

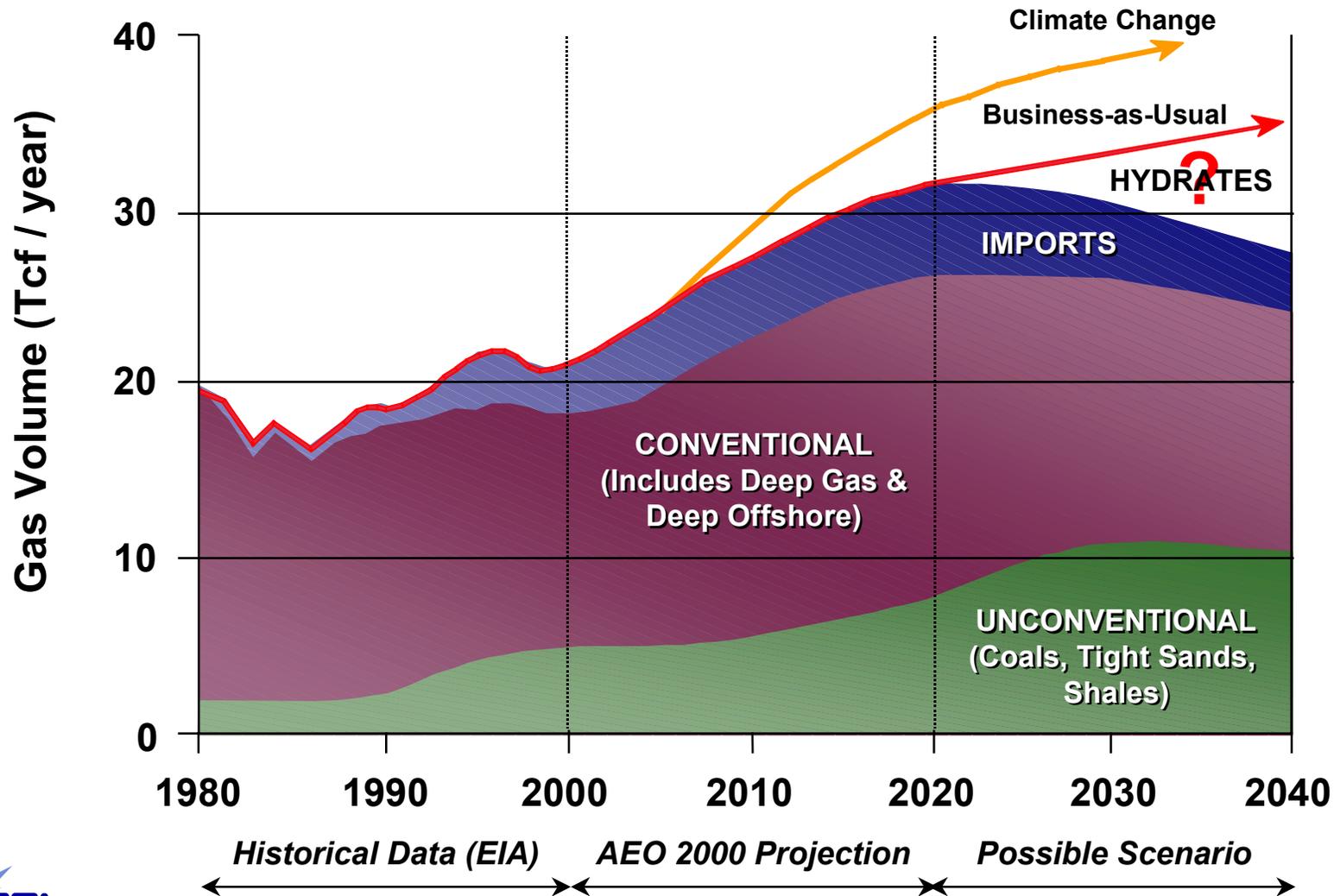
Gas Exploration, Production, and Storage



Strategic Center for Natural Gas



Enough Affordable Natural Gas to Meet Demand?

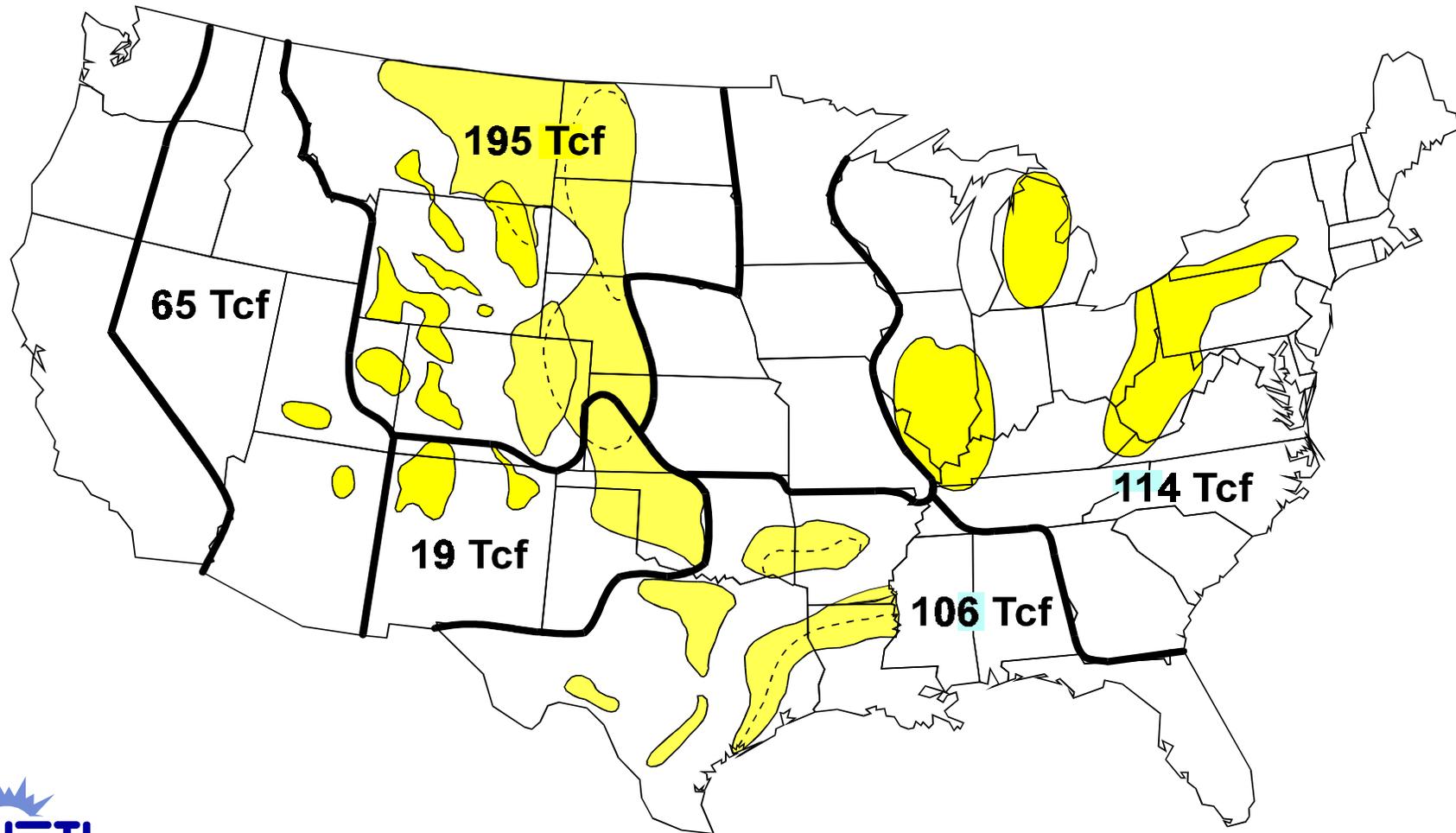


Key Issue

Development of Federal Lands

- 460 Tcf in low perm formations

- 285 Tcf (60%) is on federal lands





Gas Exploration & Production Program Goals

- **Near-Term: Recover more from developed fields**
 - Locate by-passed zones in conventional reservoirs
 - Enhance stripper well production
- **Mid-Term: Exploit low-permeability formations**
 - Reduce drilling cost
 - Improve success rates in finding gas
 - Increase recovery efficiency
- **Long-Term: Encourage E&P of frontier resources**
 - Deep (>16,000 feet) gas
 - Methane Hydrates
 - Offshore gas



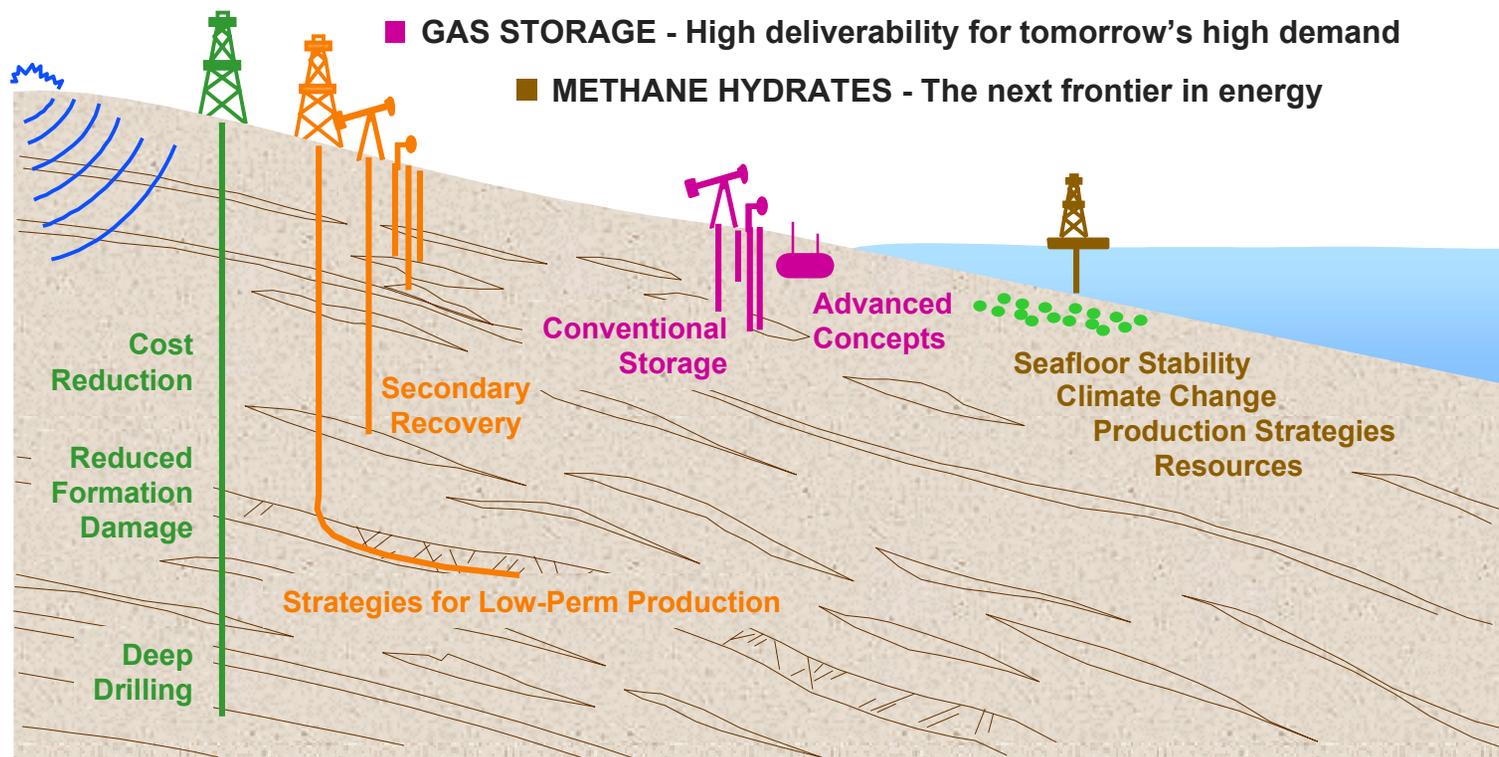
Partnership Approach

- **R&D conducted with various partners**
 - Industry (Maurer, Union Pacific Resources, Burlington)
 - Other federal agencies (USGS, Energy Efficiency)
 - National labs, universities and industry associations
- **Cost shared projects are common**
 - Field tests (independent producers)
 - Development of technologies (service companies)
- **Technology transfer**
 - Cooperative agreements with commercializing partner
 - Successful field demonstrations
 - Petroleum Technology Transfer Council

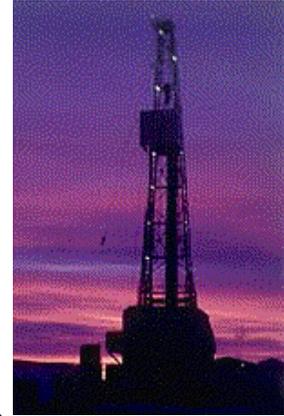


Gas Exploration, Production, and Storage

- **RESOURCE ASSESSMENTS** - Quantifying the nature and potential of gas resources
- **EXPLORATION TECHNOLOGIES** - Enabling effective natural fracture detection
- **DRILLING, COMPLETION, & STIMULATION** - Reducing the costs and risks of extracting natural gas
- **PRODUCTION TECHNOLOGIES** - Maximizing recovery of gas from discovered fields
- **GAS STORAGE** - High deliverability for tomorrow's high demand
- **METHANE HYDRATES** - The next frontier in energy



Latest Success Story



- **Project Specifics**

- Union Pacific Resources (UPR) Company
- Rock Island #4 Well drilled in Wyoming
- Deep horizontal well (15,000 TVD w/1,700 ft horizontal)
- Greater Green River Basin (Tight Sand)

- **Results**

- Production exceeded expectations (2.1 bcf in six months)
- Based on well's success, six more wells planned
- Gas bearing play covers 900 square miles potentially huge reserves

- **Project Demonstrates**

- Successful partnership between industry and Government
- Successful crosscutting of several key program elements
 - Deep gas; low perm; horizontal well; deep horizontal core



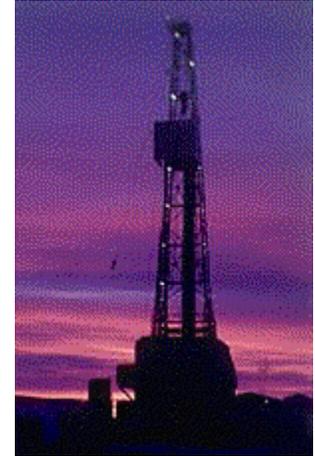
Drilling, Completion & Stimulation Objectives

- **Faster**
 - New bit technology & slim hole
- **Deeper**
 - High temperature & pressure
 - Develop smarter drilling systems
 - Increase penetration rates in hard rock
- **Cheaper**
 - Reduce cost of drilling in shale, low-perm, & deep water
 - Develop cheaper horizontal & multilateral wells
- **Cleaner**
 - Develop cost effective, environmentally friendly drilling technologies to increase access to federal lands using a small footprint.



U.S. Deep Gas Resource

- **Need for deep gas is growing**
 - 7% of U.S. gas production 1999 - 14% in 2010
 - Depths > 16000 ft below the surface
- **Significant Deep Gas Resource**
 - Rocky Mountains - >40 TCF
 - Mid-Continent - >28 TCF
 - Norphlet - >25 TCF
 - Texas Gulf Onshore - >20 TCF
 - Permian Basin - >15 TCF



Deep Gas Barriers and Issues

- **Cost to drill and produce is extremely high**
 - High temperature, high pressure, extremely hard rock, greatly increased trip time
- **Probability of success much lower**
 - High rate of dry holes (exploratory & development)
- **Inadequate geologic & reservoir information**
- **Significant resource has access restrictions**
 - Example: rocky mountains
- **Industry R&D funding is at critical low**
- **FY2000 DOE Gas E&P funding level is insufficient**



Ongoing NETL Activities

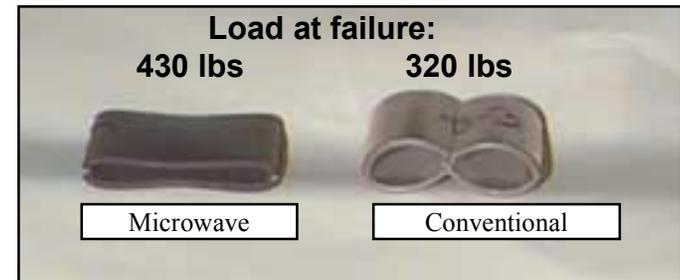
- **Resource Assessment**
 - USGS prioritization/evaluation effort underway
 - Texas BEG evaluation of deep gas in shallow GOM
- **Technology Development**
 - New drill bit technology (Novatek Mudhammer)
 - “Smart” drilling systems
 - Halliburton/Sperry-Sun, HTMWD & HTLWD)
 - New materials



Revolutionizing the Drilling Industry

- **Microwave processing**

- 30% stronger, less brittle, erosion/corrosion resistant metals
- Diamond and tungsten carbide can be formed together



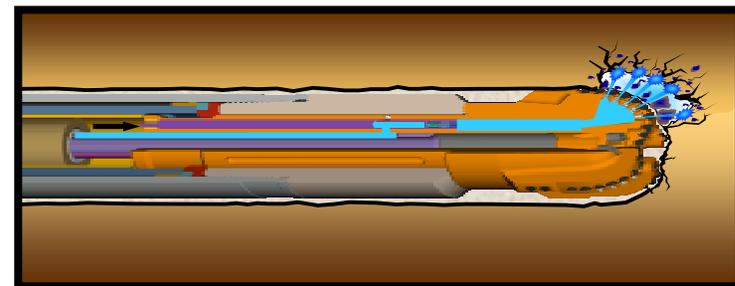
- **Advanced composite drill pipe**

- Half the weight of steel pipe
- Potential for high speed data communication



- **High Performance Drilling Systems**

- Jet assisted directional mud hammer
 - Higher ROP for hard rock
- High pressure coiled tubing drilling system



Deep Trek

Proposed Expanded DCS Program

- **Potential Technology Areas**
 - Low friction, wear resistant materials & coatings
 - “Smart” systems
 - Advanced sensors/monitoring systems
 - High performance drilling systems
- **Program Elements**
 - Develop key components
 - Demonstrate components
 - Integrate & demonstrate entire drilling system



Deep Trek Planning Workshop

- **Activities**

- Obtain industry perspective
- Identify key barriers & R&D opportunities
- Develop collaborative R&D action plan for next 2-5 years

- **Breakout Sessions**

- Drilling & completion fluids
- Completion based well design
- Advanced smart drilling systems
- Drilling diagnostics & sensors systems

- **R&D Challenge**

- Meet industry needs
- System mindset
- Collaborative in nature
- Product focused



NATIONAL ENERGY TECHNOLOGY LABORATORY
STRATEGIC CENTER FOR NATURAL GAS

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The Strategic Center for Natural Gas

Integrating All Elements of DOE's Natural Gas Research From Borehole to Burner Tip

Strategic Planning & Policy Support
 Exploration and Production
 Transmission, Distribution & Storage
 Gas Processing & End Use

Methane Hydrates Solicitation
 The Strategic Center for Natural Gas is seeking applications for the solicitation titled, "Methane Hydrates" The closing dates for submission of proposals is April 24, 2001. [Read More!](#)

Honeywell Hybrid Fuel Cell Tech. To be Added to DOE/SCNG R&D Program
 DOE has selected Honeywell International to begin developing a new type of "planar solid oxide fuel cell" hybrid power system. [Read More!](#)

Lasers Studied for 21st Century Oil, Natural Gas Drilling
 DOE and the natural gas industry are exploring whether lasers could be the next revolutionary advance in oil and gas drilling. [Read More!](#)

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