The Outlook for Energy
a view to 2030

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USAEE – Houston Chapter
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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 in Item 1 of ExxonMobil’s latest report on Form 10-K). This material is not to be reproduced without the permission of Exxon Mobil Corporation.
Importance of Energy
Your Energy Use

- EU
- North America
- Middle East
- Africa
- Asia Pacific

Energy Use Categories:
- Direct
- Indirect

Subcategories:
- Household
- Personal Vehicle
- Industry
- Commercial Transport
- Public Buildings
Challenge: Meeting Basic Needs

Electricity

- Available
- ~1.5 Billion People with no Electricity

Modern Cooking/Heating Fuels

- Available
- ~ 2.5 Billion People with no Modern Cooking/Heating Fuels

2006 World Bank
Economic Growth Drives Energy Demand

GDP

- OECD

Demand

- Non OECD

Trillion 2005$ GDP

Quadrillion BTUs

OECD

Non OECD

1980 2005 2030

1980 2005 2030
Efficiency: Reducing Demand Growth

Energy per GDP
MBTU / 2005$ k GDP

-1.2%
-1.5%

Constant 2005 Level

Demand
Quadrillion BTUs

Average Growth / Yr. 2005 - 2030
1.2%

What demand would be without efficiency gains
~300 Quads

ExxonMobil
Taking on the world’s toughest energy challenges.
Growing Global Demand

By Sector
Quadrillion BTUs

2005 – 2030

Transportation | Industrial | Res/Comm | PowerGen | Energy Savings

Taking on the world’s toughest energy challenges.
Residential / Commercial Demand

By Sector
Quadrillion BTUs

Residential
Billion Households

Residential Energy Use
MBTU / Household

OECD
Non OECD

2005
2030

Residential Commercial

1980 2005 2030

OECD Non OECD

Taking on the world’s toughest energy challenges.
Residential / Commercial Demand

By Sector
Quadrillion BTUs

Residential
Billion Households

Global Demand
Quadrillion BTUs

OECD
Non OECD

Electricity/Heat
Solar

Biomass
Coal
Gas

Oil

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Global Transportation Demand

By Sector

MBDOE

1980 2005 2030

Personal vs. Commercial

MBDOE

2005 2030

OECD Non OECD

Personal Commercial
Personal Vehicle Fleet is Growing

Vehicle Penetration
Cars and Population (millions)

- US 2005
- US 2030
- Europe OECD 2005
- Europe OECD 2030
- China 2005
- China 2030

Fleet by Car Type
Million Cars

- Advanced
- Diesel
- Gasoline

Cars and Population (millions):

- US 2005
- US 2030
- Europe OECD 2005
- Europe OECD 2030
- China 2005
- China 2030
Improving Today’s Vehicle

% MPG Improvement

- Engine
- Transmission
- Body & Accessories
- Total

- Turbo Charging
- Cylinder Deactivation
- Camless Valves
- Light Weight Materials
- Improved Tires
- Continuously Variable
- 6 Speed / 7 Speed
- A/C Efficiency

ExxonMobil
Taking on the world’s toughest energy challenges.
**Light Duty Vehicle Technology**

**Plug-in Hybrid Assumptions**

<table>
<thead>
<tr>
<th></th>
<th>2010</th>
<th>2030</th>
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<tbody>
<tr>
<td>Battery cost, $/kWh</td>
<td>800</td>
<td>300</td>
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<tr>
<td>Battery replacements</td>
<td>0</td>
<td>0</td>
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<tr>
<td>over the vehicle life, #</td>
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<tr>
<td>Electricity cost, ¢/kWh</td>
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<td>5</td>
</tr>
</tbody>
</table>

**Plug-in Hybrid vs. Conventional Vehicles**

- Additional Cost
- Annual Savings

- $2 / gallon gasoline
- $4 / gallon gasoline
Global Industrial Demand

By Sector
Quadrillion BTUs

By Region
Quadrillion BTUs
Global Industrial Demand

By Sector
Quadrillion BTUs

By Fuel
Quadrillion BTUs

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Electricity Use is Growing Fast

**By Sector**
- Residential
- Commercial
- Heavy Industry
- Other Industry
- Transportation

**By Region**
- US
- Europe
- Other AP
- Other
- China

Electricity use is expected to grow rapidly, especially in transportation and other sectors. The demand is projected to increase significantly in the US and Europe compared to other regions.
Electricity Use is Growing Fast

### By Sector

- **Residential**
- **Commercial**
- **Heavy Industry**
- **Other Industry**
- **Transportation**

### By Generation

- **Renewables**
- **Nuclear**
- **Oil**
- **Coal**
- **Gas**

Electricity Use is Growing Fast
Electricity Generation Cost

US Baseload, Startup 2025
2009 Cents/kWhr

No CO2 Cost

Coal Gas Nuclear Wind Coal + CCS Gas + CCS Solar
Electricity Generation Cost

US Baseload, Startup 2025
2009 Cents/kWhr

$30 per Ton

Coal Gas Nuclear Wind Coal + CCS Gas + CCS Solar
Electricity Generation Cost

US Baseload, Startup 2025
2009 Cents/kWhr

$60 per Ton

- Coal
- Gas
- Nuclear
- Wind
- Coal + CCS
- Gas + CCS
- Solar
Global Energy Demand and Supply

By Sector
Quadrillion BTUs

- Power Generation
- Industrial
- Transportation
- Res/Comm

By Fuel
Quadrillion BTUs

- Oil
- Gas
- Coal
- Nuclear
- Biomass
- Hydro, Geo
- Wind, Solar, Biofuels

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Global Liquids Supply Grows

Global Liquids Supply and Demand
MBDOE

- OPEC Crude
- Non-OPEC Crude & Condensate
- Other Petroleum
- Canada Oil Sands
- Biofuels

2005 Supplies
2030
Base/Adds

Taking on the world's toughest energy challenges.
Gas Supply and Demand Balance

**United States**
- Conventional
- Unconventional
- Pipeline
- LNG

**Europe**
- Conventional
- Unconventional
- Pipeline
- LNG

**Asia Pacific**
- Conventional
- Unconventional
- Pipeline
- LNG

LNG: Liquefied Natural Gas
Transition to Modern Energy / Technology

US Energy Demand

Percent

1850 1900 1950

<table>
<thead>
<tr>
<th>Year</th>
<th>Wood</th>
<th>Renewables</th>
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Personal Vehicles
Rail Freight
Electrification
Oil Prod & Refining
Telephone

Energy Information Agency

Taking on the world’s toughest energy challenges.
Transition to Modern Energy / Technology

US Energy Demand

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Passenger Flights
Road Freight
Air Conditioning
Natural Gas in Homes
Nuclear Power

Energy Information Agency

Taking on the world’s toughest energy challenges.
Transition to Modern Energy / Technology

US Energy Demand

Percent

100%

75%

50%

25%

0%

1850 1900 1950 2000

Wood Renewables Hydro Nuclear Coal Gas Oil

Energy Information Agency
US Energy Demand and Supply

By Sector
Quadrillion BTUs

By Fuel
Quadrillion BTUs

Power Generation
Transportation
Industrial
Res/Comm

Wind, Solar, Biofuels
Hydro, Geo
Biomass
Nuclear
Coal
Gas
Oil

Taking on the world’s toughest energy challenges: ExxonMobil
Global Energy Demand & CO₂ Emissions

**Demand**
Quadrillion BTUs

- **Coal**
- **Oil**
- **Gas**
- **Other**

**Average Growth / Yr. 2005 - 2030**

- **Coal**: 0.9%
- **Res/Comm**: 1.2%

**CO₂ Emissions**
Billion Tons

- **Res/Comm**
- **Transportation**
- **Industrial**
- **Power Generation**

**Average Growth / Yr. 2005 - 2030**

- **Res/Comm**: 0.9%
Global Energy Demand & CO₂ Emissions

**Demand**

Quadrillion BTUs

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**Average Growth / Yr. 2005 - 2030**

- Coal: 0.9%
- Gas: 1.2%
- Oil: 1.2%
- Other: 1.2%

**CO₂ Emissions**

Billion Tons

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**Average Growth / Yr. 2005 - 2030**

- Gas: 0.9%
- Oil: 0.9%
- Coal: 0.9%
CO₂ Emissions

<table>
<thead>
<tr>
<th>CO₂ Emissions</th>
<th>Emissions per Capita</th>
<th>Emissions per GDP</th>
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</thead>
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<td>Billion Tons</td>
<td>Tons / Person</td>
<td>Tons / 2005$ k GDP</td>
</tr>
</tbody>
</table>

- **OECD**
  - 2005: 10 Tons / Person
  - 2030: 8 Tons / Person

- **Non OECD**
  - 2005: 12 Tons / Person
  - 2030: 8 Tons / Person

**ExxonMobil**

Taking on the world’s toughest energy challenges.
OECD Transitions to Lower Emissions

**Change in CO₂ Emissions**
Billion Tons

<table>
<thead>
<tr>
<th>Period</th>
<th>Emissions (Billion Tons)</th>
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</thead>
<tbody>
<tr>
<td>1980-2005</td>
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<td>2005-2030</td>
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**Energy per GDP**
MBTU / 2005$ k GDP

- **Reducing CO₂ Content**
- **Increasing Efficiency**

**CO₂ Content** (Tons CO₂ / BBTU)
Integrated Energy Solutions

Now
- 6.7 billion people
- Global economic linkages
- Disparate living standards
- Enormous energy needs
- Environmental gains & concerns
- Growing technology use & focus

Increase Efficiency

2030
- 8 billion people
- Non OECD leads economic growth
- Less poverty; living standards improve
- Global energy needs up one-third
- Progress on environmental goals
- Significant advances in technology

Expand Supply

Mitigate Emissions
Integrated Energy Solutions

Technology

Mitigate Emissions

Increase Efficiency

Expand Supply
More information available at:

www.exxonmobil.com/energyoutlook