U.S. DEPARTMENT OF ENERGY

Oil and Natural Gas

Informing Public Policy on Oil and Natural Gas Resources: DOE R&D and Related Activities

Nancy Johnson
Interstate Oil and Gas Compact Commission
Annual Meeting
Buffalo, New York
October 17, 2011

DOE Basic and Applied Research

Core Capabilities

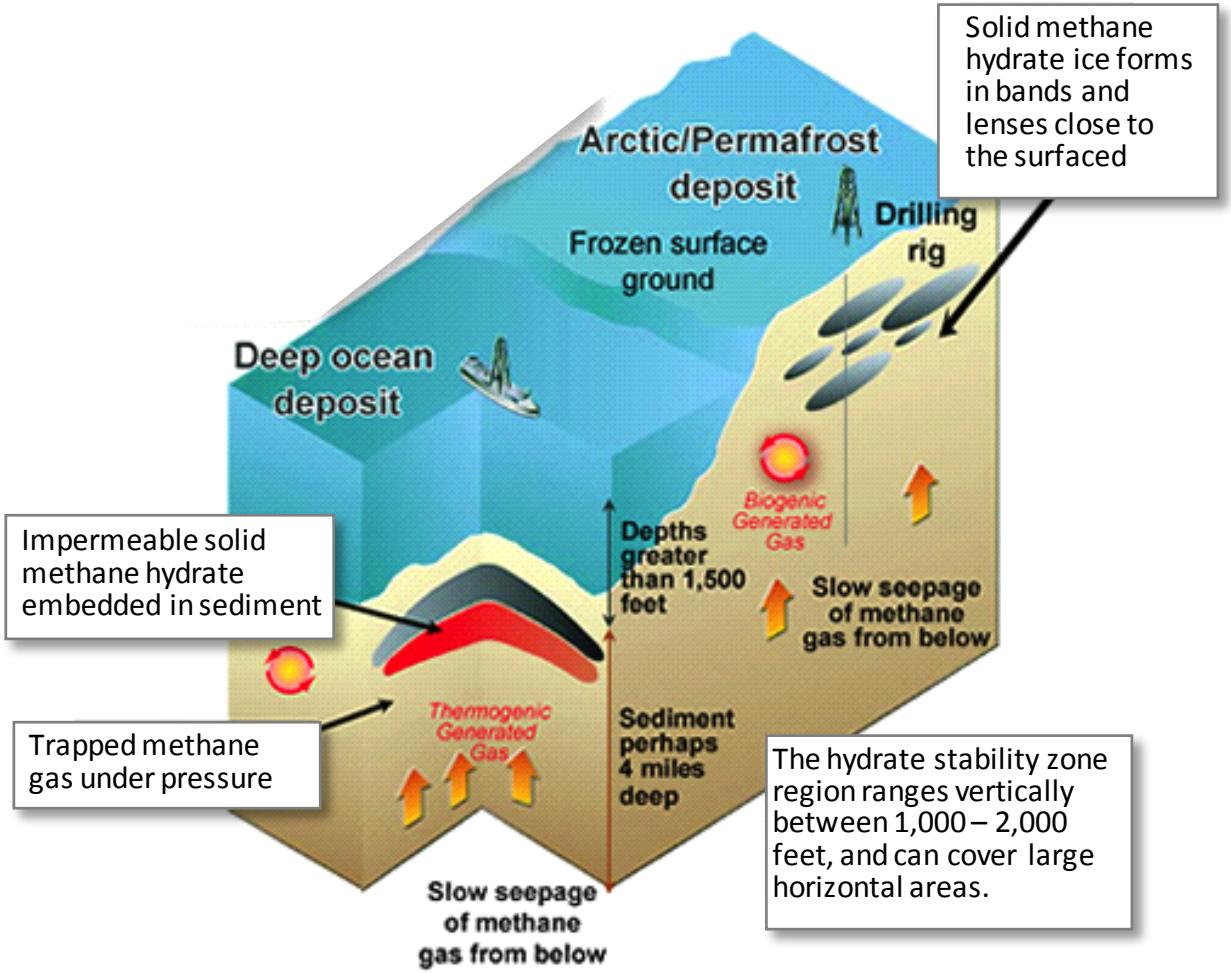
- Geospatial engineering and modeling
- Underground containment in engineered natural systems
- High performance computing
- Fluid flow in porous media
- Image processing
- Mechanical/structural stress analysis
- Complex fluid flow simulations
- Systems analysis and human factors engineering

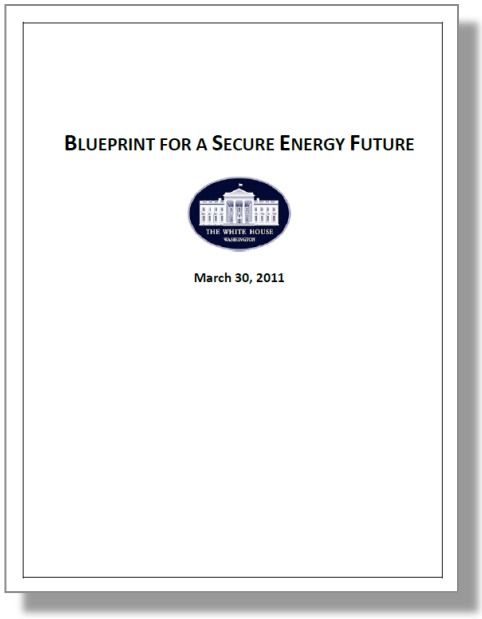
Recognized by

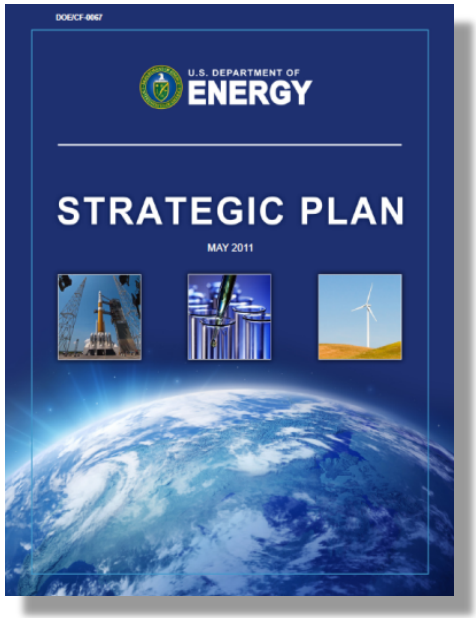
- National Research Council of the National Academies
- President's Council of Advisors on Science and Technology

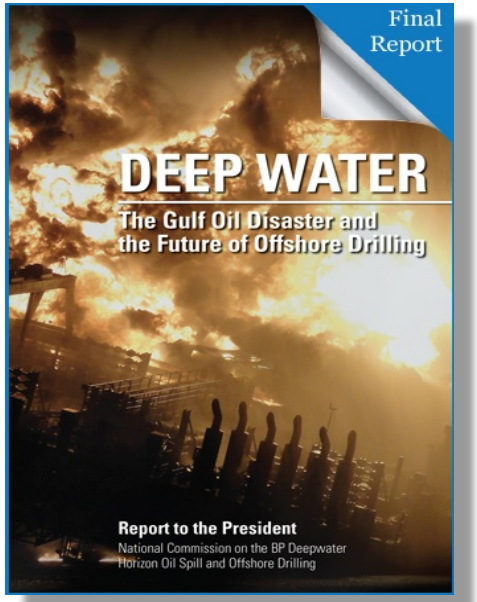
Methane Hydrate

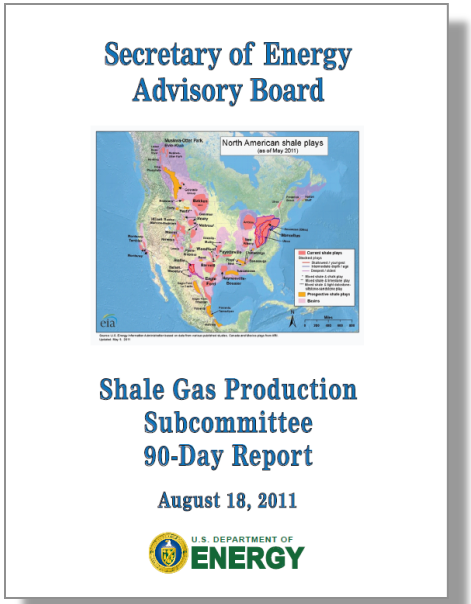
- Naturally-occurring combination of methane gas and water that form under specific conditions of low temperature and high pressure.
- Originally of interest solely as a drilling hazard to be avoided
- Potentially large source of natural gas for the world economy

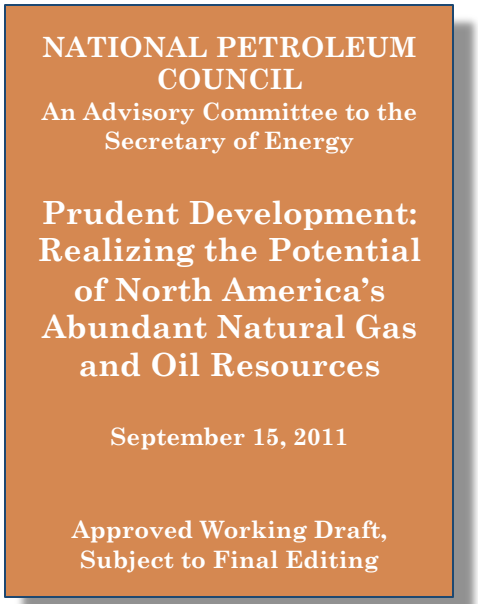


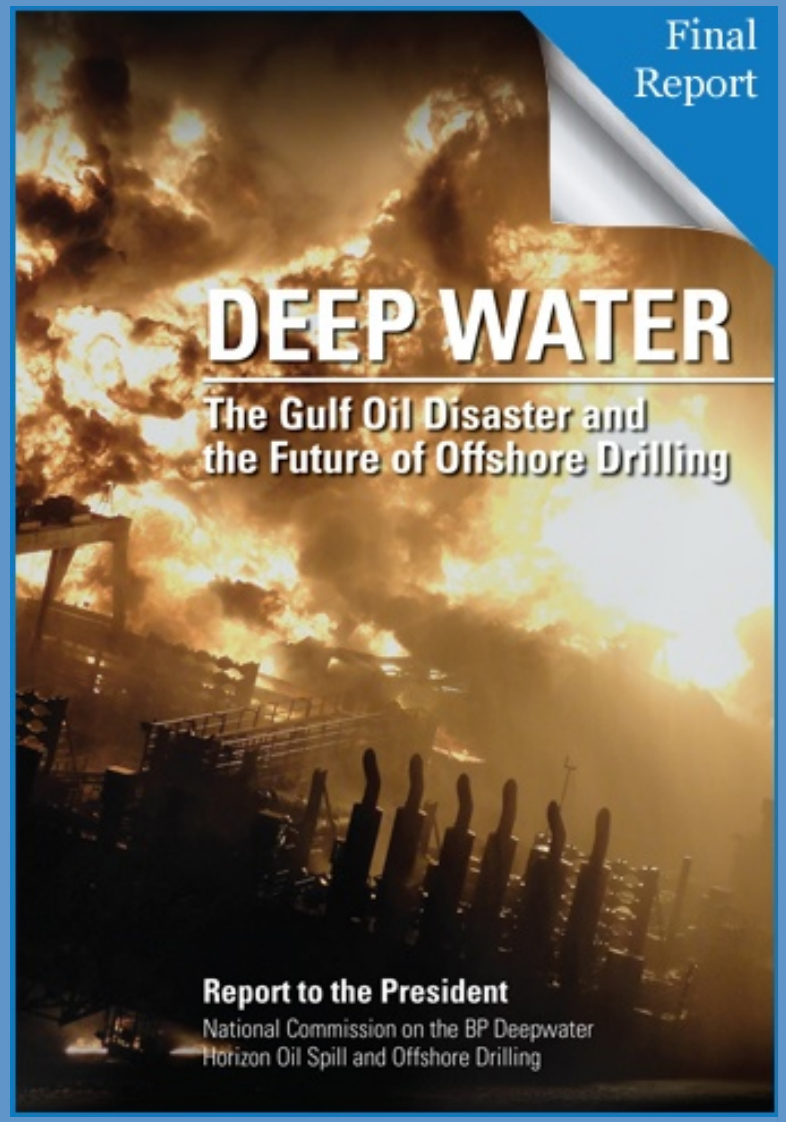

BLUEPRINT FOR A SECURE ENERGY FUTURE
THE WHITE HOUSE
March 30, 2011


DOE/CF-0057
U.S. DEPARTMENT OF ENERGY
STRATEGIC PLAN
MAY 2011


Final Report
DEEP WATER
The Gulf Oil Disaster and the Future of Offshore Drilling
Report to the President
National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling


Secretary of Energy Advisory Board
North American shale plays
Shale Gas Production Subcommittee 90-Day Report
August 18, 2011
U.S. DEPARTMENT OF ENERGY


NATIONAL PETROLEUM COUNCIL
An Advisory Committee to the Secretary of Energy
Prudent Development: Realizing the Potential of North America's Abundant Natural Gas and Oil Resources
September 15, 2011
Approved Working Draft, Subject to Final Editing



The Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Resources Program, an existing research and development program created by statute and managed by the Secretary of Energy, should be refocused toward mitigating the risks of offshore operations

National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling, January 2011

Section 999 of EPAct 2005

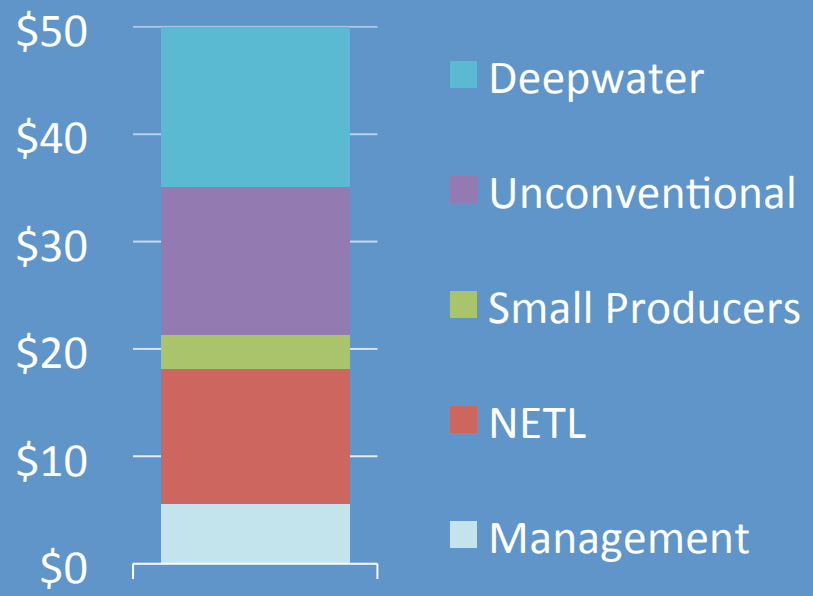
- Section 999 of the Energy Policy Act of 2005 created an oil and gas R&D program funded by royalties paid by companies producing on public lands.
- $50 million per year
- Administered by NETL and RPSEA

National Energy Technology Laboratory

Research Partnership to Secure Energy for America

Programs:

- Deepwater
- Unconventional
- Small Producers
- Complementary (NETL)
- Program Administration



U.S. Department of
ENERGY

2011 Annual Plan

Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Resources Research and Development Program

Provided in Response to Energy Policy Act of 2005
Title IX, Subtitle J, Section 999B(e)

September 2010

United States Department of Energy
Washington, DC 20585

Winning the Future: American Energy

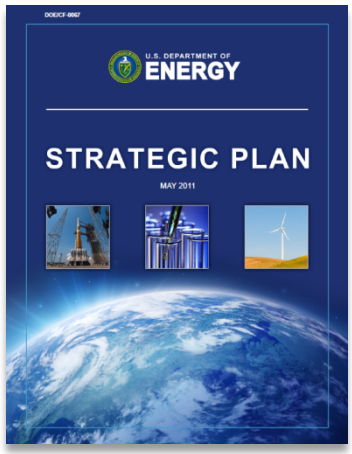
There have been instances where natural gas has been appearing in water supplies where it should have never appeared …. And so the question is, what is the cause of that? Can they be mitigated and prevented?

SECRETARY STEVEN CHU, APRIL 25 2011

The oil and gas industry will continue to meet our economy's immediate needs by pushing into increasingly difficult frontiers, including deepwater operations offshore and unconventional gas onshore.

The Department will ensure that the federal government's understanding of the risks associated with these operations keeps pace. This will be accomplished through scientific assessment of the risks, potential impacts, and adequacy of current response and mitigation technologies.

DEPARTMENT OF ENERGY STRATEGIC PLAN, MAY 2011



Challenges

OFFSHORE (DEEPWATER)

Technically complex

As producers push to find and produce oil and gas in ultra-deep environments they must deal with tremendous technical challenges. This provides a high barrier to entry.

Unified regulatory environment

The Federal government has clear regulatory responsibility over exploration and production activities offshore.

ONSHORE (SHALE)

Accessible technology

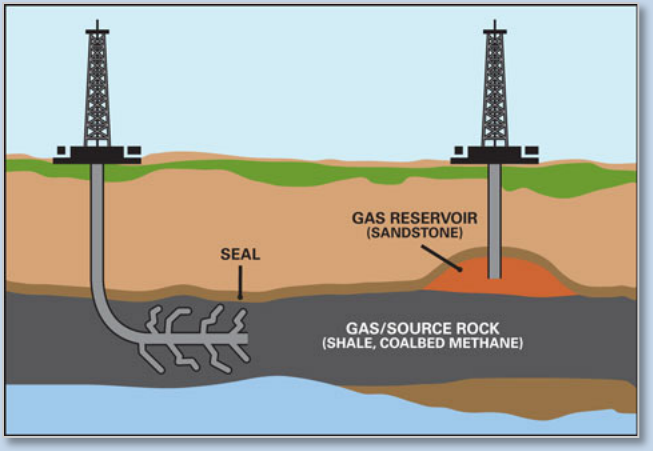
The technical hurdles to producing shale gas have been tackled by domestic independent producers. Compared to deepwater and ultra deepwater operations the barriers to entry are low.

Fragmented regulatory environment

Shale gas and hydraulic fracturing are governed by a complex set of federal, state, and local laws. Exploration and production operations, consequently, are carried out by individual operators according to their own individualized engineering approaches within each unique play, under the regulations that apply in each state where these plays are being developed.

Shale gas: Expanding natural gas supplies

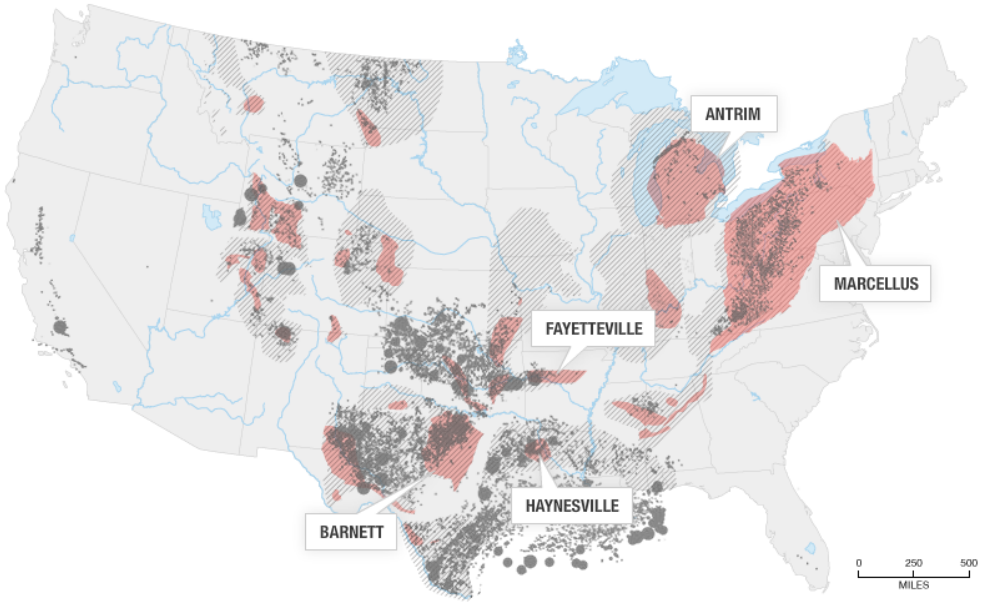
WHAT?



The natural gas stored in shales is no different than that found in conventional reservoirs, but the physical mechanisms trapping the gas in these rocks and the technologies needed to extract it are different, requiring long horizontal laterals and hydraulic fracturing.

The extraction process is more complicated, but exploration risk is much lower.

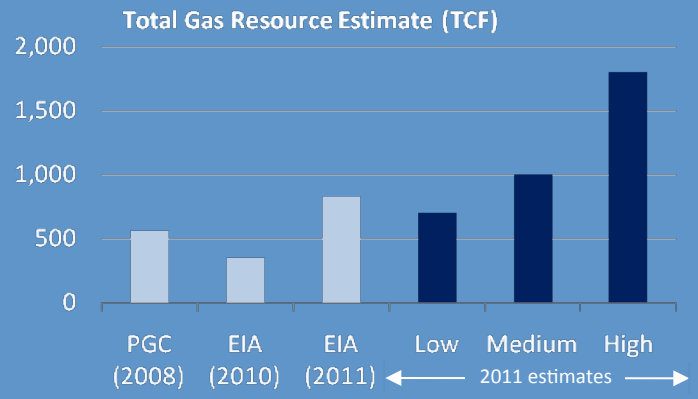
WHERE?

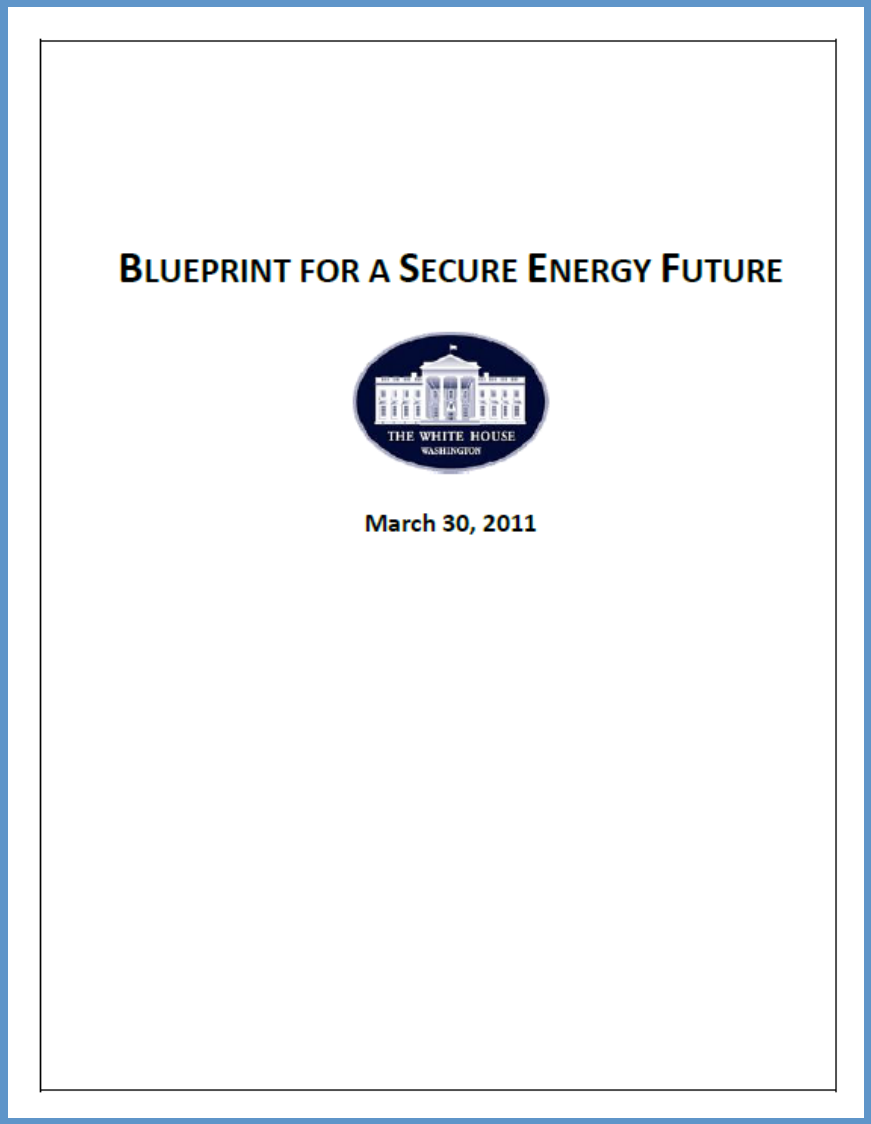


Shale gas can be found in a vary wide range of areas throughout the United State, including regions that don't have extensive recent history with exploration and production activities.

HOW MUCH?

Estimates of commercial shale gas resources have increased substantially in recent years, largely due to improvements in production technology.





"…I've asked Secretary Chu, my Energy Secretary, to work with other agencies, the natural gas industry, states, and environmental experts to improve the safety of this [shale gas extraction] process."

PRESIDENT OBAMA, MARCH 30, 2011

The Federal government will conduct research to examine the impacts of fracking on water resources. At Congress' direction, EPA will continue with its study of fracturing impacts on drinking water and surface water, and DOE will likewise sponsor research on these issues.

DOE and EPA are establishing a mechanism to provide technical assistance to states to assess the adequacy of existing state regulations.

WHITE HOUSE BLUEPRINT FOR A SECURE ENERGY FUTURE, March 30 2011

Secretary of Energy Advisory Board

Shale Gas Production Subcommittee 90-Day Report

August 18, 2011

U.S. DEPARTMENT OF ENERGY

The DOE, EPA, the USGS, and DOI Bureau of Land Management all have mission responsibility that justify a continuing, tailored, federal R&D effort.

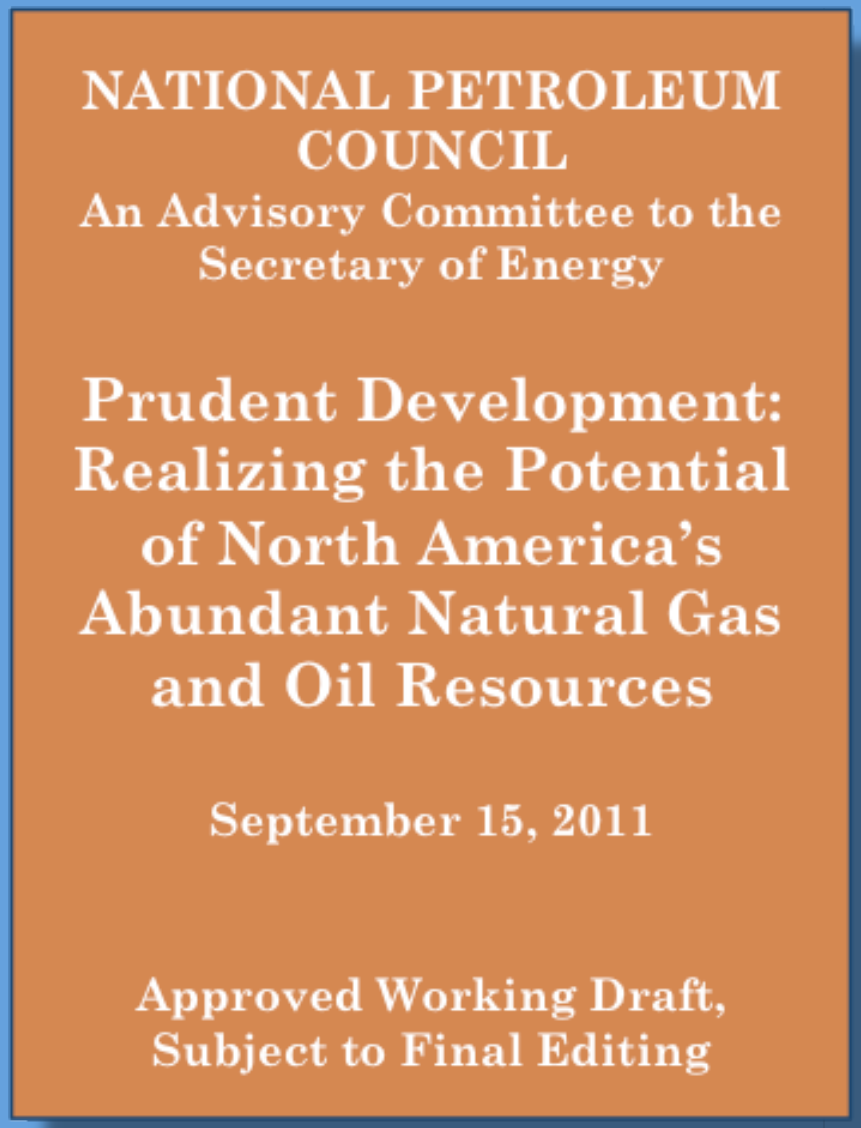
RPSEA is the Research Partnership to Secure Energy for America, a public/ private research partnership authorized by the 2005 Energy Policy Act at a level of $50 million from offshore royalties….The Subcommittee strongly supports the RPSEA program at its authorized level

SECRETARY OF ENERGY ADVISORY BOARD, AUGUST 18 2011

SEAB 90-Day Shale Gas Report

Initial recommendations; further SEAB guidance in November 2011. States, individually and through states organizations such as the IOGCC, have a key role in successful implementation.

- Improve public information – *Shale Gas Data Portal*
- Enable continuous improvement, sharing of best practices among regulators – *STRONGER, Risk Based Data Management*
- Reduce emissions of air pollutants, ozone precursors and methane
- Implement life-cycle, systems approaches to water management – *Flow/ composition measurement; well stimulation/completion best practices*
- Disclose fracturing fluid composition
- Reduce diesel use in shale gas production/delivery – *Natural gas or electric*
- Manage short-term/cumulative community and ecosystem impacts
- Organize within industry for continuous improvement, sharing of best practices
- Implement a continuing, tailored Federal R&D effort – *DOE, EPA, USGS, BLM*



Broader in scope than the SEAB, yet both reports underscore:

- Realizing the ***economic, energy security and environmental benefits*** of domestic resource development will require:
  - ❑ Innovation
  - ❑ Investment
  - ❑ Public confidence operations are safe and environmentally responsible

- Other prerequisites include:
  - ❑ Industry's commitment to excellent environmental performance and continuous improvement
  - ❑ Transparency and community engagement
  - ❑ Effective regulation
  - ❑ Enhanced performance indicators and analytic tools.

Natural Gas Issues

VENTING AND FLARING

energy security

Abandoned orphan wells

NORM

variable renewables

Transportation Infrastructure

Propagation of Fractures

Fugitive Emissions

Smart Energy Grid

Disclosure of Fracking Fluids

JOBS

Green Fracking Fluids

Methane hydrate

Induced Seismicity

Protection of Groundwater

GHG Emissions

Cementing and Casing Standards