

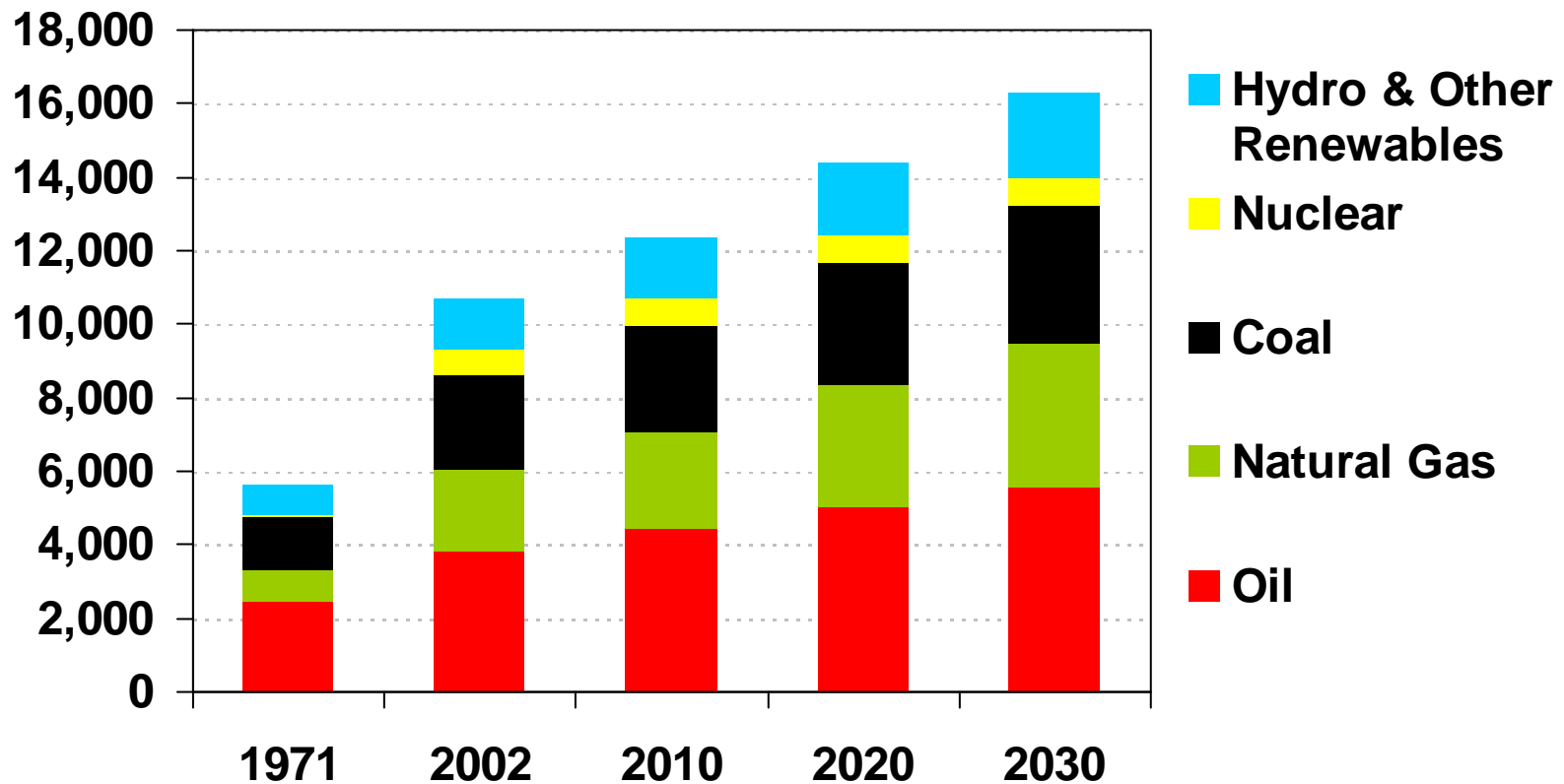
Transportation Fuels

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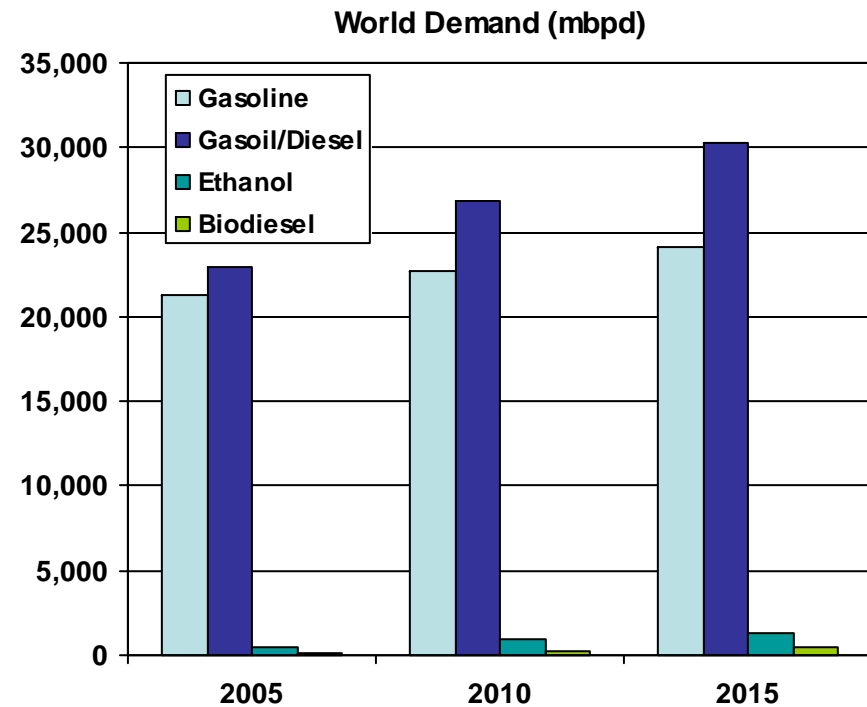
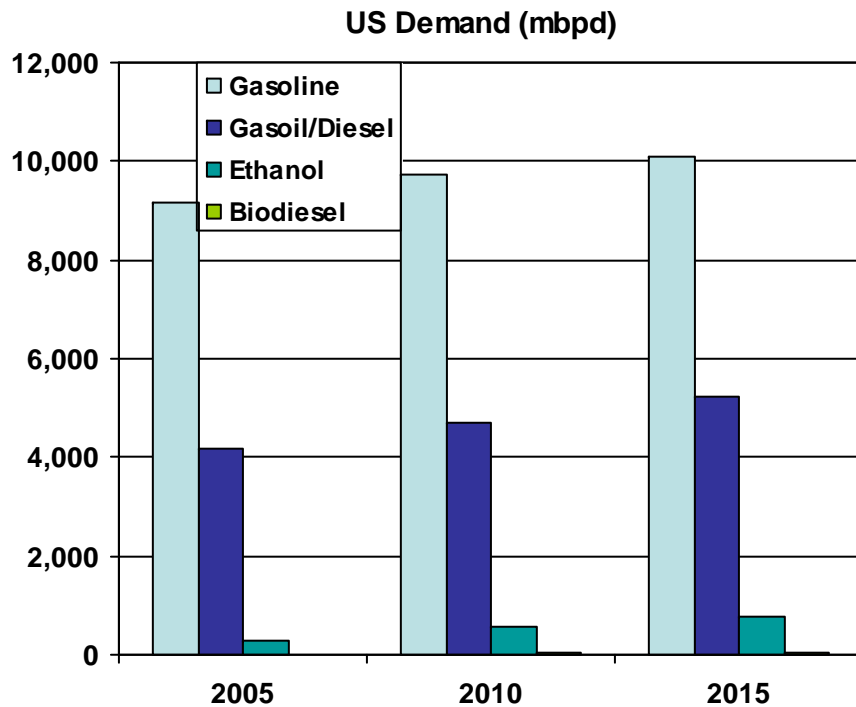
ConocoPhillips

World Energy Demand Outlook



- Fossil fuels will still have over 80% market share
- Natural gas is gaining share
- Nuclear losing share
- Renewable sources only 14% share by 2030

The Fuels Market



Source: Purvin & Gertz – Gasoline & Gasoil/Diesel
CERA – Ethanol & Biodiesel – includes US, Europe and Brazil

Renewable Fuel Drivers

- U.S. Energy Policy Act of 2005
 - 7.5 billion gallons renewable fuel use in 2012
 - Renewable fuel is fuel from biomass used to reduce fossil fuel used in motor vehicles
- EU Directive
 - 5.75% renewable in transportation fuel by 2010 on an energy basis

U.S. Fuels

	Volume, Billion Gal	Relative Capex	Relative Opex
Gasoline + Diesel	198 Approximation of EIA data	1	1
Ethanol	4.2 Renewable Fuels Assoc	3-5x	5-12x
Biodiesel	0.075 National Biodiesel Board	4-6x	4-9x

Product Comparison

- EtOH vs. Gasoline

- Octane 

- Fuel Economy 

- Infrastructure 

- Emissions Impact

- VOC 

- NOx 

- CO 

- Refinery Impacts (BOB Volatility) 

- Quality 

 Positive

 Variable


 Negative

Product Comparison

- Diesel vs. Biofuel

- Cetane 

- Lubricity 

- Cold Flow (CFPP) 

- Emissions

- NOx 

- PM 

- HC 

 Positive

 Variable

 Negative

Distribution expense  (Biodiesel Only)

Quality  (Biodiesel Only)

Food vs Fuel

- Oils
 - US # 2 40 B gallons - All oils could make small percentage
 - Germany biodiesel = oil crop today
 - Palm oil – sustainable?
- Carbohydrates
 - E 10 would take ~ 50% of corn market (x DDG credit)
 - World sugar market price increase?
 - WTI Link?
- Or is Biomass the only way to large volumes
 - What happens to oil/carbohydrate based fuels post biomass?

Or does transportation electrify?

- Hybrid
 - Mileage impact maximum during stop and go
 - Buyers remorse vs Sticker EPA delaying pay-back
 - Commercial applications look potentially attractive
 - New battery and ultra-capacitor technologies commercializing
- Plug In Hybrid
 - Large Impact on city driving with 50 mile range
 - Li-Ion batteries may further enable commercialization
- Fuel Cells
 - Advances continue, but most see impact post 2025
 - Transition looks ominous

Let the market decide

- Mandates cause problems
 - Minnesota's biodiesel transition
- Market Distortions drive sub-optimal solutions
 - Supply/Demand imbalances lead to undesired pricing changes
 - E85 CAFÉ methodology
 - Small manufacturers supported (rural jobs) irrespective of large plant efficiency gains
- Focus on the feedstock not the molecule
 - Ethanol and FAME support may delay introduction of better, more cost effective solutions