

A History and Overview of the Barnett Shale



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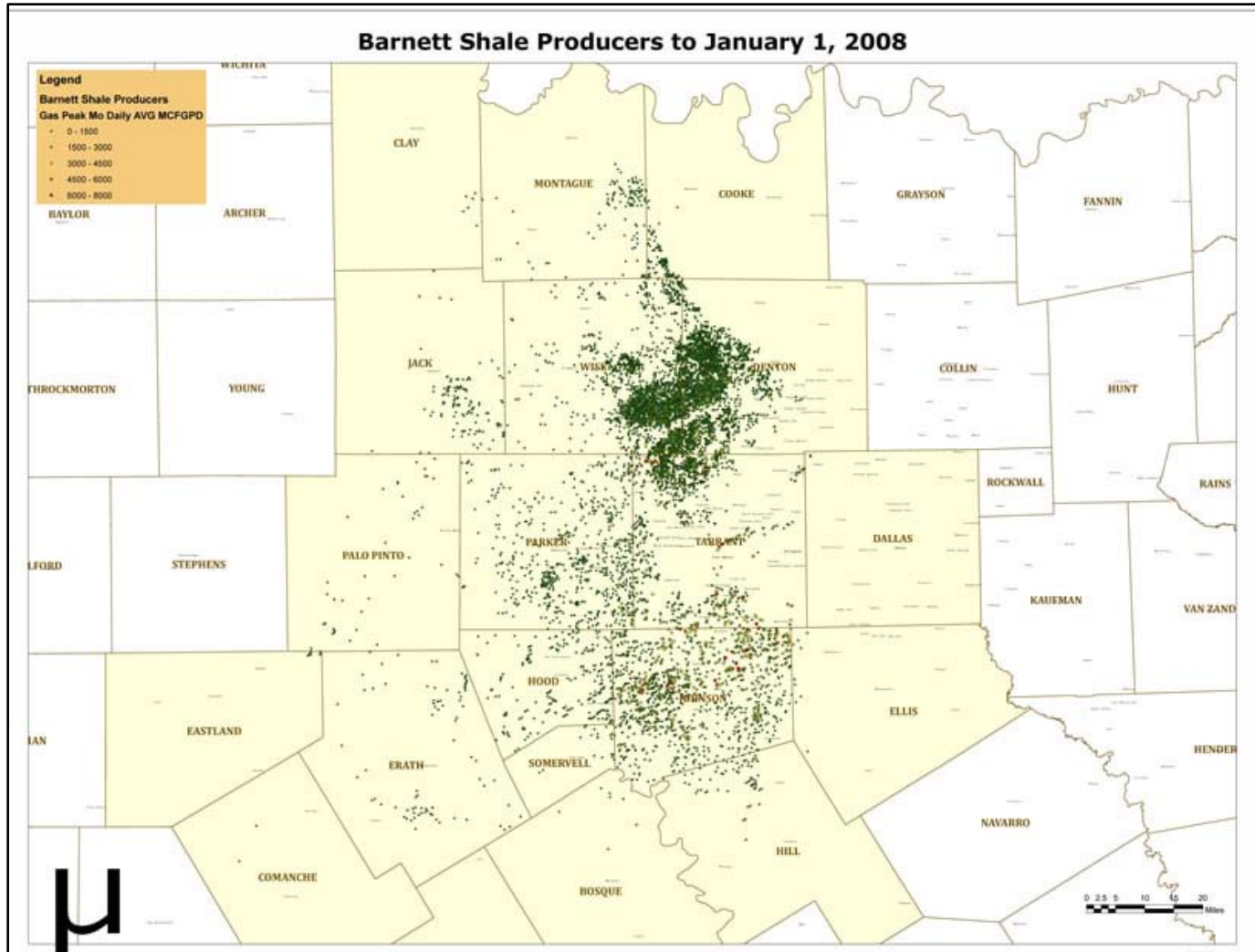
Introduction

- What is the Barnett Shale?
- What is natural gas?
- History of the Barnett Shale
- Overview of the production process
- Urban drilling issues
- Current situation
- The future

What is the Barnett Shale?

- The Barnett Shale is an onshore natural gas field
 - Covers more than 5,000 square miles
 - About a mile and a half below the surface
 - Production in 20 NTX counties
 - Contains reserves estimated at about 39 TCF of gas
- Named after 19th Century settler John W. Barnett
- Geologists have known about it for a long time... but they didn't know how to get the gas out
- Economics and technology have made it possible
 - Higher natural gas prices
 - Horizontal drilling
- Almost certainty of success (no dry holes)

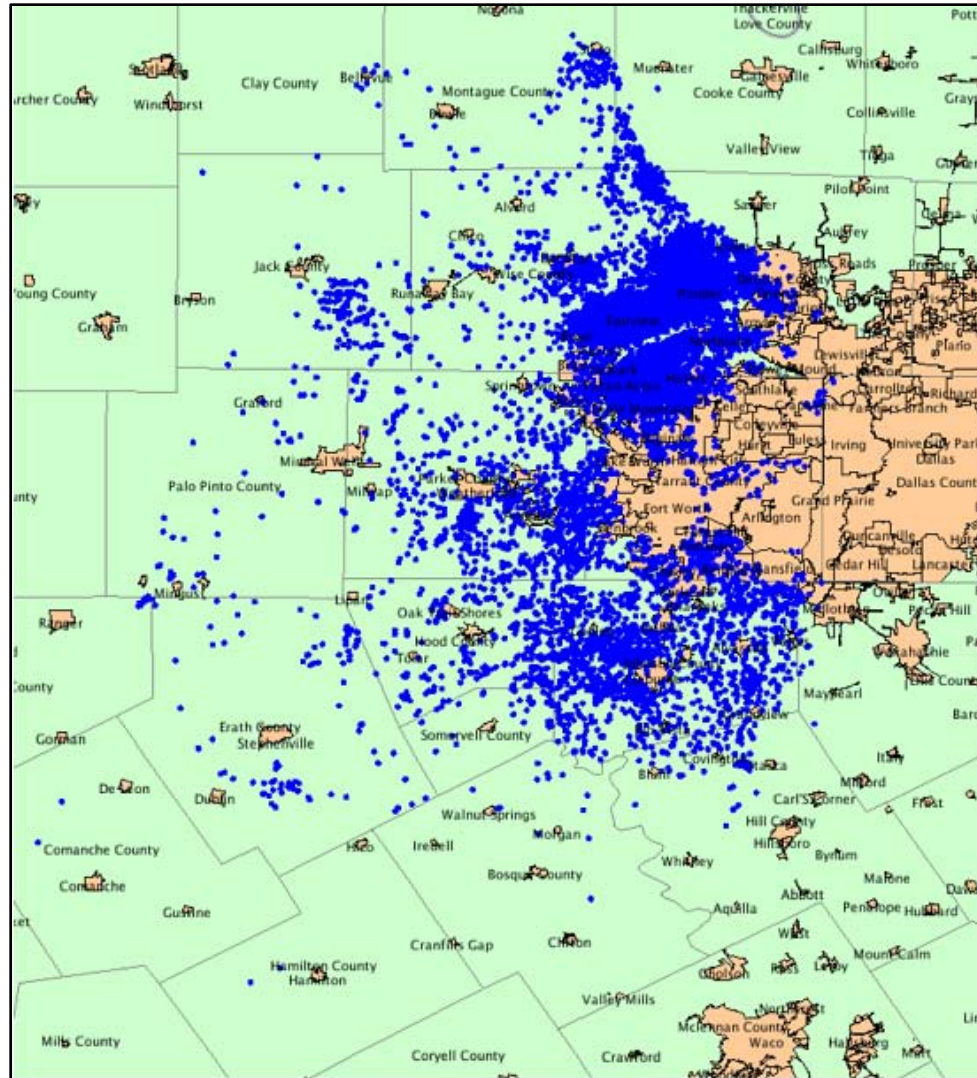
Barnett Shale Producing Wells



What is the Barnett Shale?

- There have been 10,564 producing wells thru June 30, 2008
- Contributes 8% of U.S. natural gas supply (U.S. consumption was 22 TCF in 2005)
- The Barnett Shale has produced 4.4 TCF of gas & 13.5 MMBO thru 6/30/08
- The Barnett Shale produced 1.115 TCF in 2007 and is projected for 1.55 TCF in 2008
- Urban area (654 wells in FW thru 2007, city expects >3,000 by end of 2010) – reverse of oil towns of the past

Barnett Shale Producers & Urban Area



What is the Barnett Shale?

- Economic: More than 80,000 new jobs & \$8 billion in 2007 (>50% gain over 2006)
- Economic: Barnett Shale now about 8% of NTX economy
- Economic: More than \$1.1 billion to state & local governments
- Economic: Strong demand for office space in Fort Worth

What is Natural Gas?

- Cleanest burning fossil fuel (mostly made up of methane)
- Uses: heating, generating electricity, powering vehicles (CNG)
- Used in plastics, medicines, fertilizers, etc.
- DOE: Natural gas accounts for 22% of U.S. energy consumption
- Alternative to oil, “bridge fuel” to future (T. Boone Pickens)

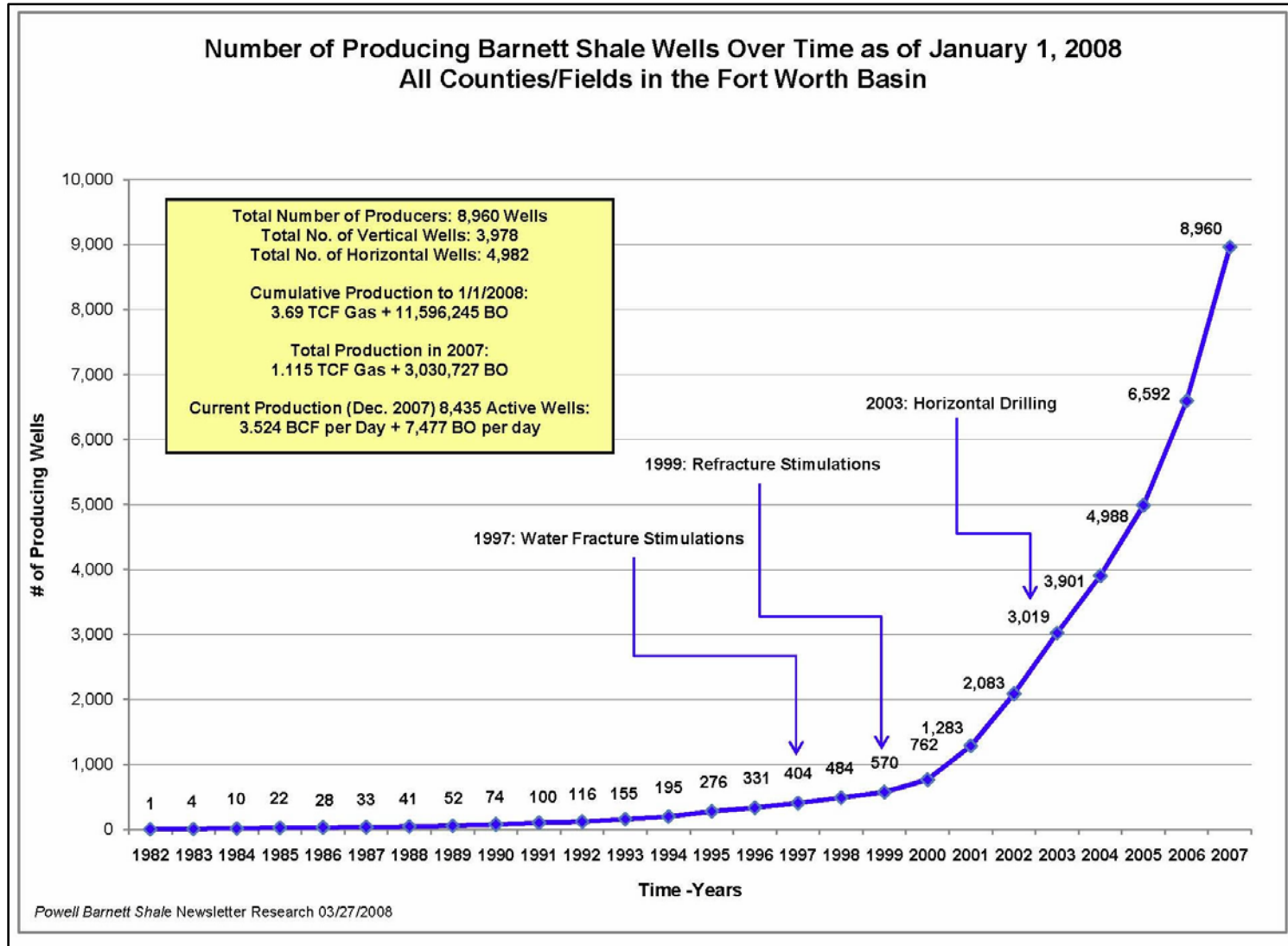
History of the Barnett Shale - Geology

- Over 300 million years ago, NTX an ocean
- Sea creatures died and sunk to bottom
- Seas dried up, sea bed with organic matter became rock
- Pressure and temps “cooked” organic matter into oil and natural gas
- Shale: hard, heavy, dense black rock – how could anything come from it?
- Gas trapped in shale for millions of years... until now

Early Development

- George Mitchell, father of the Barnett Shale
- First well: C.W. Slay #1 in 1981 (Wise County)
- Experiments continued for almost 20 years, especially with fracturing (water best)
- Play took off with horizontal drilling in 2003

Growth in the # of Producing Wells



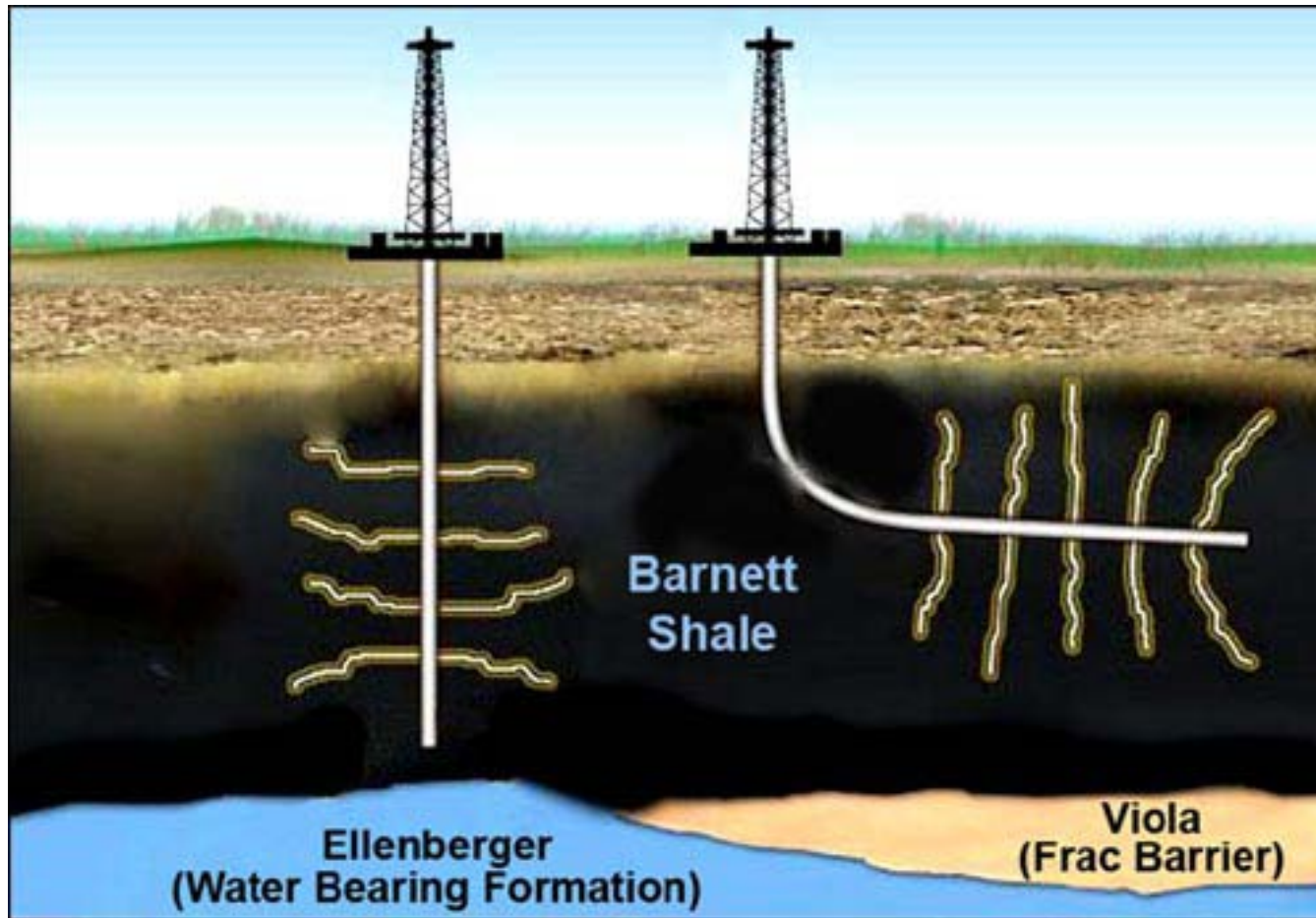
Overview of the Production Process

- Identify location to drill (geology, county, urban vs. rural)
- Leasing
 - Mineral estate vs. surface estate (mineral dominant)
 - Energy company needs lease to drill and develop your minerals
 - Mineral owner receives upfront signing bonus and royalties (% of production)

Drilling & Completing a Well

- Need permits from TXRRC (state) and if urban, municipality (ordinance)
- Rig takes 14-21 days to drill one well
- Rig leaves after wells drilled
- Horizontal drilling (see graphic)
 - Rig can be up to 1.5 miles away
 - One pad site can support up to 35 wells
 - More productive than vertical
 - But more expensive too

Vertical vs. Horizontal Drilling



Hydraulic Fracturing (Fracing)

- After well drilled, it must be fraced
- Well bore is perforated
- 3-4 million gallons of water mixed with sand pumped down well bore at high pressure
- Water fractures rock, sand props it open (proppant) so gas can escape
- Fracing is necessity in Barnett Shale

Hydraulic Fracturing (Fracing)



Wastewater an Issue

- Frac water comes back (flowback water)
- About 40% of frac water recovered
- What to do with wastewater?
- Salt water disposal wells
- Water recycling efforts

Production

- Well must be connected to pipeline for gas to flow
- Once connected, gas can be transported and sold
- Mineral owners receive royalty payments

Urban Drilling Issues

- Drill site locations (setback distances in ordinances)
- Truck traffic and road damage
- Water usage (<1% of TRWD sales in 2007)
- Wastewater disposal
- Pipelines: routes, eminent domain
- Noise

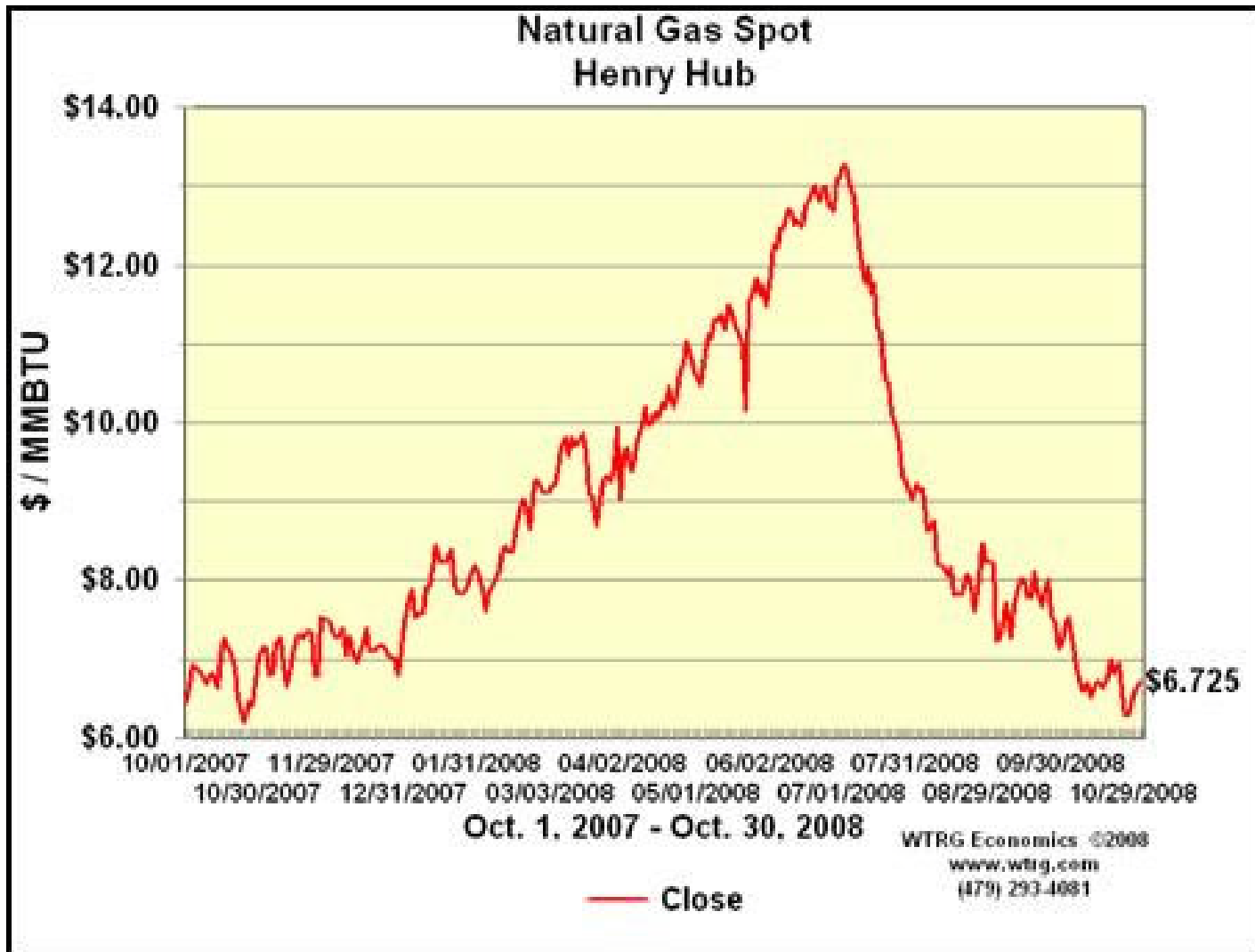
Sound Wall



Current Situation

- Natural gas prices have fallen about 50% since early July (chart)
- Credit crunch and national economy
- Result: leasing slowdown or halt; deals cancelled, offered prices falling
- Drilling pace may slow somewhat
- Natural gas prices will climb again with cold winter

Natural Gas Prices



The Future

- Improved technology boosts recovery rates (currently about 20%)
- Re-fracing
- Natural gas prices climb, leasing picks up
- Barnett Shale peak production expected in the next few years
- Barnett Shale to produce for 20 to 30 years or more
- Economic impact to last for years to come

Thank You



Photo by Gary Wilson