



Future Fuel Sources – Options and Opportunities

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Outline

- Global perspectives and trends in energy
- Fuel diversification and transition criteria
- Choosing the best options - nearer term and long term
- Enabling elements for change
- Future steps

Global energy perspectives

- Growing energy demand globally, especially in China, India and Latin America
- Increasing competition and investments for resources
- Developing cleaner fuels and technologies
- Improving energy efficiency
- Diversify supply – integrate sustainable resources
- Growing expectations surrounding climate change

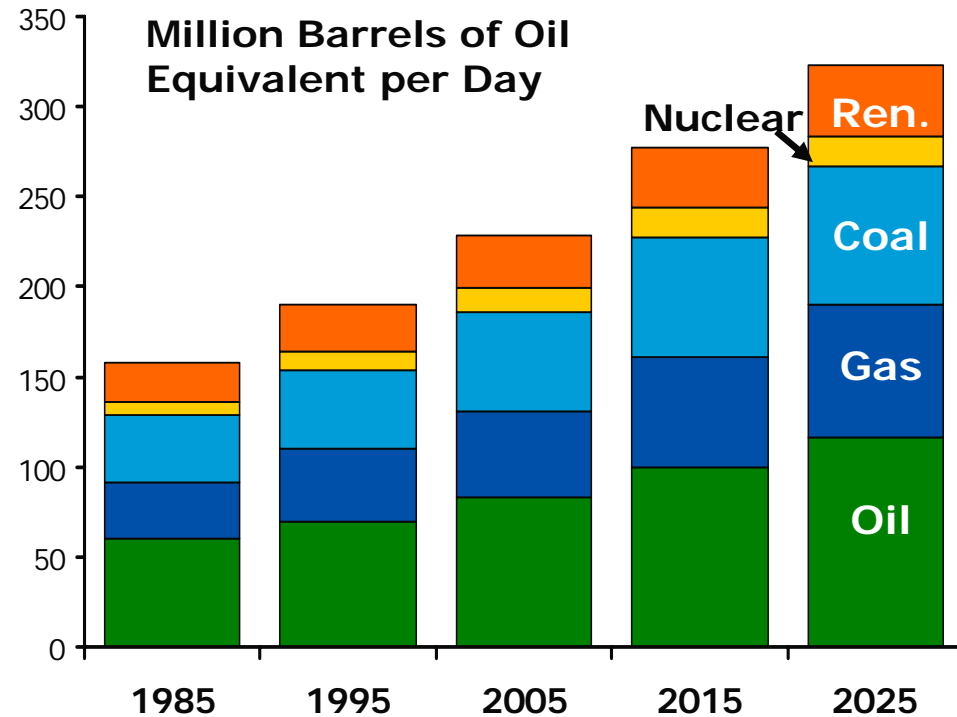


New energy equation

Through 2025

- Total world energy consumption is expected to grow by over 40%
- Global oil demand will increase 1.4% annually
- **Demand for natural gas is projected to rise at >2% annually**

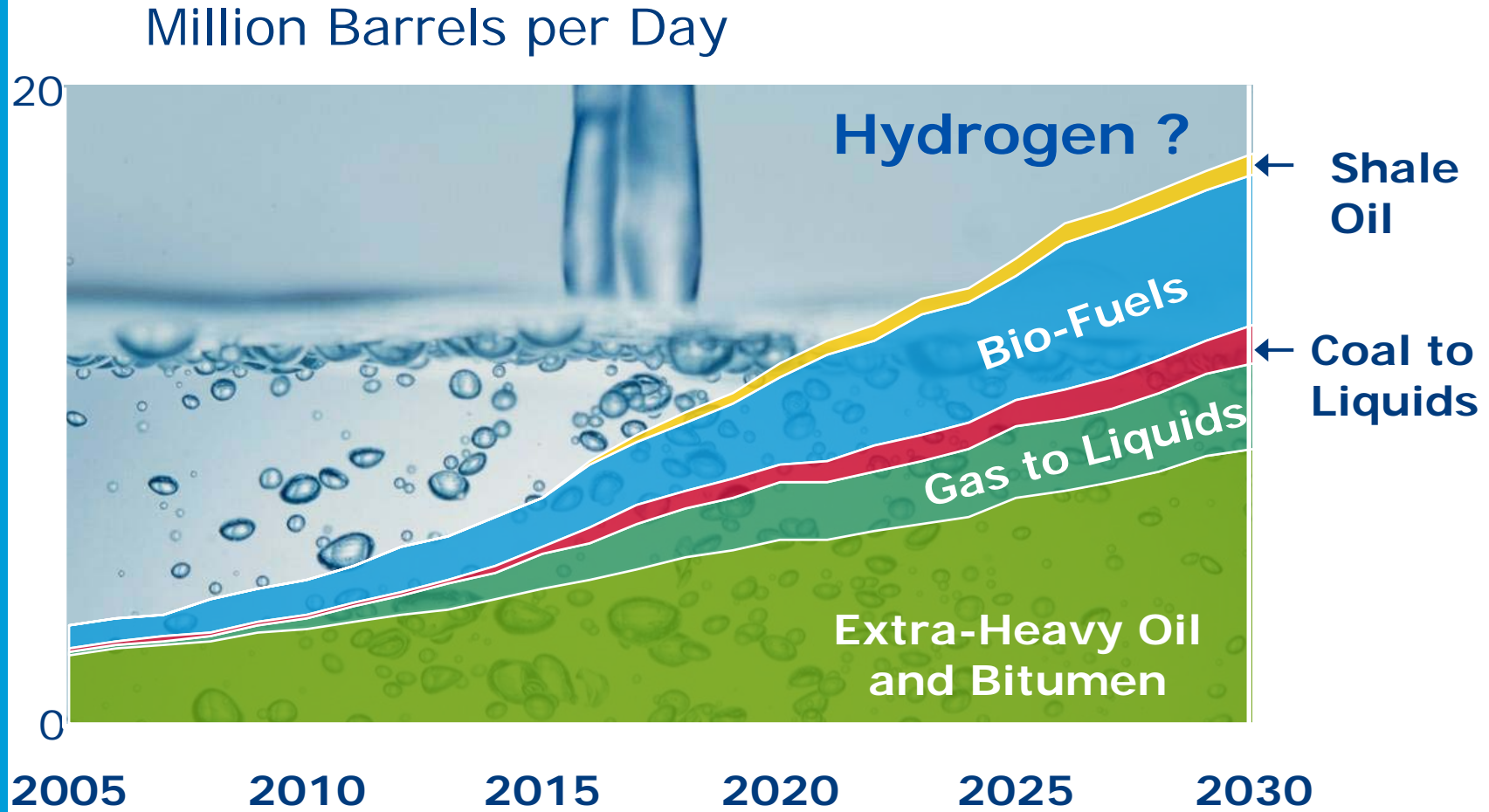
Total World Energy Consumption



Meeting increased demand

- Develop and deploy technologies that will allow us to produce hydrocarbons in complex environments such as ultradeep waters and heavy oil
- Research technologies for conversion of other heavy hydrocarbons to liquid transportation fuels
- Deployment of gas to liquids technologies
- Develop new energy sources such as biofuels and hydrogen
- Become more efficient in our energy use

Diversification of feedstock and fuel: How big will it really be? What will it be?



Switching to an alternative fuel vehicle - Three transition criteria for the customer

Energy companies will provide whatever fuels customers demand

For a customer to demand an alternative fuel vehicle, they want to see three criteria fulfilled:

- Equal or improved driving performance, safety, reliability and comfort
- Equal or lower vehicle and fuel costs
- Improved fuel economy & environmental benefits



How do alternative fueled vehicles fit into this picture?



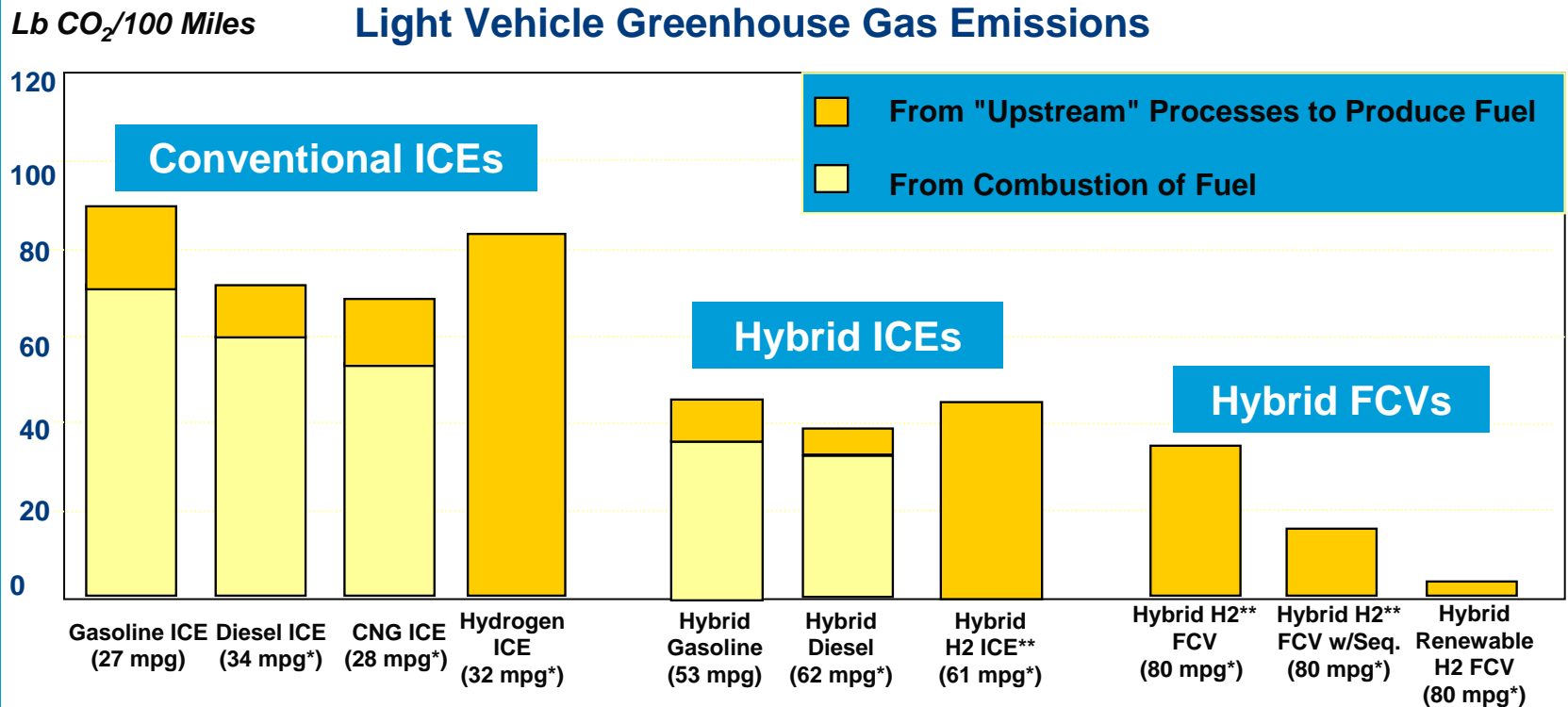
Which fuel and powertrain combinations?



Wells to wheels greenhouse gas emissions

...Also Range Of Options for Improvement; Mid Sized Car Example

For GHG mitigation, gasoline and diesel ICE-Hybrids are also strong competition for Alternative Fueled Vehicles...



*Gal. Gasoline BTU Equiv.

**Compressed H₂ stored on board at 5000 psi; "w/Seq" means CO₂ from central H₂ production is sequestered. H₂ reformed from natural gas unless noted otherwise.

Finding and encouraging the best options

...Enable the winners, don't pick them

There is no silver bullet

- Issues of dependency, reliability of supply, environmental footprint and cost apply to all fuels to some degree

All economic fuels - plus conservation - will be needed to meet future demand

- The government should support conservation and technology development
- Market-based competition amongst technologies should not be inhibited
- Consumers have the means to conserve and are beginning to respond

Allow time for technology to advance

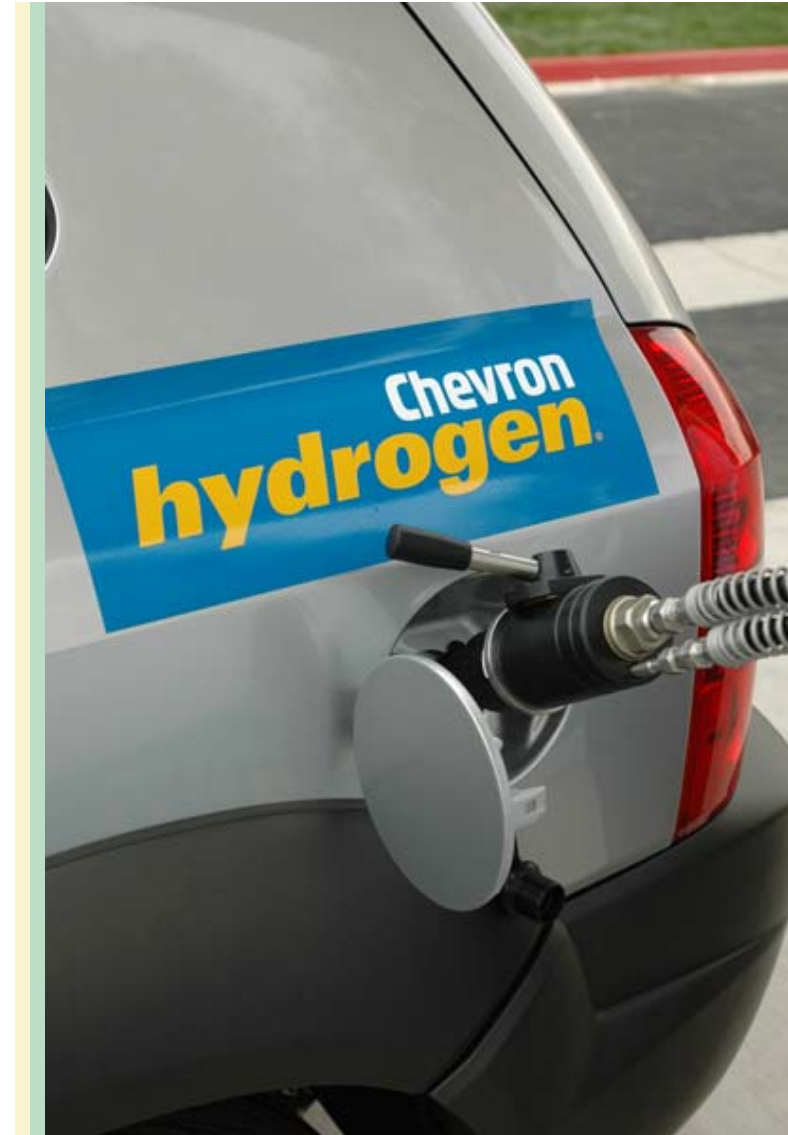
- New technologies must offer tangible benefits to consumers and real-world wells-to-wheels benefits to the environment

Discussions such as this forum are good way to advance

- Progress on new technologies is like a journey, with lots of unknowns

Chevron hydrogen strategy

- Connect hydrogen as an extension of core energy businesses
- Extend leadership in fuel processing and infrastructure development
- Influence the development of technologies, standards and regulations
- Focus on stationary, fleet and transit systems – no retail



Distributed hydrogen production





California E85 Demonstration Program

- Demonstration program to learn more about E85 and how it works in practical applications
- Collaborative project with the State of California, General Motors and Pacific Ethanol Inc.
- Evaluate E85 performance, efficiency and environmental issues over a one-year period, using California-formulated fuel
- Provide E85 to the Caltrans test fleet of flex-fuel vehicles
- Two to three locations
- Provide dispensing and storage capabilities

Galveston Bay Biodiesel

Chevron invested in GBB, a Texas-based start up

- One of first large-scale biodiesel production facilities
 - 25 MM gal/yr initial production
 - Ability to scale up to 100 MM gal/yr
- Initially soy feedstocks
- Targeting marine, commercial, trucking and industrial markets in the Galveston and Houston metropolitan areas



Collaboration with Georgia Tech

- Strategic research alliance to pursue advance technology aimed at making cellulosic biofuels and hydrogen viable transportation fuels
- Chevron contributing up to \$12 million over five years
- Research focus
 - production of cellulosic biofuels
 - understanding the characteristics of biofuel feedstocks
 - developing regenerative sorbents
 - improving sorbents used to produce high-purity hydrogen



Future steps

As a major energy company, we will:

- Provide analysis and experience on the full range of transportation fuel options to address environmental issues
- Share our experience in addressing issues involving GTL, biofuels, hydrogen and their infrastructure
- Pursue commercial opportunities in advanced fuels
- Participate in appropriate demonstrations of technology

Chevron is committed to:

- Investing in promising innovative energy technologies
- Supporting flexible and economically sound policies that protect the environment
- Increasing energy efficiency and reducing Greenhouse Gas Emissions

