

DOE's Oil and Natural Gas R&D Program

Mastering the Subsurface Through Technology Innovation & Collaboration:
Carbon Storage and Oil and Gas Technologies Review Meeting

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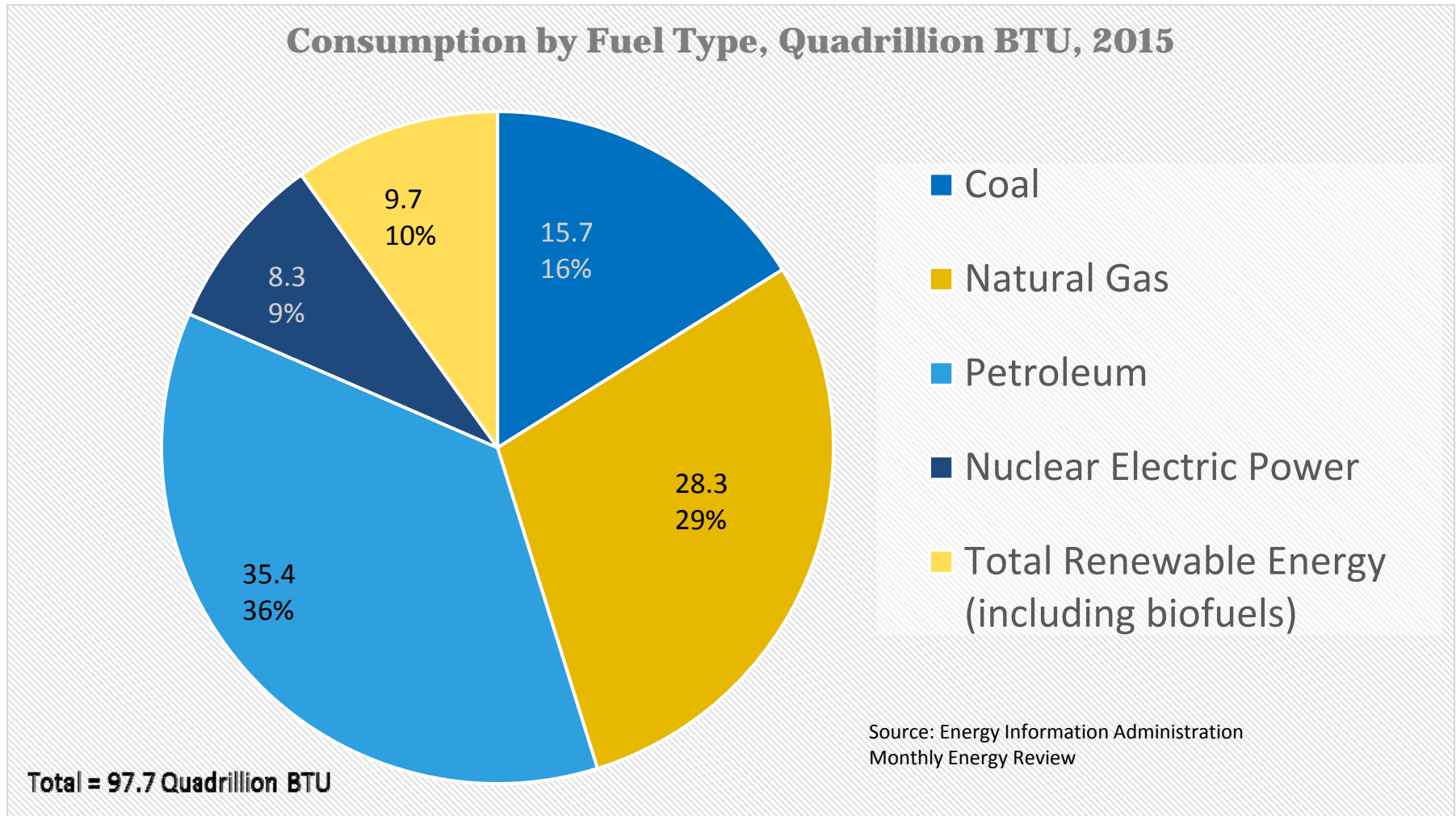
Economic prosperity requires low cost fuels.

Energy security requires stable, abundant domestic resources.

Low carbon economy requires reduction of greenhouse gas emissions.

*--2015 Quadrennial Technology Review
U.S. Department of Energy*

U.S. DOMESTIC CONSUMPTION BY FUEL TYPE - 2015



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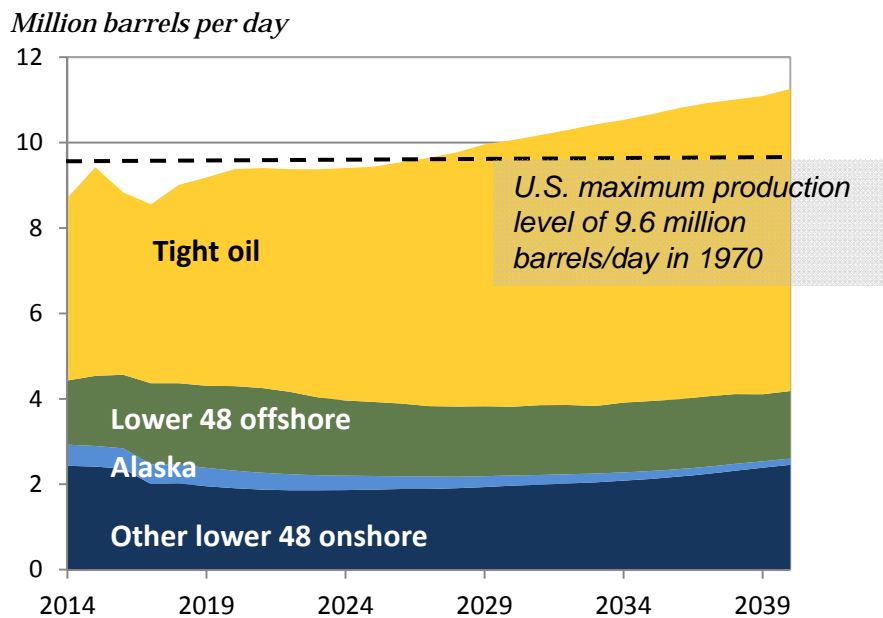
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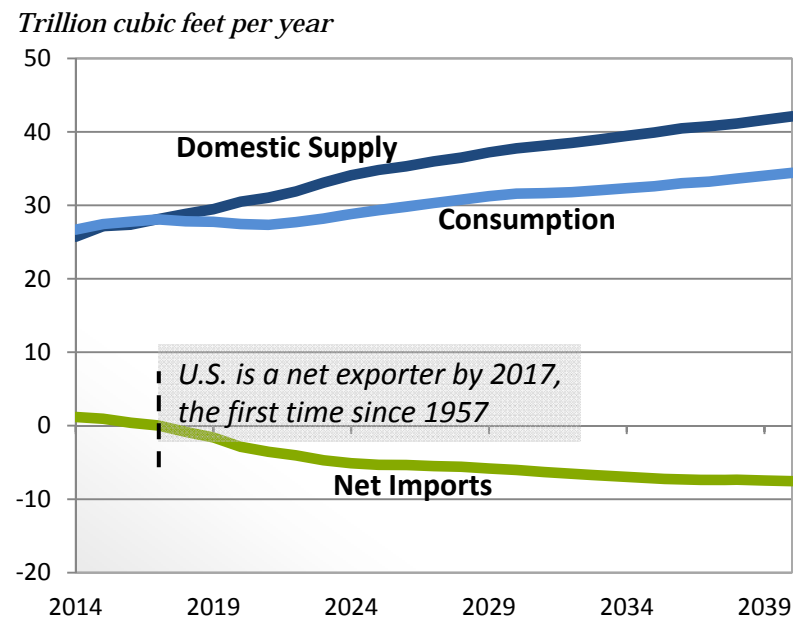
U.S. OIL & NATURAL GAS OUTLOOK TO 2040

U.S. Crude Oil Production



- The United States has been the world's top producer of petroleum hydrocarbons since 2013.
- Before 2030, U.S. oil production is expected to exceed the previous historical high of 9.6 million barrels/day in 1970.

U.S. Natural Gas Production, Consumption, and Imports



- The first U.S. exports of LNG produced in the lower 48 states occurred in February 2016.
- By 2017, the U.S. will become a net exporter of natural gas, presenting significant implications for global markets.

- ✓ Economic prosperity requires low cost fuels.
 - ✓ Energy security requires stable, abundant domestic resources.
- Low carbon economy requires reduction of greenhouse gas emissions.

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FEDERAL POLICY AND R&D PROMOTES INNOVATION IN OIL AND GAS



1970s

- R&D to improve shale and other unconventional gas extraction



1980s-1990s

- Section 29 tax incentives
- Industry partnership to make drilling in the Barnett Shale economic



2010-Present

- Research continues to promote prudent exploration, development, and environmental protection

MAJOR ADMINISTRATION ENERGY AND CLIMATE GOALS

Reduce GHG emissions by 17% by 2020, 26-28% by 2025 and 83% by 2050 from a 2005 baseline

- Climate Action Plan

Reduce net oil imports by half by 2020 from a 2008 baseline

-Blueprint for a Secure Energy Future

Double energy productivity by 2030

-Department of Energy

By 2035, generate 80% of electricity from a diverse set of clean energy resources





-Blueprint for a Secure Energy Future

Reduce CO₂ emissions by 3 billion metric tons cumulatively by 2030 through efficiency standards set between 2009 and 2016

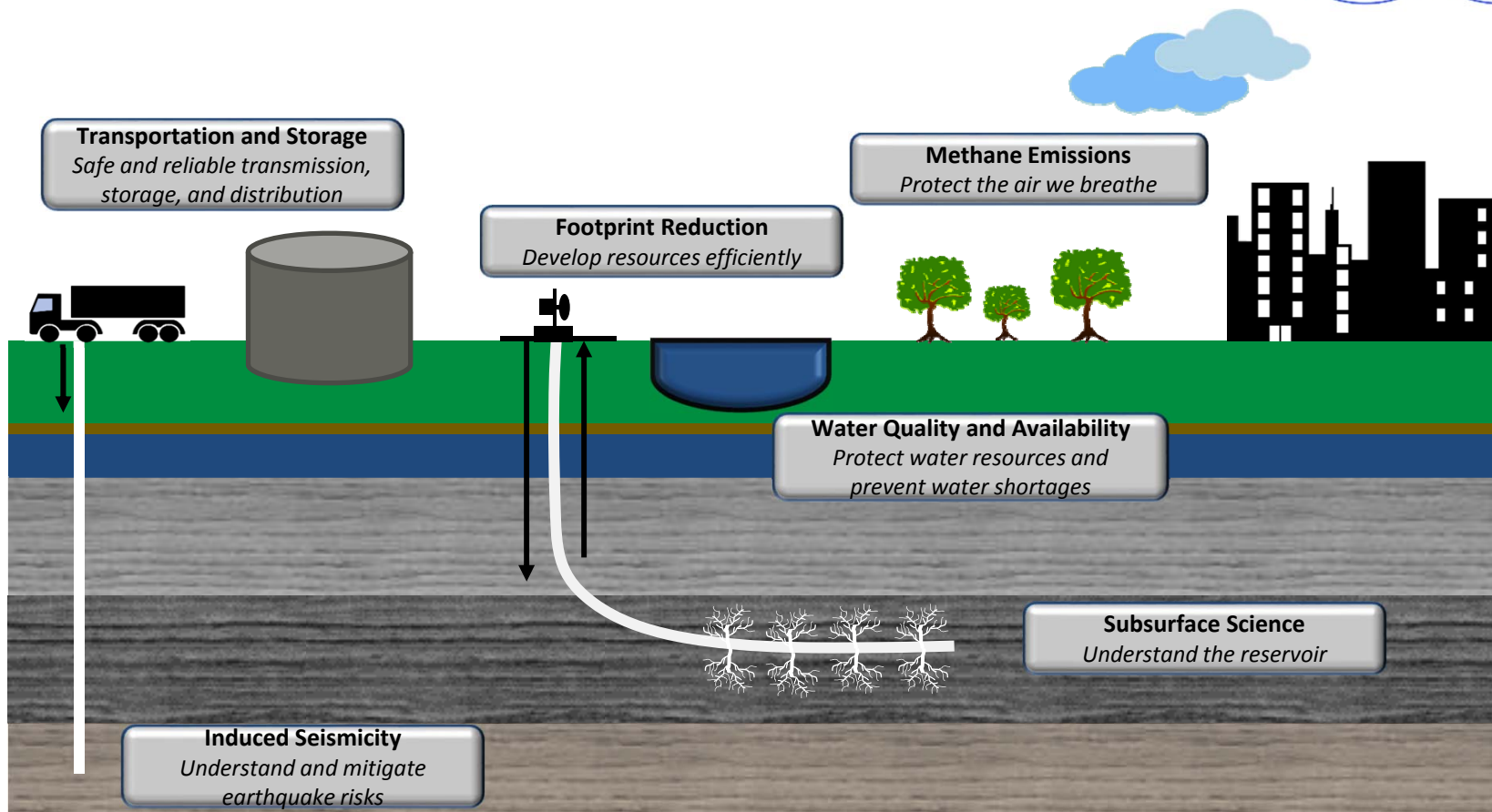
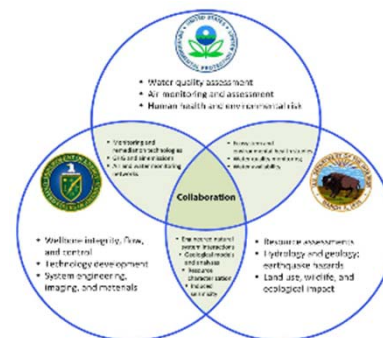
-Climate Action Plan Progress Report

PRUDENT DEVELOPMENT OF OIL AND NATURAL GAS: R&D FOCUS AREAS

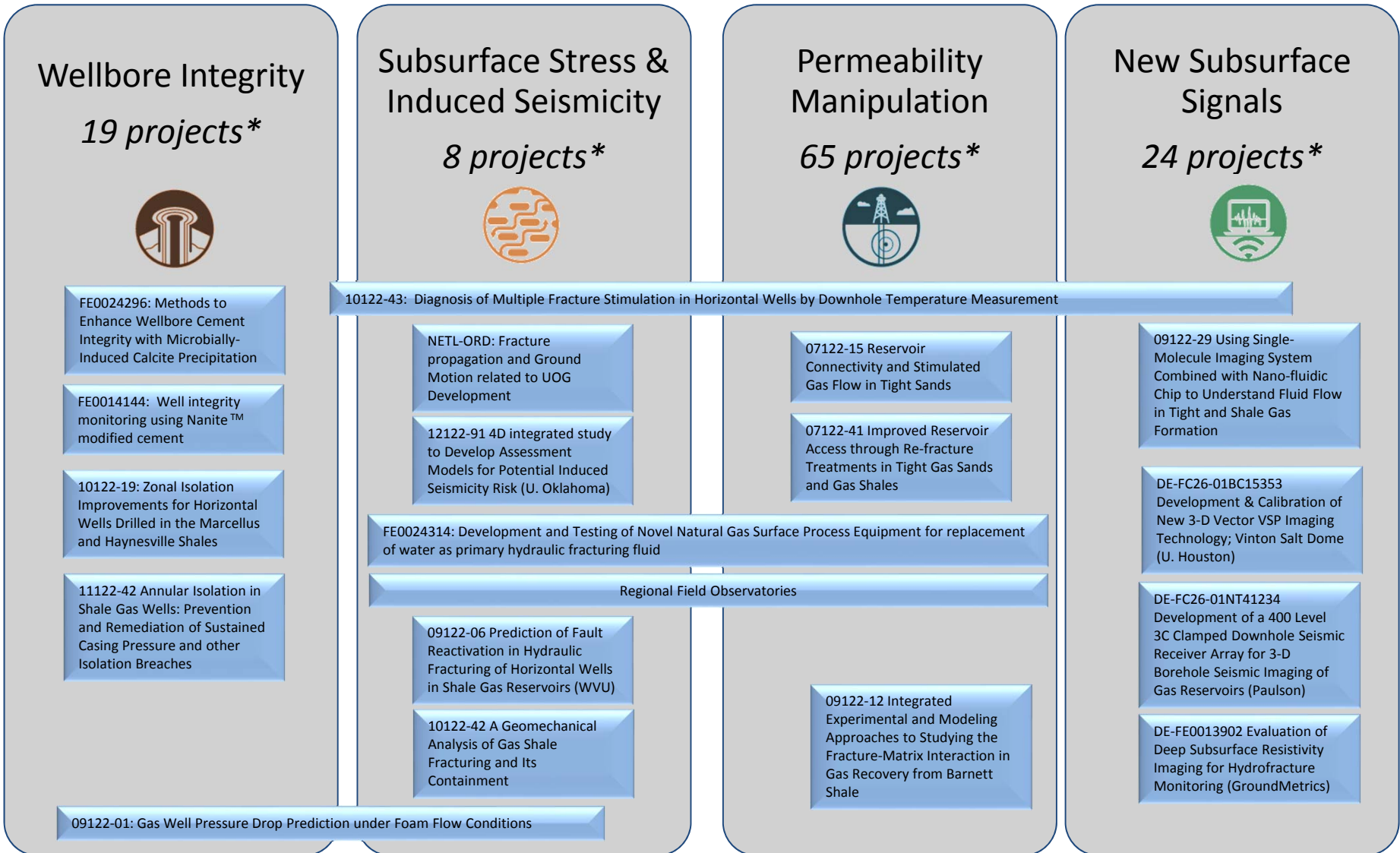
Relying on exiting fuels through the transition to a low carbon economy

Area	Description
 Unconventional Oil & Gas	Unconventional oil and gas refers to resources that cannot be produced economically through standard drilling and completion practices – such as shale gas, shale oil, tight gas and tight oil.
 Offshore	Given the importance of deepwater and ultra-deepwater production worldwide, it is imperative that U.S. producers and technology developers maintain a focus on technologies that help minimize environmental impacts as companies move into deeper and more extreme environments around the globe.
 Methane Hydrates	The most plentiful supplies of natural gas throughout the world may be the methane molecules trapped in ice-like structures called hydrates. Our research is focused on unlocking the mysteries of hydrates.
 Midstream Infrastructure	The U.S. has a robust natural gas delivery infrastructure, consisting of over 2.4 million miles of pipelines. We will develop technologies and leading practices to mitigate methane emissions from natural gas transmission, distribution, and storage facilities.

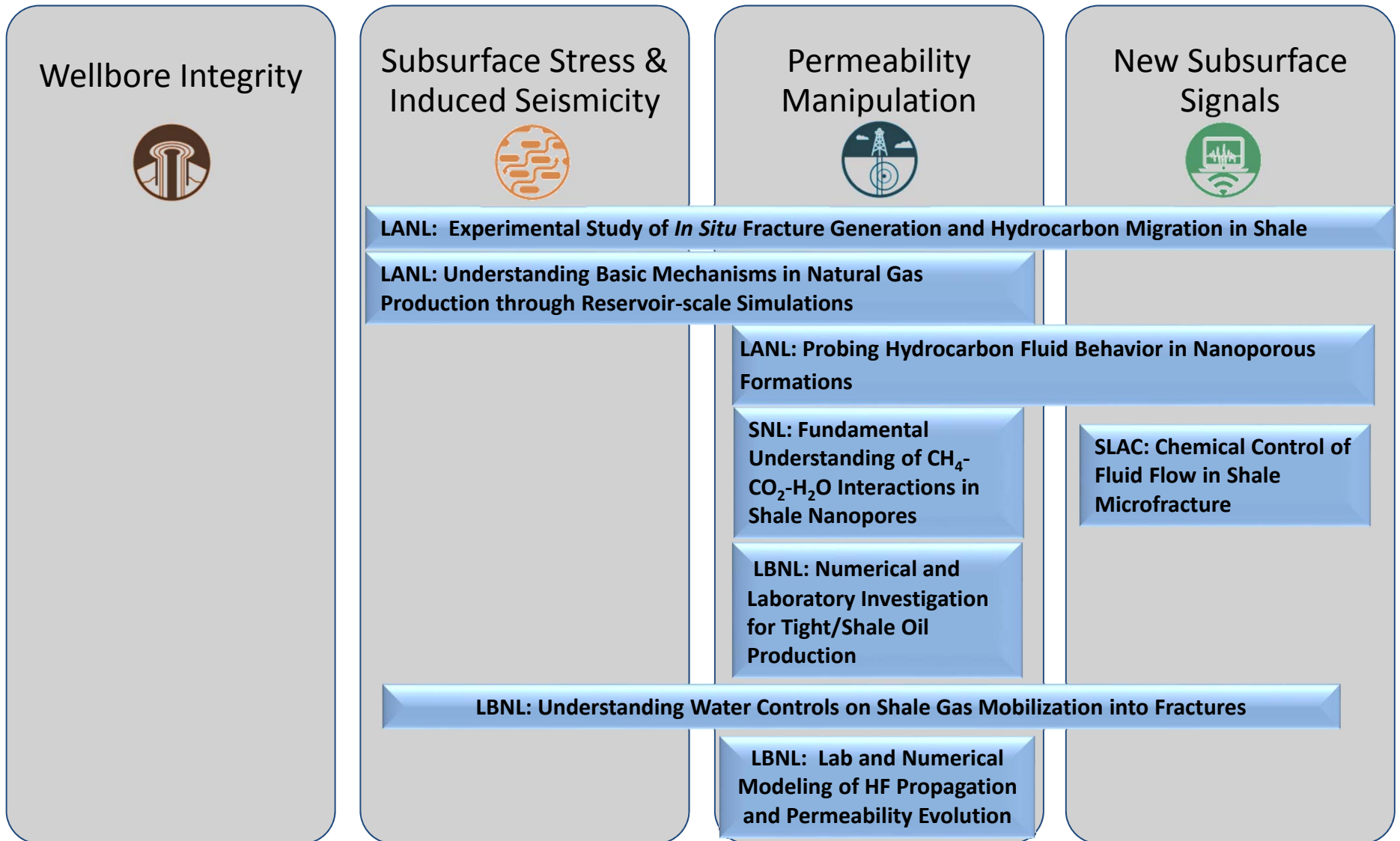
DOE'S ONSHORE OIL & GAS RESEARCH PROGRAM



UNCONVENTIONAL OIL & GAS PROJECTS RELATED TO SUBTER

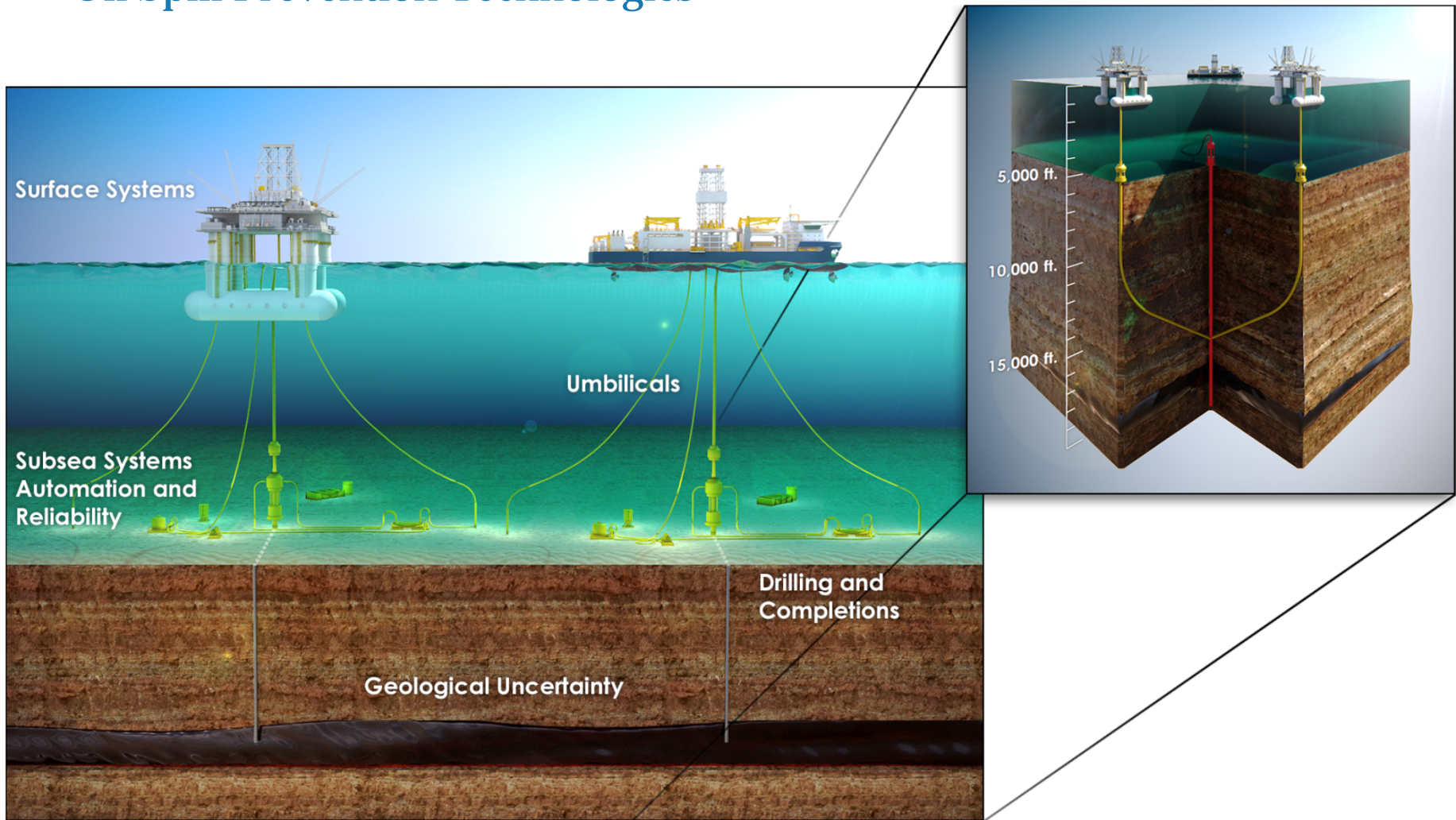


FUNDAMENTAL SHALE PROJECTS RELATED TO SUBTER



DOE'S OFFSHORE RESEARCH PROGRAM

Oil Spill Prevention Technologies



OFFSHORE RESEARCH AREAS

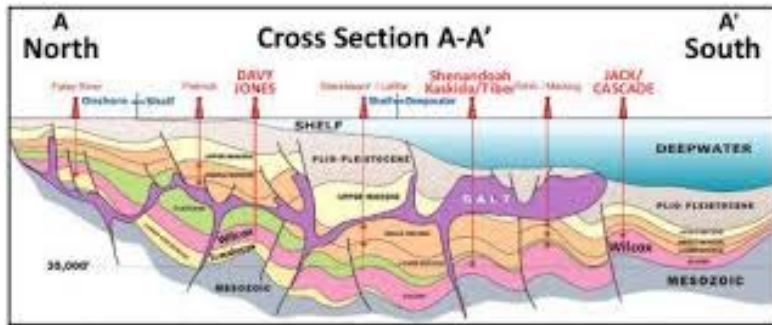
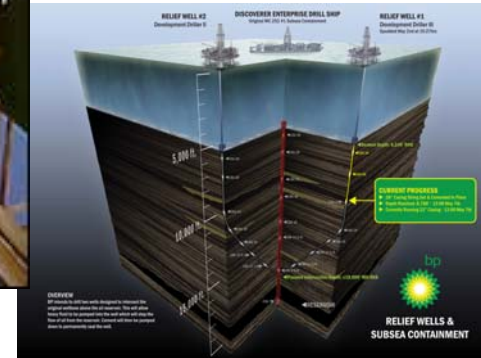


Figure 2. Idealized structural cross section showing prospects and discoveries in Tertiary and Upper Cretaceous reservoirs. Modified from McMoran Exploration Company 3rd Quarter 2009 Conference Call (October 19, 2009).

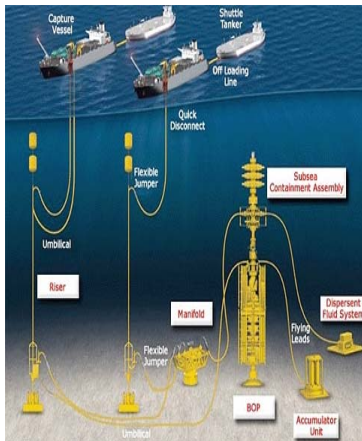
Geologic Uncertainty

Research Questions: How can research improve the quality of the geologic data, decrease the environmental impact of acquiring data, and use data to more accurately model the subsurface so as to quantify resources and avoid geologic hazards?



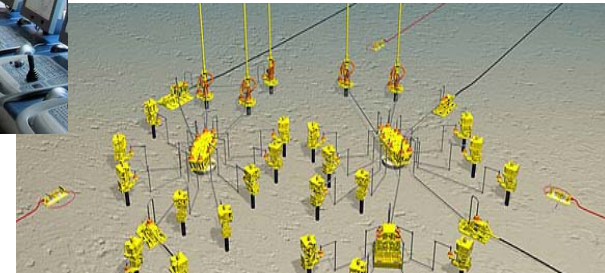
Drilling and Completions

Research Questions: How can current construction materials, technologies, and best practices be improved, and verified by modeling, to quantify and reduce risk and improve safety-while-drilling, as well as increase the long-term reliability of wells? How can intelligent materials and sensors allow for better real-time data collection downhole and initial preventative action?



Surface Systems and Umbilicals

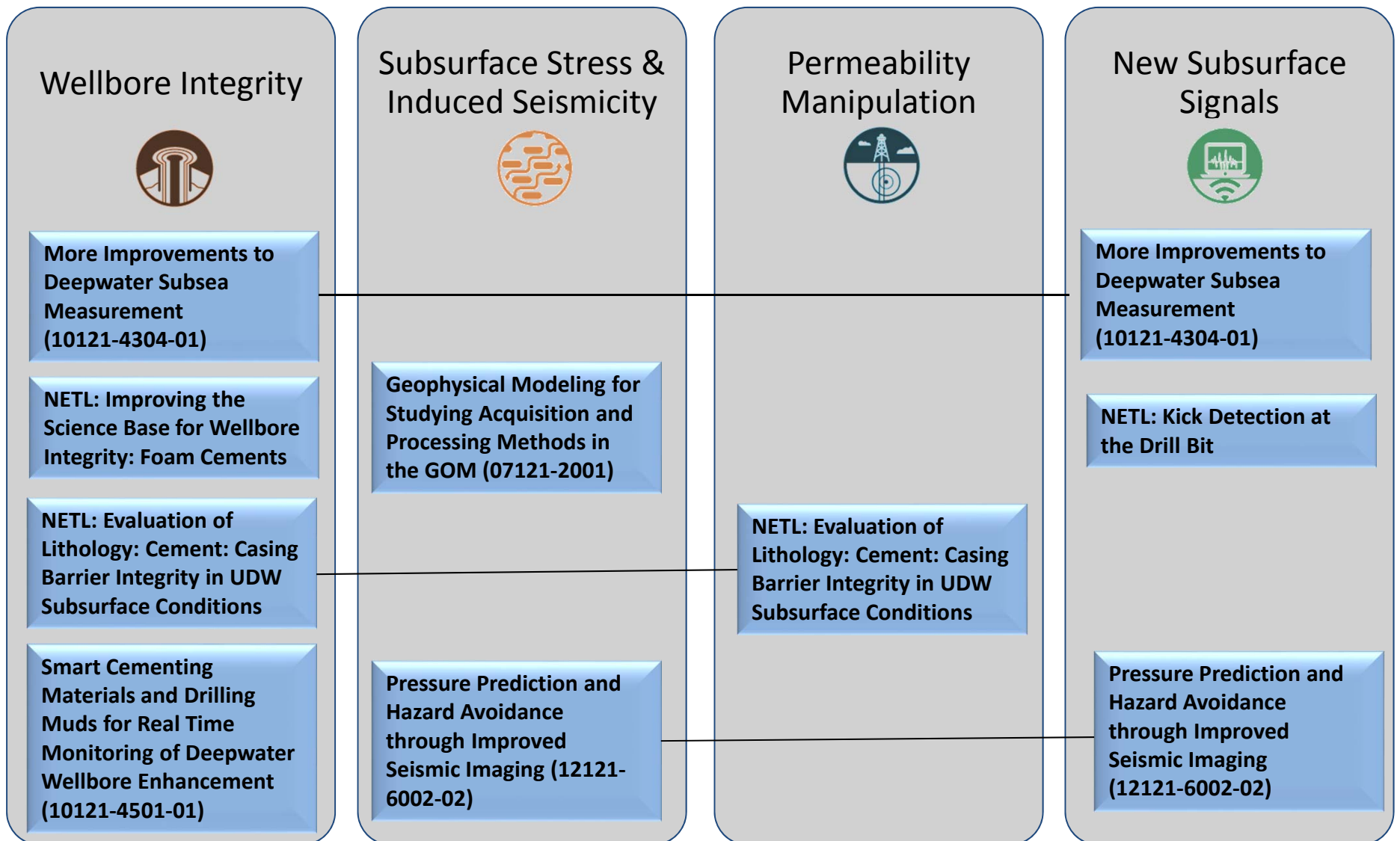
Research Questions: How can the design of offshore facilities and systems be optimized using modeling to minimize impacts of worst-case incidents related to hurricane forces, wave motion, and fires or explosions?



Subsea Systems Automation and Reliability

Research Questions: What technologies will improve the capability to inspect and monitor the integrity of subsea equipment be improved in the areas of resolution, speed, and reliability so as to improve rapid detection of damage, corrosion, and other concerns?

EXAMPLE DOE OFFSHORE PROJECTS RELATED TO SUBTER

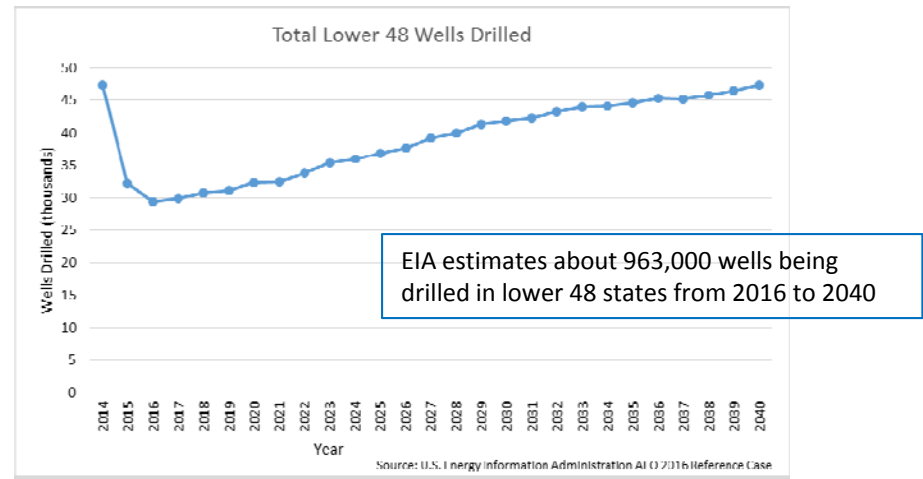
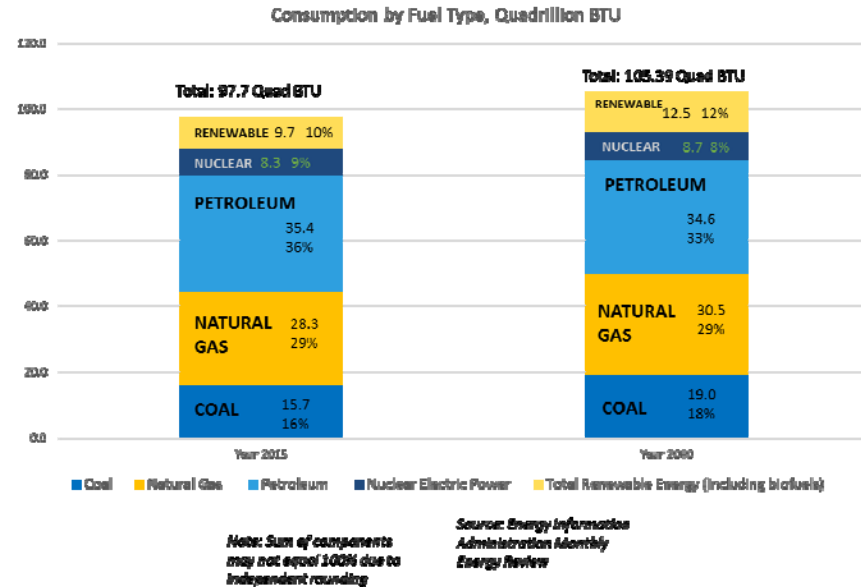


THE TRANSITION TO A LOW CARBON ECONOMY REQUIRES STABLE ABUNDANT DOMESTIC SUPPLIES OF OIL AND NATURAL GAS

Oil and gas play an essential role in our nation's economic prosperity, energy security, and national security.

There are environmental challenges to the development of stable, abundant domestic supplies of oil & gas.

DOE's investment in innovative technology R&D *in concert with our partners* focuses on the sustainable and prudent development of these important oil & gas resources.





energy.gov/fe/science-innovation/oil-gas-research