

# *FutureGen*

## Coal-to-Hydrogen for Transportation



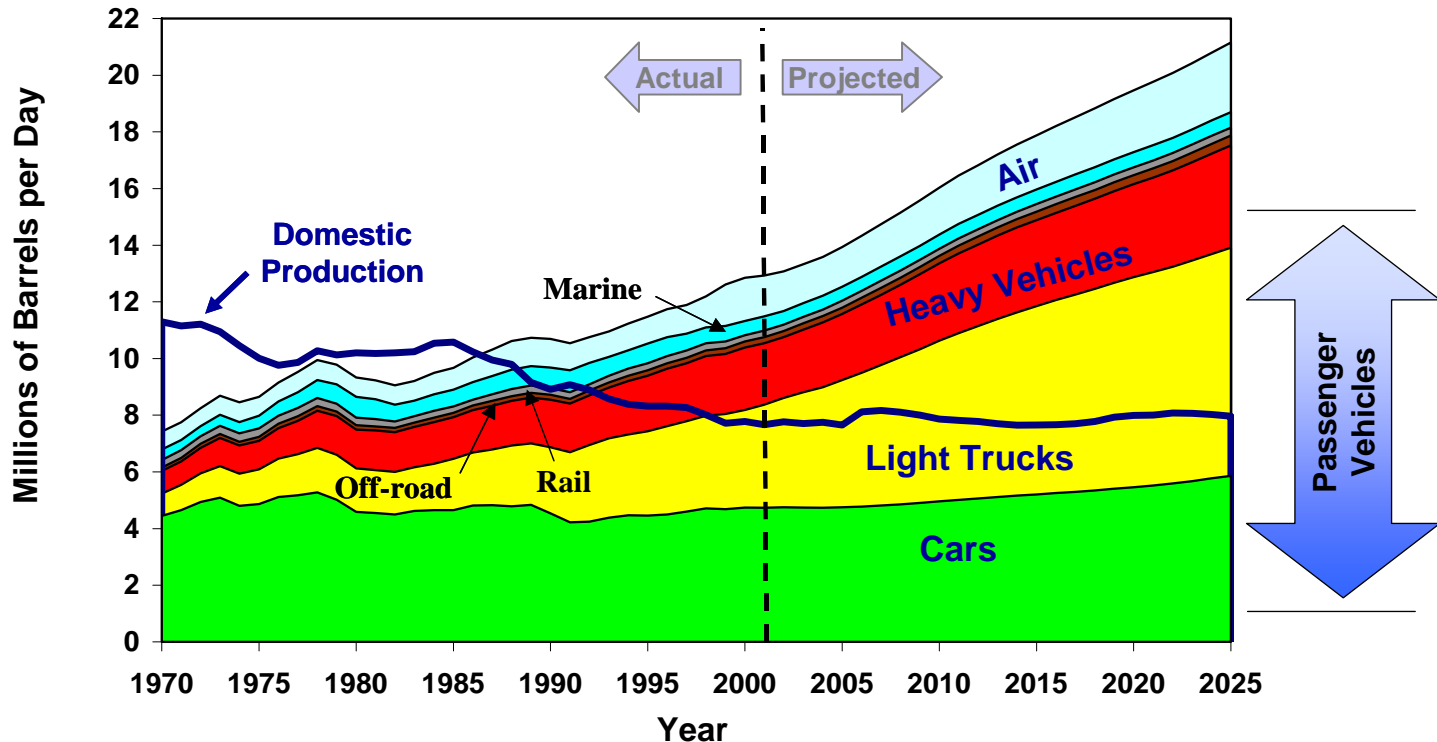
*Presented at:*  
*“Getting There from Here” –*  
*Energy Panel*

*By:*  
*Mike Eastman, FutureGen*  
*Technology Manager*  
*University of Charleston*  
*March 2, 2004*

National Energy Technology Laboratory



# U.S. Energy Dependence is Driven By Transportation



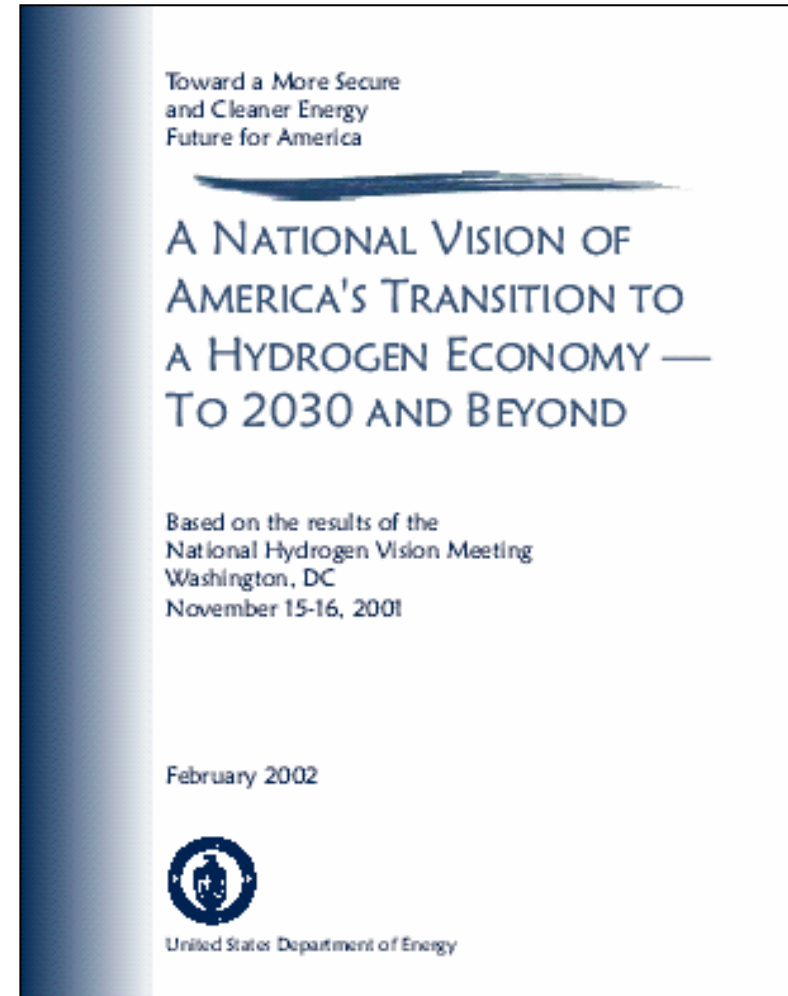
Source: Transportation Energy Data Book: Edition 22, September 2002,  
and EIA Annual Energy Outlook 2003, January 2003

- Transportation accounts for 2/3 of the 20 million barrels of oil our nation uses each day.
- The U.S. imports 55% of its oil, expected to grow to 68% by 2025 under the status quo.
- Nearly all of our cars and trucks currently run on either gasoline or diesel fuel.

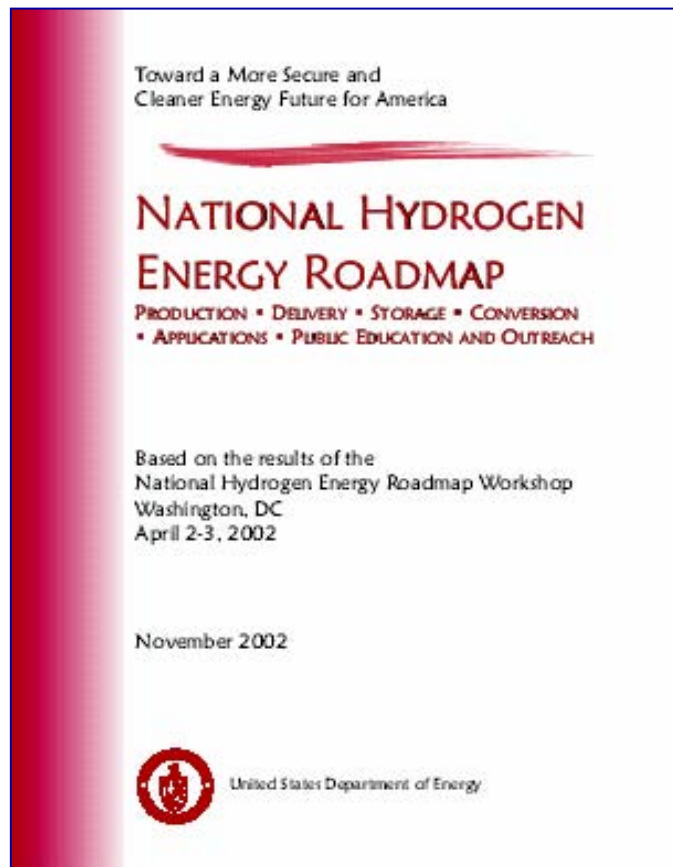
# National Vision of the Hydrogen Economy

**“Hydrogen is America’s clean energy choice.**

**Hydrogen is flexible, affordable, safe, domestically produced, used in all sectors of the economy, and in all regions of the country.”**



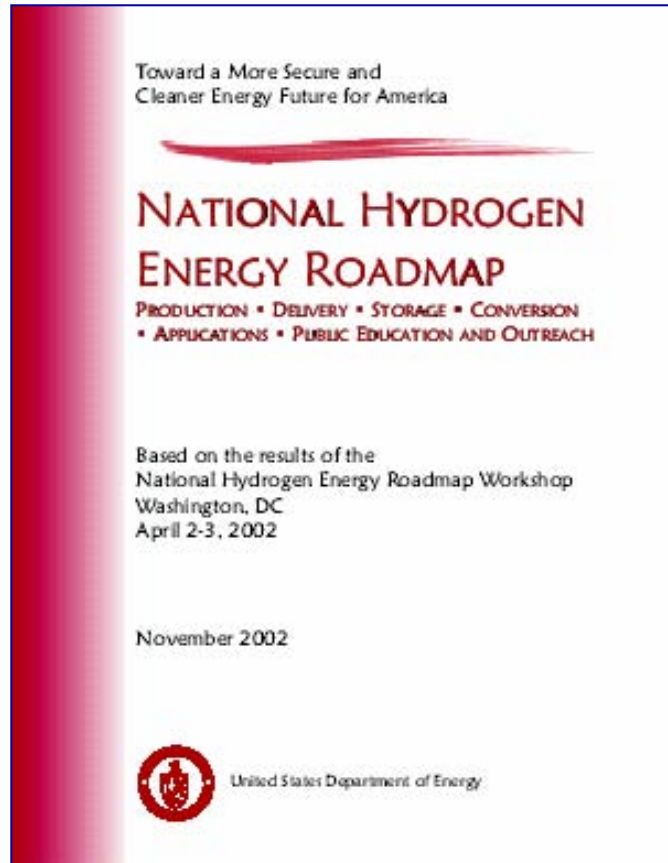
# National Hydrogen Energy Roadmap



**“At the Department of Energy we’re not just talking about the hydrogen economy, we’re working to make it a reality. This Roadmap provides a framework that can make the hydrogen economy a reality.”**

**Energy Secretary Spencer  
Abraham, November 12, 2002**

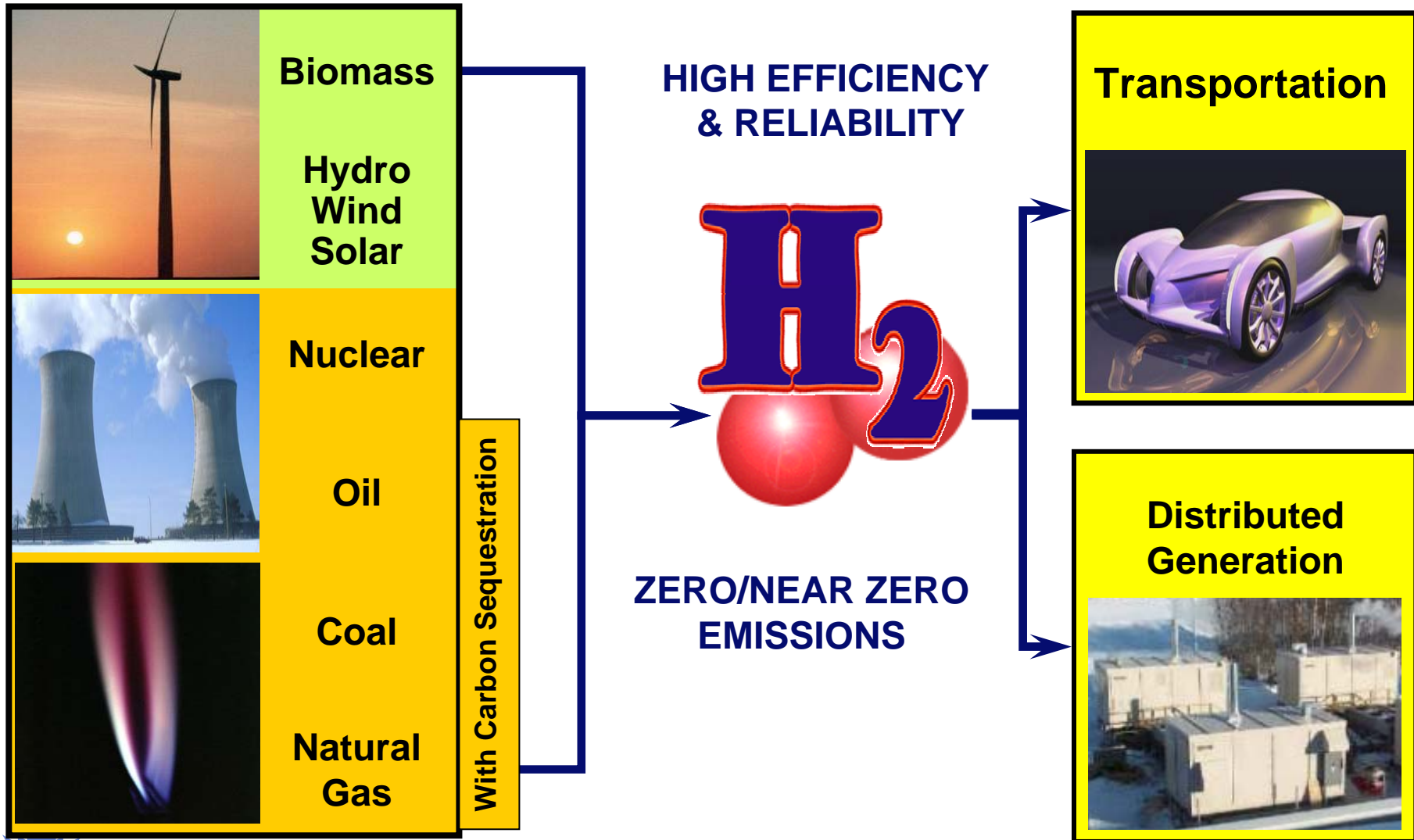
# National Hydrogen Energy Roadmap



**“In transportation applications, reformer research should be directed to enable near-term end use of hydrogen prior to the development of a nationwide hydrogen delivery system.”**

**Short-Term Fuel: Gasoline & Diesel  
Long-Term Fuel: Hydrogen  
Pages 30 and 31**

# Hydrogen Production/Hydrogen Use Options



# President's Hydrogen Fuel Initiative Complements FreedomCAR

- Freedom from foreign petroleum dependence
- Freedom from pollutant and carbon dioxide emissions
- Freedom for Americans to drive where they want, when they want, in the vehicle of their choice
- Freedom to obtain fuel affordably and conveniently



*On January 9, 2002, Energy Secretary Abraham announced the FreedomCAR Partnership*



**FreedomCAR and Fuel  
Initiative**



# FutureGen: A Presidential Initiative

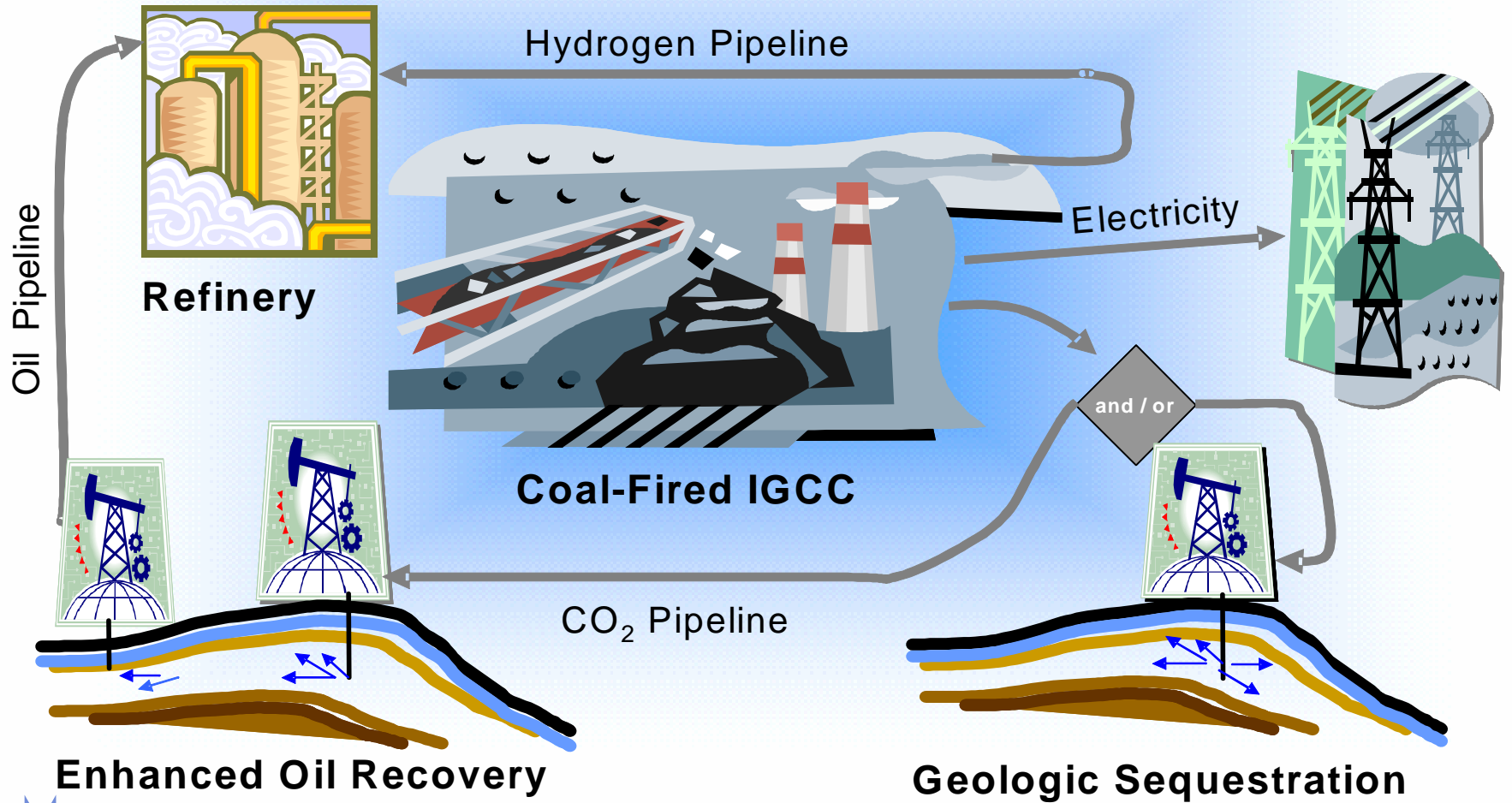
**One-billion-dollar, 10-year demonstration project to create world's first coal-based, zero-emission electricity and hydrogen plant**  
*President Bush, February 27, 2003*

- Produce electricity and hydrogen from coal using advanced technology
- Emit virtually no air pollutants
- Capture and permanently sequester CO<sub>2</sub>

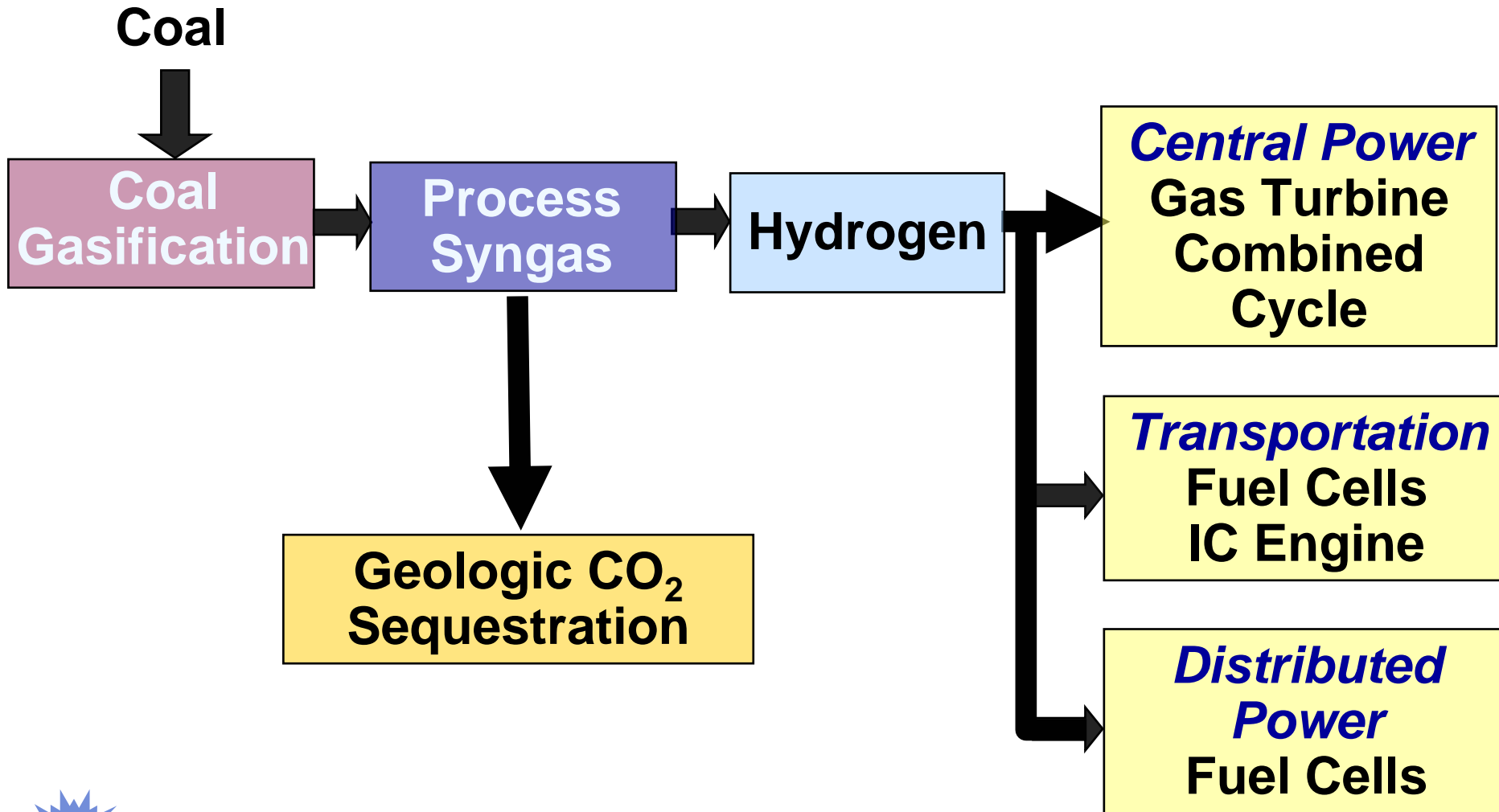




# FutureGen Concept

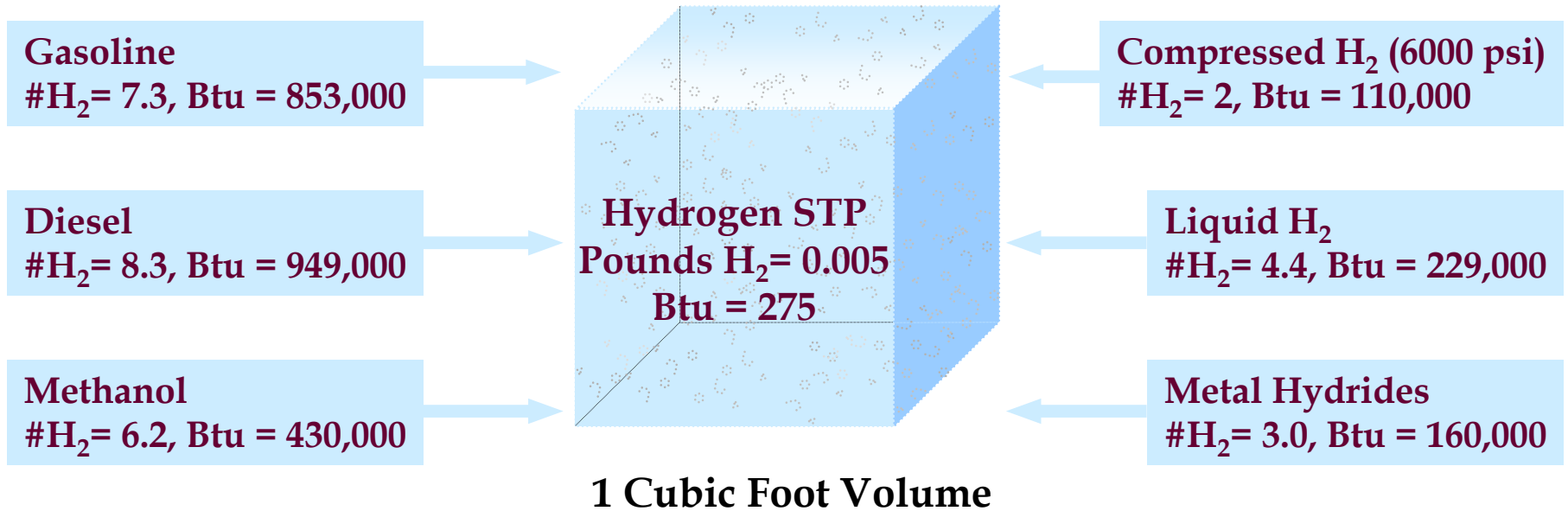


# IGCC in FutureGen

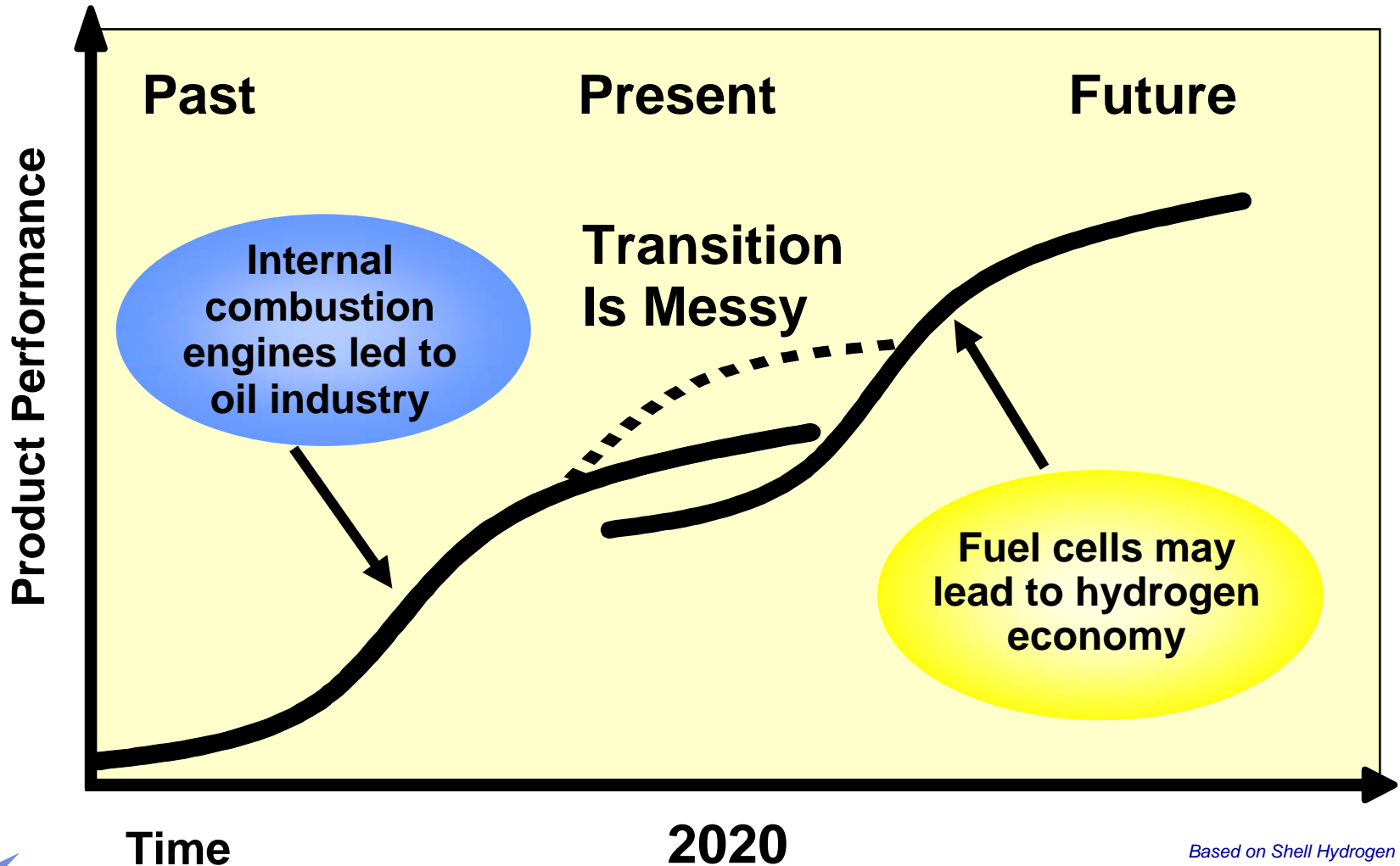


# Hydrogen Storage

## *Safe Energy Density Issues*



# Transition to New Energy Economy Presents Challenges



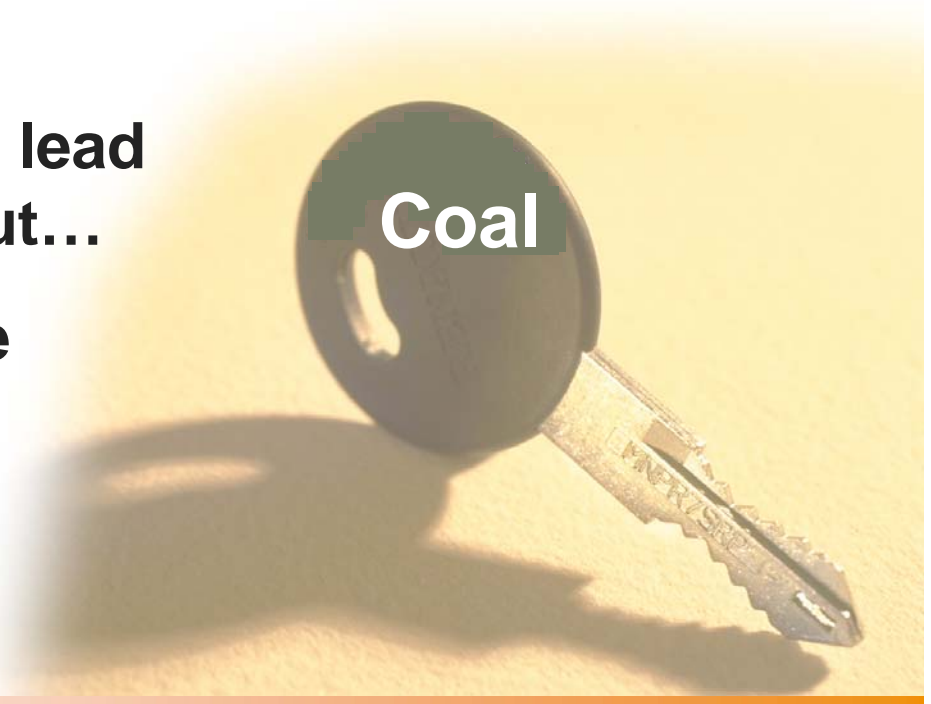
# West Virginia Participation/Benefits

- **Hydrogen economy is a long way off but...**
  - A national priority
- **High interest in research activities**
  - Universities participate in DOE R&D
  - WV companies participate in DOE R&D
- **Carbon sequestration-Regional Partnerships**
- **Large-scale research**
  - *FutureGen*
  - Deployment testing (clean fleets...clean cities)
- **Coal resource a national treasure**



# Closing Comments

- **Coal must play a key role to secure a healthy economy**
  - Is recognized in Presidential-level initiatives; Climate Change, FutureGen, Hydrogen, Sequestration
  - Coal can play an important role in a potential future carbon-constrained world
- **Coal-based systems can lead to hydrogen economy but...**
- **Technical challenges are significant; secure and affordable energy future**
  - Research is key



# For More Information...

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