Facing The Hard Truths About Energy

A Comprehensive View To 2030 Of Global Oil And Natural Gas

July 18, 2007

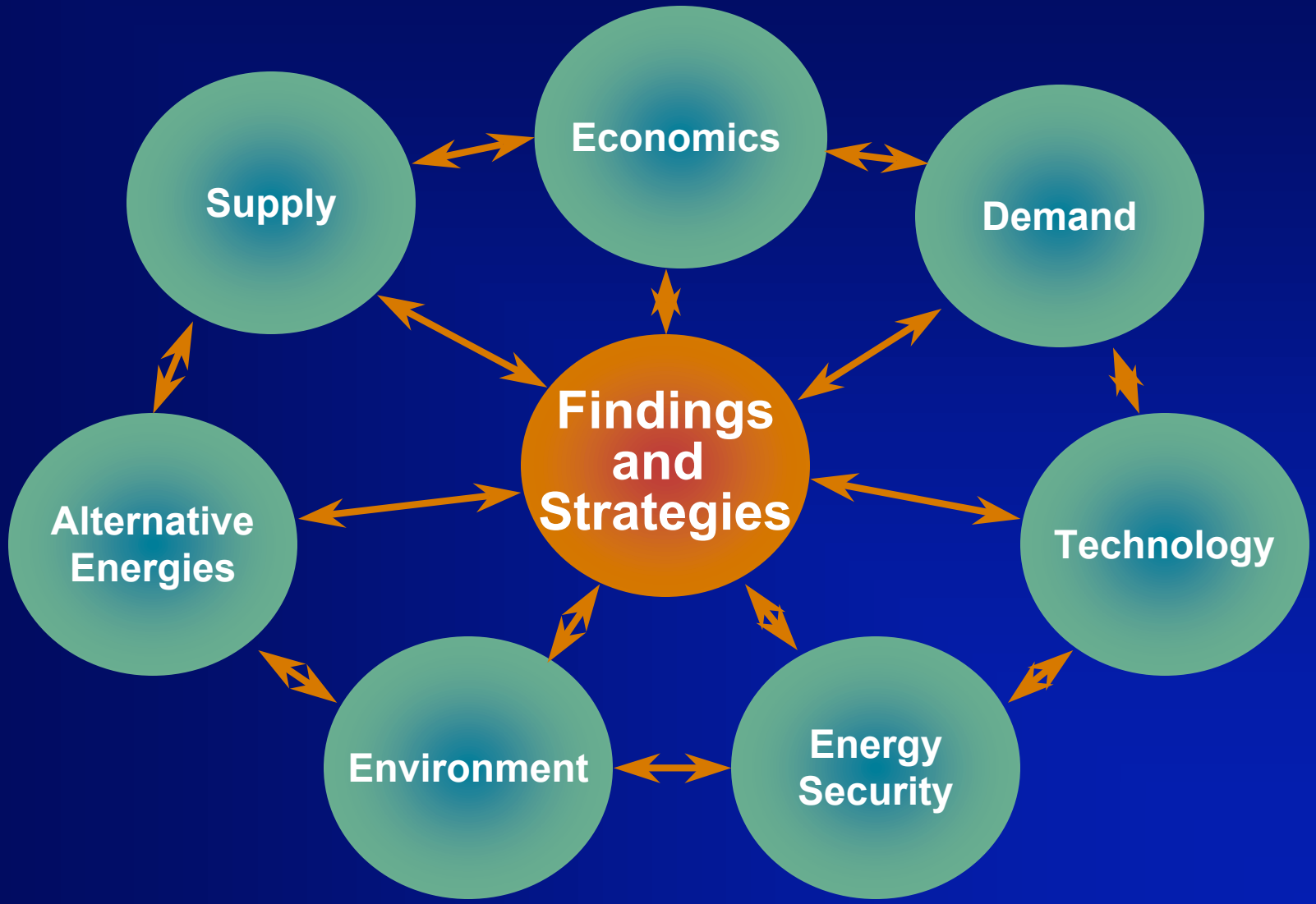
Today's Discussion

- Study Approach
- What We Learned : The Hard Truths
- Recommended Strategies For The U.S.

The Secretary's Suggested Questions

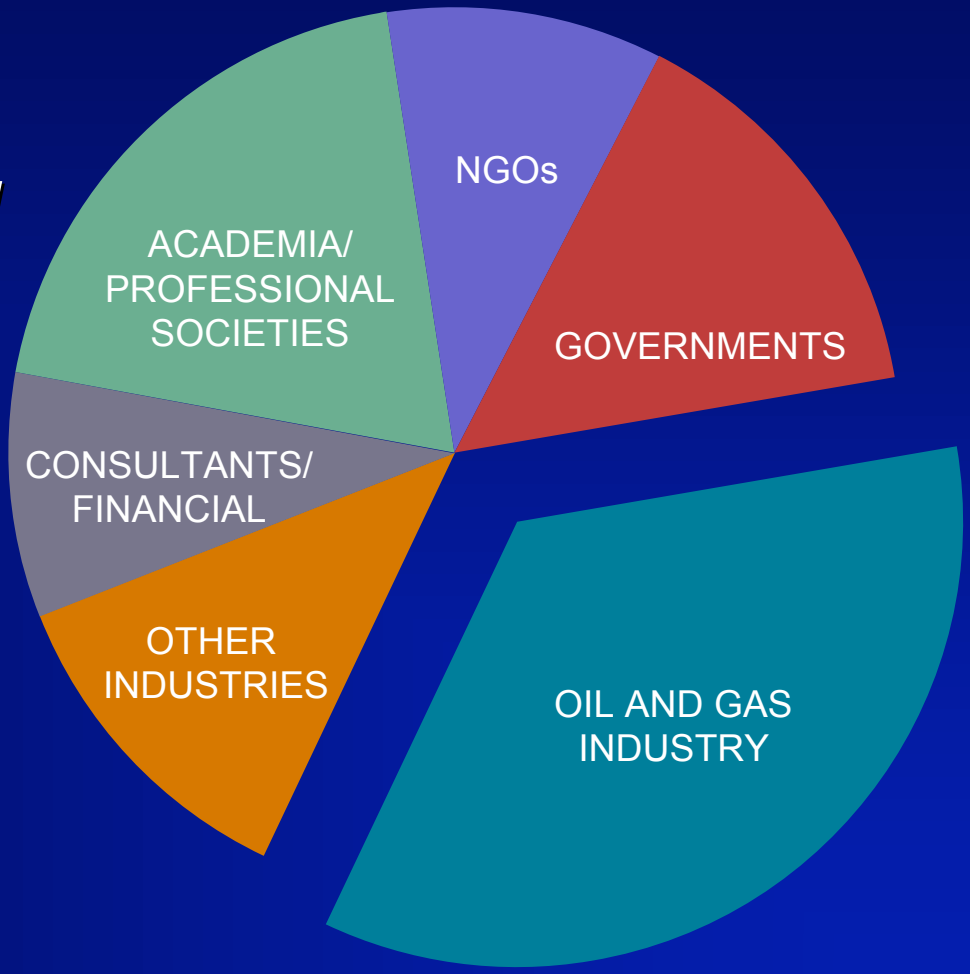
- What does the future hold for global oil and natural gas supply ?
- Can incremental oil and gas supplies be brought on-line, on time, and at a reasonable price to meet future demand without jeopardizing economic growth ?
- What oil and gas supply and / or demand-side strategies does the Council recommend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

Dimensions of the Study



How This Study is Different

65% participants from outside of oil and gas industry



350 + participants, plus input from 1000 + others

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

Technology Assessment Depth

- Technology Development
- Personnel Issues: The Big Crew Change
- Carbon Management
- Conventional Resources (includes EOR and Arctic)
- Exploration Technology
- Deepwater Technology
- Unconventional Gas (including Coal and Shale gas)
- Heavy Oil and Bitumen
- Oil Shale
- Gas Hydrates
- Coal to Liquids and Gas
- Biomass fuels
- Nuclear Outlook and impact on Oil and Gas demand
- Transportation Efficiency
- Other Renewables

- Time horizons
- Research budgets
- Human resources
- Deployment

The Hard Truths ....

Demand

Supply

Energy Sources

Energy Security

Workforce

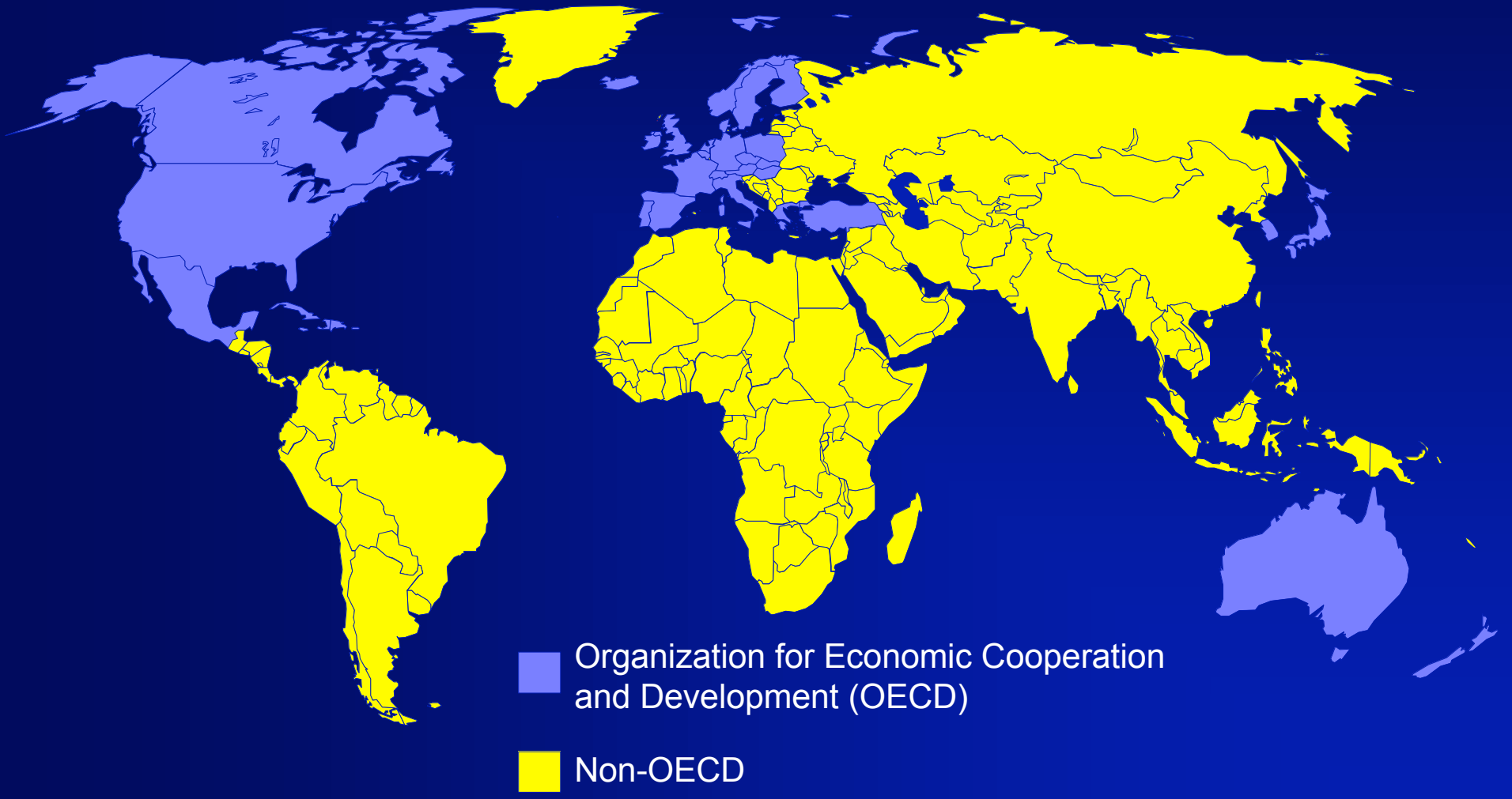
Carbon Emissions

What We Learned: The Hard Truths

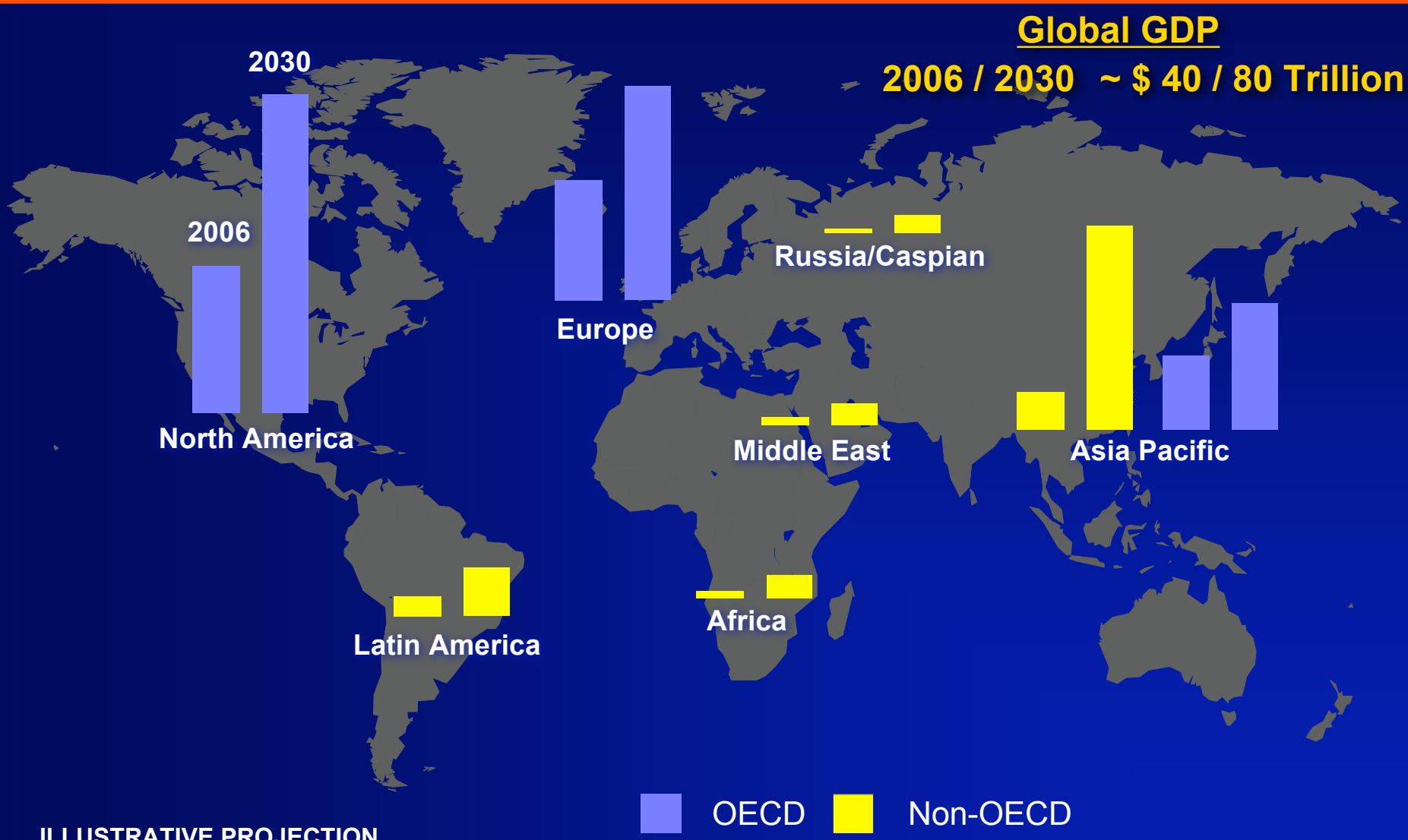
The Hard Truth: Demand

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

OECD and Non-OECD Countries



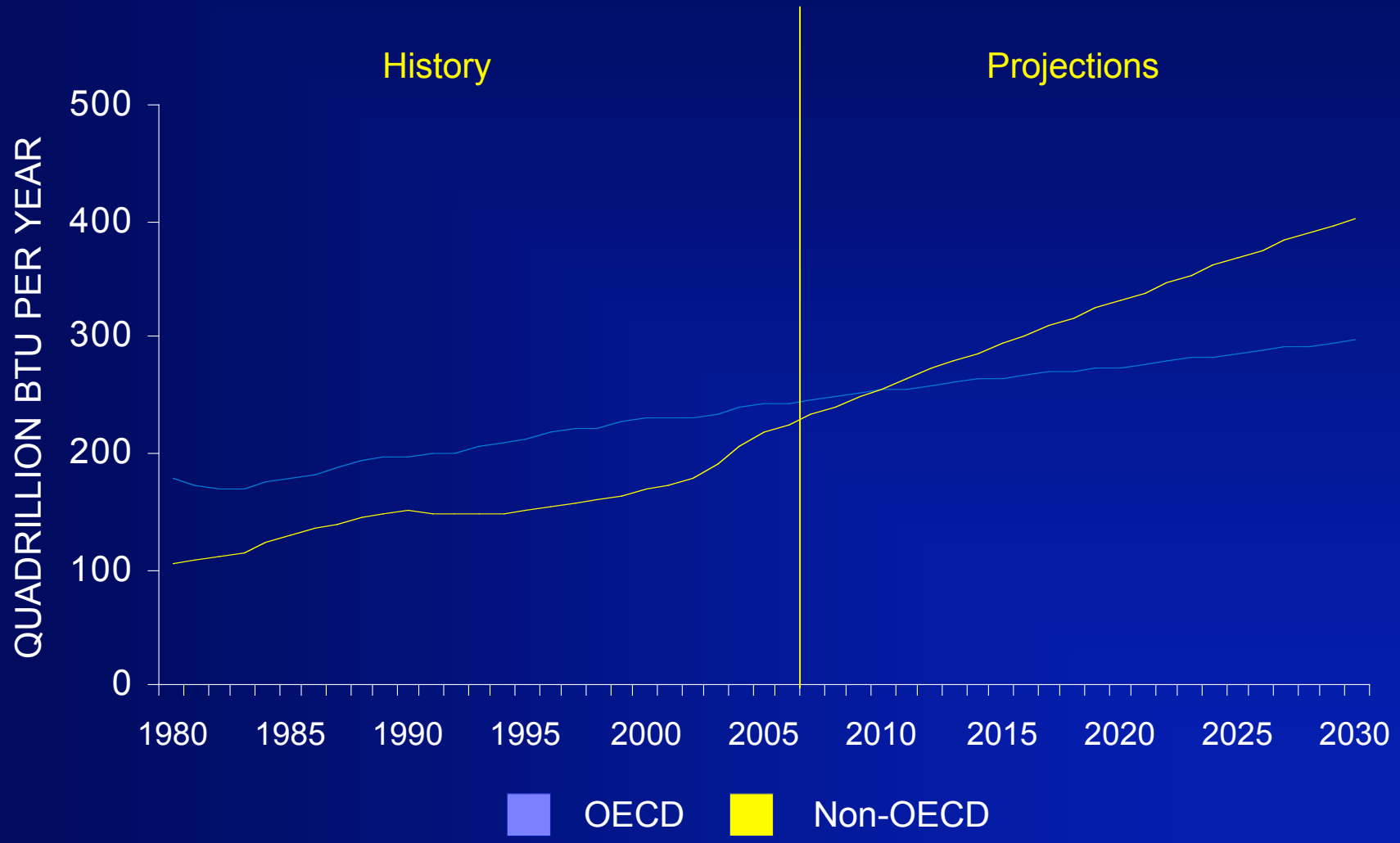
Economic Growth Patterns Are Shifting



ILLUSTRATIVE PROJECTION

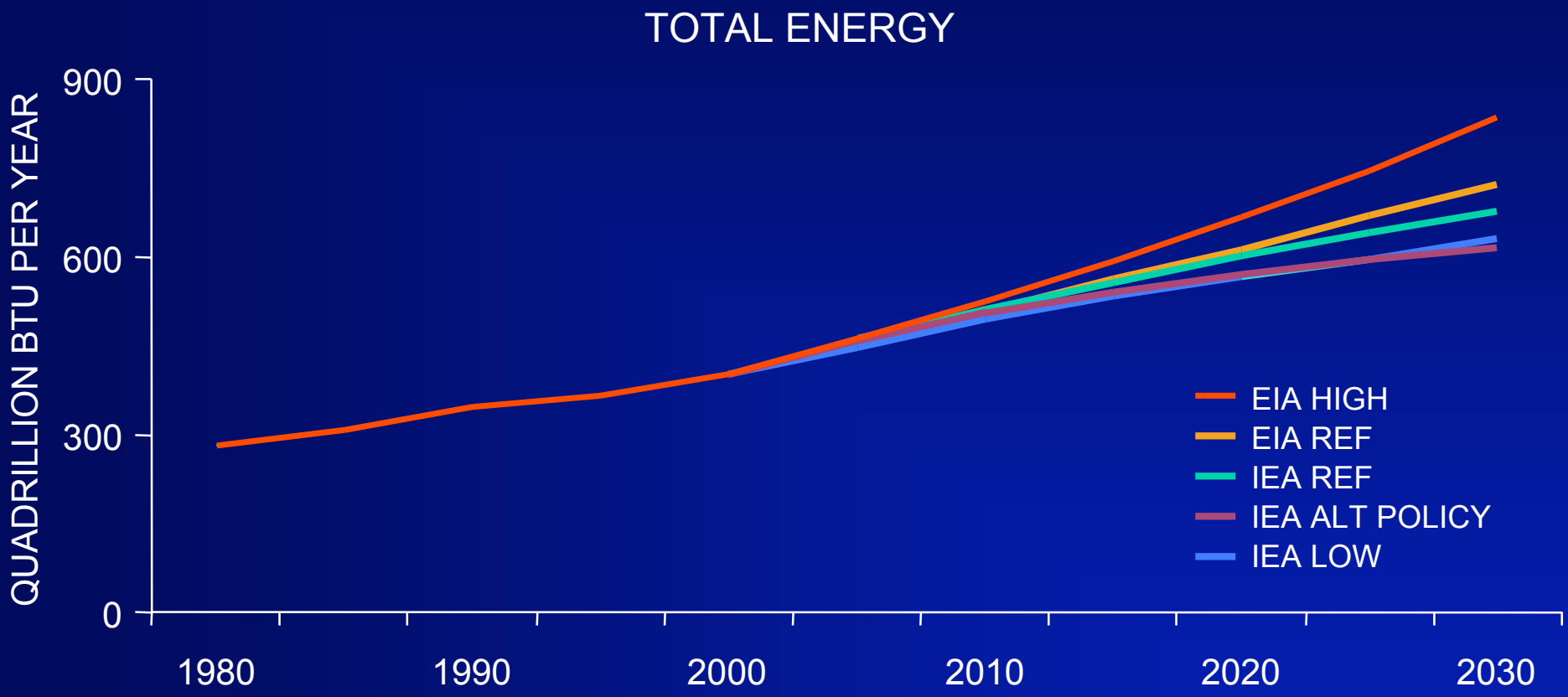
Source EIA, IEA & Other Outlooks

... And Energy Demand Growth Follows

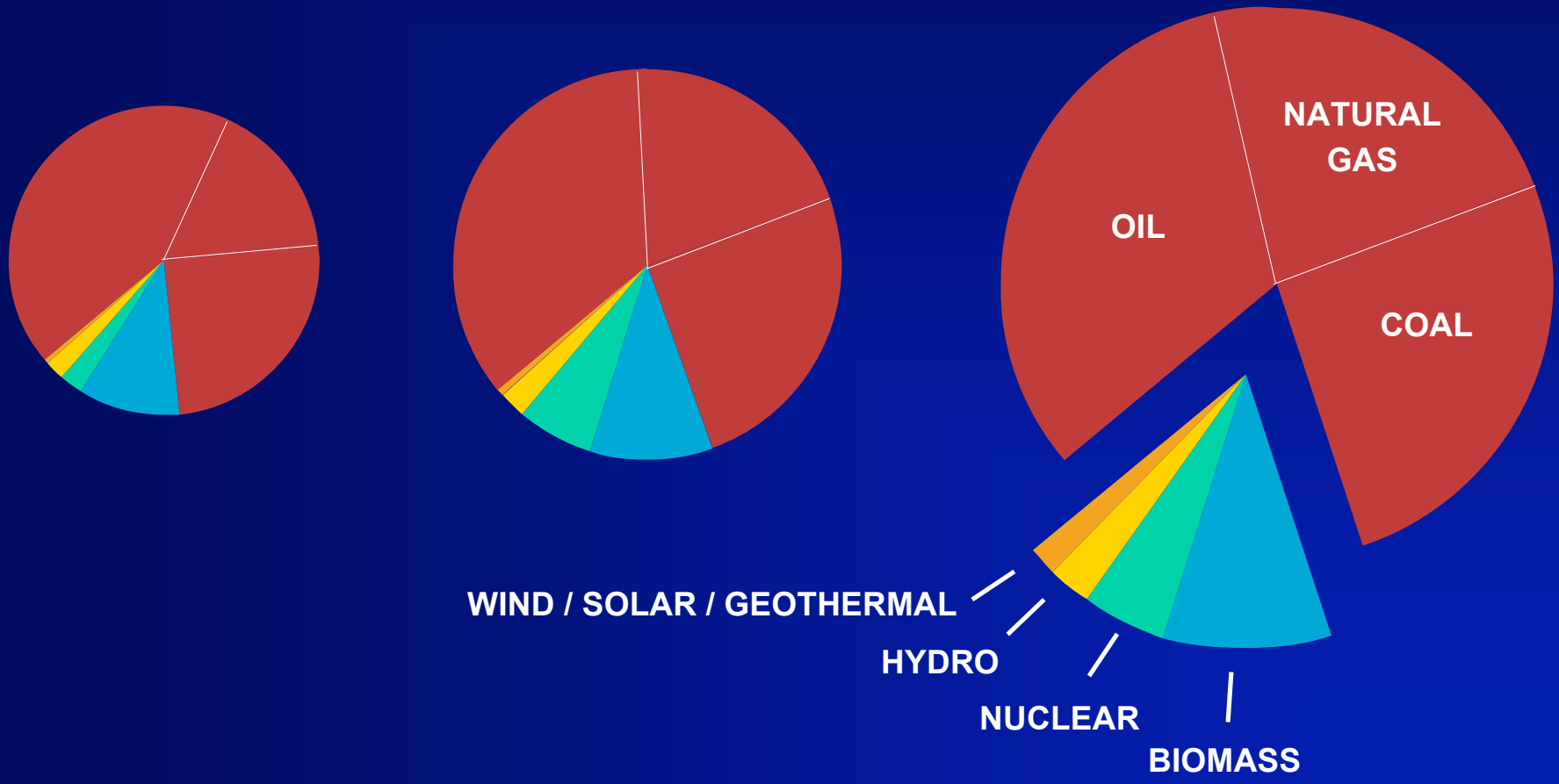


Source: EIA 2007

Range of Projections Point to Growing Demand



Coal, Oil, and Natural Gas Will Remain Indispensable

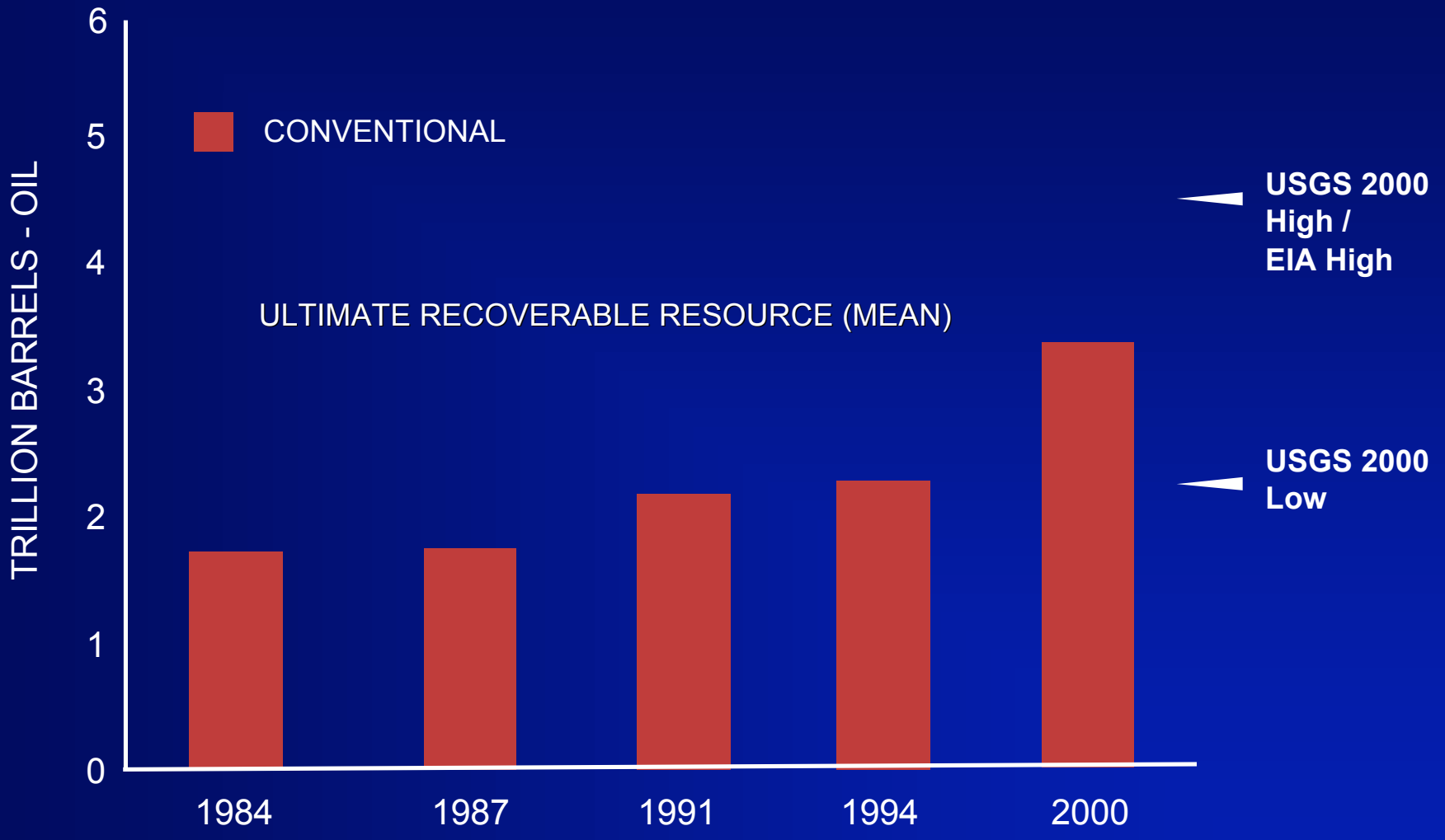


Source: IEA REFERENCE CASE

The Hard Truth: Supply

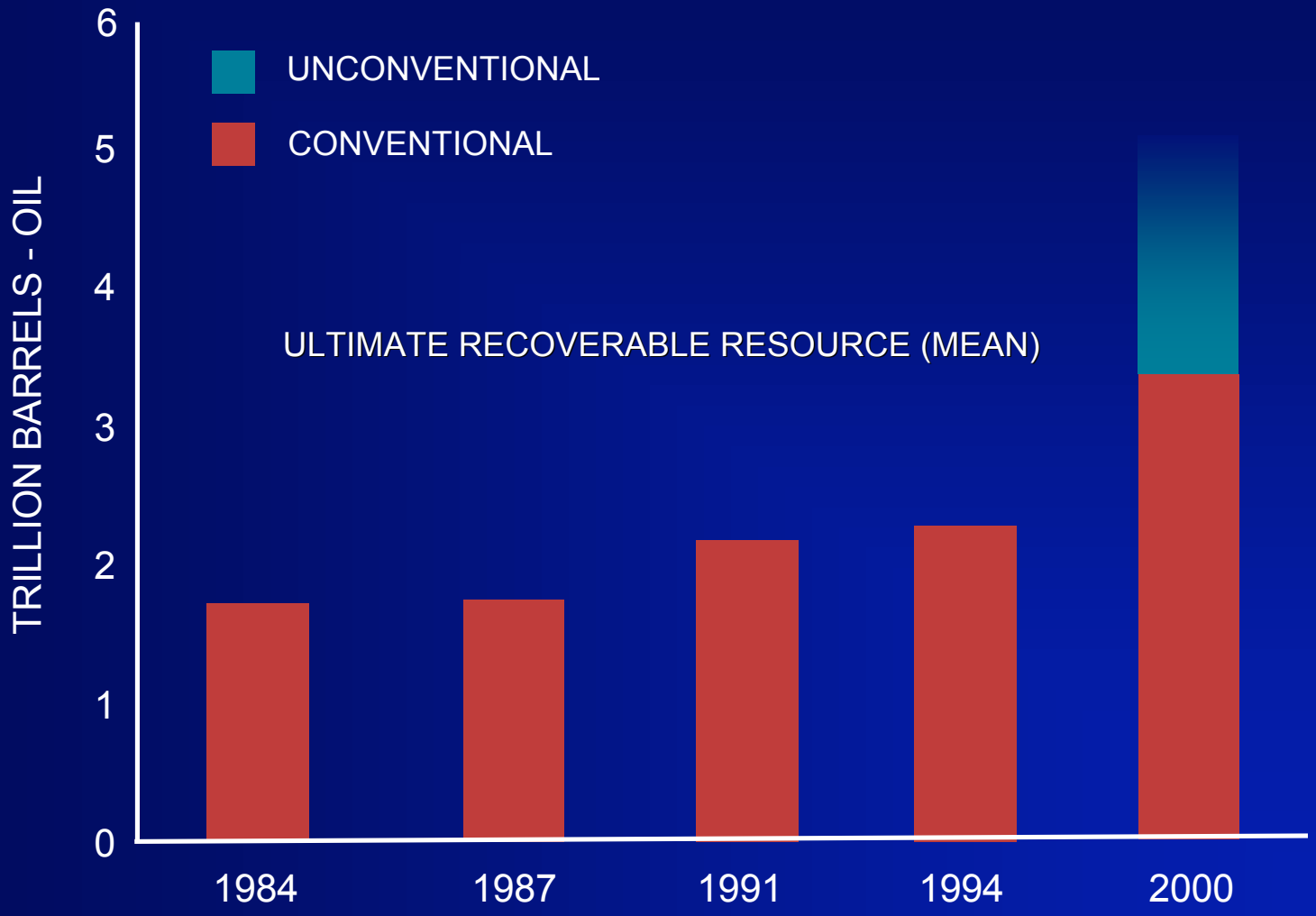
The world is not running out of energy resources, but there are accumulating risks to continuing expansion of oil and natural gas production from the conventional sources relied upon historically. These risks create significant challenges to meeting projected total energy demand.

Wide Range of Projections



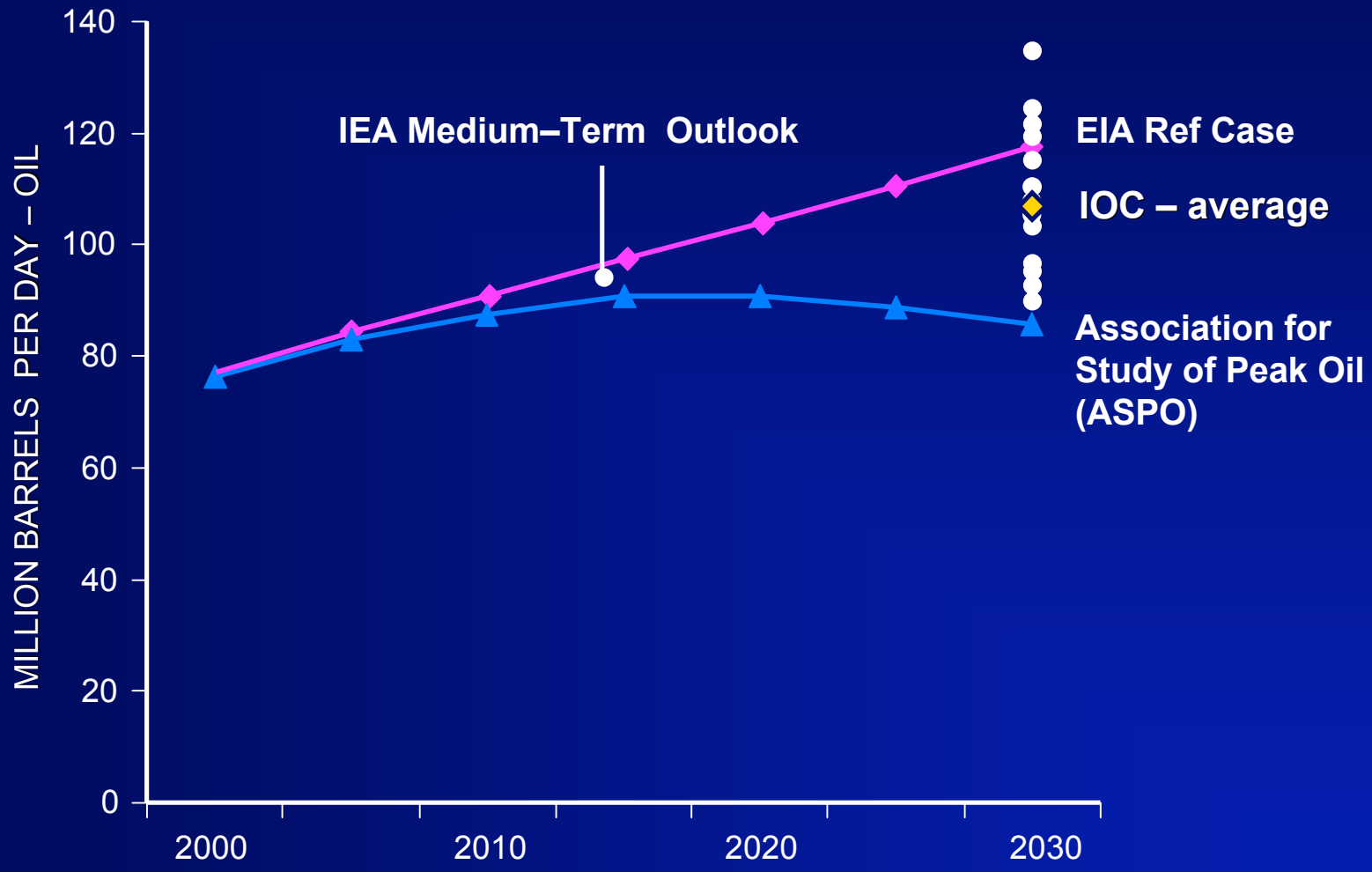
Source: USGS

Large Oil Resource Base



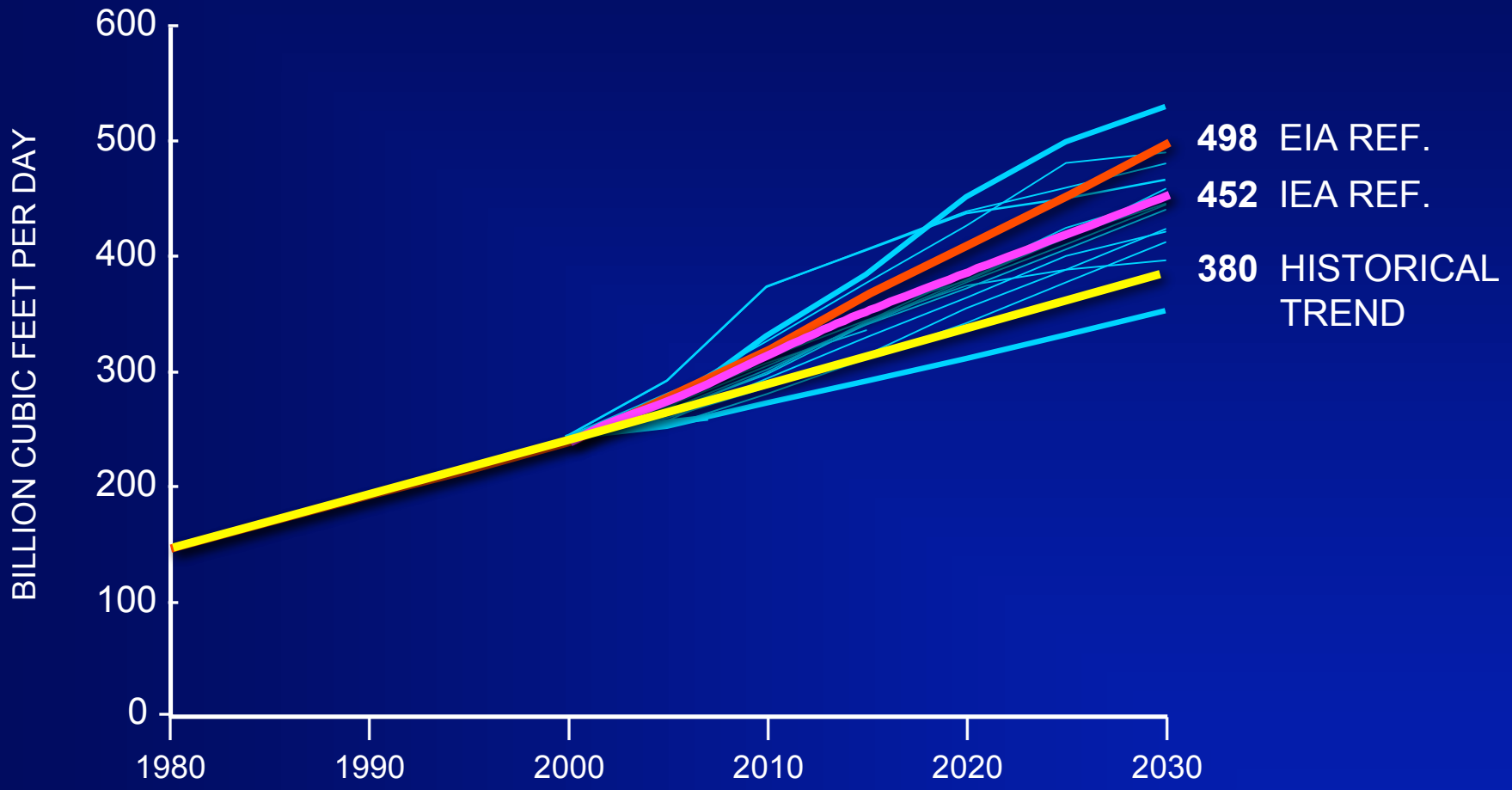
Source: USGS

Risks Reflected in Range of Production Projections



* Source: NPC Data Warehouse.

Range of Global Supply Projections – Gas

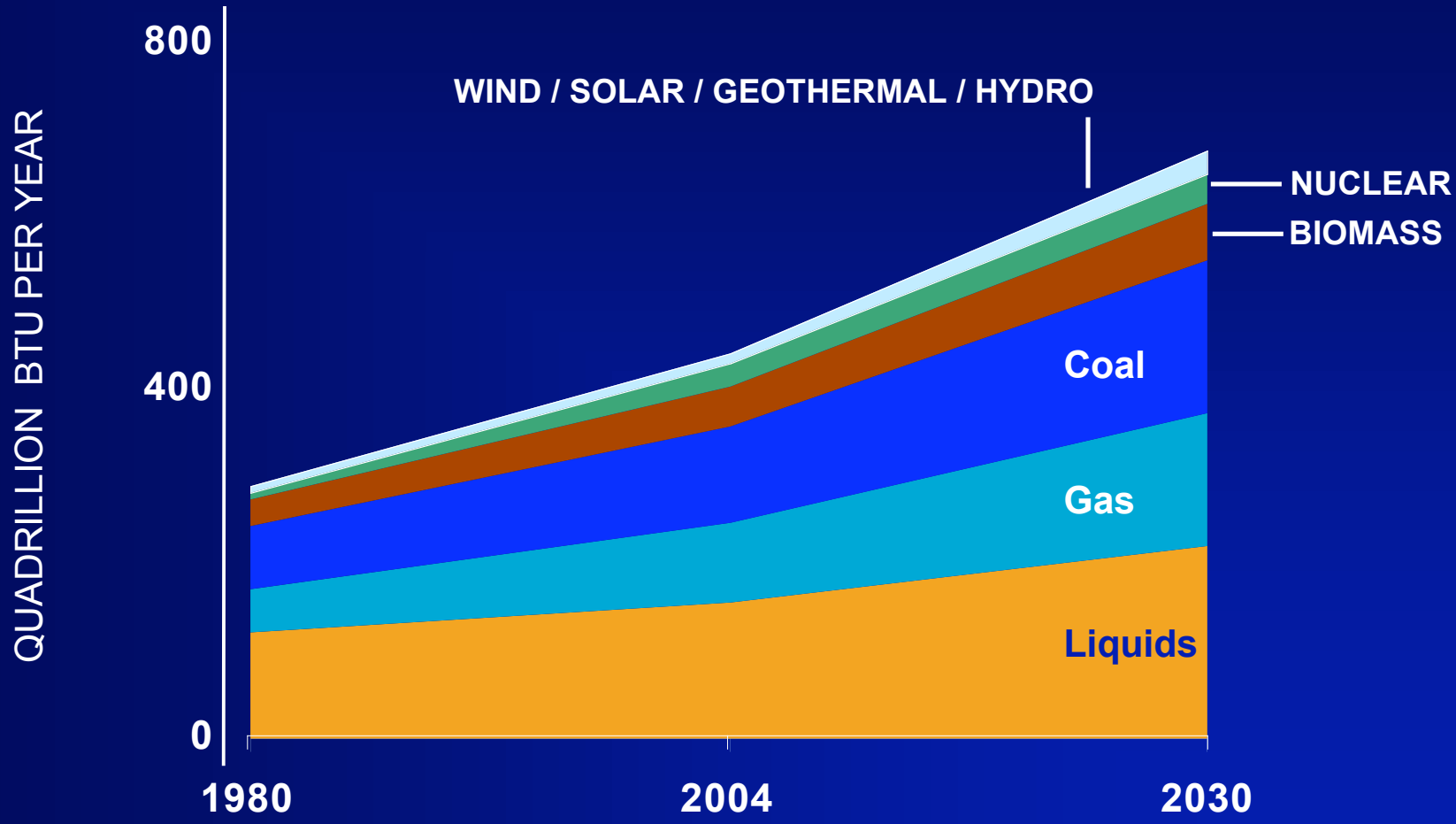


Source: NPC Survey for the Oil & Gas Study.

The Hard Truth: Energy Sources

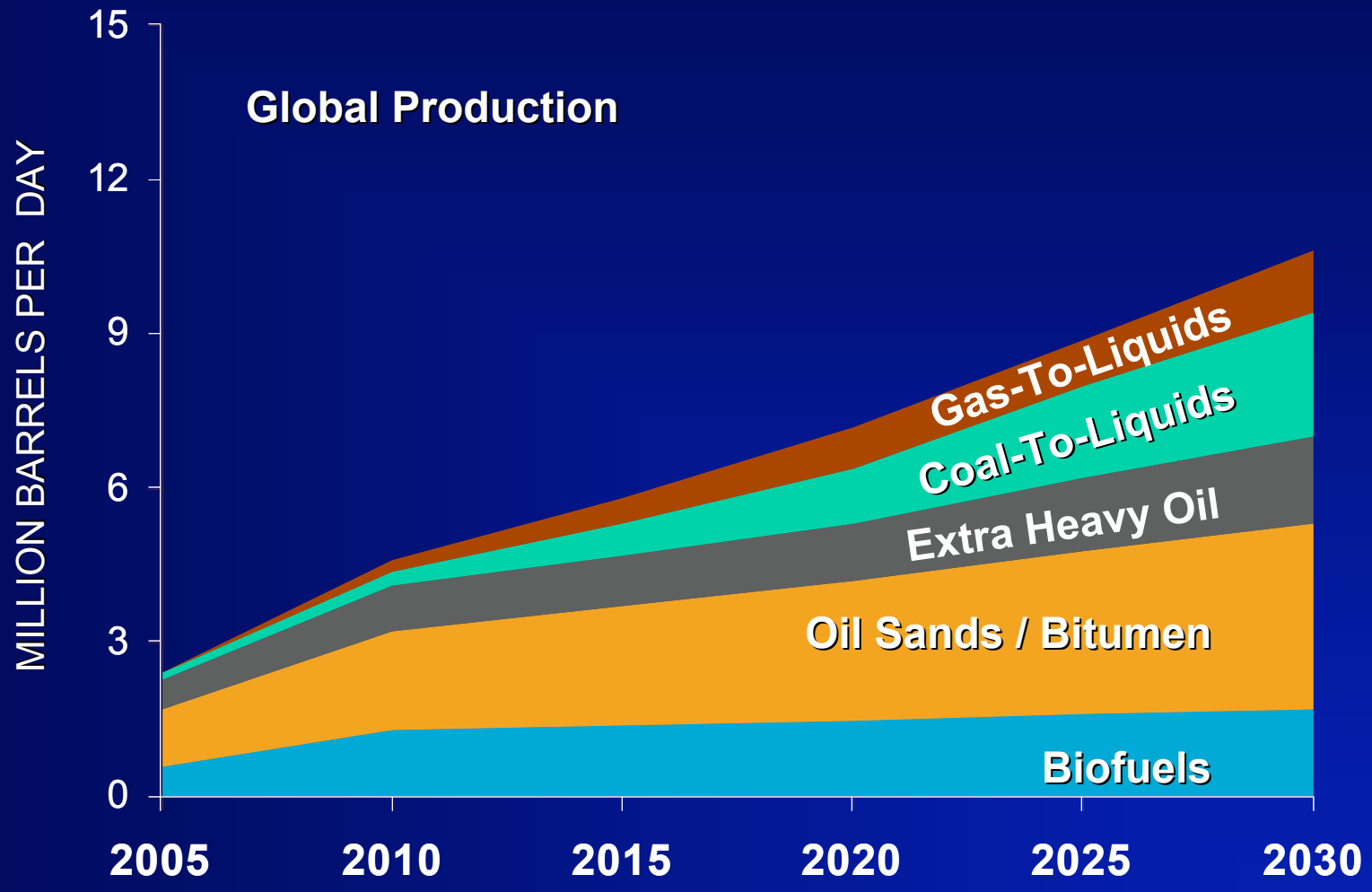
To mitigate these risks, expansion of all economic energy sources will be required, including coal, nuclear, biomass, other renewables, and unconventional oil and natural gas. Each of these sources faces significant challenges including safety, environmental, political, or economic hurdles, and imposes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

All Sources of Energy Will Be Needed



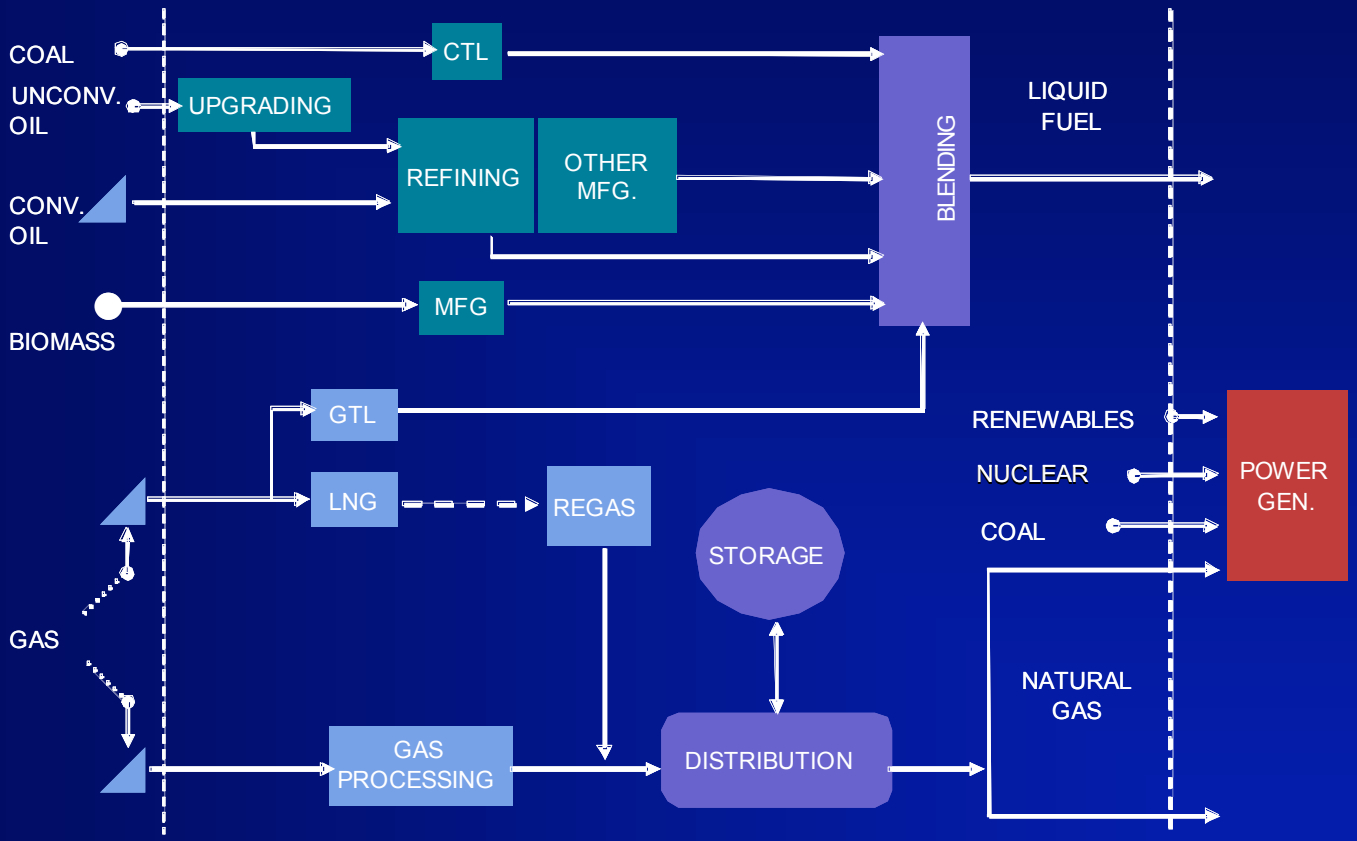
Source: IEA REFERENCE CASE

Contribution of Unconventional Liquids



Source: Data From EIA 2007 Reference.

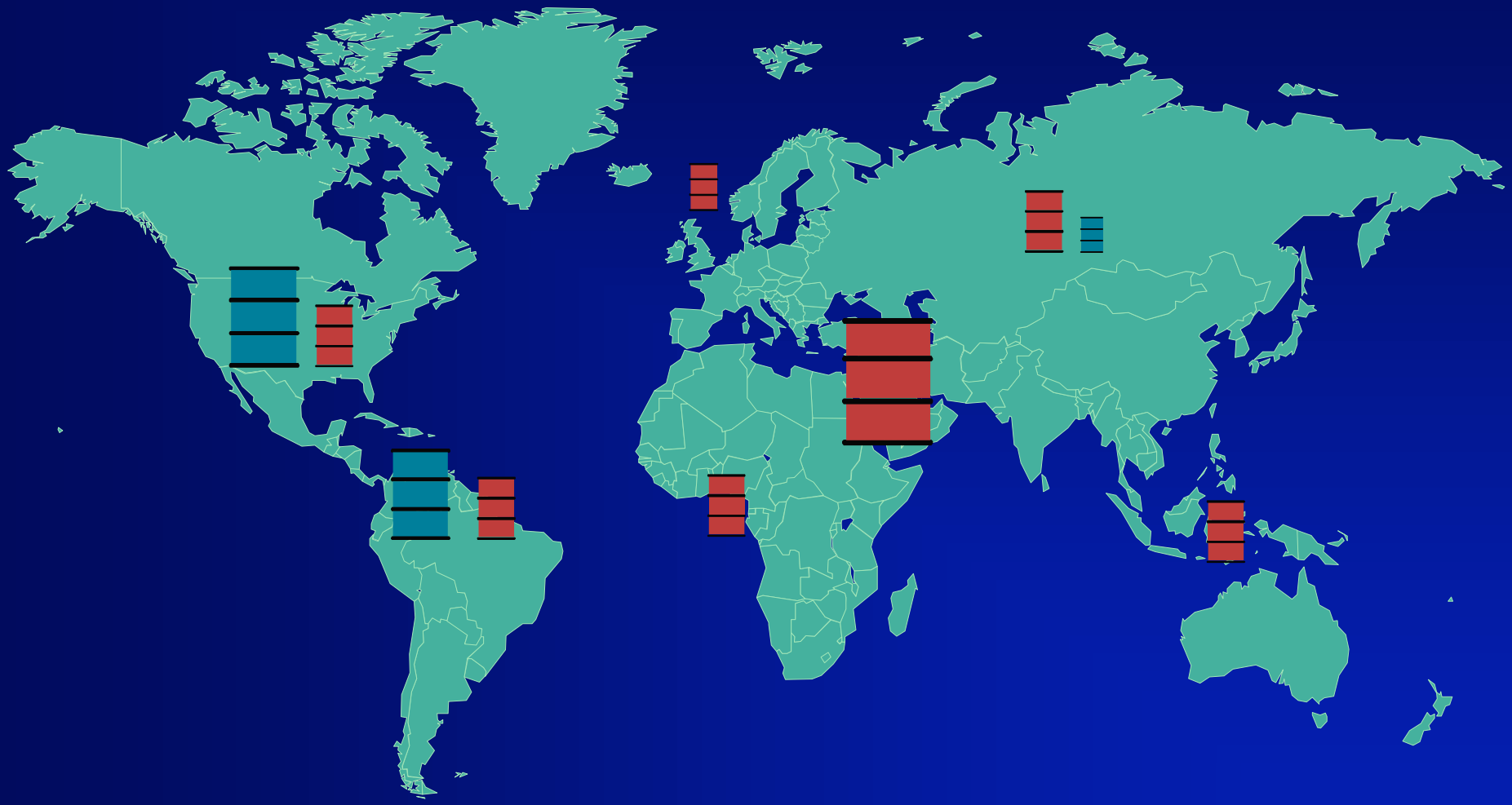
Massive Infrastructure Investments Required



The Hard Truth: Energy Security

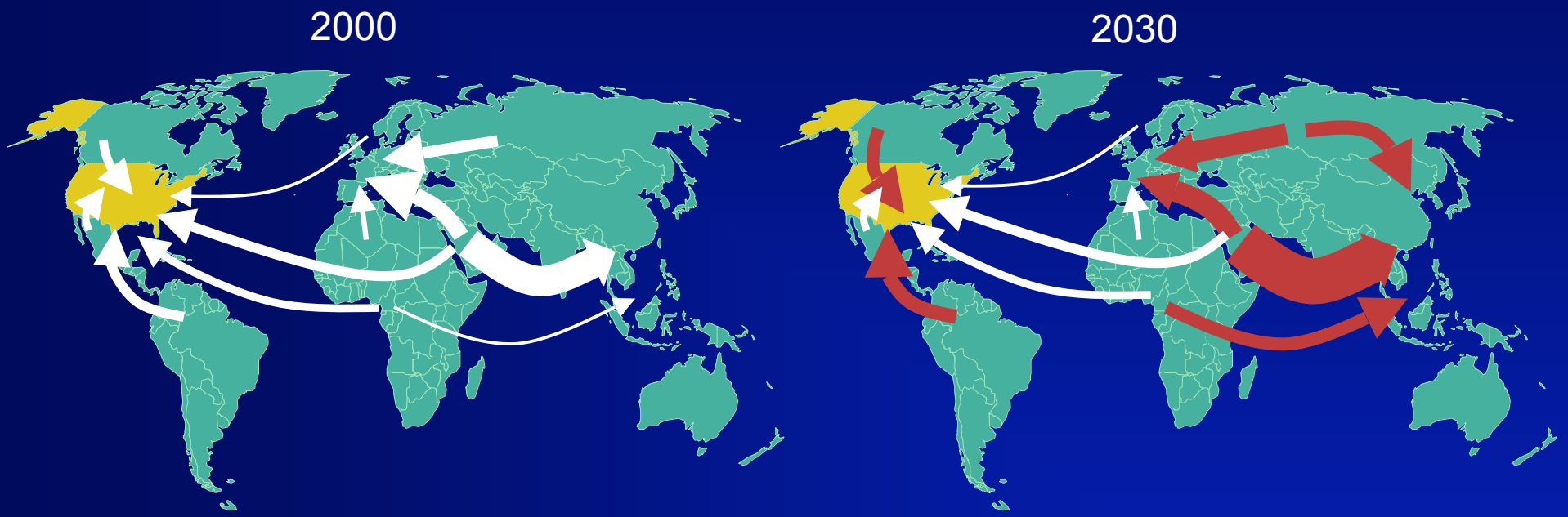
"Energy Independence" should not be confused with strengthening energy security. The concept of energy independence is not realistic in the foreseeable future, whereas U.S. energy security can be enhanced by moderating demand, expanding and diversifying domestic energy supplies, and strengthening global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

Oil Resource Concentration



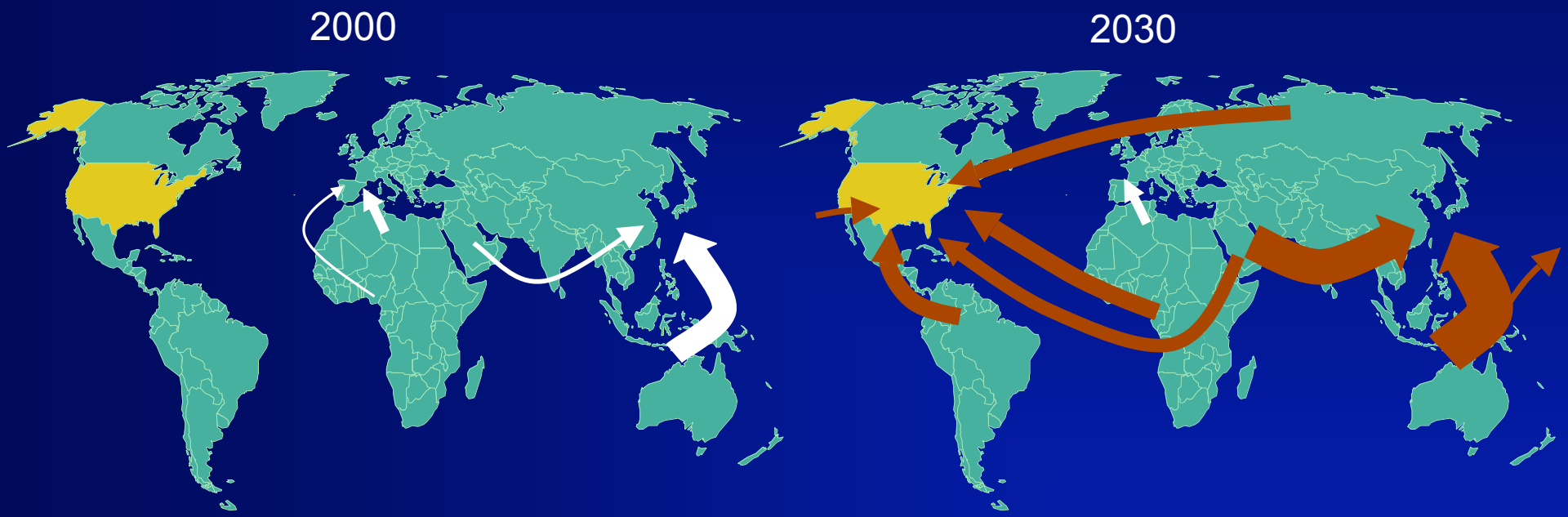
ILLUSTRATIVE PROJECTION
Source USGS

Global Oil Trade



EXPANDING FLOW TRENDS

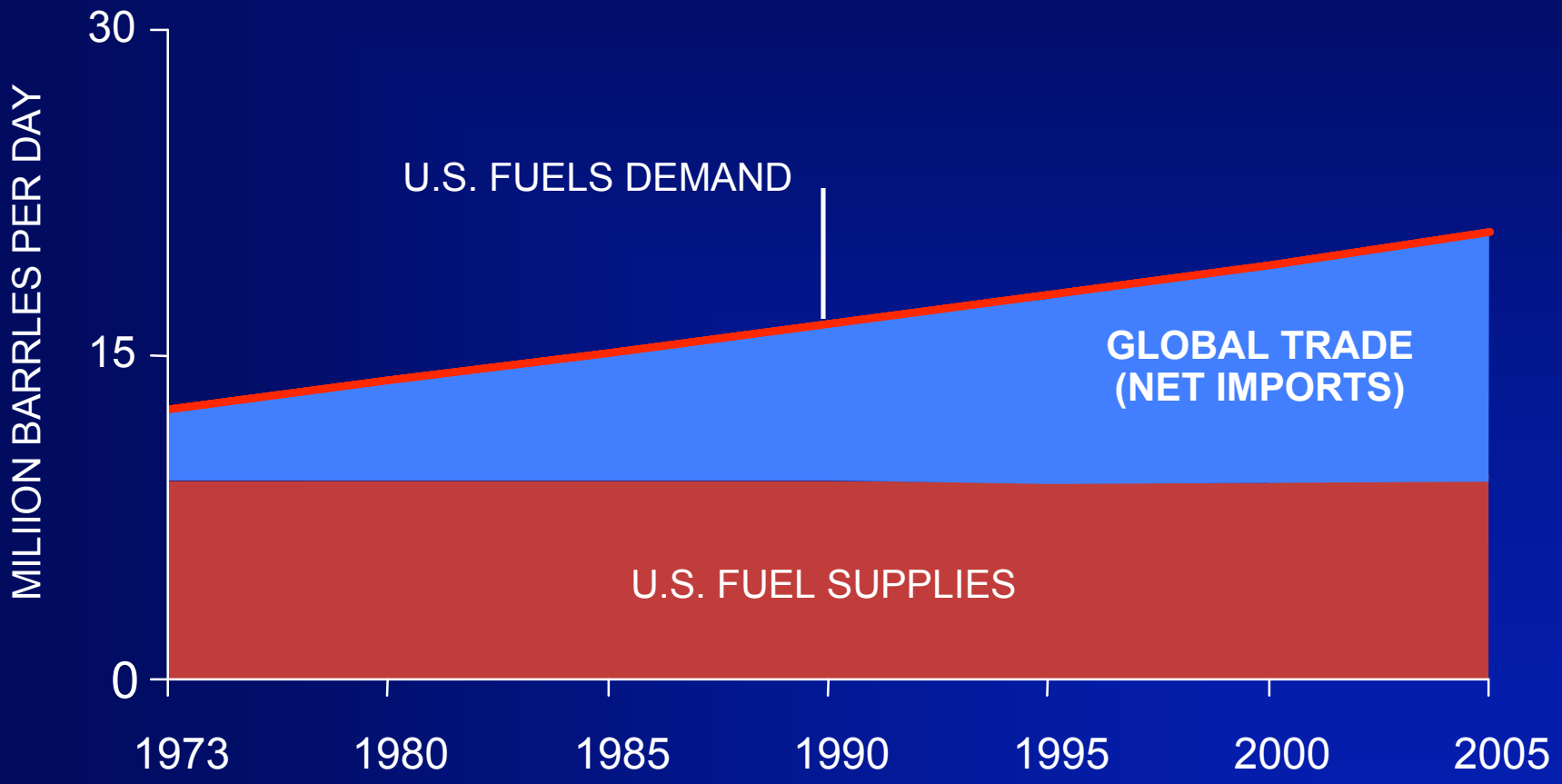
Global LNG Trade



EXPANDING FLOW TRENDS

Supply Vulnerability Zones

U.S. Historical Supply and Demand Trends

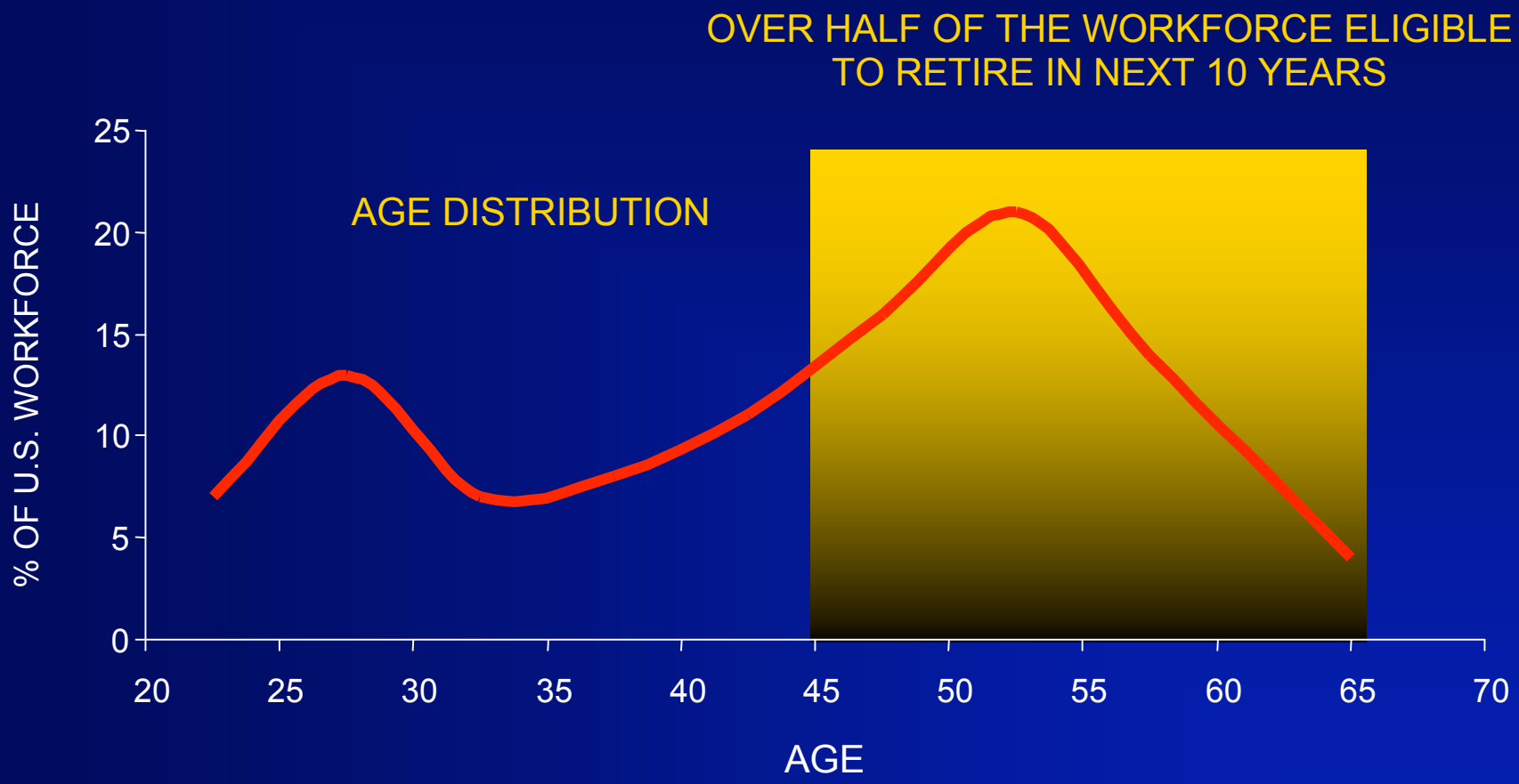


Source: EIA Reference Case / NPC Global Oil and Gas study survey.

The Hard Truth: Workforce

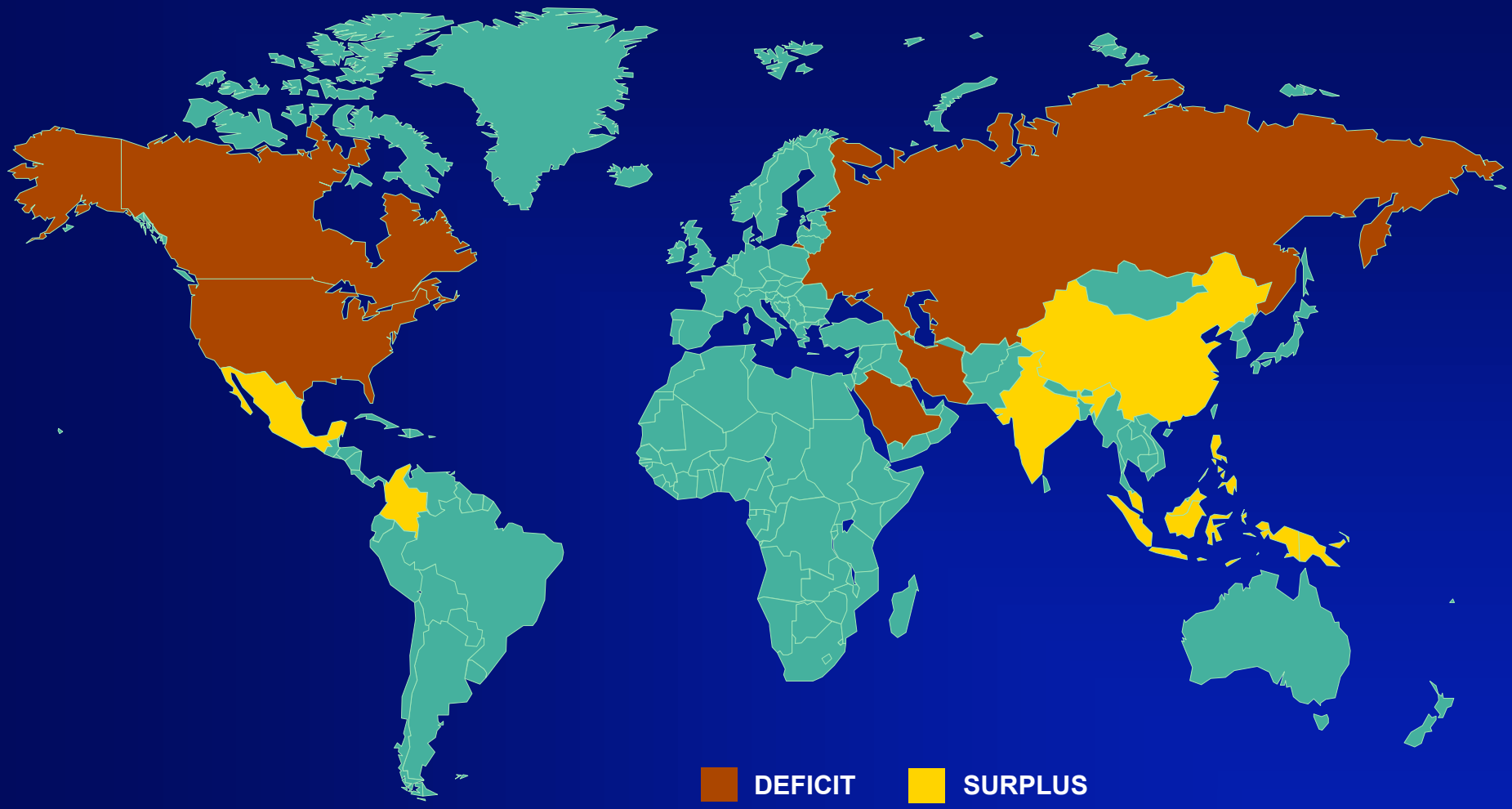
A majority of the U.S. energy sector workforce, including skilled scientists and engineers, is eligible to retire within the next decade. The workforce must be replenished and trained.

U.S. Human Resources Challenge



Source: U.S. Dept of Labor.

Regional Imbalance of Geoscience Graduates



Source: 2005 Schlumberger Business Consulting study (Annual average over next 10 years).

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.

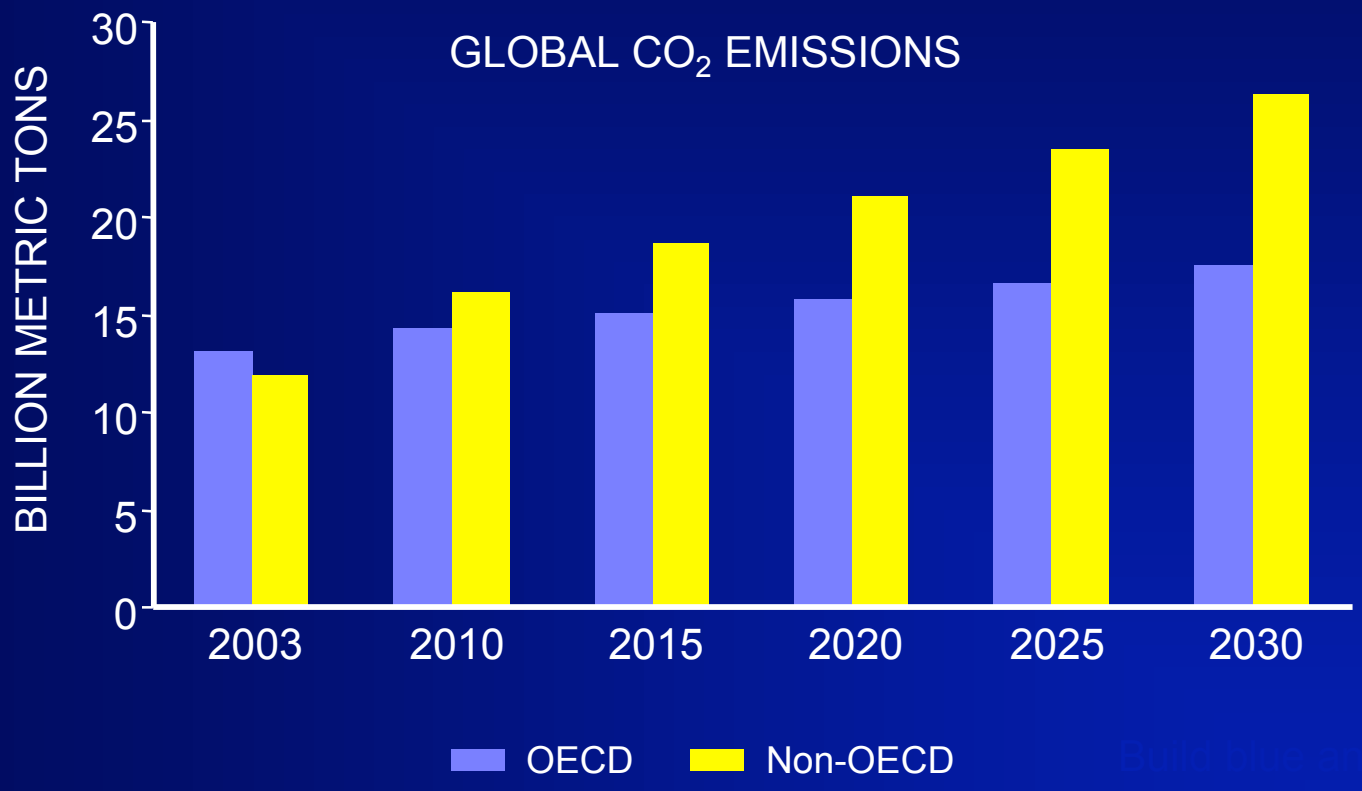
CO_2 Emission Limits Will Alter Energy Strategies

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

60% of Emissions Growth in Developing World



Build blue and then yellow

Source: EIA 2006

Carbon Mitigation

Continued use of fossil fuel in a carbon constrained world will require:

- Moderating demand by improving energy efficiency
- Developing low / no-carbon energy sources
- Implementing large scale carbon capture and sequestration

Five Core U.S. Strategies

The 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

The Five Core U.S. Strategies

Moderate Demand By Increasing Energy Efficiency

Moderate Demand Growth

Improve U.S. car and light truck fuel economy standards at the maximum rate possible by applying economic, available technology.

Moderate Demand Growth

Improve efficiency in U.S. residential and commercial sectors by encouraging states to implement and enforce more aggressive energy efficiency building codes, updated on a regular basis.

Moderate Demand Growth

Improve efficiency in U.S. industrial sector by conducting and promoting research, development, demonstration and deployment of industrial efficiency technologies and best practices.

The Five Core U.S. Strategies

Expand And Diversify U.S. Energy Supply

Expand and Diversify Supply

Reduce declines in U.S. conventional oil and natural gas production.

Increase access for new energy development.

Expand and Diversify Supply

Diversify long-term energy production

- Accelerate development of energy from biomass
- Enable the long-term environmental viability of coal for power, fuel, and feedstock
- Expand domestic nuclear capability

The Five Core U.S. Strategies

Strengthen Global And U.S. Energy Security

Promote Global and U.S. Energy Security

Integrate energy policy into trade, economic, environmental, security, and foreign policies.

Promote Global and U.S. Energy Security

Continue to develop the international energy marketplace by expanding the energy dialog with major producing and consuming nations.

Promote Global and U.S. Energy Security

Promote an effective global energy marketplace by sustaining and intensifying efforts to encourage global adoption of transparent, market-based approaches.

Promote Global and U.S. Energy Security

Assist and encourage global adoption of energy efficiency technologies through technology transfer programs.

The Five Core U.S. Strategies

Reinforce Capabilities To Meet New Challenges

Reinforce Capabilities to Meet New Challenges

Rebuild U.S. science and engineering capabilities.

Create research and development opportunities.

Reinforce Capabilities to Meet New Challenges

Improve the quality of energy data and information.

Develop a comprehensive forecast of U.S. infrastructure requirements.

The Five Core U.S. Strategies

Address Carbon Constraints

Actions to Address Carbon Constraints

Develop legal and regulatory framework to enable carbon capture and sequestration.

Actions to Address Carbon Constraints

As options are considered to reduce CO_2 emissions:

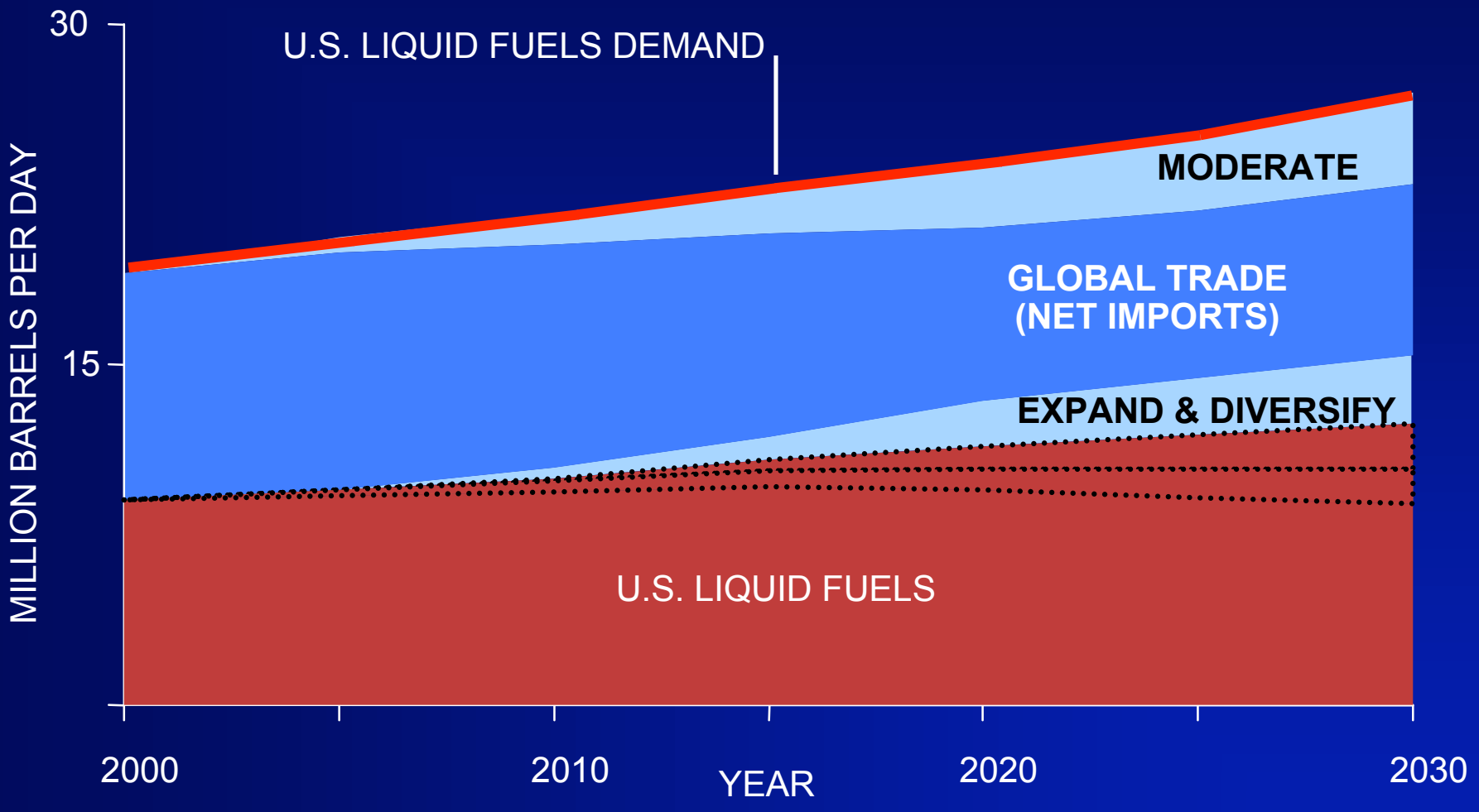
- Provide effective global framework for carbon management
- Establish transparent, predictable, economy-wide cost for CO_2 emissions

Summary

There Is No Single, Easy Solution

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

All Strategies Are Essential



Source: EIA Reference Case / NPC Global Oil and Gas study survey.

Illustrative View

Thank You

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