



Facing The Hard Truths About Energy

**A Comprehensive View To 2030
Of Global Oil And Natural Gas**

US Association of Energy Economists

Houston Chapter

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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

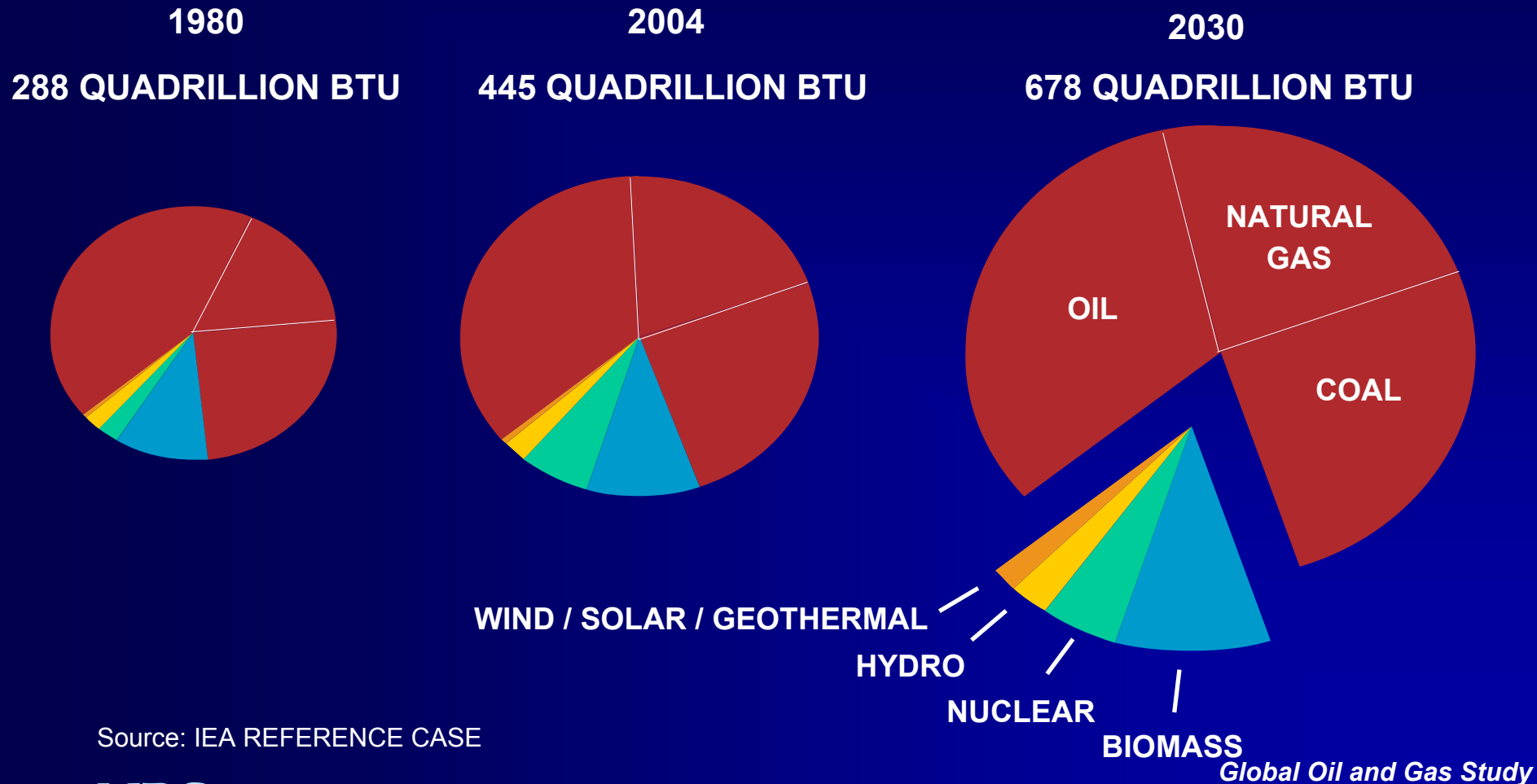
- 350 participants with backgrounds in all aspects of energy including efficiency, economics, geopolitics, environment

Technology Assessment

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

The Hard Truth: Demand

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

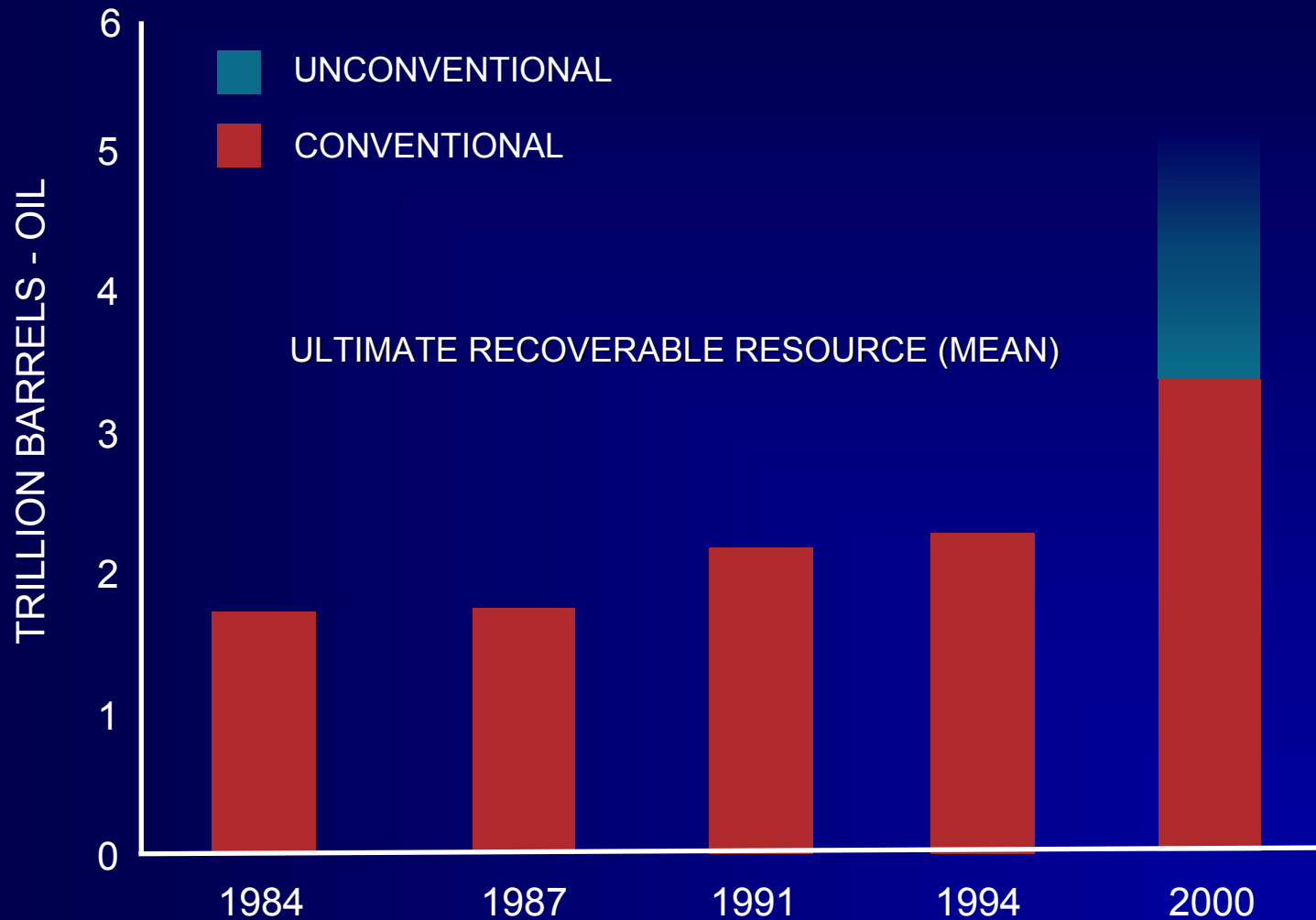


Source: IEA REFERENCE CASE

The Hard Truth: Supply

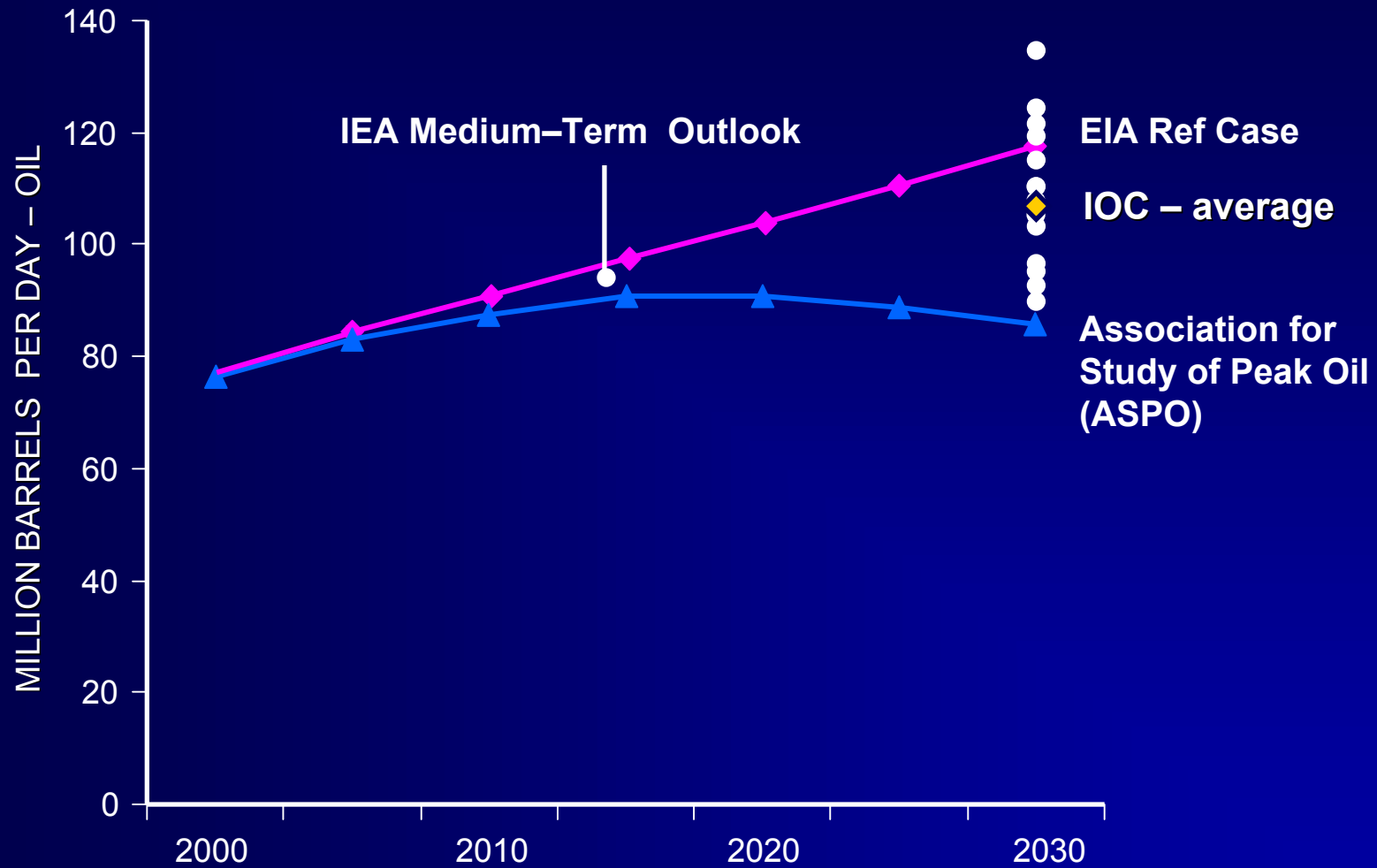
The world is not running out of energy resources, but there are accumulating risks to continuing expansion of oil and natural gas production from the conventional sources relied upon historically. These risks create significant challenges to meeting projected total energy demand.

Large Oil Resource Base



Source: USGS

Risks Reflected in Range of Production Projections

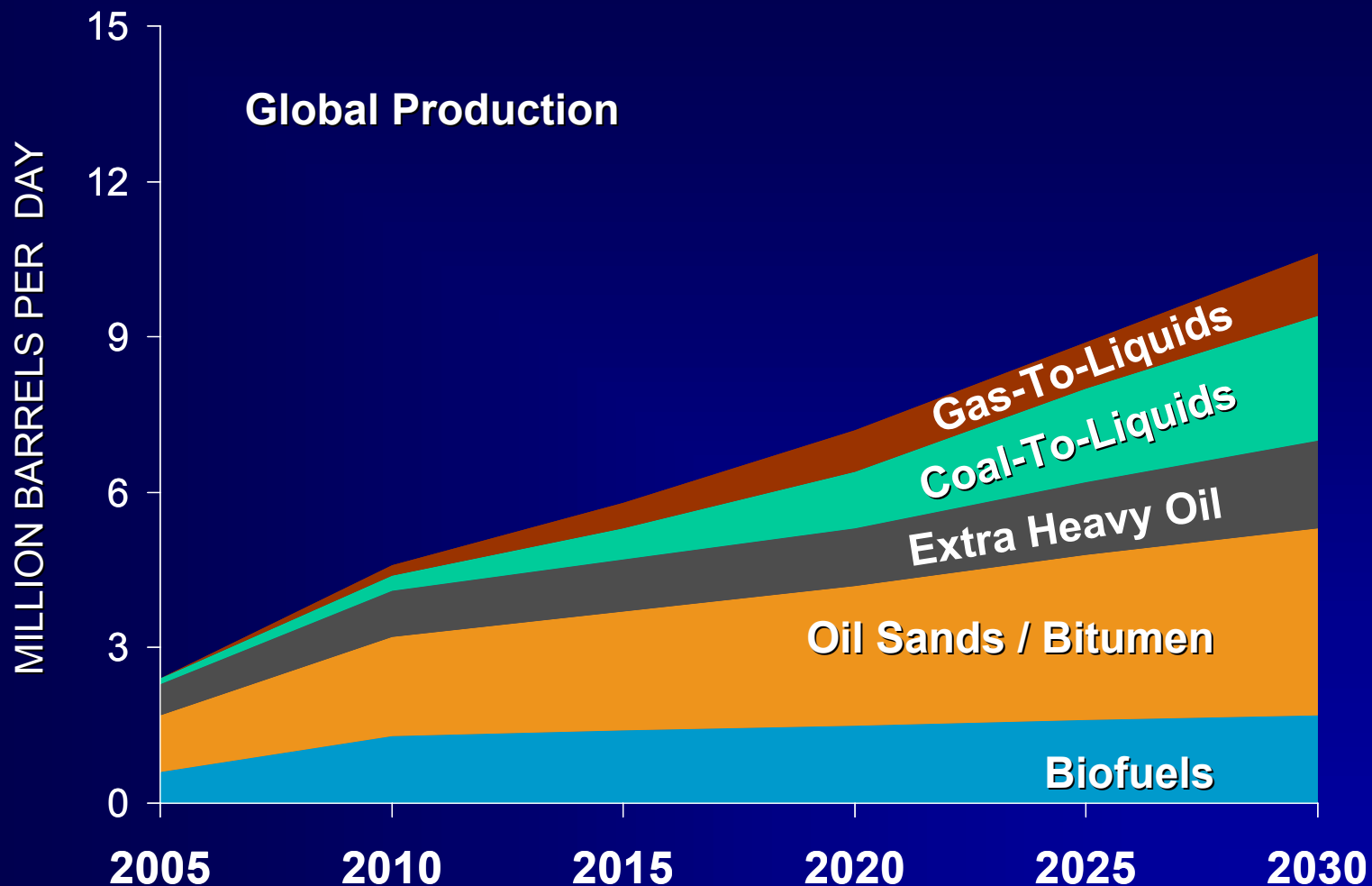


* Source: NPC Data Warehouse.

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.

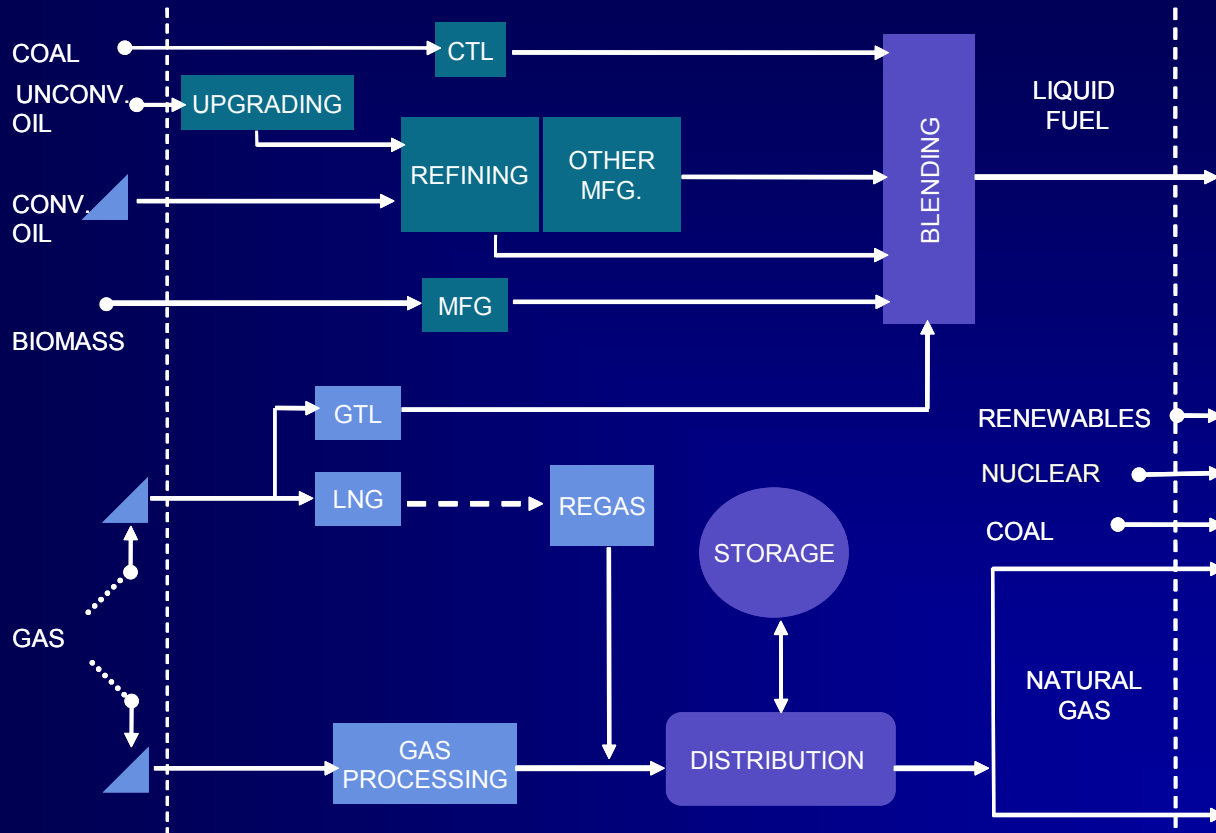
Contribution of Unconventional Liquids



Source: Data From EIA 2007 Reference.

Massive Infrastructure Investments Required

Supply

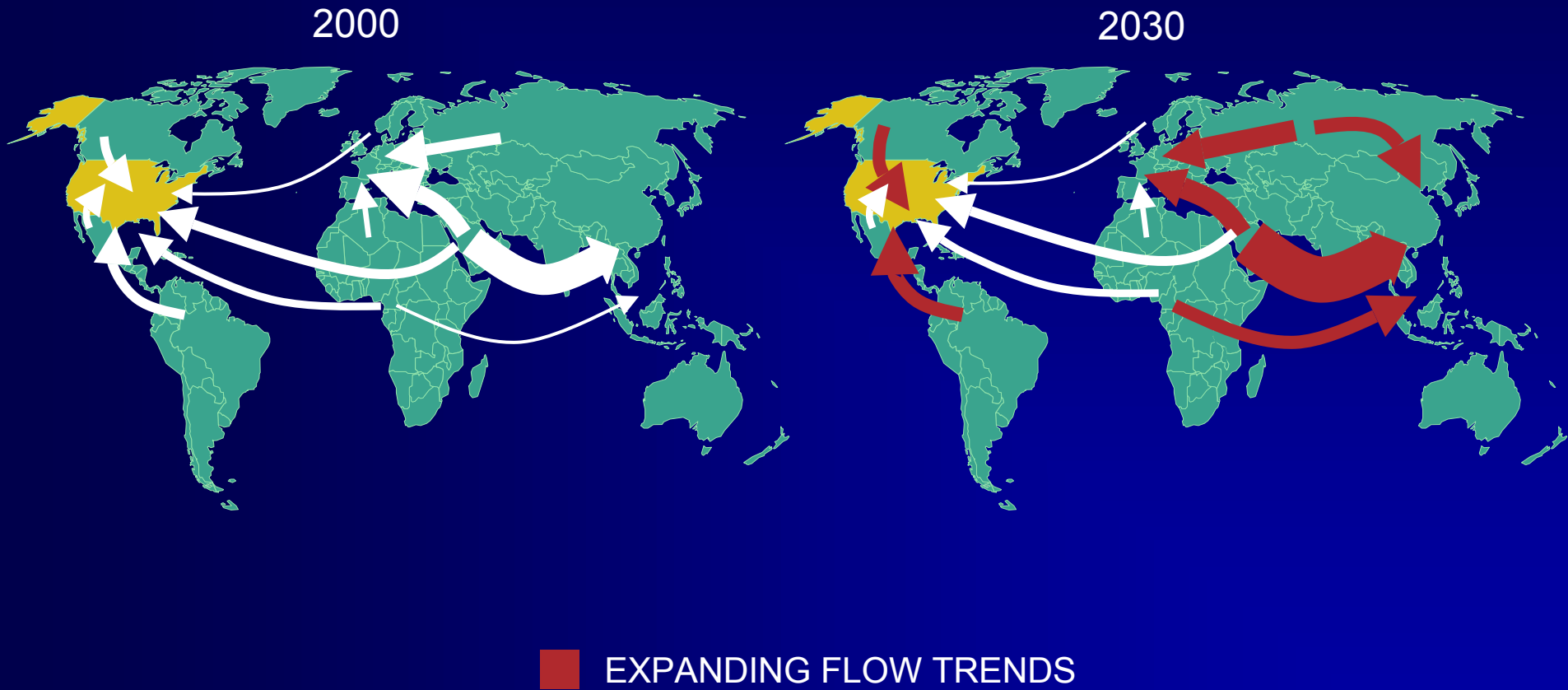


Demand

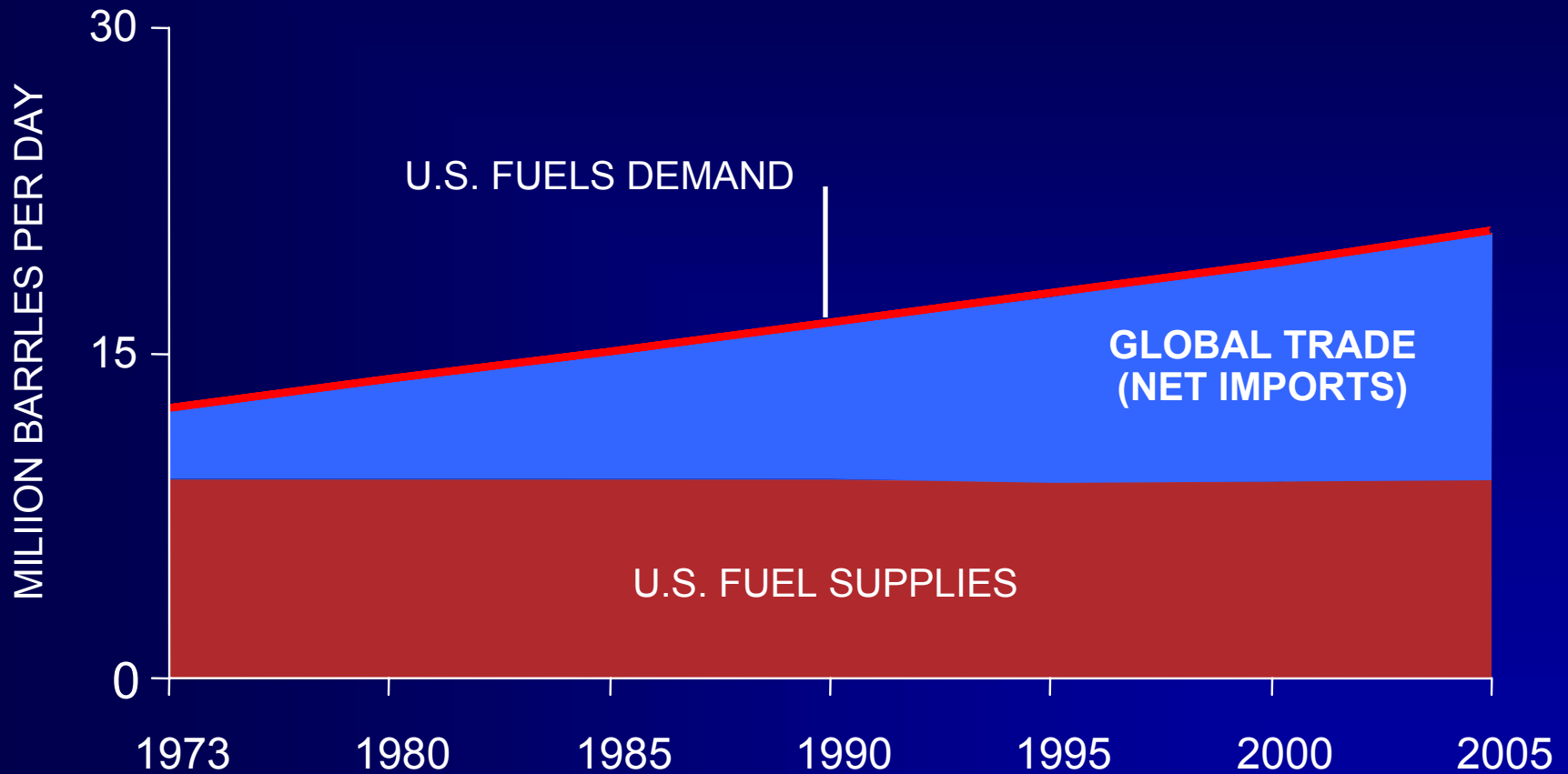
The Hard Truth: Energy Security

"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.

Global Oil Trade



U.S. Historical Supply and Demand Trends

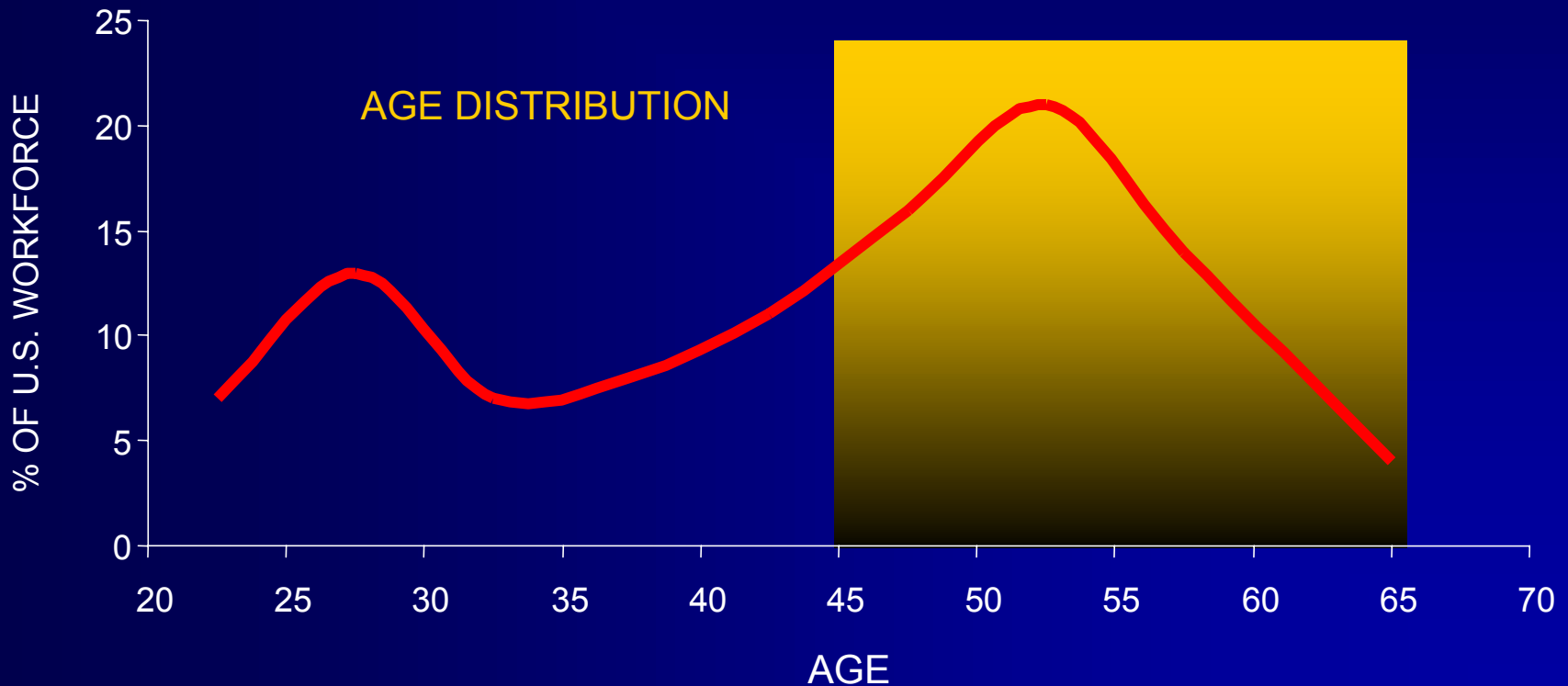


Source: EIA Reference Case / NPC Global Oil and Gas study survey.

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.

OVER HALF OF THE WORKFORCE ELIGIBLE TO RETIRE IN NEXT 10 YEARS



Source: U.S. Dept of Labor.

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.

CO₂ Emission Limits Will Alter Energy Strategies

Growing concern that climate is warming and CO₂ concentrations in the atmosphere play a role.

The challenge of significantly reducing CO₂ emissions is unprecedented and will require:

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

Technology

Technology Pipeline is Robust

- Industry spends \$6B+ on Oil and Gas related R&D
 - Achieved many dramatic technology advances
 - Much more to come from “Technology Pipeline”
 - Improved exploration tools
 - Increased recovery methods
- Alternative energy R&D investment increased to \$3B

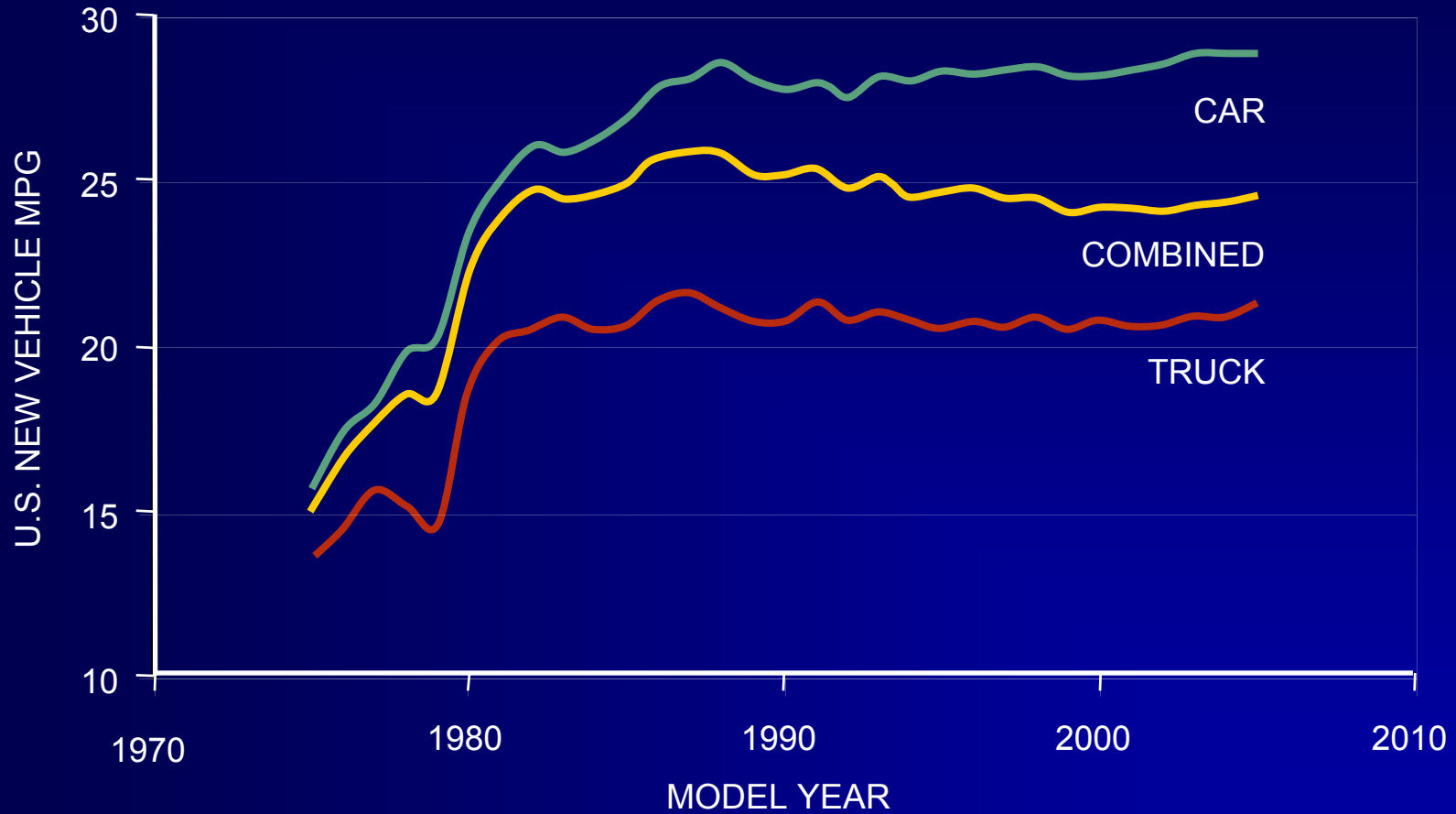
There Is No Single Easy Solution

- Technology “Concept-to-widespread-adoption” is ~16 years
- When Government enables development, technology follows
- DOE oil and gas related technology spend decreasing
 - Impacting U.S. lower 48 and universities

- Efficiency significant in supply and demand balance
 - Continued role for government standards
 - e.g., refrigeration efficiency
- Transportation fuel forecasts do not capture cross sector efficiency gains
 - e.g., light duty vehicle to rail shift
- Additional auto efficiency improvements possible
 - Implementation depends upon consumer and government actions

Efficiency Technology Historic Trends

DRAFT
Do Not Cite or Quote



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

Moderate Demand Growth

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

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

Promote Global and U.S. Energy Security

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

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

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

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

Reinforce Capabilities to Meet New Challenges

Rebuild U.S. science and engineering capabilities.

Create research and development opportunities.

Improve the quality of energy data and information.

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

Actions to Address Carbon Constraints

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

As options are considered to reduce CO₂ emissions:

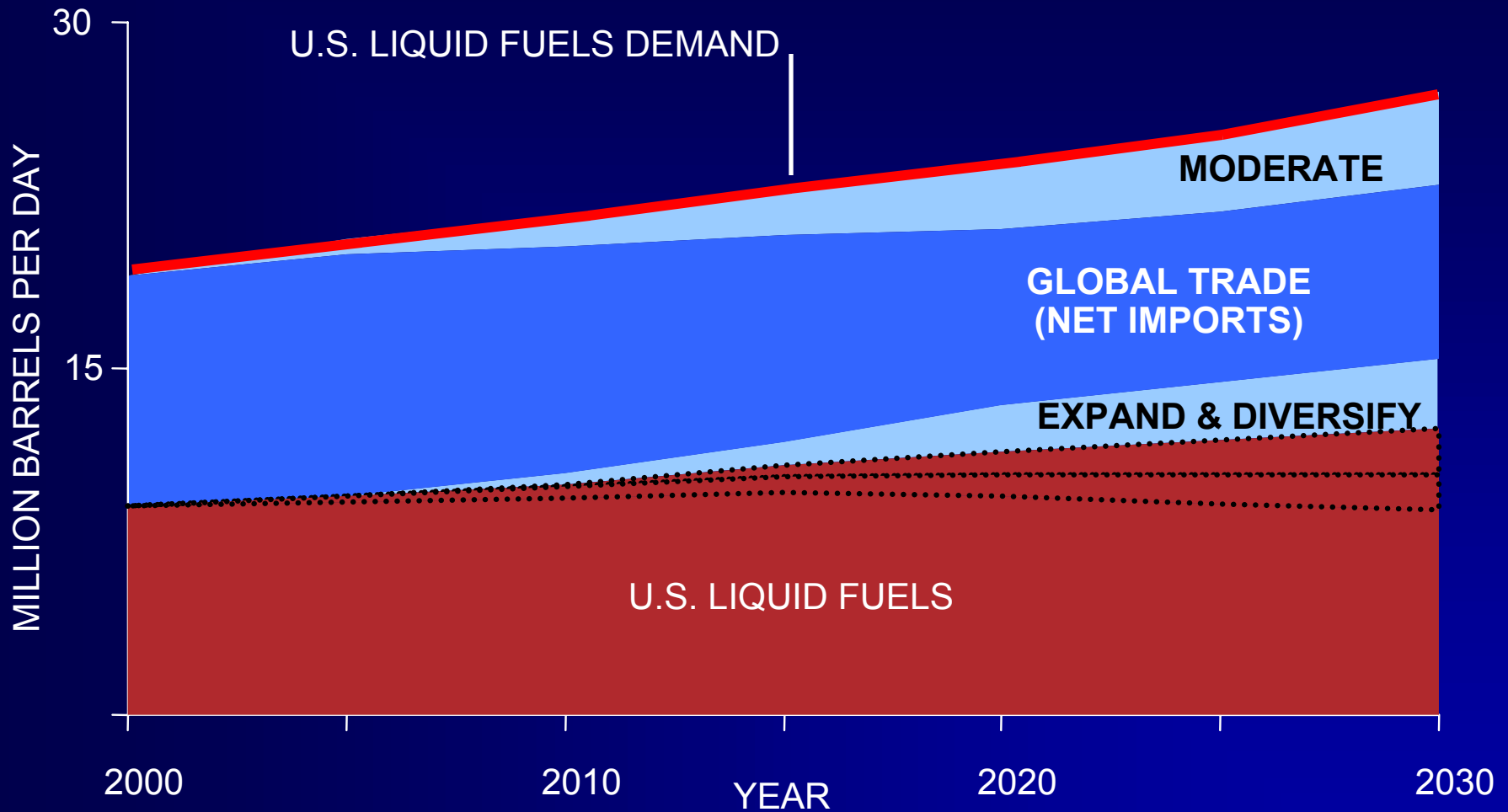
- Provide effective global framework for carbon management
- Establish transparent, predictable, economy-wide cost for CO₂ emissions

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

“Facing the Hard Truths About Energy”

***For information, please refer to the NPC Website
for a complete list of available resources:***

<http://www.npc.org>

Send your follow-up questions and comments to:

comments@npc.org