

Pennsylvania's Energy Industry

Past, Present and Future



PIOGA/Independent Oil and Gas Producers

- PIOGA: largest and most diverse association of oil and gas businesses, over 900 members
- Represent conventional and Marcellus/Utica shale producers
- Pennsylvania activity:
 - Conventional natural gas/coal-bed methane well
 - Shallow oil wells
 - Unconventional/Shale wells



Quest for Energy



Quest for Energy



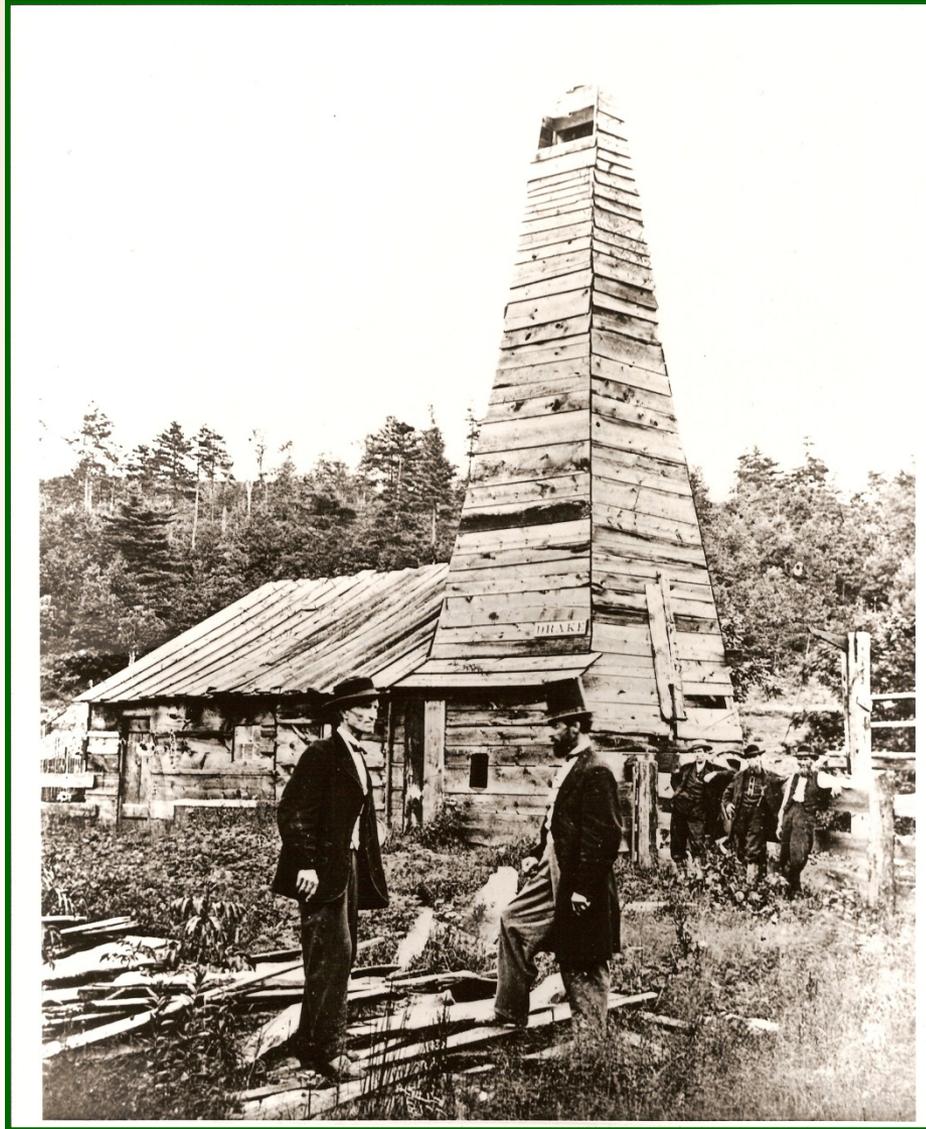
Edwin L. Drake 1819-1880

Petroleum in Pennsylvania





Quest for Energy



Quest for Energy

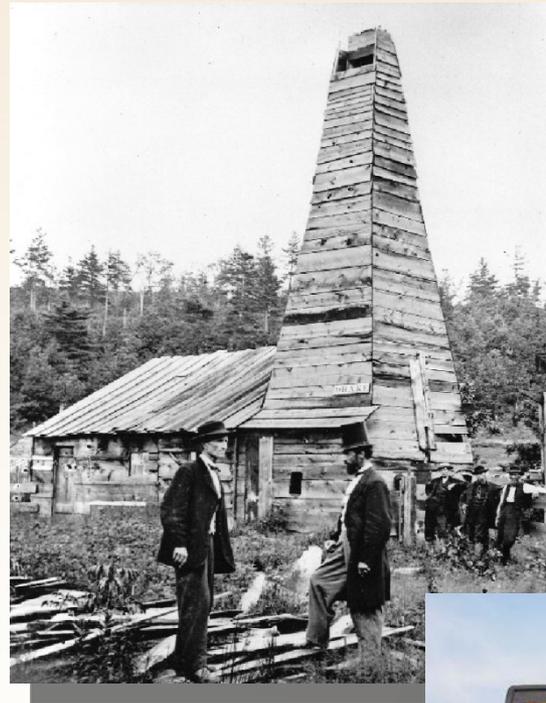


Quest for Energy



Pennsylvania Oil and Natural Gas History

- Fueling Pennsylvania for more than 150 years
- 1859: Drake Oil Well near Titusville, “The start-up that changed the world”
- 1878: Haymaker Well in Murrysville, First commercial natural gas well in U.S.
- 350,000 vertical wells drilled
- 100,000 wells remain in production today



Natural Gas Facts and Usage

- **Cleanest-Burning Fossil Fuel**
 - 30 percent less CO₂ than oil
 - 45 percent less CO₂ than coal
 - Virtually no SO₂, Mercury or Particulates

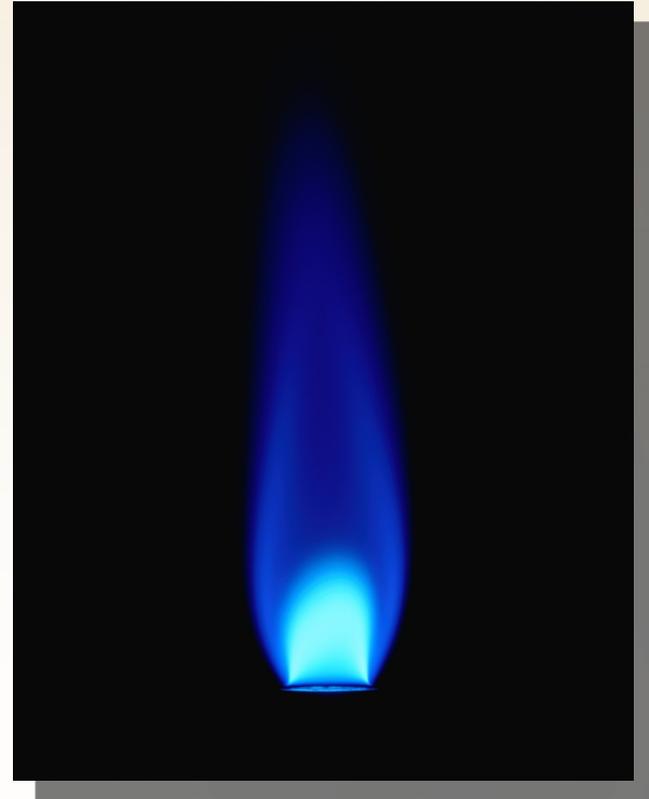
Residential Use: 22 percent

Heat, hot water, ovens/stoves

**Industrial/Commercial Use:
44 percent**

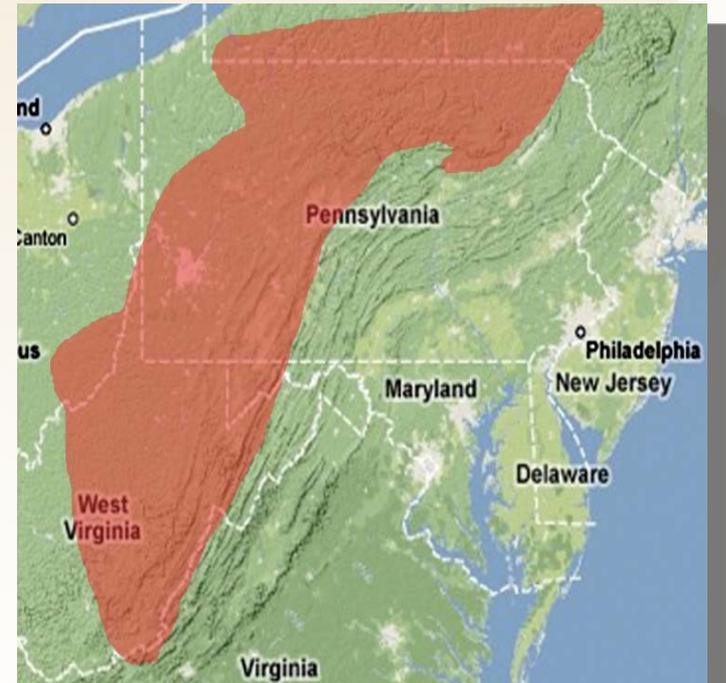
**Electrical Generation Use:
32 percent**

Transportation Use: 3 percent



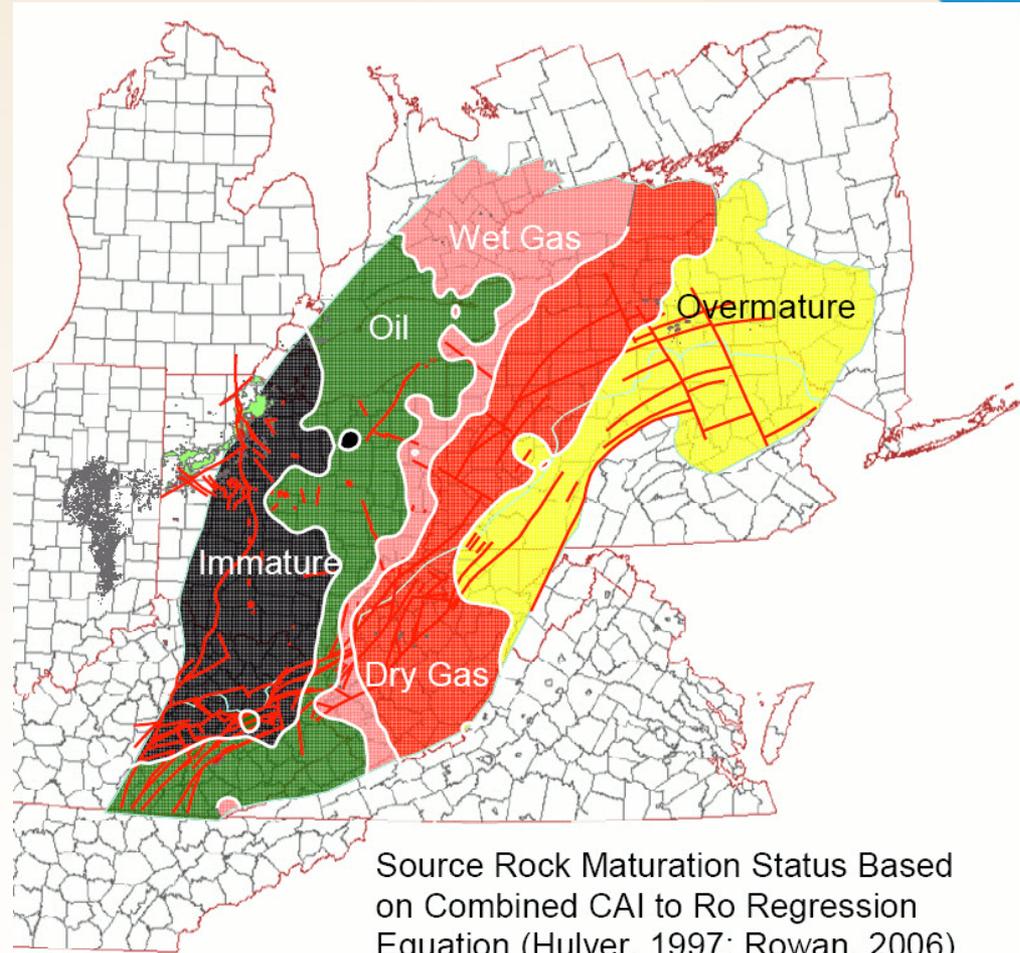
Marcellus Shale Formation

- Geological formation created about 380 million years ago in Middle Devonian age
- As formation aged and decayed, natural gas trapped in the shale
- Formation rests a mile or more below surface, thickness between 50-200 feet
- Approximately size of 95,000 square miles
- Reserves estimated at approximately 500 trillion cubic feet

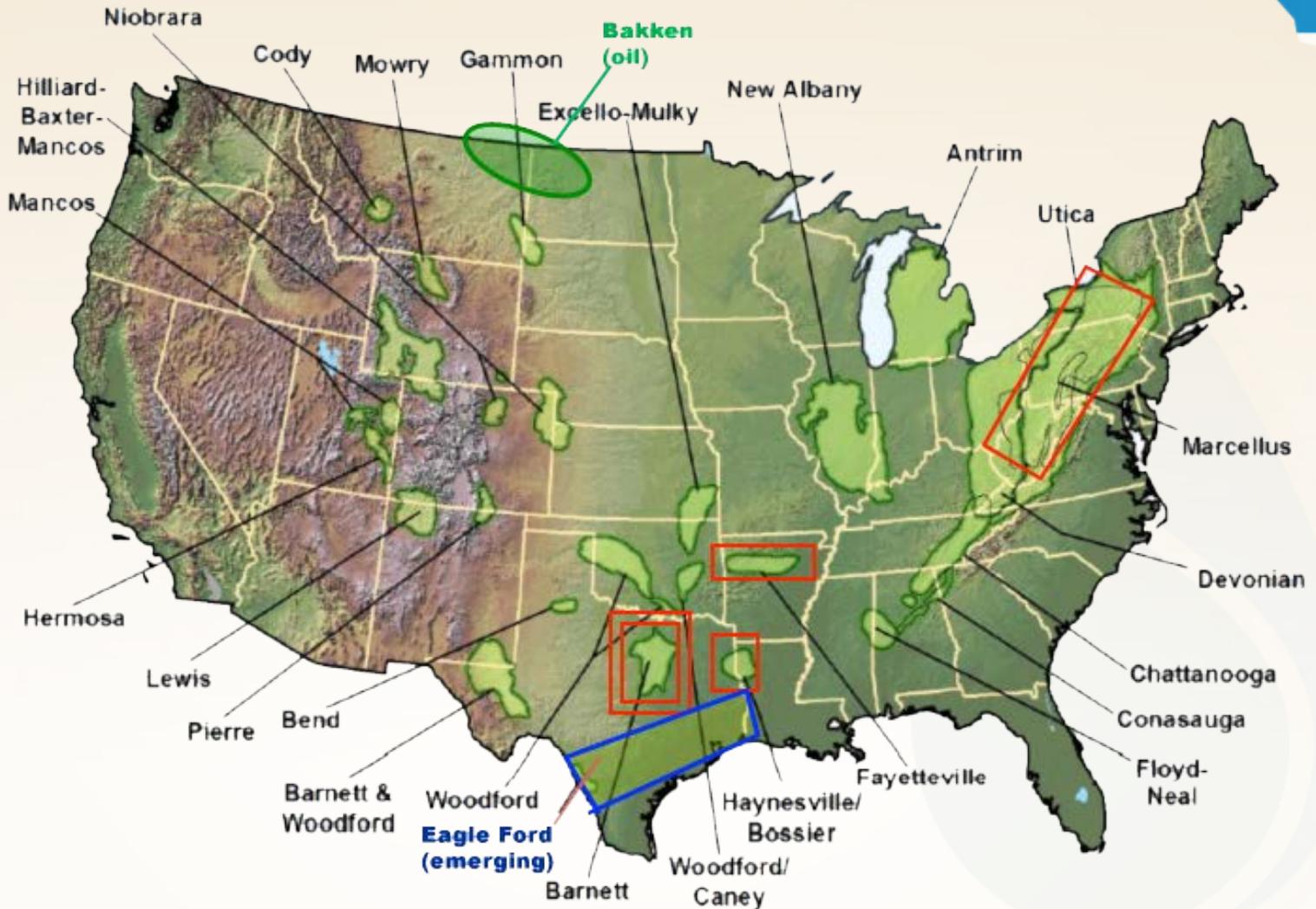


Utica Shale Formation

- Preliminary drilling activity in Eastern Ohio/Western Pennsylvania
- Over 250 wells drilled to date
- “Wet” gas in formation includes ethane, butane, propane and natural gasolines
- Between Marcellus and Utica formations, region has decades-long development potential



The Competition

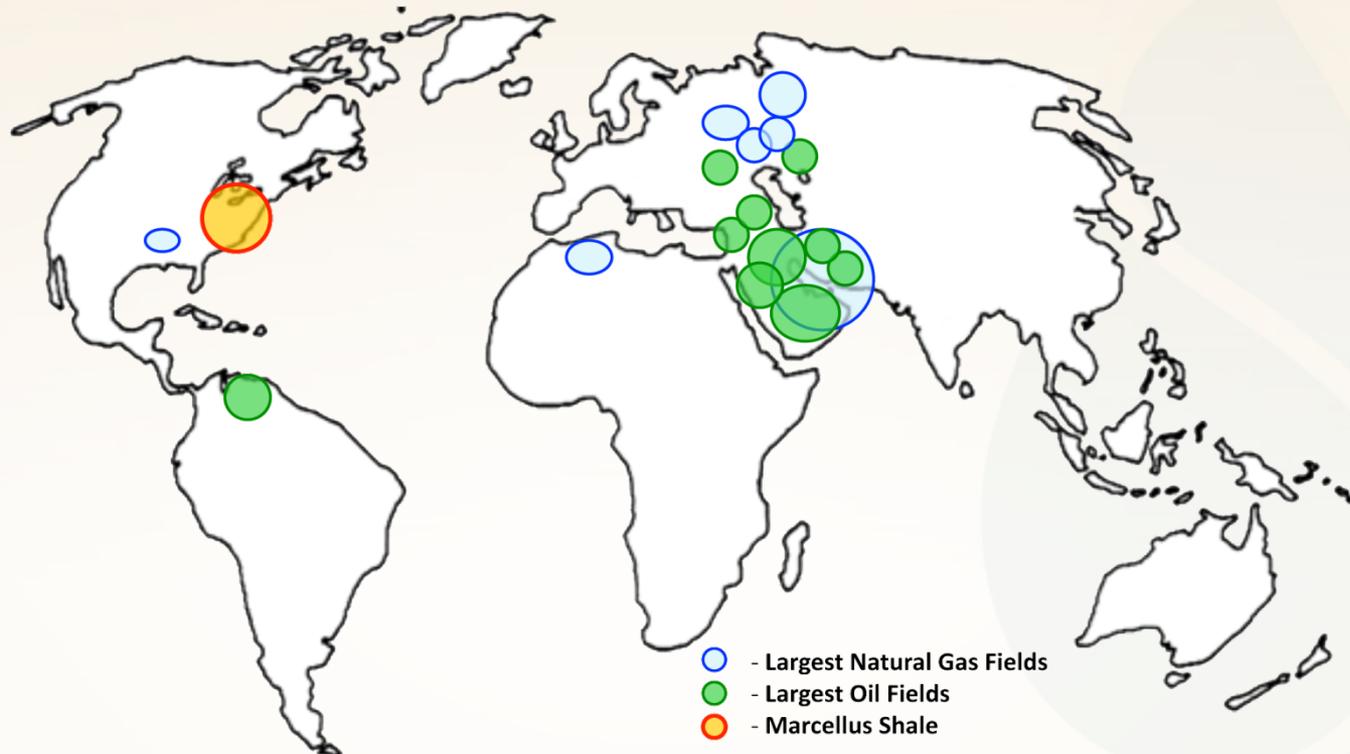


U.S. Department of Energy, U.S. Shale Basins

How the Appalachian compares...

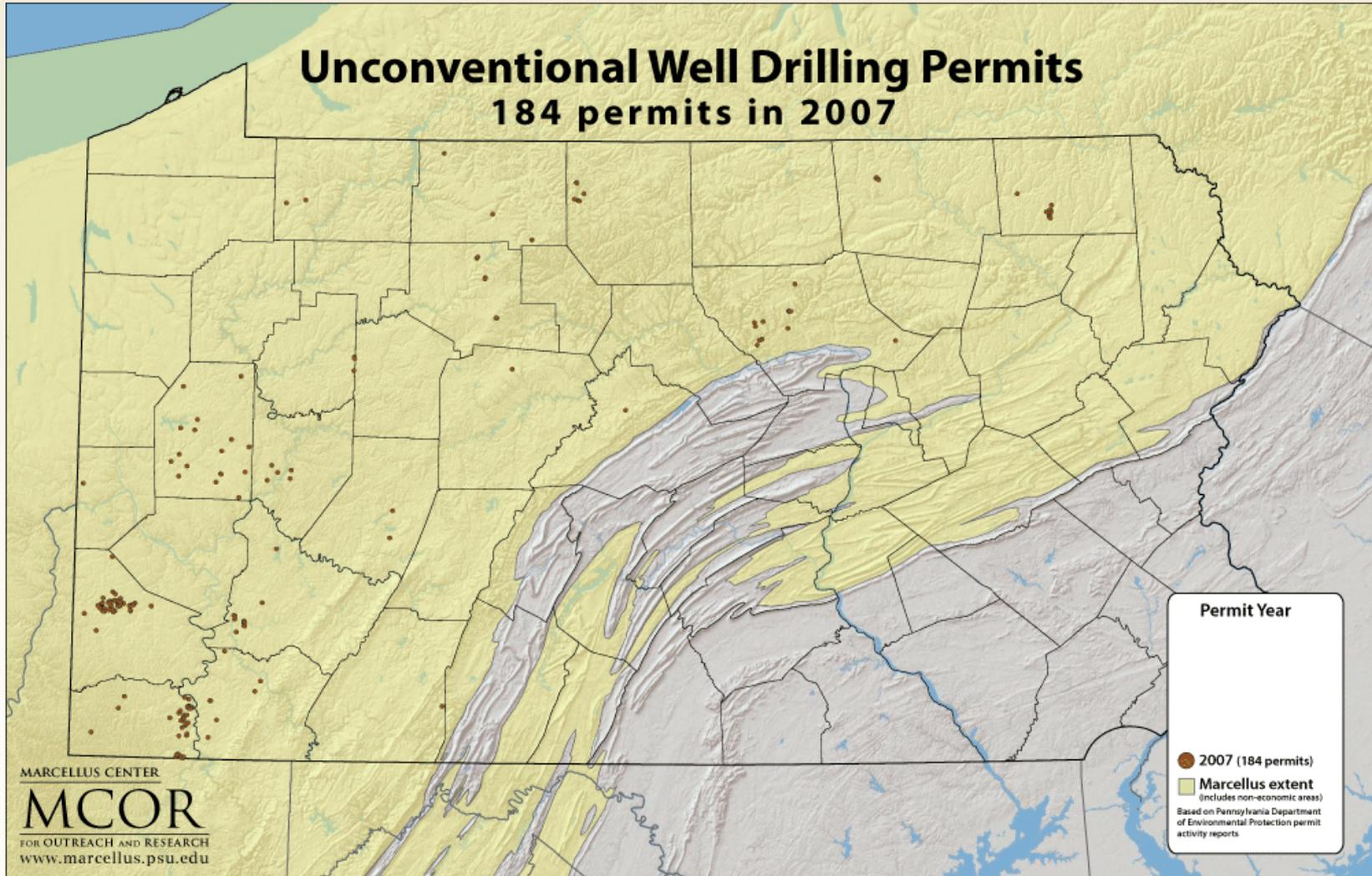
...to the largest oil and gas fields in the world

Marcellus and Utica reserves could exceed those of the largest oil field in the world (Saudi Arabia) and be the 2nd largest natural gas field (largest in Qatar/Iran)



(Bubble size approximates reserves)

Growth



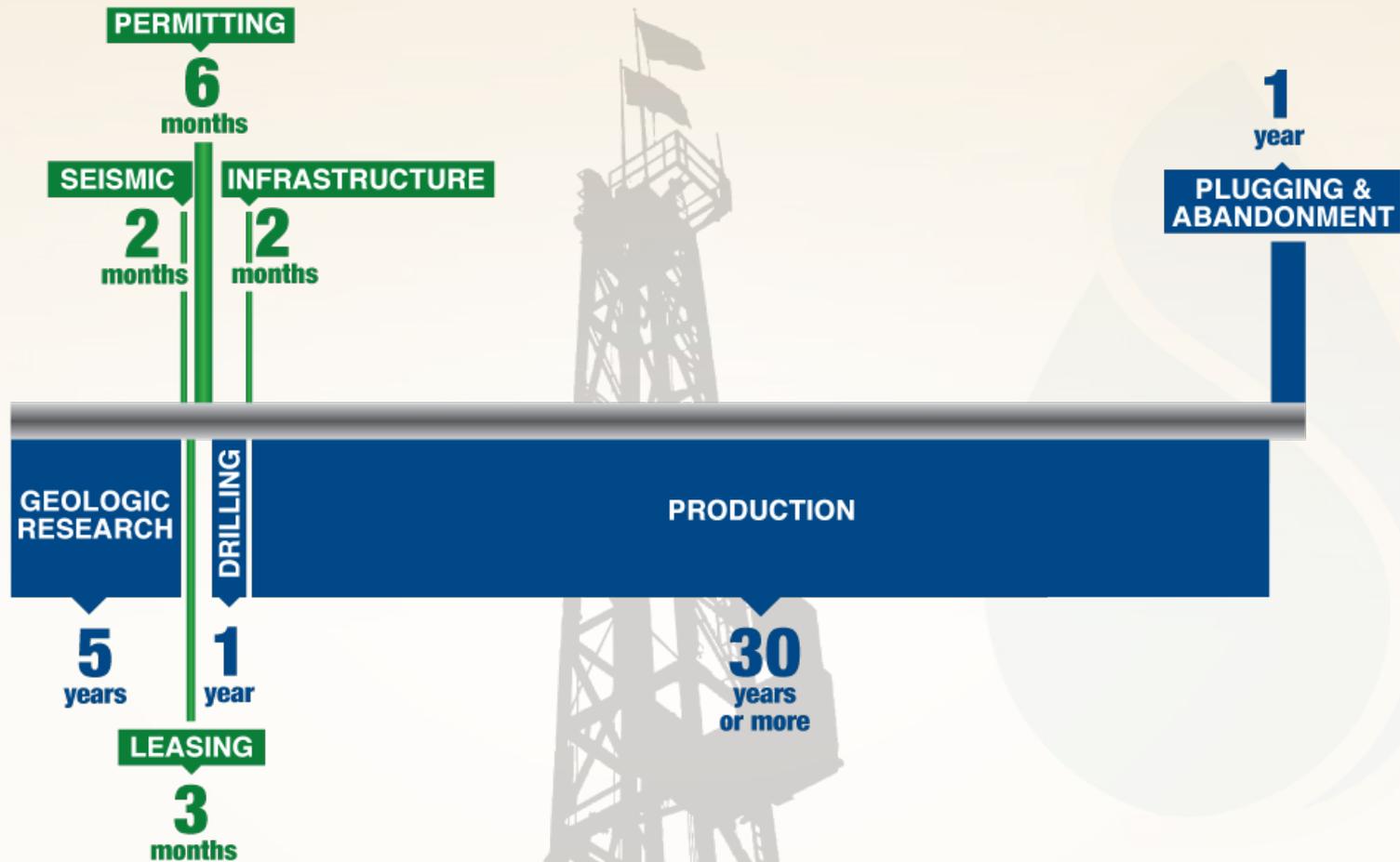
Phases in Shale Development

1. **Pre-Drilling**
 - Exploration
 - Leasing
2. **Drilling**
 - Construction
 - Horizontal Drilling
 - Casing and Groundwater Protection
3. **Completion**
 - Hydraulic Fracturing/Well Stimulation
 - Flow-Back
4. **Production**
 - Post-Production
 - Site Reclamation



Long-Term Perspective

Exploration, Drilling, Production



Production and Progress

- Pennsylvania produced 1 percent of nation's natural gas in 2007; now accounts for 9 percent
- Production increased from 1 BCF/day to 6 BCF/day between 2010-2012
- Natural gas usage in electric power generation increased 35 percent in PJM region between 2011-2012



The Future



Up Coming Events

Alternative Fuel Cruise-In

Bringing you the vehicles of tomorrow, today!

Sept. 30, 3 - 8 PM

FREE event open to All

CNG, Electric, Propane, LNG, Bio-Fuel Vehicles!

Educational Displays, Kids Activities, and Giveaways!

