National Petroleum Council

Facing The Hard Truths About Energy

A Comprehensive View To 2030 Of Global Oil And Natural Gas

APGAS Forum 2007

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Today's Outline

- Global Oil and Gas Study Overview
- The Hard Truths about Energy
- Core U.S. Strategies

The Secretary of Energy's Questions

- What does the future hold for global oil and natural gas supply?
- Can incremental oil and gas supplies be brought on-line, on time, and at a reasonable price to meet future demand without jeopardizing economic growth?
- What oil and gas supply and / or demand-side strategies does the Council recommend the U.S. pursue to ensure greater economic stability and prosperity?

How This Study Is Different

Integrated, In-Depth Analysis

- Over 100 studies incorporated to include both public and aggregated proprietary outlooks
- Not another forecast of supply, demand or price

Diversity of Expertise

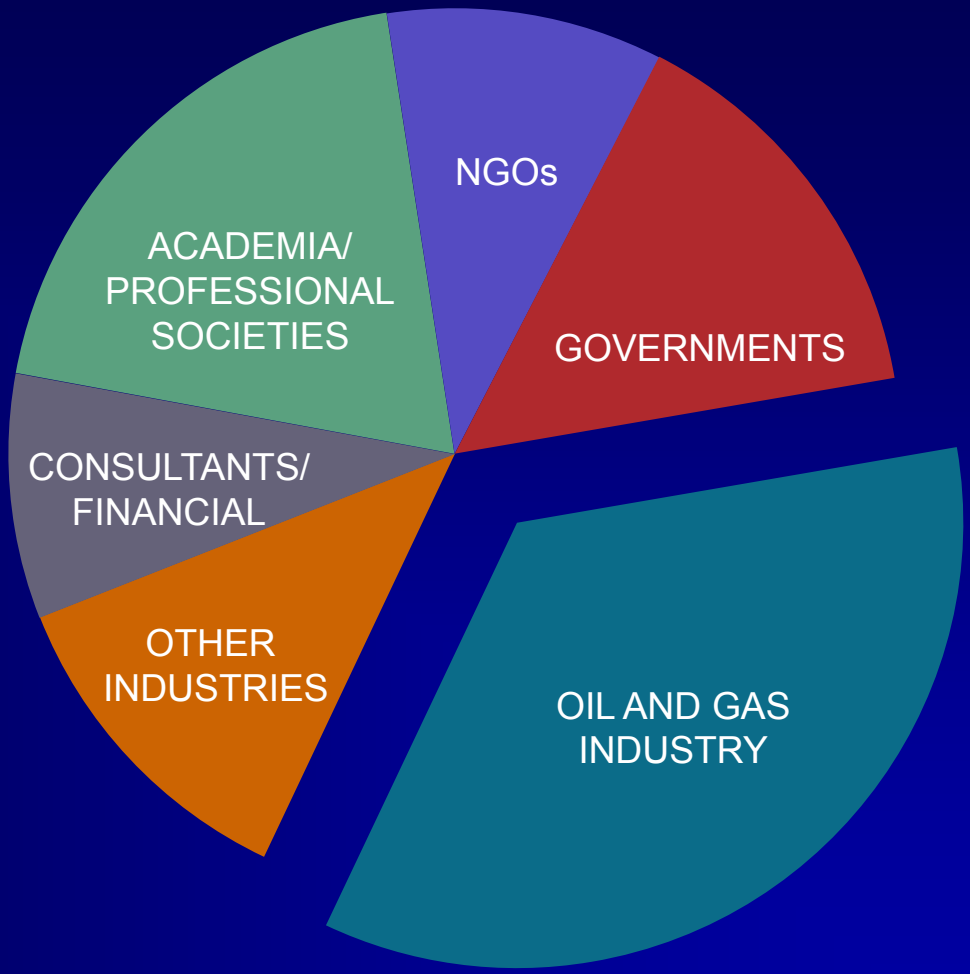
- 350 participants with backgrounds in all aspects of energy including efficiency, economics, geopolitics, environment

Technology Assessment

- Identified achievable opportunities and likely deployment timing
- Looked across the energy spectrum, including both supply and demand

Participants

65% of participants from outside the oil and gas industry



350 + participants, plus input from 1000 + others

Dimensions of the Study

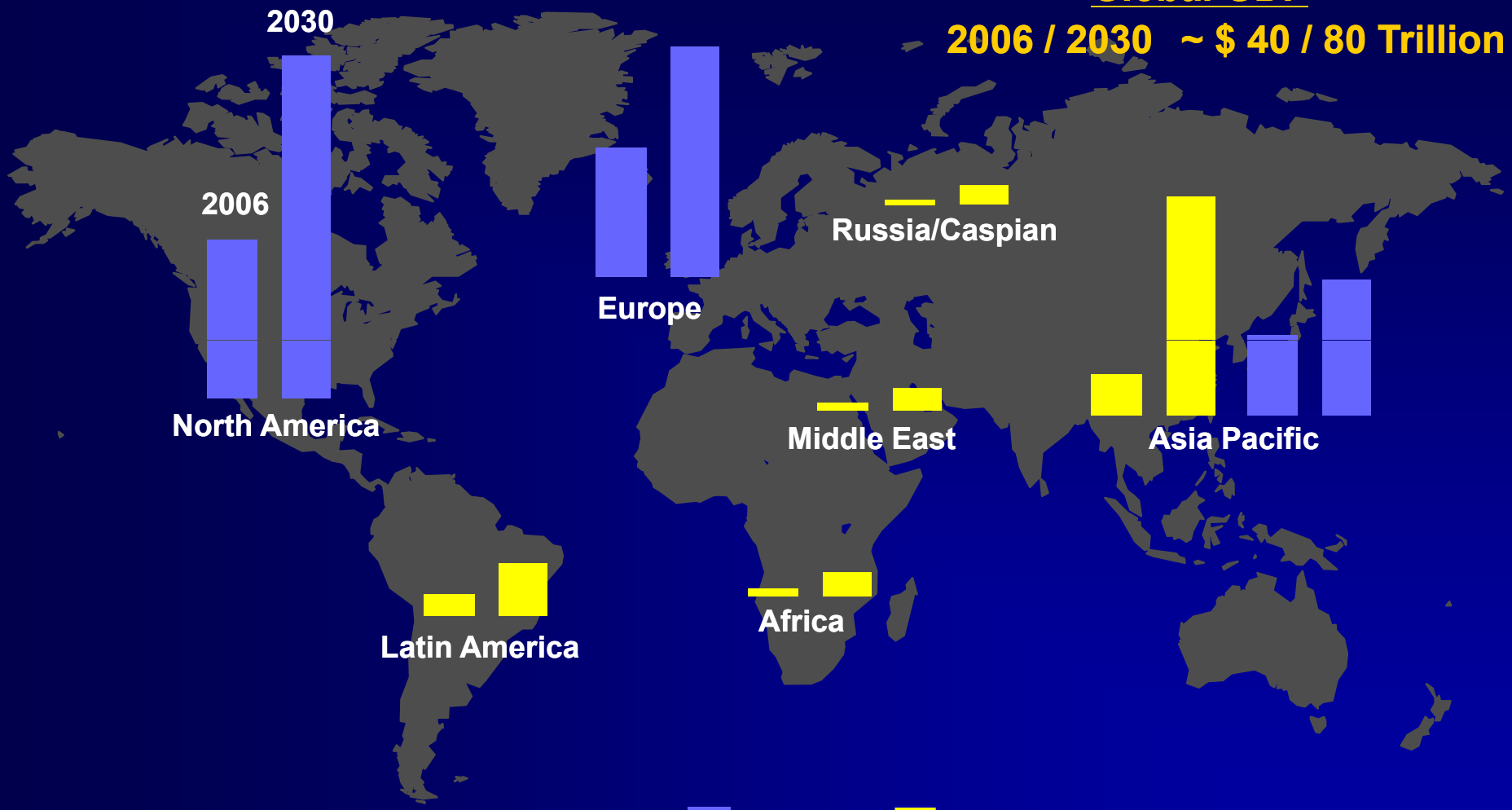
What We Learned: The Hard Truths

The Hard Truth: Demand

Most forecasts project global energy demand growth to increase by 50-60%, mainly as a result of population growth and improved living standards.

Coal, oil, and natural gas will remain indispensable to meeting total projected energy demand.

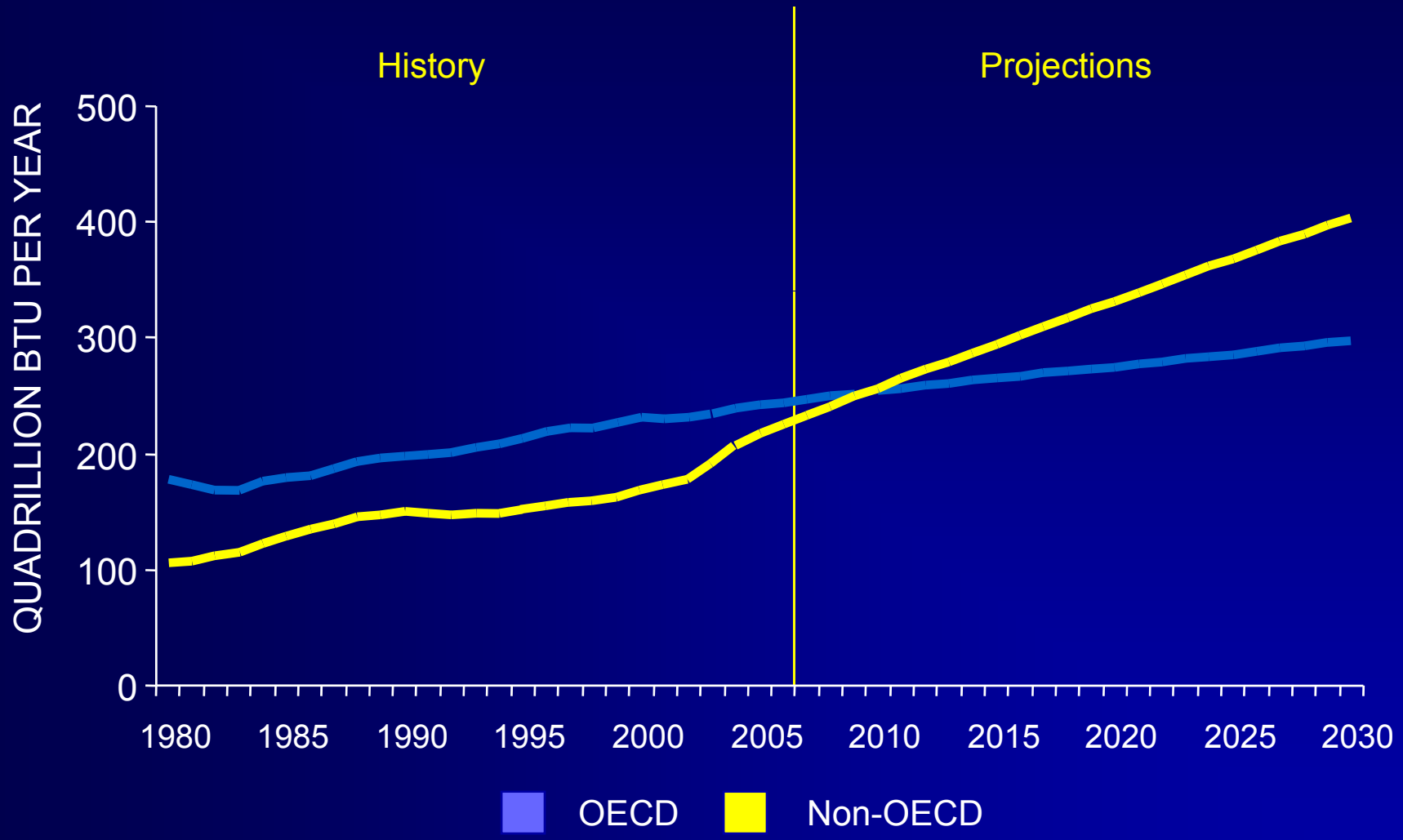
Projected Global Economic Growth



ILLUSTRATIVE PROJECTION

Source EIA, IEA & Other Outlooks

… Energy Demand Growth Follows

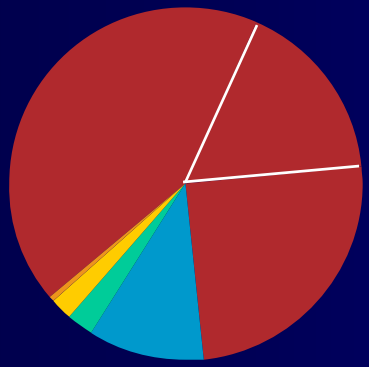


Source: EIA 2007

Coal, Oil, and Natural Gas Remain Indispensable

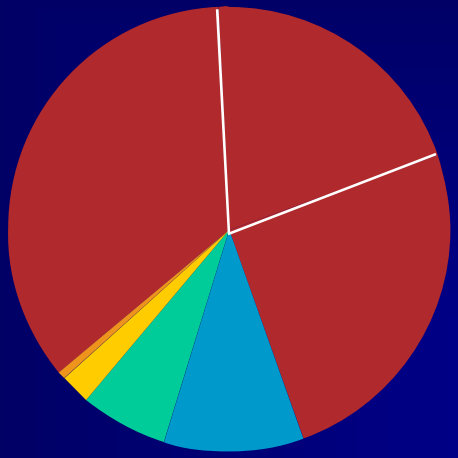
1980

288 QUADRILLION BTU



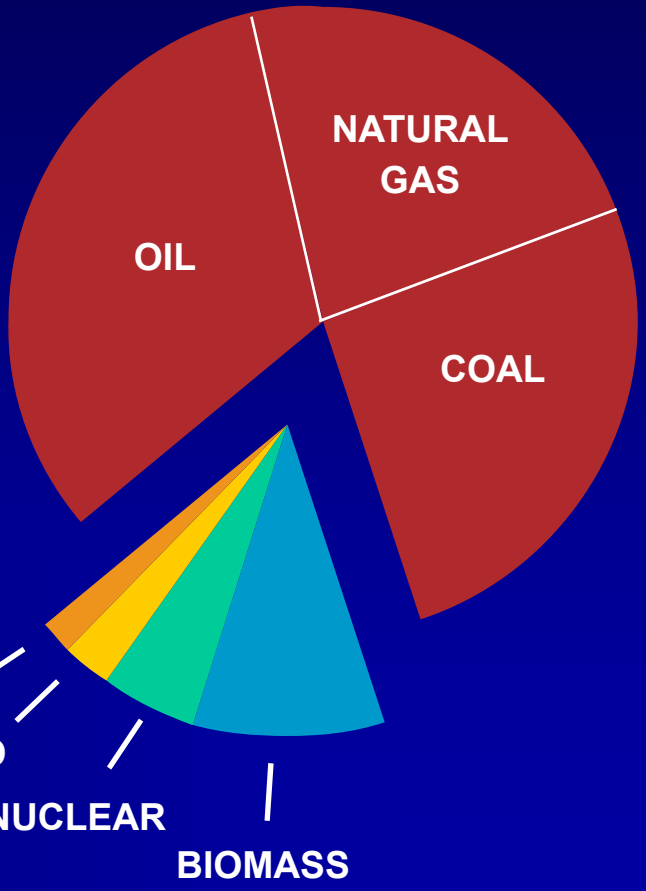
2004

445 QUADRILLION BTU



2030

678 QUADRILLION BTU

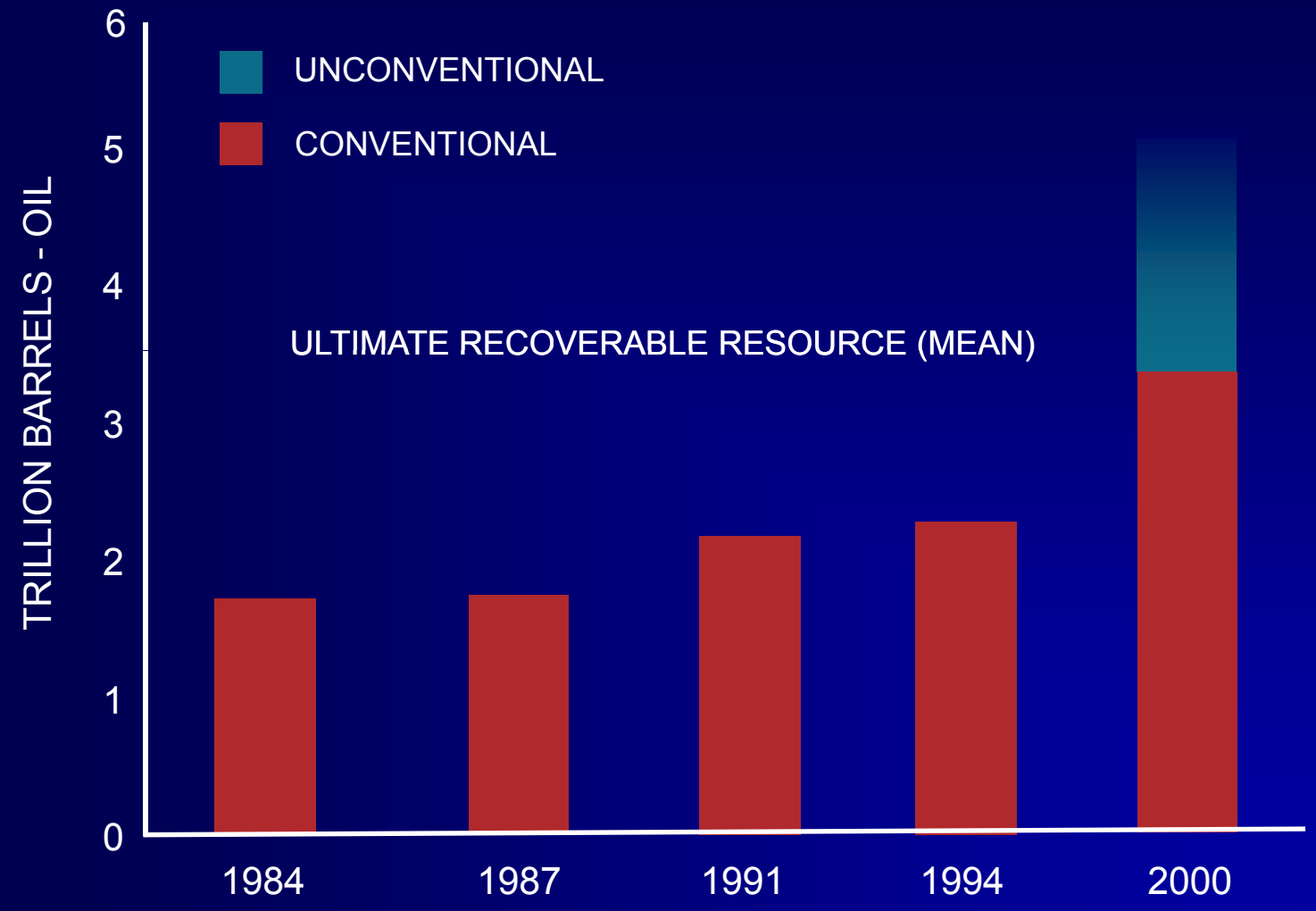


Source: IEA REFERENCE CASE

The Hard Truth: Supply

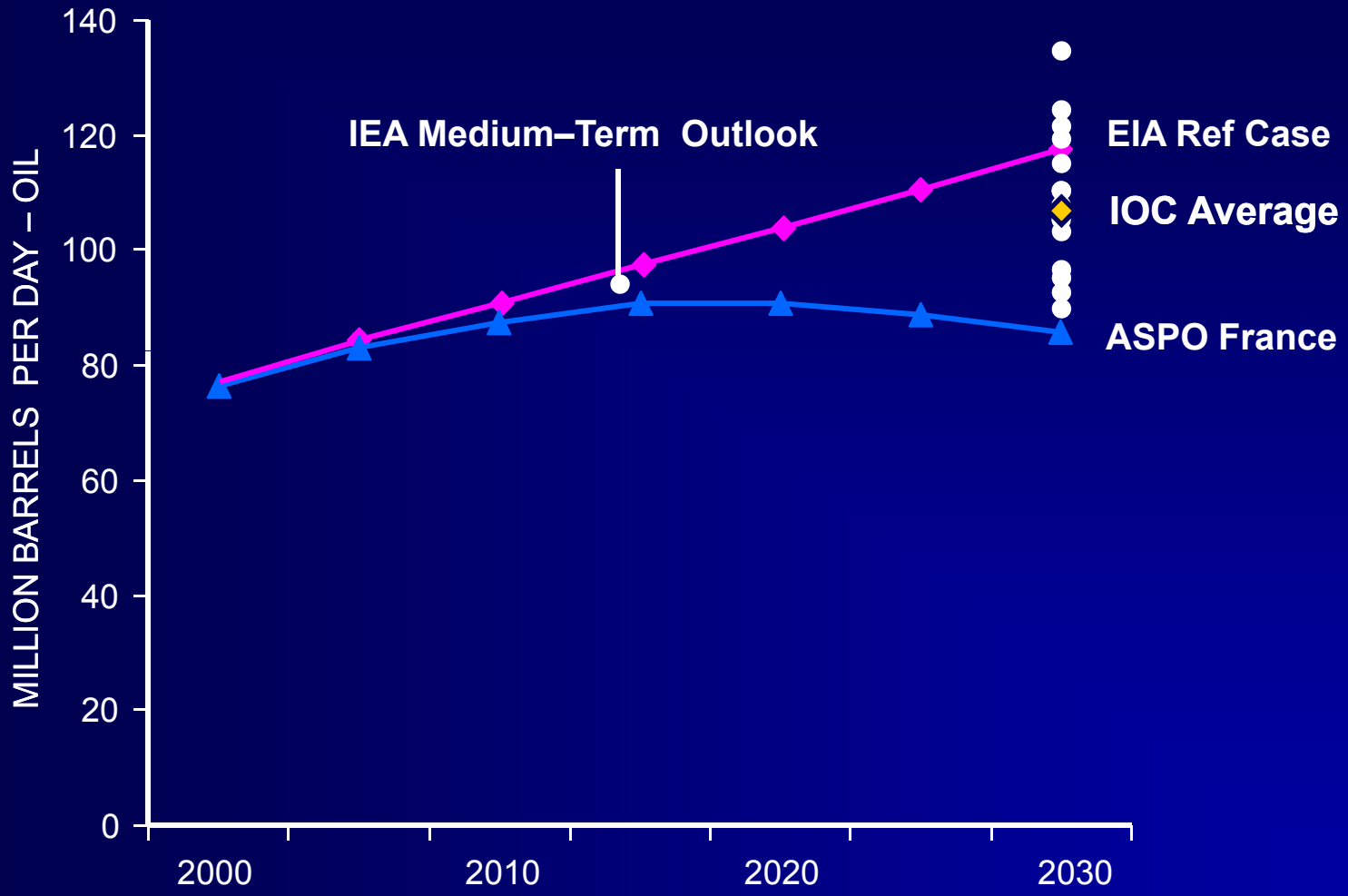
The world is not running out of energy resources, but there are accumulating risks to continuing expansion of oil and natural gas production from the conventional sources relied upon historically. These risks create significant challenges to meeting projected total energy demand.

Large Oil Resource Base



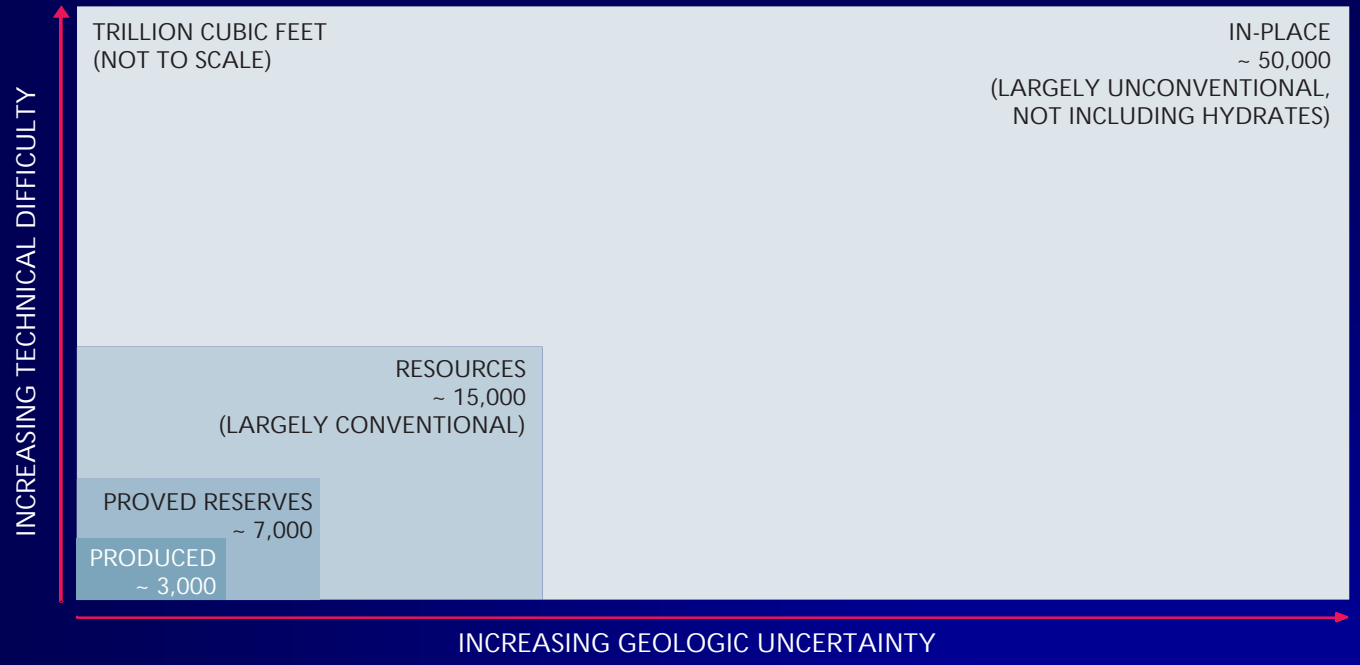
Source: USGS

Risks Reflected in Range of Production Projections



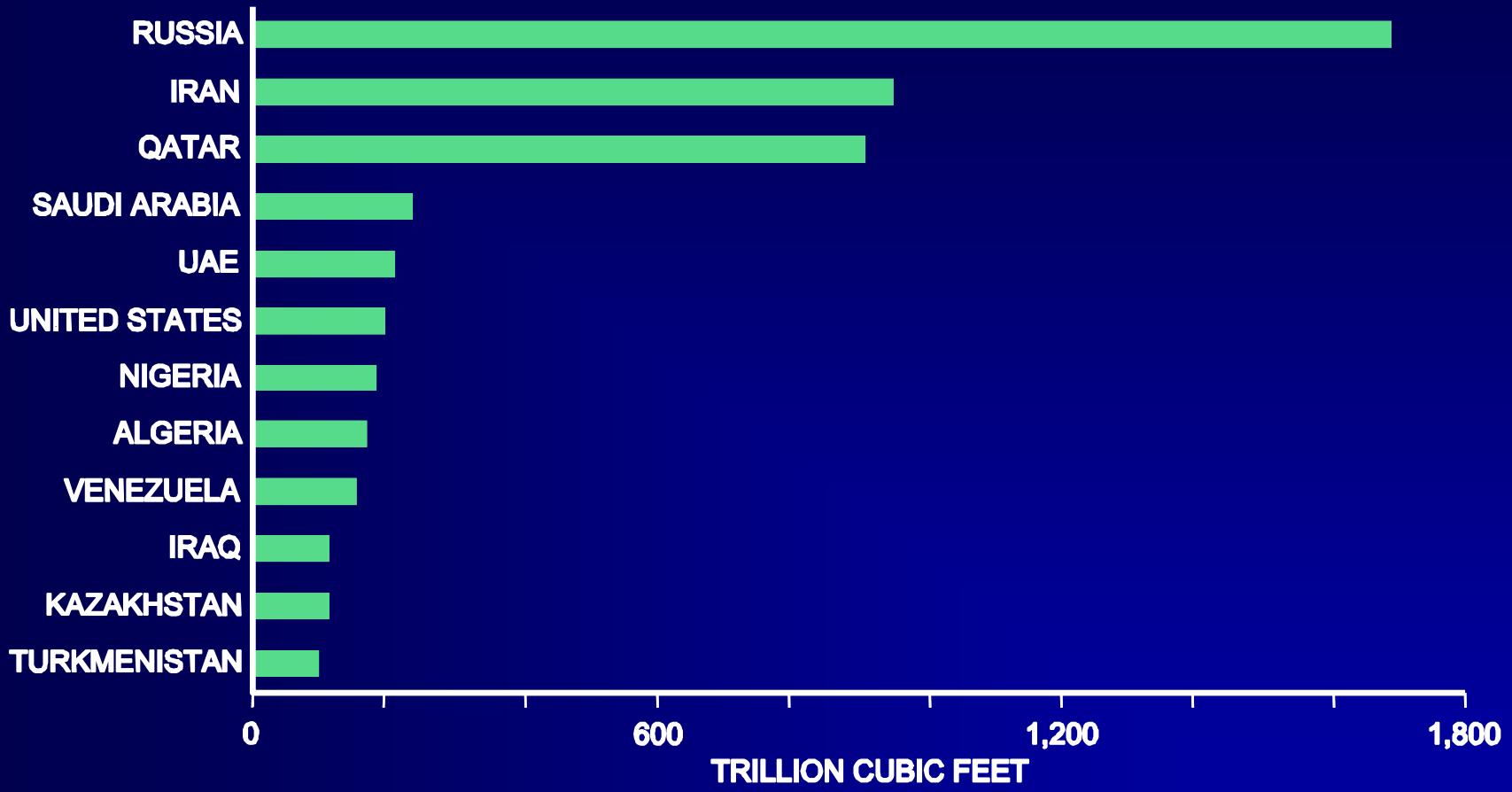
* Source: NPC Data Warehouse.

Global Gas Endowment



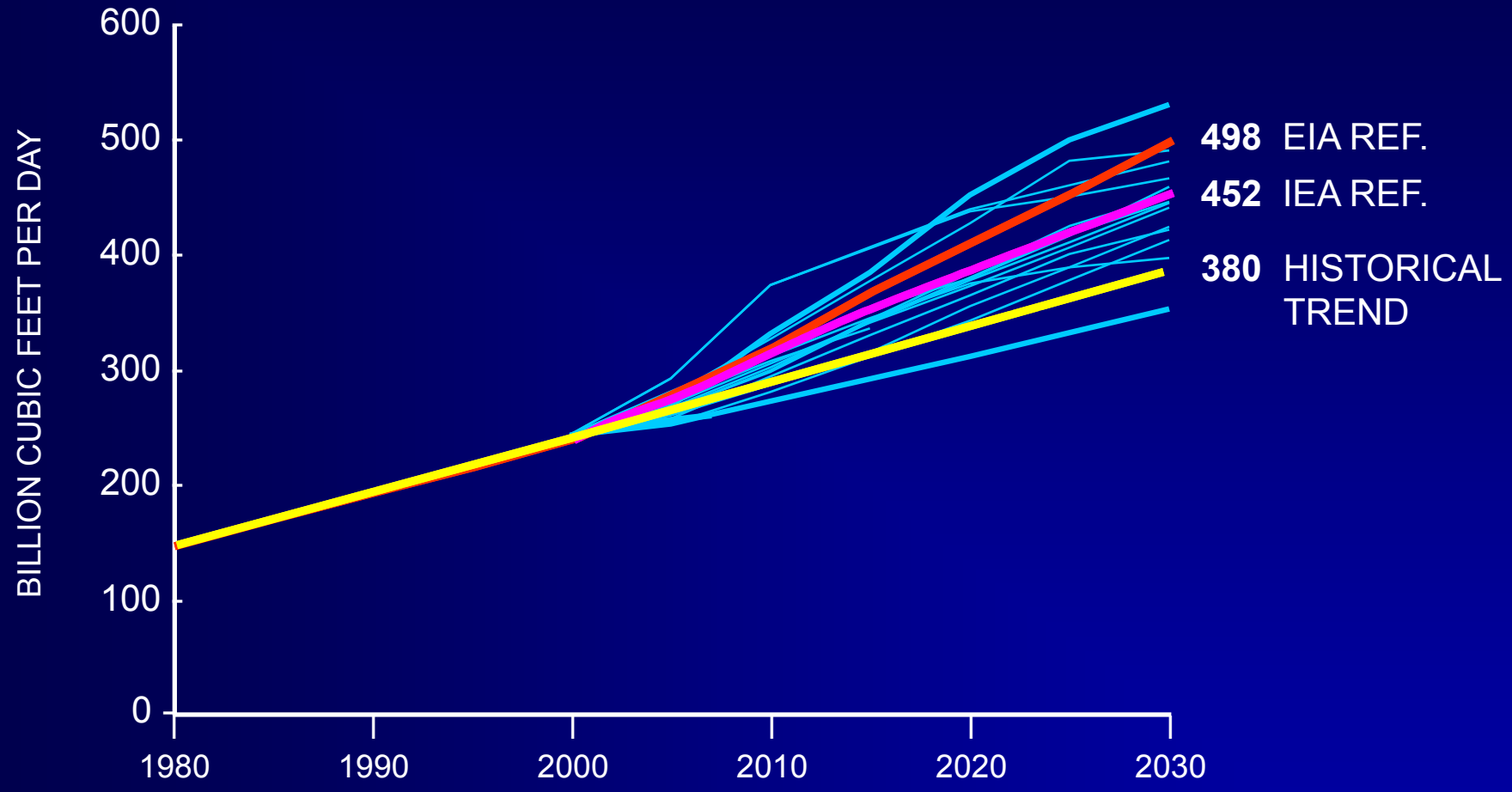
Sources: U.S. Geological Survey, 2000; and Rogner, H-H, "An Assessment of World Hydrocarbon Resources," Institute for Integrated Energy Systems, University of Victoria, 1997.

Largest Natural Gas Reserve Holders (2005)



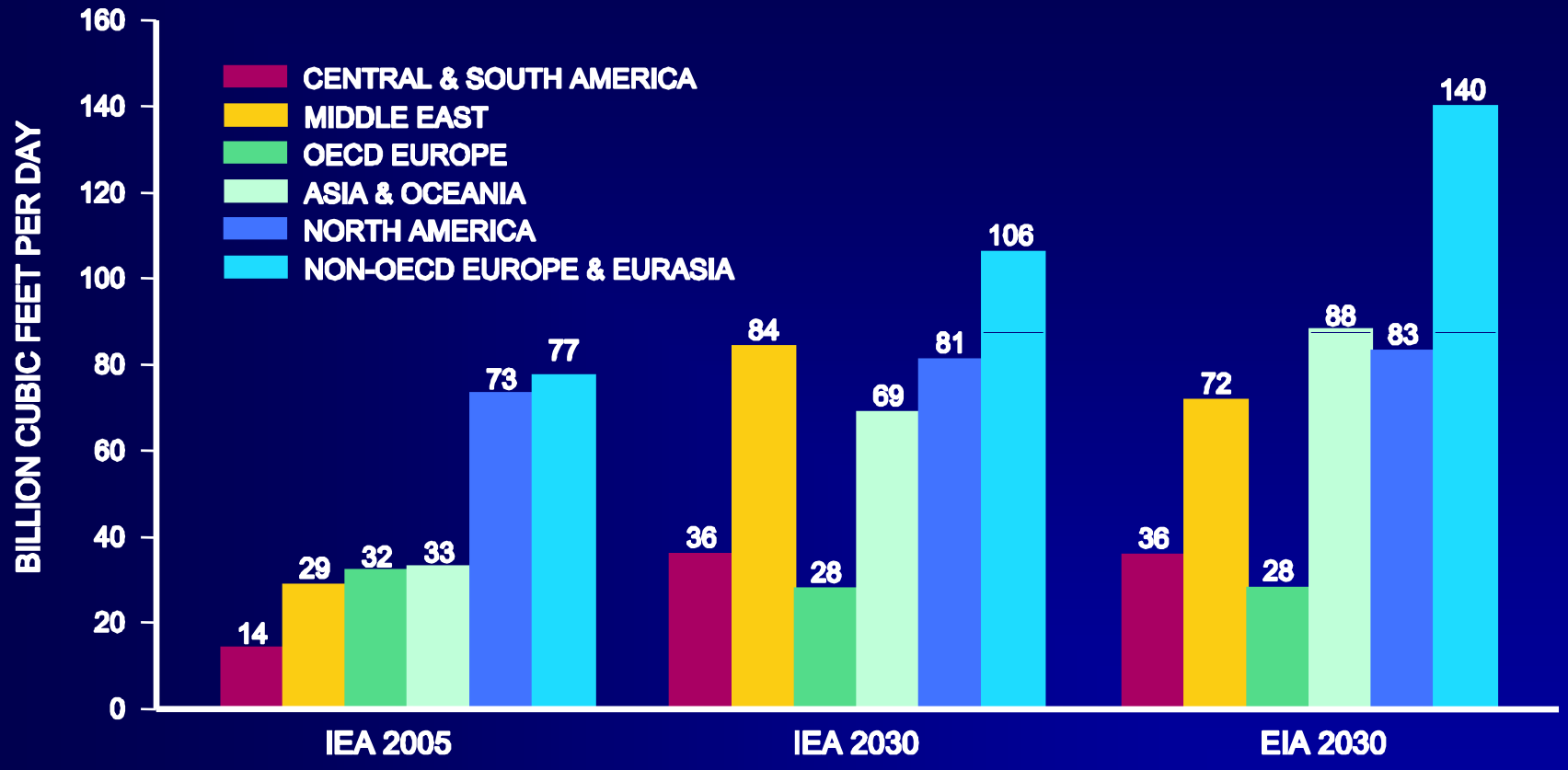
Source: BP Statistical Review of World Energy 2006.

Projected Global Natural Gas Production



Source: NPC Survey for the Oil & Gas Study

Projected Regional Natural Gas Production



Sources: International Energy Agency (IEA), World Energy Outlook 2006; and Energy Information Administration (EIA), International Energy Outlook 2006.

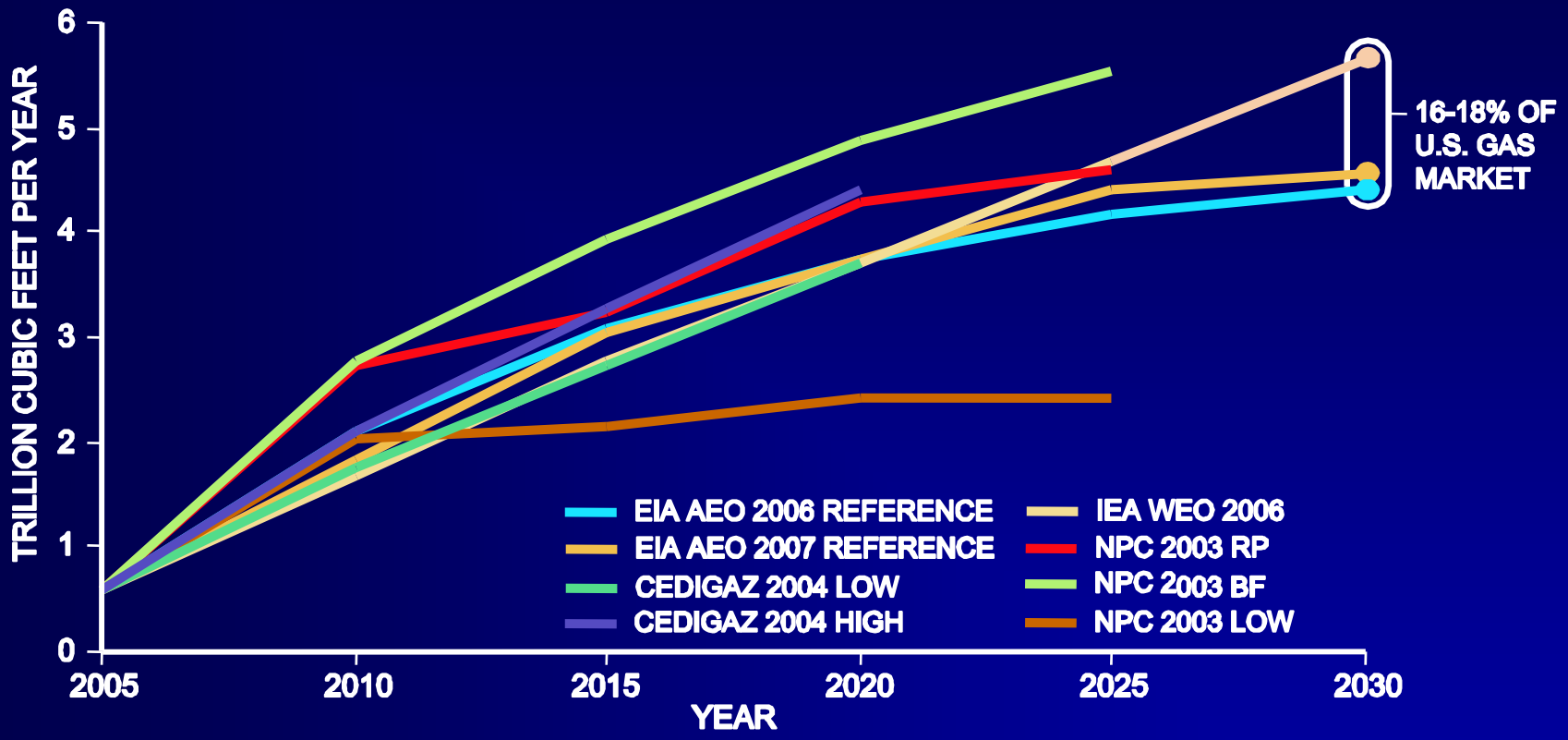
Observations on Projected Natural Gas Supply

- All projections are above the historical trend
- Gas is less developed than oil
- Meeting mid-range demand to 2030 will
  - consume 50% of existing reserves
  - require significant new infrastructure
- Natural gas demand in a carbon-constrained world is likely to be significantly higher than in a business-as-usual future

LNG and GTL Observations

- LNG is projected to grow faster than historical or future global gas and energy demand
- The natural gas reserve base can support the projected expansion of LNG supply over the next 25 years
- The global LNG market has many new entrants
- Major uncertainties surround the scope and pace of liquefaction development in key supply countries
- GTL is projected to grow quickly from a very low base, but not enough to significantly affect oil product or natural gas markets

Projected U.S. LNG Imports



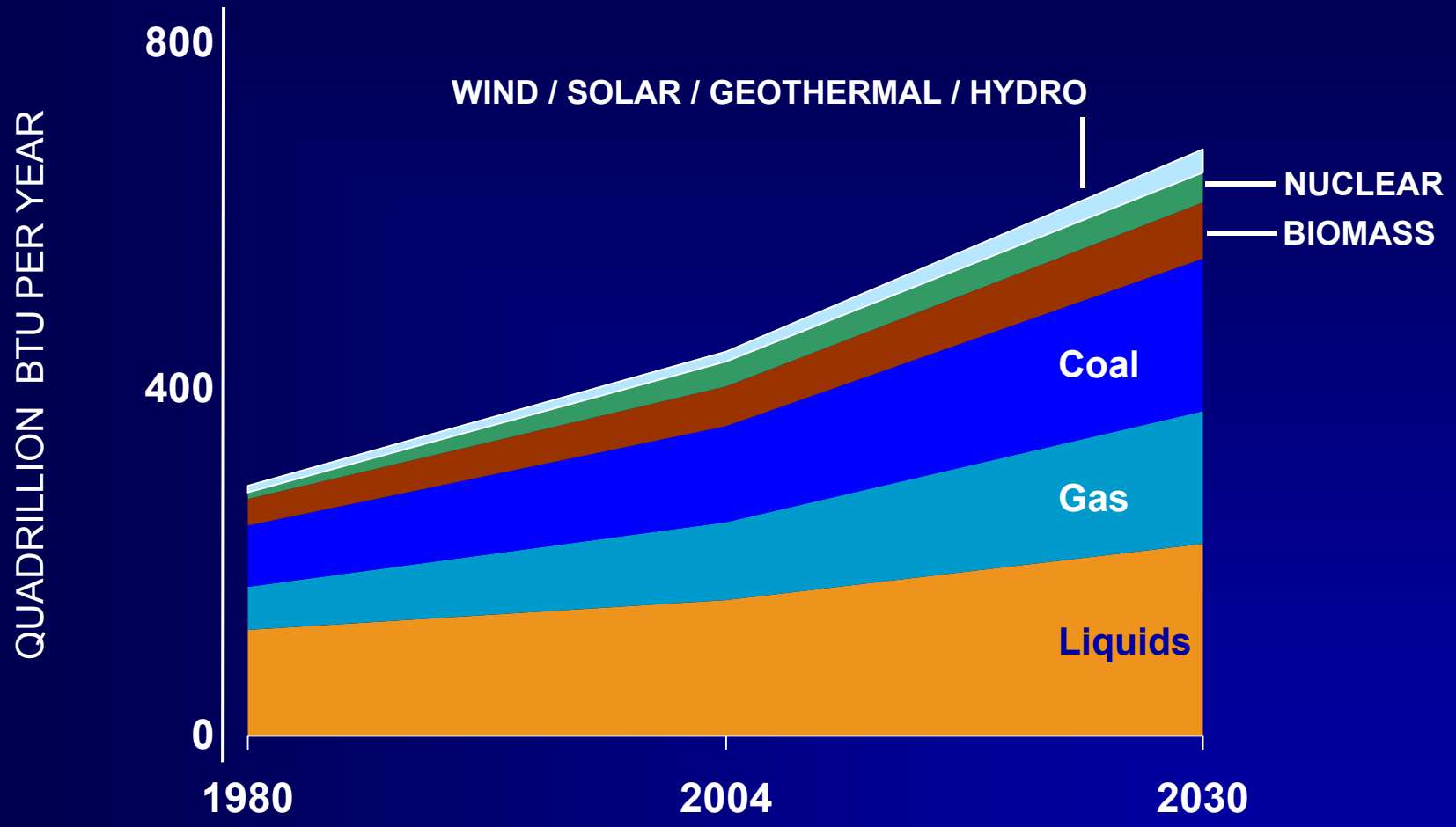
Note: RP = Reactive Path scenario; BF = Balanced Future scenario.

Sources: Energy Information Administration (EIA), Annual Energy Outlook 2006 and 2007; Cedigaz, LNG Trade and Infrastructures , February 2004; International Energy Agency (IEA), World Energy Outlook 2006; and National Petroleum Council (NPC), Balancing Natural Gas Policy , September 2003.

The Hard Truth: Energy Sources

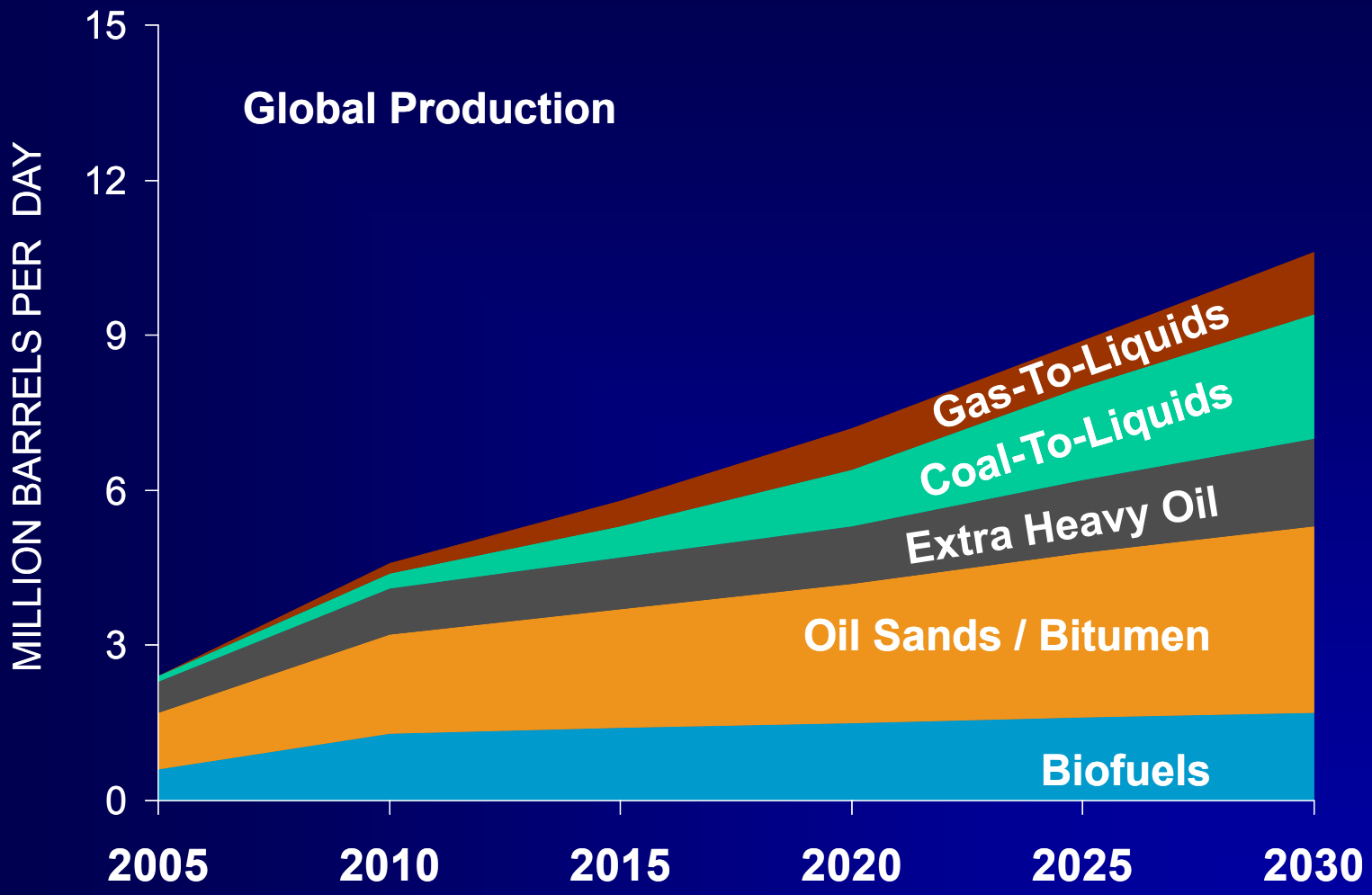
To mitigate these risks, expansion of all economic energy sources will be required, including coal, nuclear, biomass, other renewables, and unconventional oil and natural gas. Each of these sources faces significant challenges including safety, environmental, political, or economic hurdles, and imposes infrastructure requirements for development and delivery.

All Sources of Energy Will Be Needed



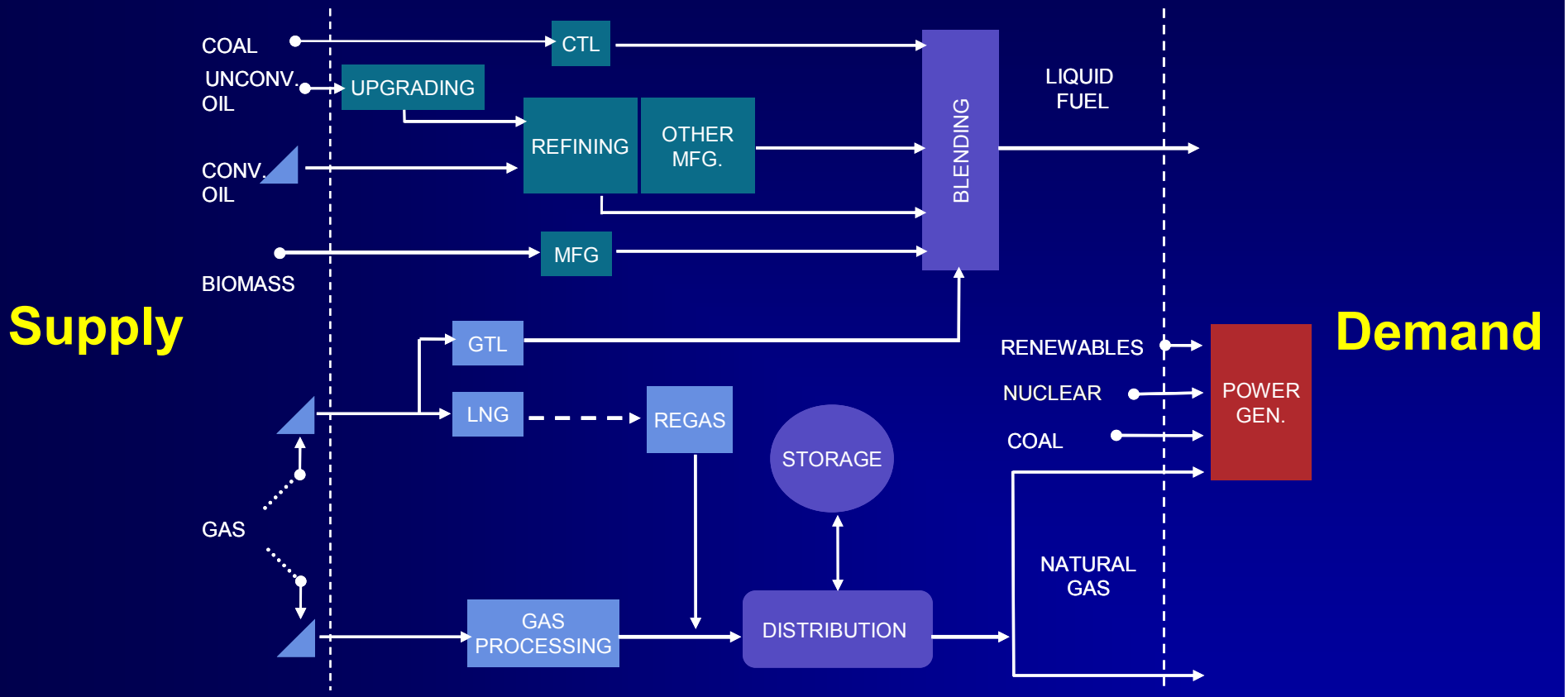
Source: IEA REFERENCE CASE

Contribution of Unconventional Liquids

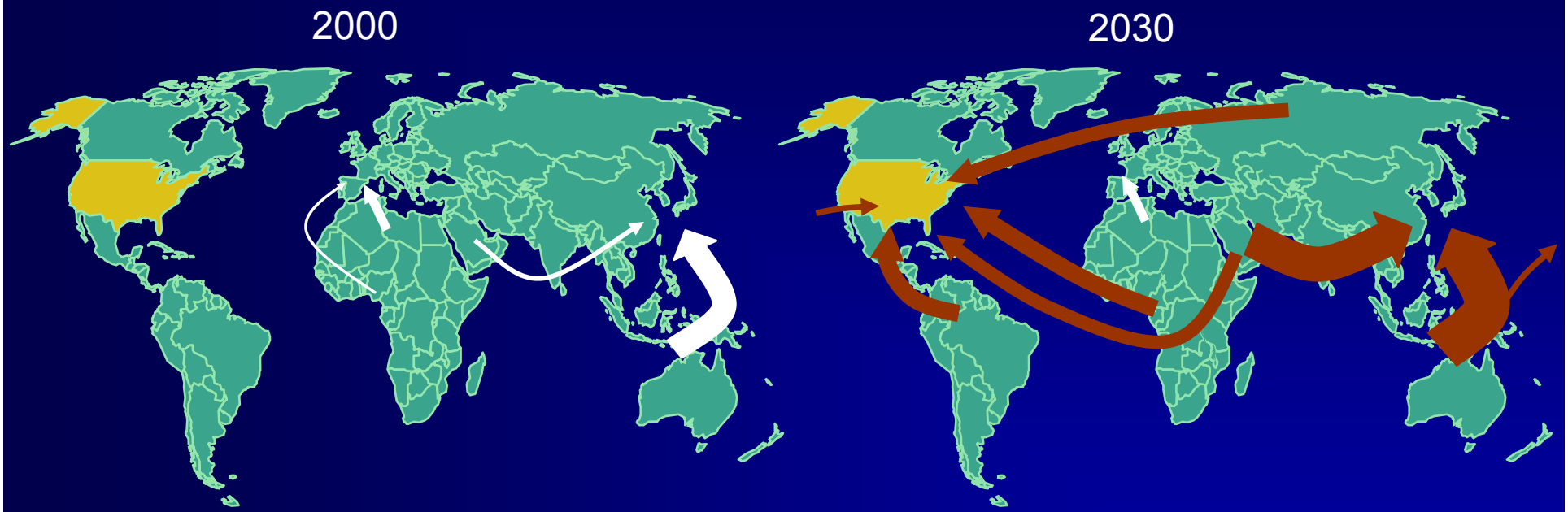


Source: Data From EIA 2007 Reference.

Massive Infrastructure Requirements



Global LNG Trade



EXPANDING FLOW TRENDS

The Hard Truth: Energy Security

"Energy Independence" should not be confused with strengthening energy security. The concept of energy independence is not realistic in the foreseeable future, whereas U.S. energy security can be enhanced by moderating demand, expanding and diversifying domestic energy supplies, and strengthening global energy trade and investment. There can be no U.S. energy security without global energy security.

The Hard Truth: Workforce

A majority of the U.S. energy sector workforce, including skilled scientists and engineers, is eligible to retire within the next decade. The workforce must be replenished and trained.

The Hard Truth: Carbon Emissions

Policies aimed at curbing carbon dioxide emissions will alter the energy mix, increase energy-related costs, and require reductions in demand growth.

CO_2 Emission Limits Will Alter Energy Strategies

Growing concern that climate is warming and CO_2 concentrations in the atmosphere play a role.

The challenge of significantly reducing CO_2 emissions is unprecedented and will require:

- Global, broad actions on multiple fronts
- Long time horizons
- Major additional investments

Five Core U.S. Strategies

- Moderate Demand By Increasing Energy Efficiency
- Expand And Diversify U.S. Energy Supply
- Strengthen Global And U.S. Energy Security
- Reinforce Capabilities To Meet New Challenges
- Address Carbon Constraints

There Is No Single, Easy Solution

There Is No Single, Easy Solution

- All Five Strategies Must Be Addressed Together
- Global Cooperation is Required
- Begin Now And Plan For Sustained Commitment

For additional information or to download the NPC Report: "Facing the Hard Truths About Energy,"

- Please refer to the NPC Website:

http:www.npc.org

- Send questions and comments to:

comments@npc.org