The Outlook for Energy: A View to 2040

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May 5, 2015

Council for Chemical Research Annual Meeting Alexandria, VA

This presentation includes forward-looking statements. Actual future conditions (including economic conditions, energy demand, and energy supply) could differ materially due to changes in technology, the development of new supply sources, political events, demographic changes, and other factors discussed herein and under the heading “Factors Affecting Future Results” in the Investors section of our website at www.exxonmobil.com. The information provided includes ExxonMobil’s internal estimates and forecasts based upon internal data and analyses as well as publicly-available information from external sources including the International Energy Agency. This material is not to be used or reproduced without the permission of Exxon Mobil Corporation. All rights reserved.
Global Progress Drives Demand

Population
Billion

GDP
Trillion 2010$

Energy Demand
Quadrillion BTUs

*Mexico and Turkey included in Key Growth countries
Electricity Generation Leads Growth

Primary Energy Demand by Sector
Quadrillion BTUs

Electricity Generation
Industrial
Transportation
Res/Comm

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Transportation
Transportation Demand

Sector Demand
MBDOE

- Rail
- Marine
- Aviation
- Heavy Duty
- Light Duty

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Technologies for Light Duty Transport

technologies for fuel production

shorter-term
- energy efficiency
- flare reduction
- cogeneration

longer-term
- second generation bio-fuels
- Carbon Capture and Storage (CCS)

technologies for consumers’ use of fuel

shorter-term
- conventional vehicle technology improvements
- advanced vehicles – hybrid, advanced diesel, CNG

longer-term
- breakthrough vehicles – fuel cell, PHEV/EVs, HCCI

well-to-wheels basis

Production
20% GHG/mile

Consumers’ use
80% GHG/mile

WTW: US Basis, Argonne National Lab, 2005
Light Duty Vehicles

Fleet by Type

Million

- Elec/Plug-in/Fuel Cell
- Full Hybrid
- Natural Gas & LPG
- Diesel
- Gasoline

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Heavy Duty Transportation

Heavy Duty Demand by Region
MBDOE

Heavy Duty Demand by Fuel
MBDOE

*Mexico and Turkey included in Key Growth countries

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Industrial
Chemicals Demand Sees Significant Growth

**By Sector**

- **Fertilizer**
- **Steam Cracking**
- **Other Chemicals**

**Ethylene Production**

- Rest of World
- Asia Pacific
- North America

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Chemicals Demand Grows Globally

By Sector
- MBDOE
- Steam Cracking
- Other Chemicals
- Fertilizer

By Region
- MBDOE
- Asia Pacific
- Africa
- Middle East
- Russia/Caspian
- Latin America
- Europe
- North America

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Chemical Feedstocks Vary Among Regions

North America
MBDOE

Asia Pacific
MBDOE

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Heavy Industry Demand

**Heavy Industry by Region**
Quadrillion BTUs

- Rest of World
- Key Growth
- India
- China
- OECD*
- United States

**Heavy Industry by Fuel**
Quadrillion BTUs

- Oil
- Gas
- Coal
- Biomass
- Elec/Heat

*Mexico and Turkey included in Key Growth countries

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Electricity Generation
Electricity Demand

**Electricity Demand**

Thousand TWh

- Improved Standard of Living
- Population Growth
- Industrial Growth
- Base Demand

**Electricity Demand by Region**

Thousand TWh

- United States
- India
- Europe
- China

Key Growth

- 2014

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# Fuel Choices for Power Generation

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<th>Relative benefit/impact</th>
<th>Coal</th>
<th>Coal w/ CCS</th>
<th>Natural Gas</th>
<th>Nuclear</th>
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Source: EPRI, Generation Technology Assessment
Electricity Generation Fuel by Region

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*Mexico and Turkey included in Key Growth countries
Global Demand

2040 By Fuel
Quadrillion BTUs

- **Oil**: 2010: 0.8%, 2010-2040: 0.1%
- **Gas**: 2010: 1.6%, 2010-2040: 1.6%
- **Coal**: 2010: 0.1%, 2010-2040: 0.1%
- **Biomass**: 2010: 0.5%, 2010-2040: 0.5%
- **Nuclear**: 2010: 2.3%, 2010-2040: 2.3%
- **Solar/Wind/Biofuels**: 2010: 5.8%, 2010-2040: 5.8%
- **Hydro/Geo**: 2010: 1.8%, 2010-2040: 1.8%

Average Growth / Yr. 2010 - 2040: \( \sqrt{1.0\%} \)
CO$_2$ Emissions
World Emissions

CO₂ Emissions by Region
Billion metric tonnes

- Rest of World
- Key Growth
- India
- China
- OECD*

Emissions per Capita
Tonnes / Person

- OECD
- Non OECD

*Mexico and Turkey included in Key Growth countries

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Supply
Global Liquids and Gas Supply

Supply by Type

- Biofuels
- Other Liquids
- NGLs
- Oil Sands
- Tight Oil
- Deepwater
- New Conventional C&C Development
- Developed Conventional Crude & Condensate

Global Gas Supply

- Rest of World
- Asia Pacific
- North America
- Unconventional
- Conventional

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Closing Comments – Technology Evolution

• Global progress drives energy demand. Technology drives changes in energy system

• Technology development requires longer-term focus and is unpredictable
  – Benefits from a portfolio approach; Learning from failure advises future projects
  – May require business model innovation, especially in “new-to-world” applications
  – Sometimes driven by science and technology developments in other unrelated areas
  – Extent, pace, and source of future cost reduction cannot be precisely predicted

• Technologies evolve “Bottoms-up” or “Top-down”
  Top-down: Technologies are likely commercialized in higher value segments before they are used in lower value segments
  – CCS – NG separation/EOR > Power plants/storage > Refineries/storage
  – Butanol: Bio-n-butanol – displaces chemical n-butanol > fuel additive > neat fuel

  Bottoms-up: Technologies enter less-demanding, un-bundled segments

• Global widespread technology adoption is driven by long-term economic fundamentals

• Market driven selection of the solutions will ensure longer-term viability
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