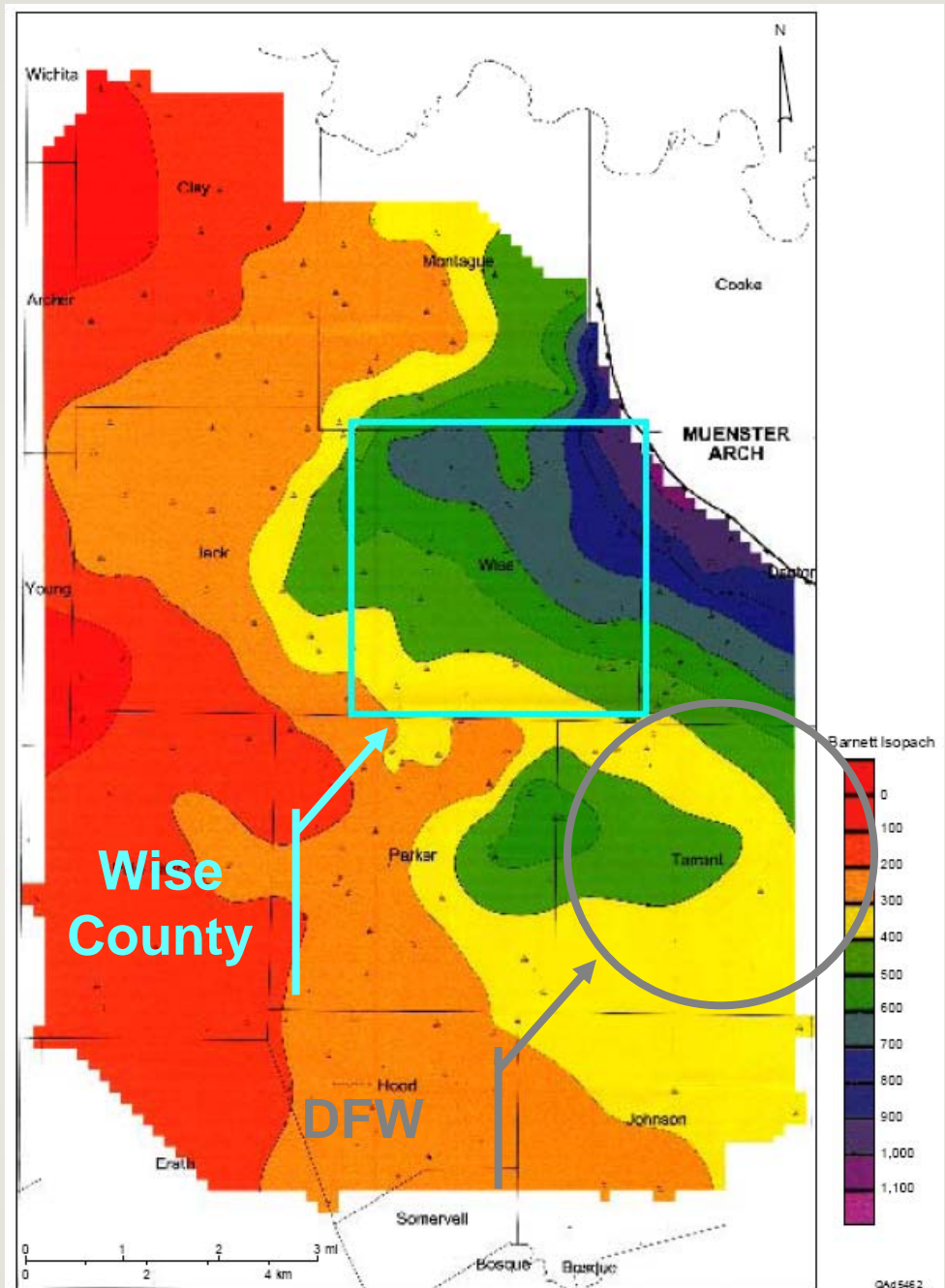
Second tier: 2.5 – 3.0 bcf

Third tier: 1.75 – 2.5 Bcf

Fourth tier: 1.25 – 1.5 bcf

Fifth tier: 0.5 – 1.25 bcf

Basin margin: 0.5 bcf

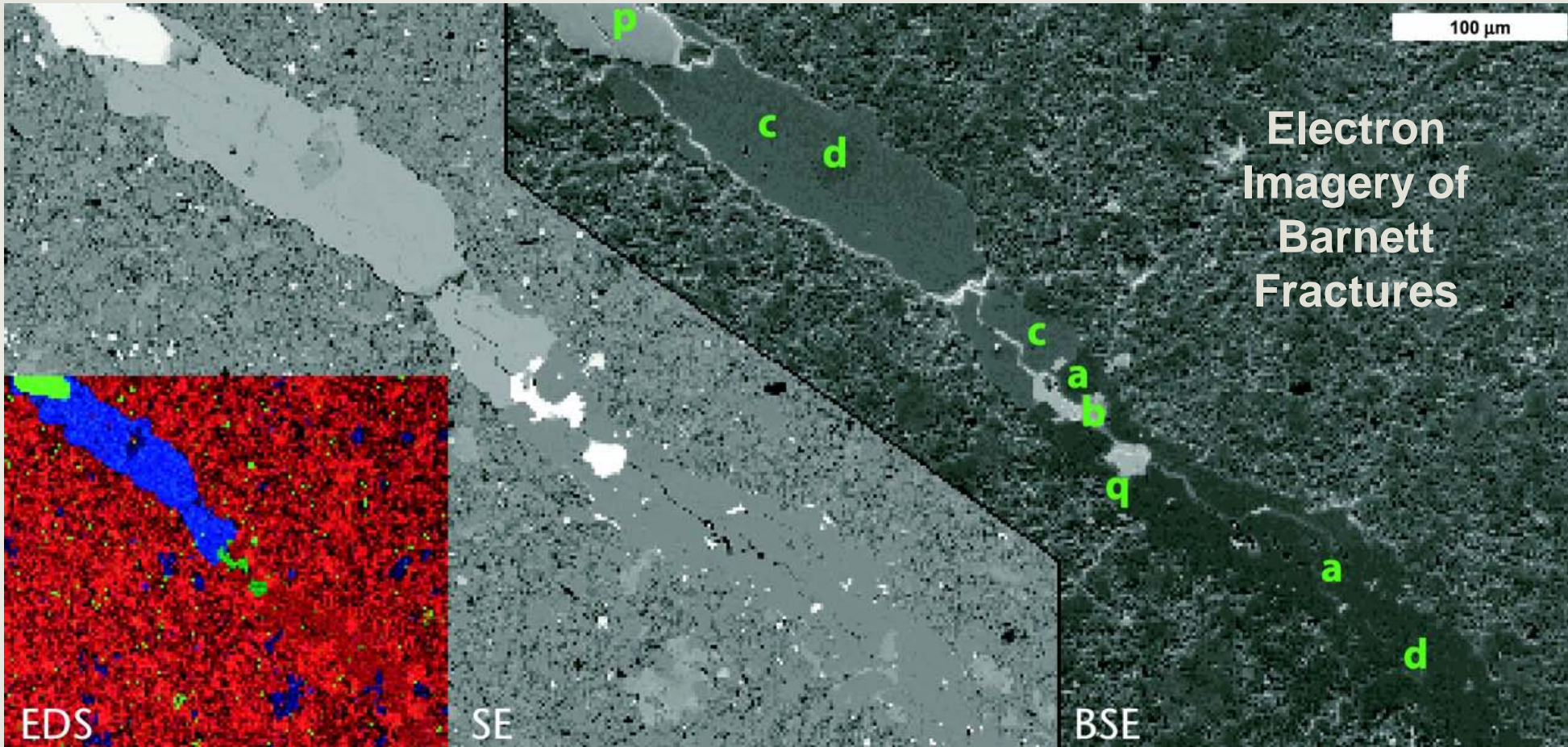


# Barnett Shale Experience

- Water use for “fracing” and other Barnett Shale development is less than 1% of total water use in affected counties
  - Water use has been growing, but rate of use in future may be lower with technology improvement and recycling
  - Operators are actively testing recycling to manage water demand and produced water
- NETL Produced Water MIS

<http://www.netl.doe.gov/technologies/PWMIS/>

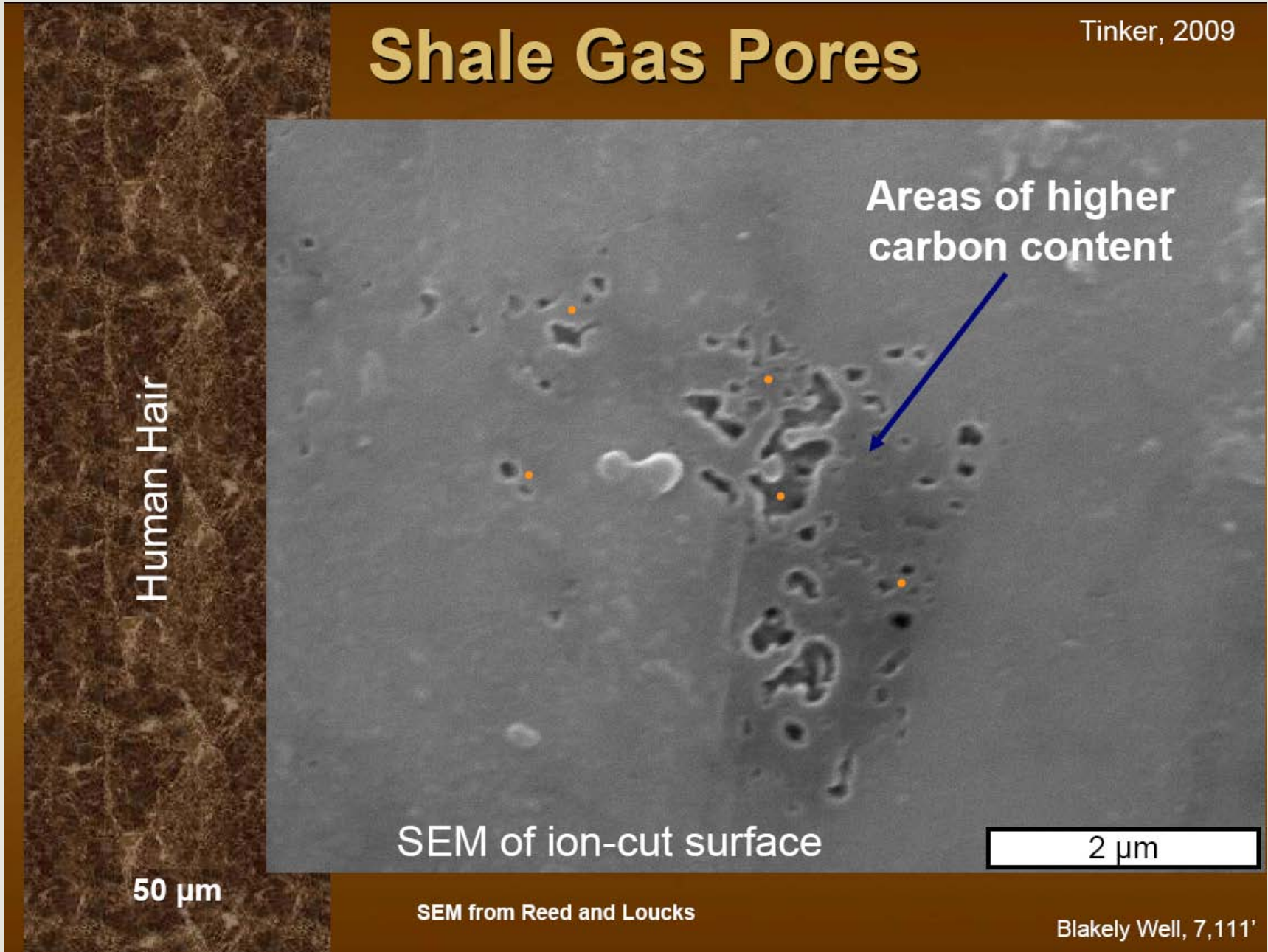
# The Frontier



*Gale, J. F. W., Reed, R. M., and Holder, Jon, 2007, Natural fractures in the Barnett Shale and their importance for hydraulic fracture treatments: AAPG Bulletin, v. 91, no. 4, p. 603–622.*

# Shale Gas Pores

Tinker, 2009



Human Hair

50  $\mu\text{m}$

Areas of higher carbon content

SEM of ion-cut surface

2  $\mu\text{m}$

SEM from Reed and Loucks

Blakely Well, 7,111'

# New “Nanodarcy” Universe of Technology

- Detection and advanced stimulation
- Slow decline curves
- Reduce drilling (fewer rigs, lower costs)
- Manage water disposal issues