

# 2017 Outlook for Energy: A View to 2040

Texas A&M Energy Symposium  
Som Sinha

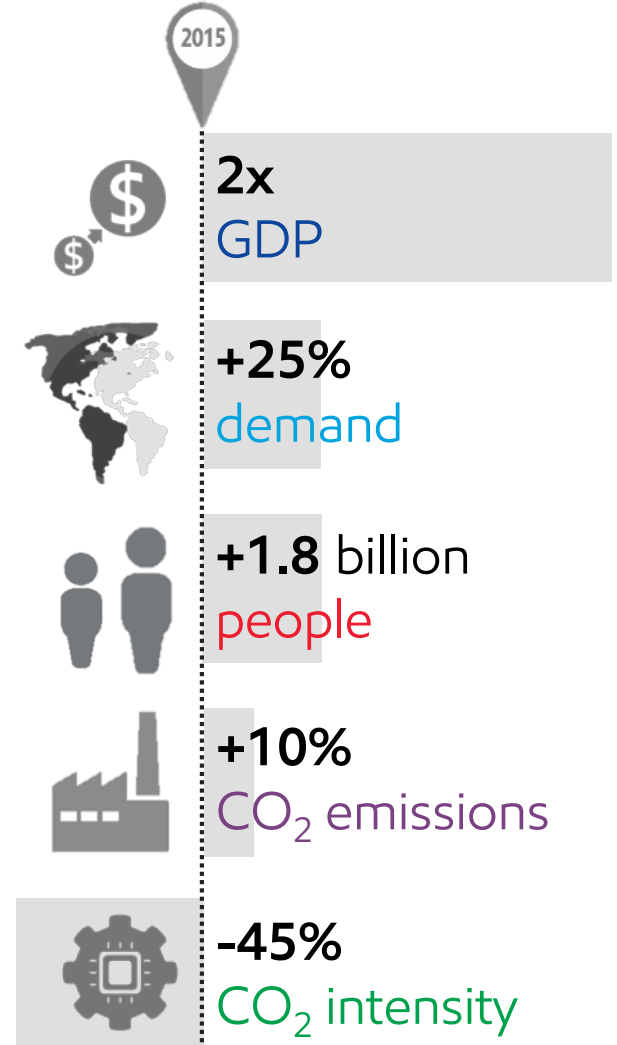
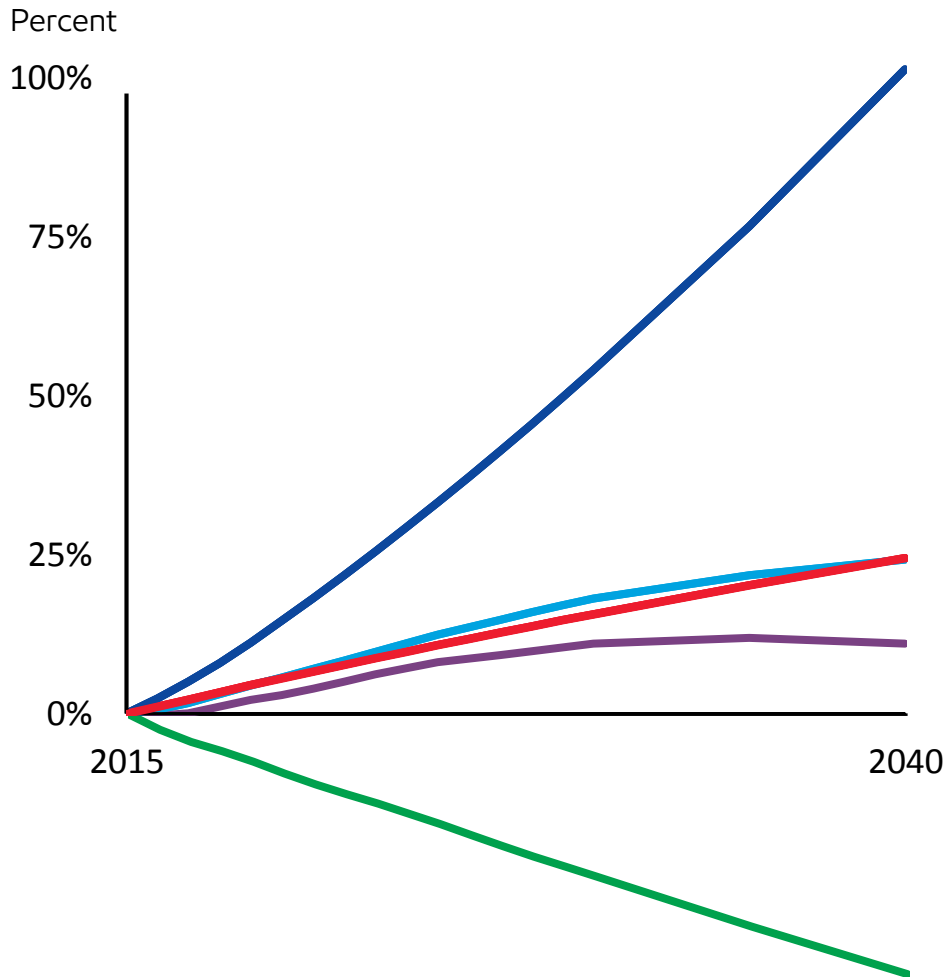


*The Outlook for Energy* includes Exxon Mobil Corporation's internal estimates and forecasts of energy demand, supply, and trends through 2040 based upon internal data and analyses as well as publicly available information from external sources including the International Energy Agency. Work on the report was conducted throughout 2016. This presentation includes forward looking statements. Actual future conditions and results (including energy demand, energy supply, the relative mix of energy across sources, economic sectors and geographic regions, imports and exports of energy) could differ materially due to changes in economic conditions, 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](http://www.exxonmobil.com). This material is not to be used or reproduced without the permission of Exxon Mobil Corporation. All rights reserved.

**ExxonMobil**

# Global Trends Continue to Evolve

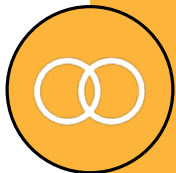
Growth from 2015 Level



# Key Energy Outlook Themes



**Energy** is fundamental to standards of living



**Economics** and **policies** impact the energy mix



**Natural gas** grows more than any other energy source

**Developing nations lead** gains in GDP and living standards



**Oil** remains the world's primary fuel through 2040



**Technology** has the highest potential and greatest uncertainty



# The energy equation

People



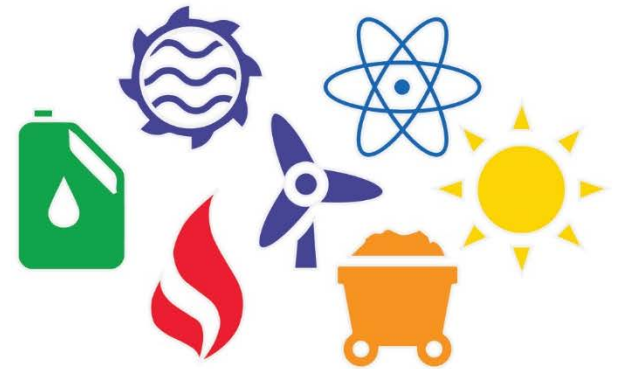
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living standards



=

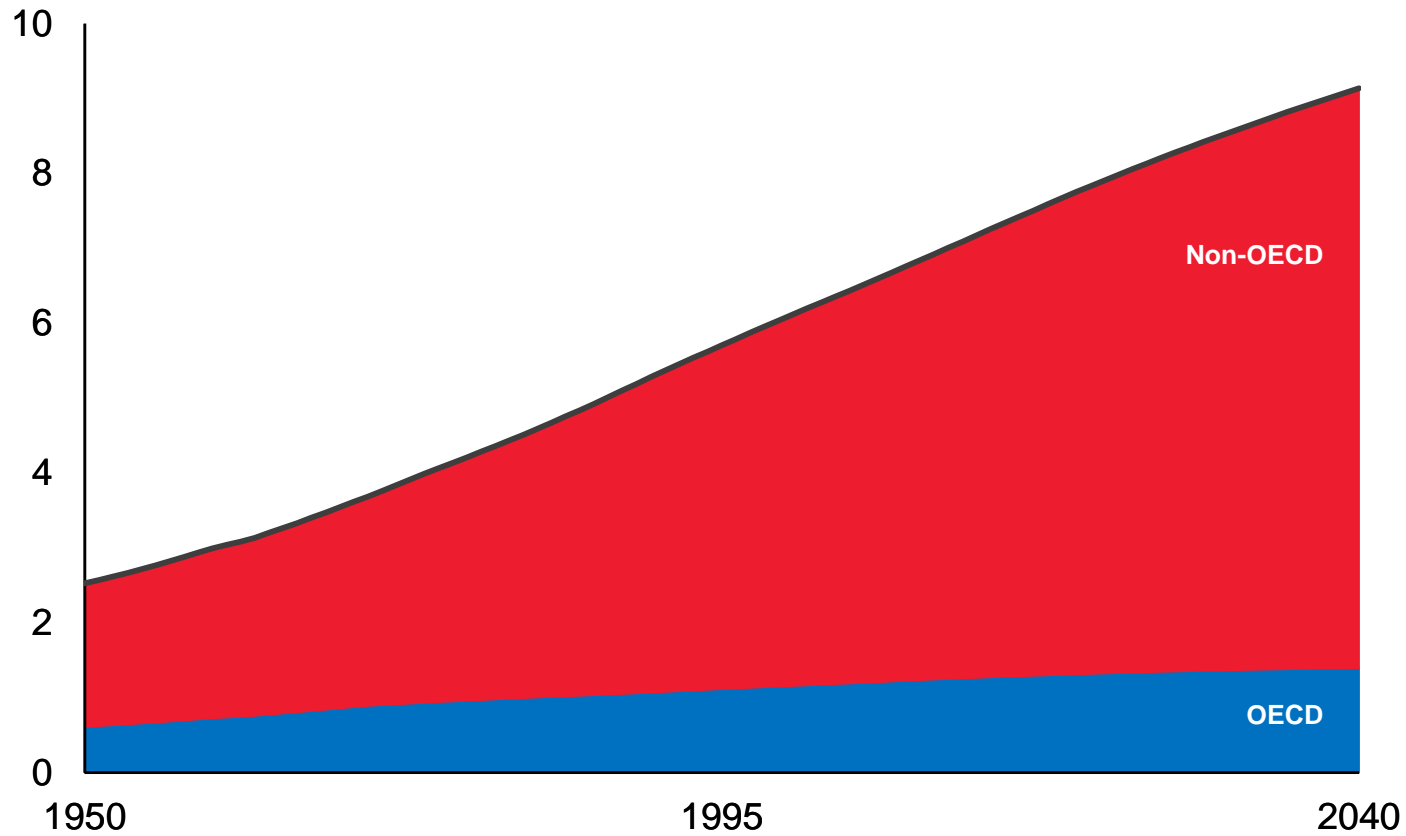
energy needs



# Developing Nations Lead Population Growth

## Global Population

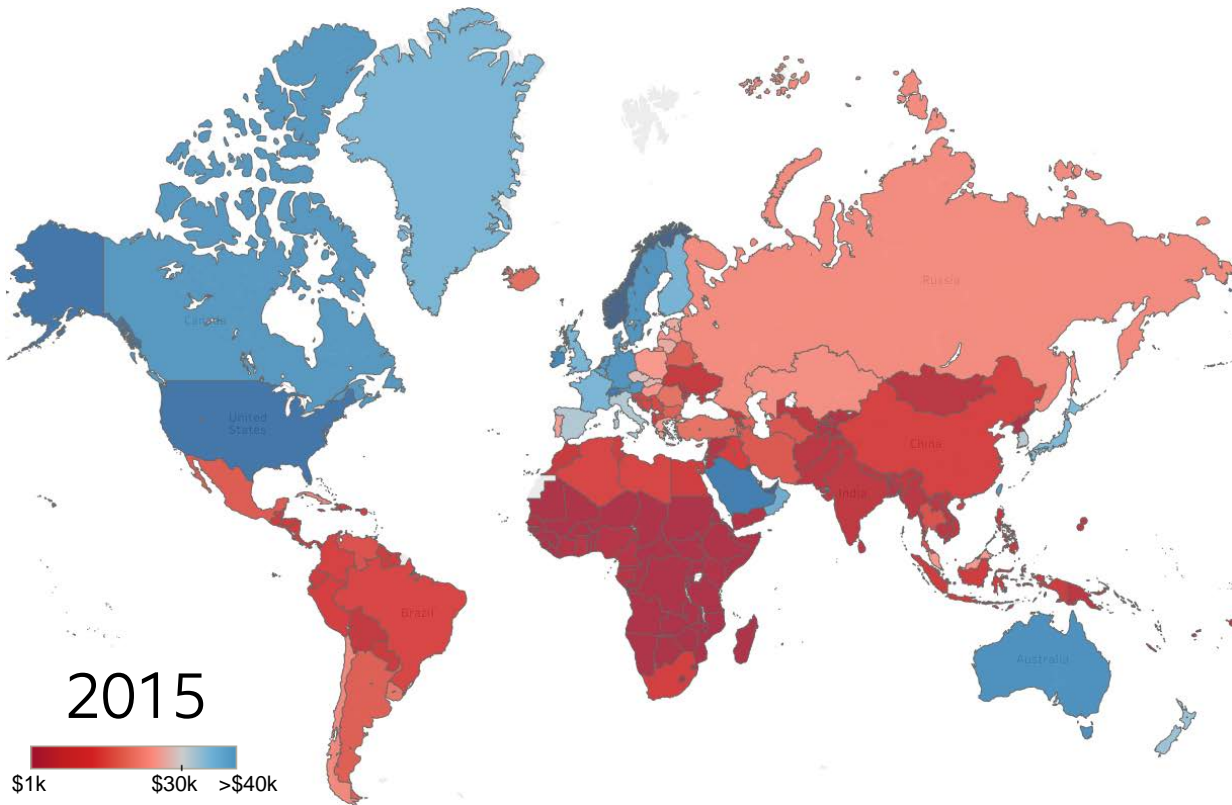
Billion People



# Purchasing Power and Middle Class Grow

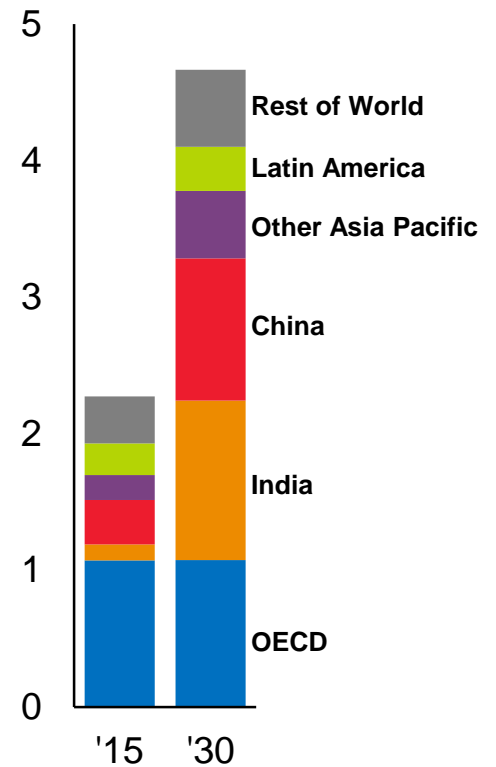
## GDP Per Capita

Thousand PPP Dollars



## Global Middle Class

Billion People

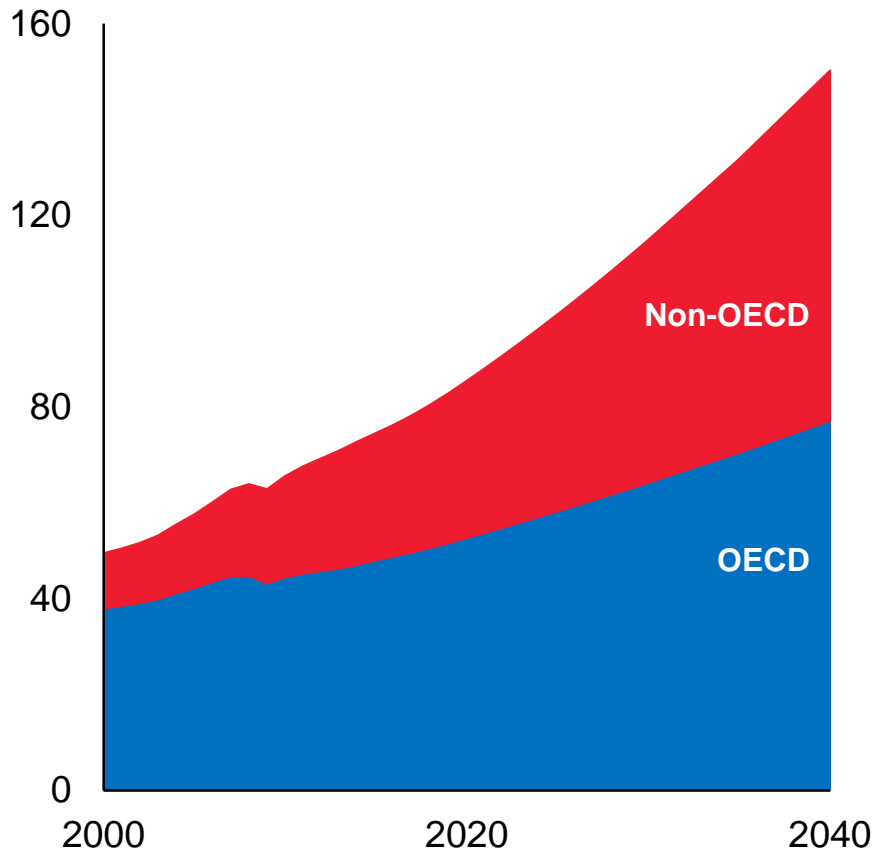


Source: The Brookings Institution

# Non-OECD Leads Economic Growth

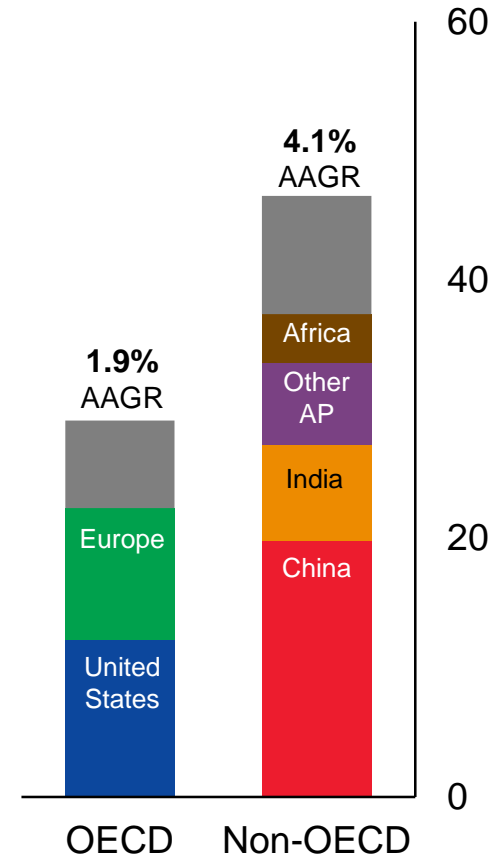
## World GDP

Trillion 2010\$



## Growth 2015-2040

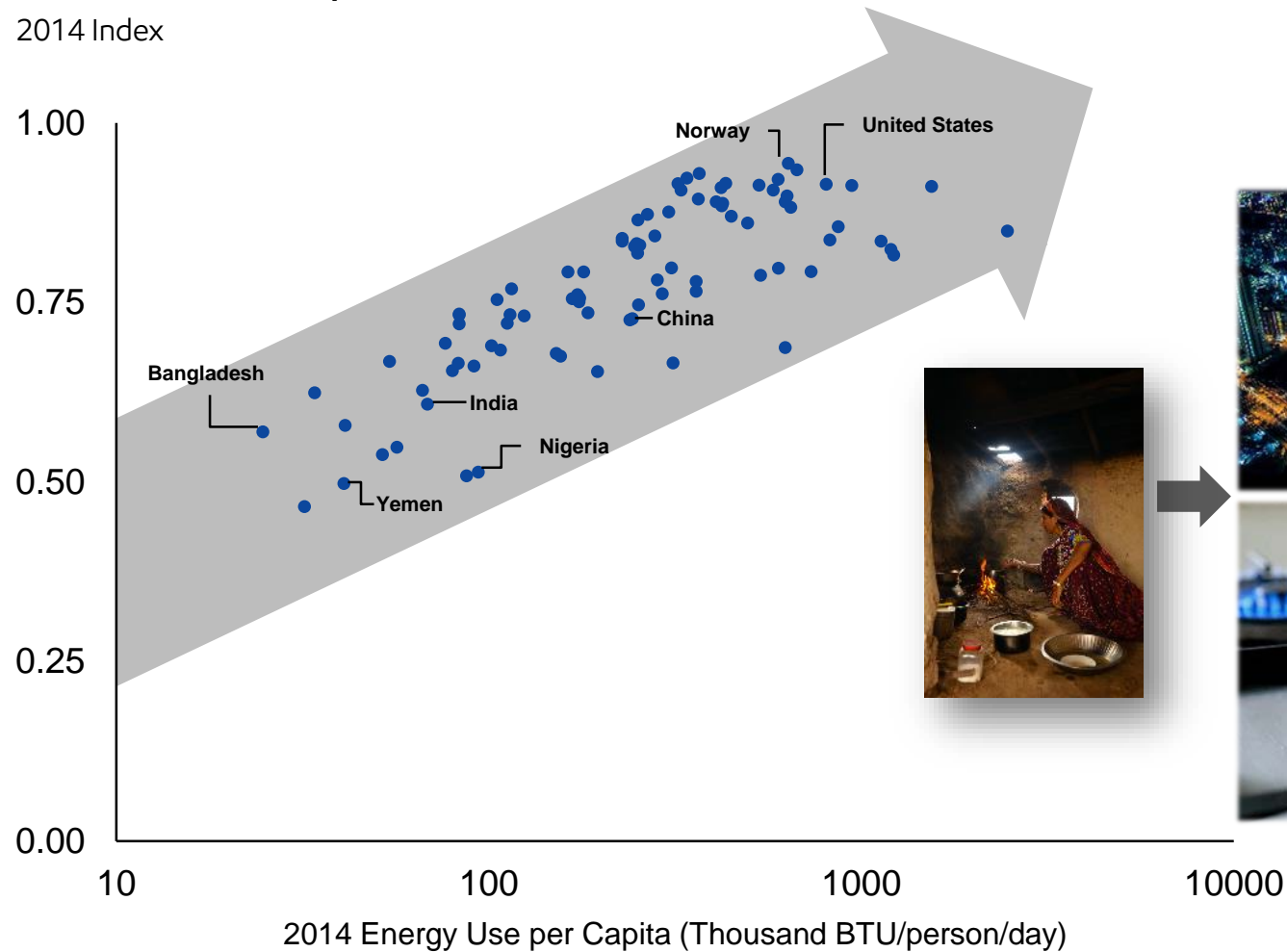
Trillion 2010\$



# Energy Fuels Human Development

## U.N. Human Development Index

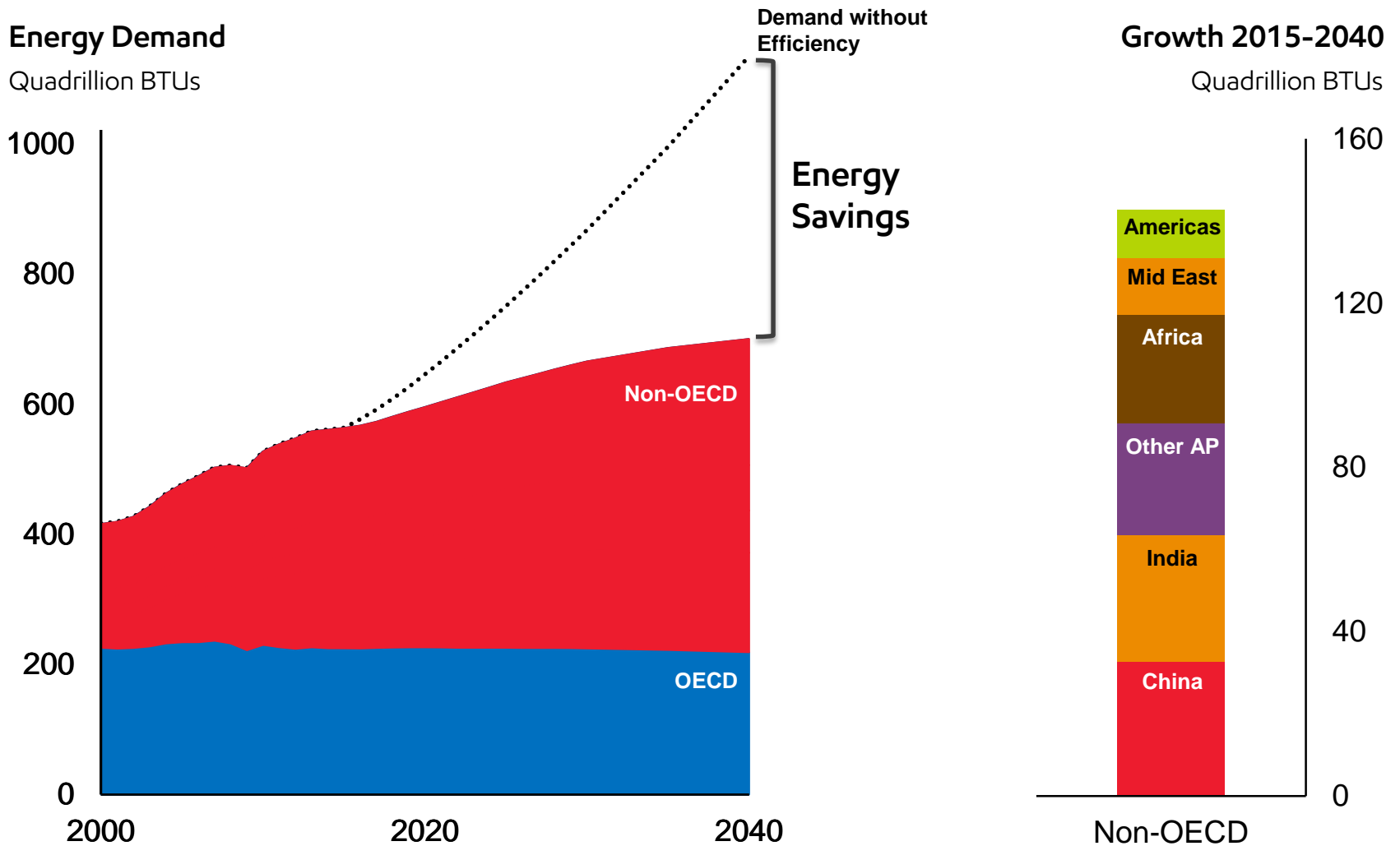
2014 Index

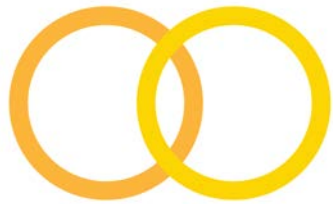


Source: United Nations, ExxonMobil estimates



# Demand Growth From Developing Nations



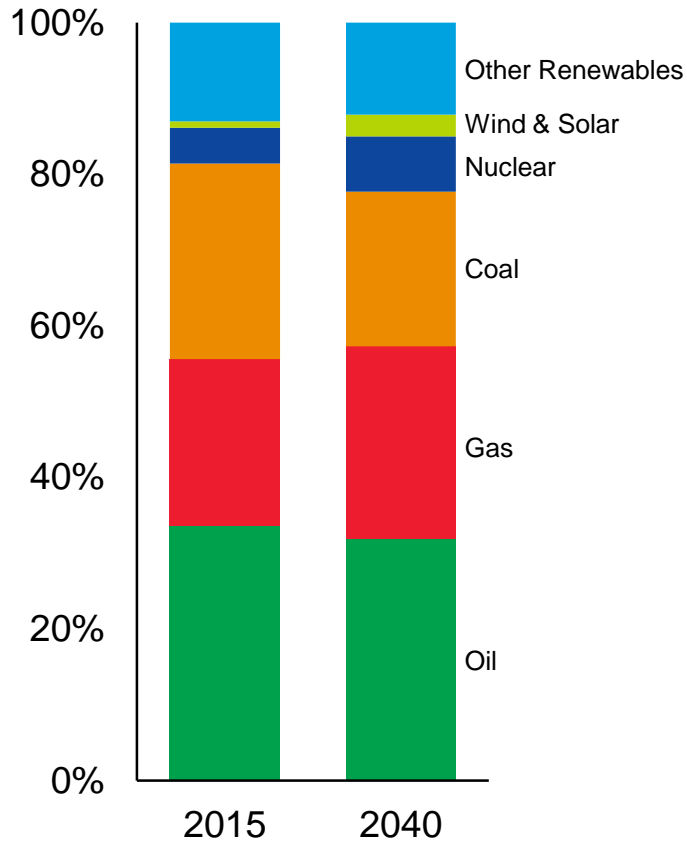


**Economics** and **policies**  
impact the energy mix.

# Energy Mix Shifts to Lower-Carbon Fuels

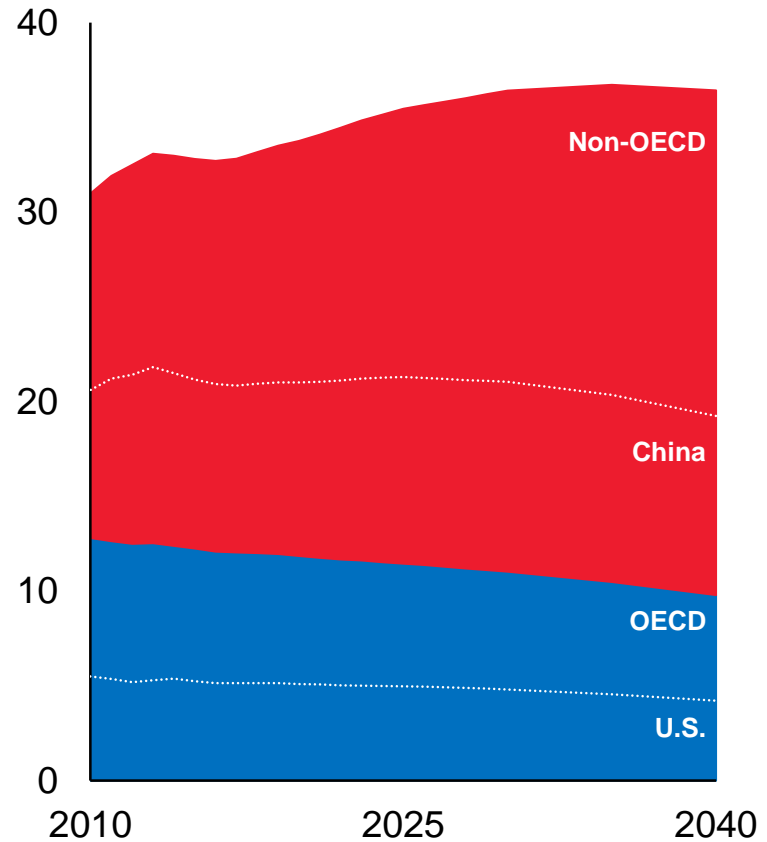
## Global Energy Mix

Percent



## Energy-Related CO<sub>2</sub> Emissions by Region

Billion Tonnes



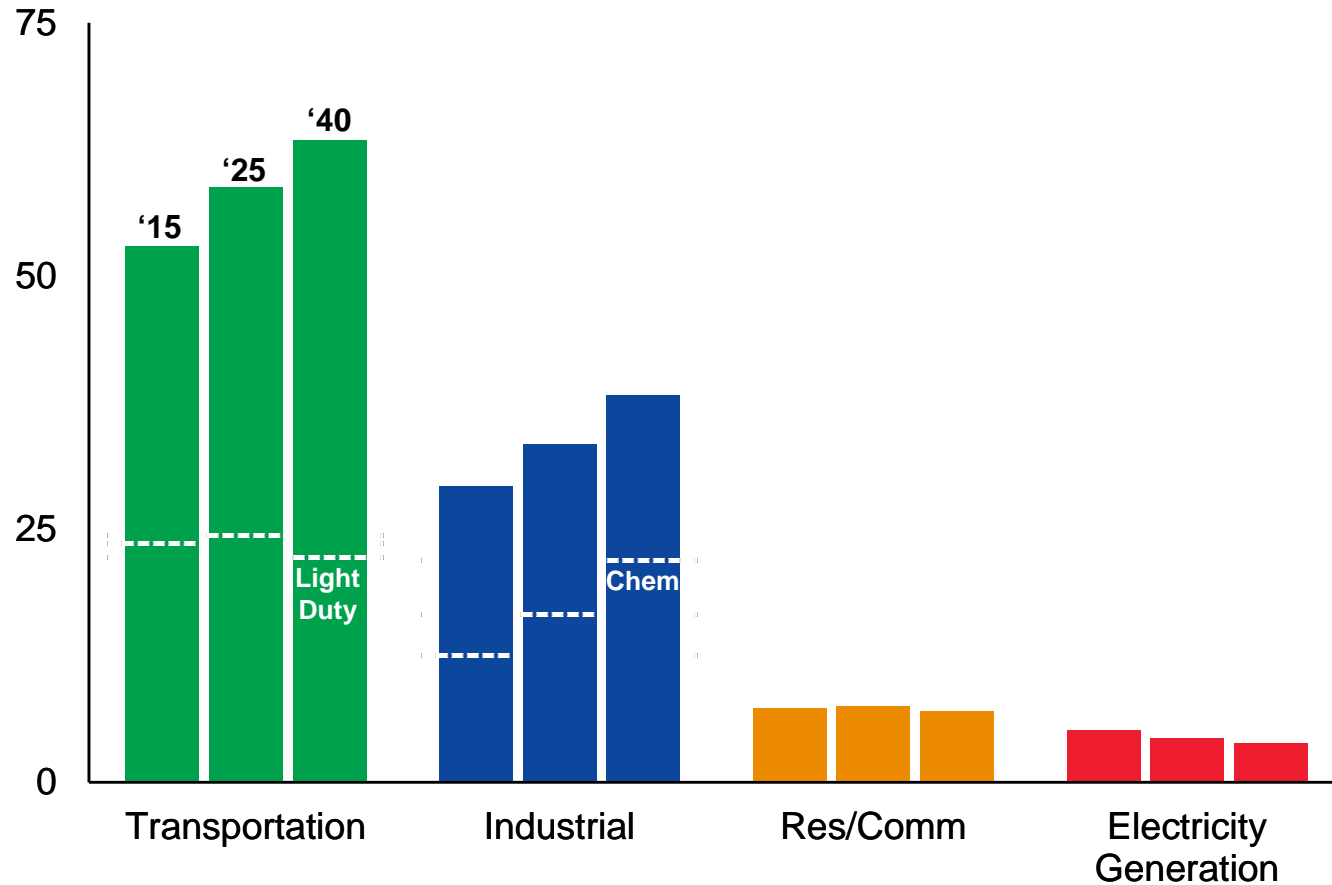


**Oil** remains the world's primary fuel through 2040.

# Transportation and Chemicals Drive Growth

Liquids Demand by Sector

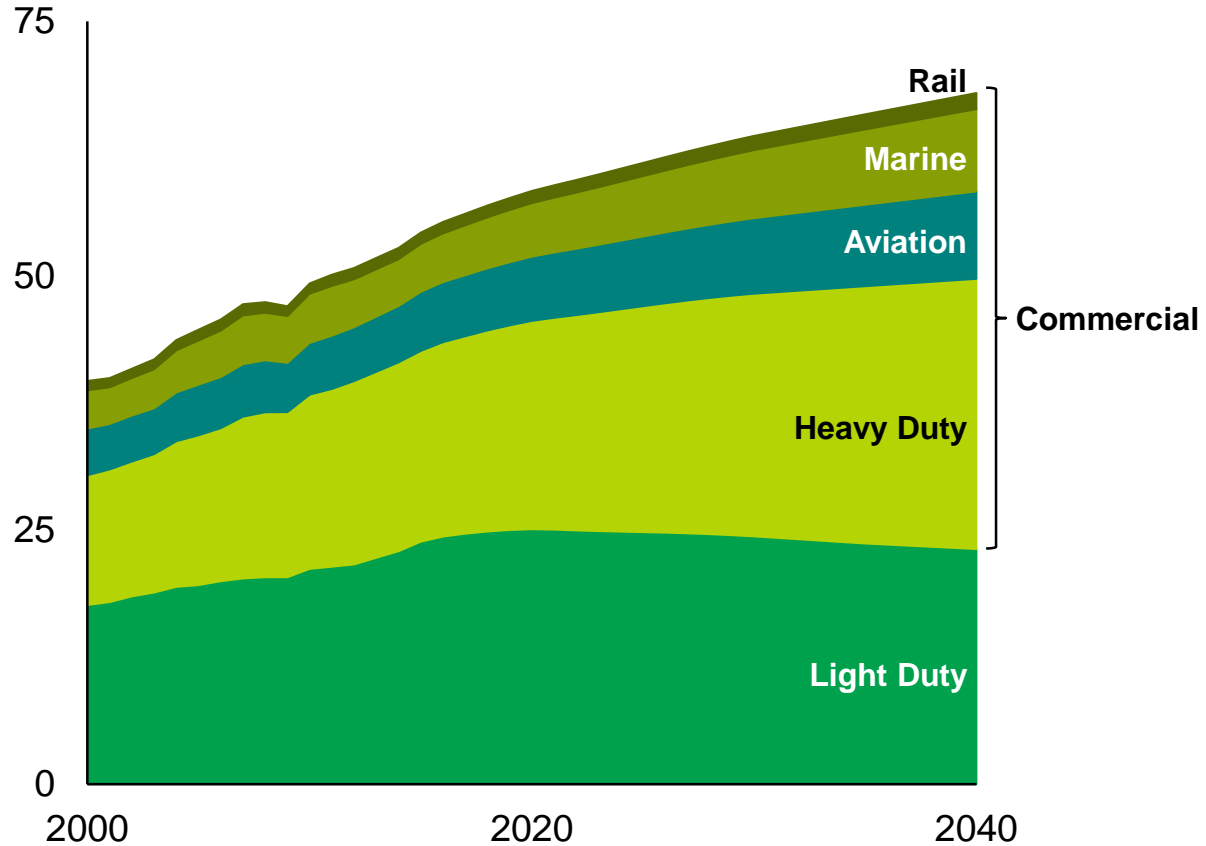
MBDOE



# Transportation Demand Driven by Commerce

## Sector Demand

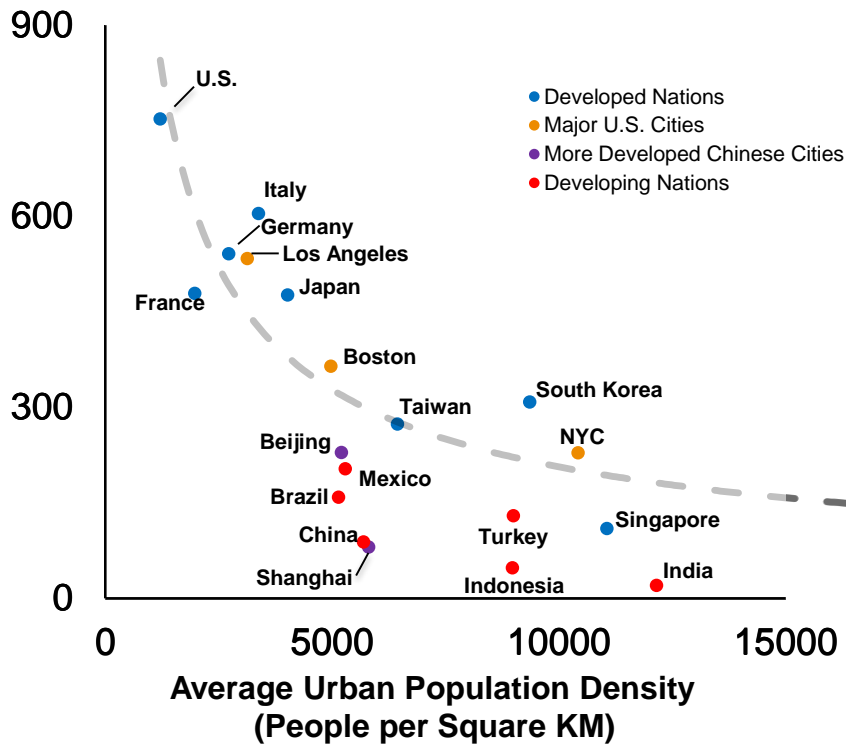
MBDOE



# Car Penetration Rises

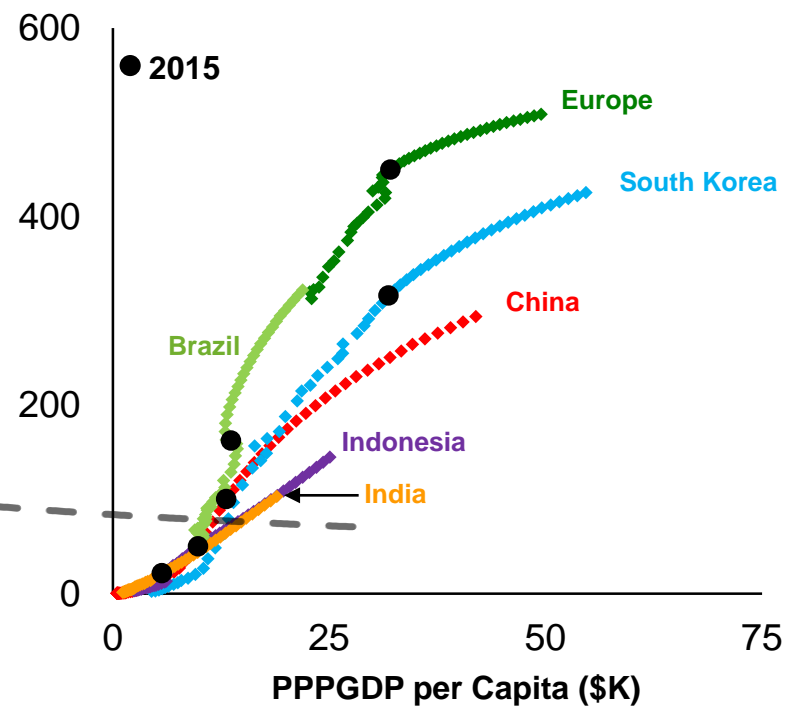
## Car Penetration

2014 Cars per Thousand People



## Car Penetration

Cars per Thousand People

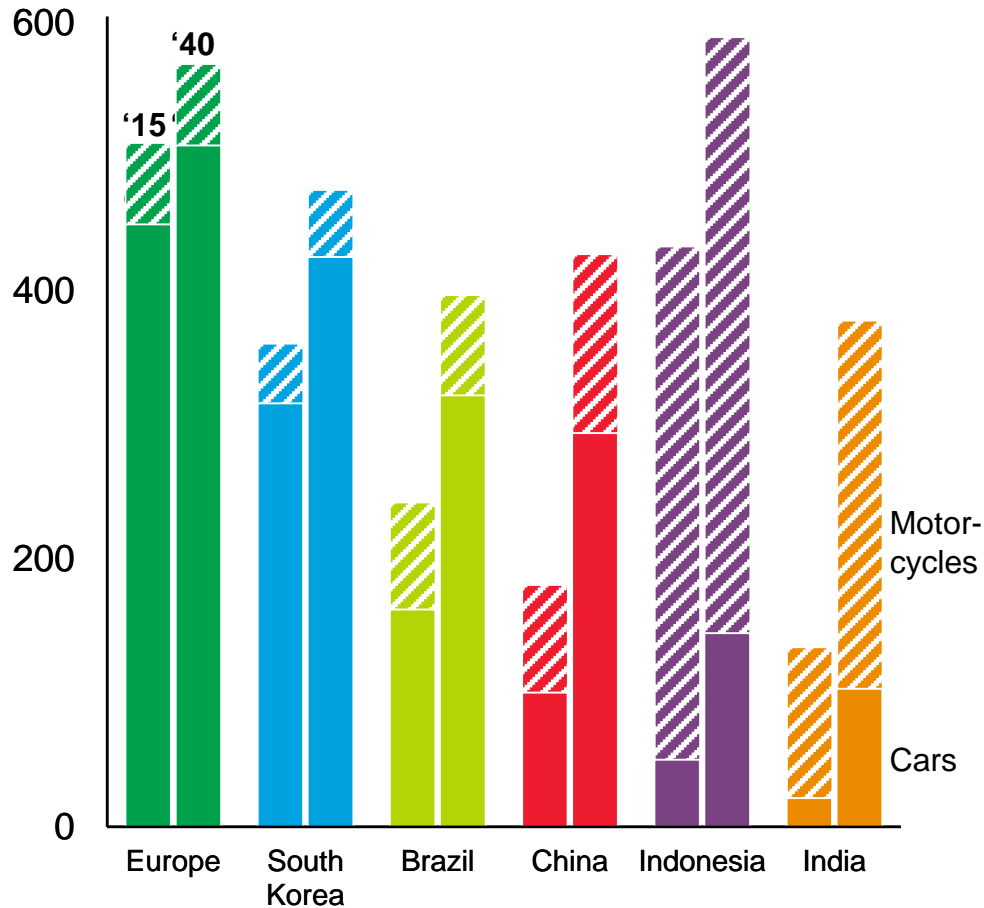


Source: demographia.com, ExxonMobil estimates

# Personal Mobility Increases

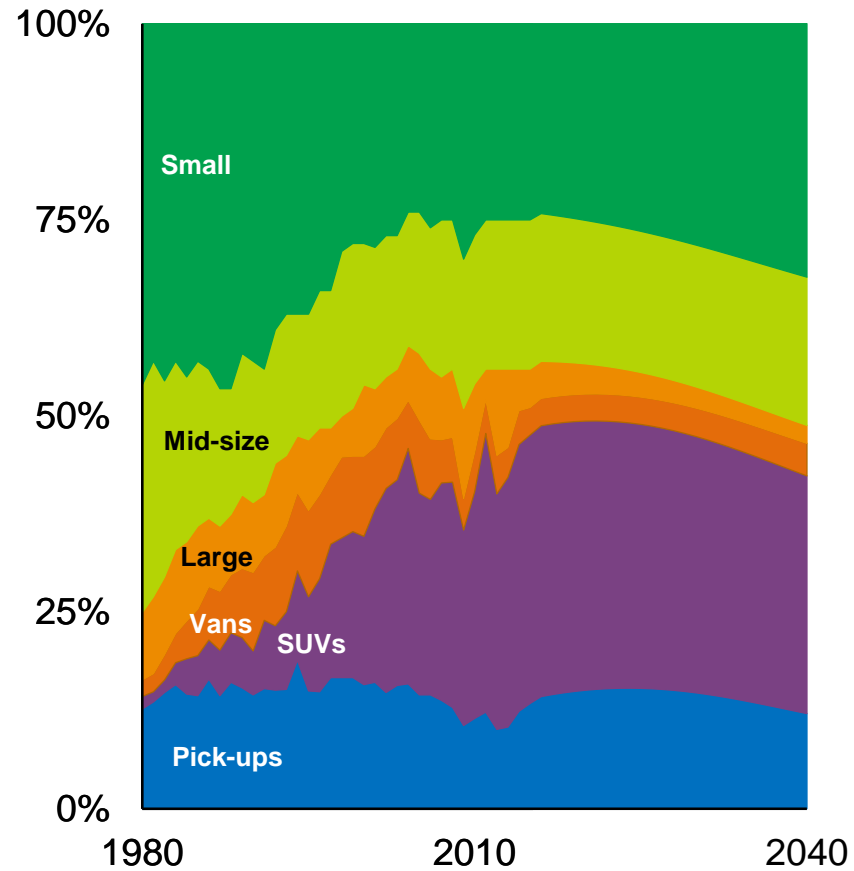
## Penetration

Vehicles Per Thousand People



## U.S. Car Sales by Class

Percent

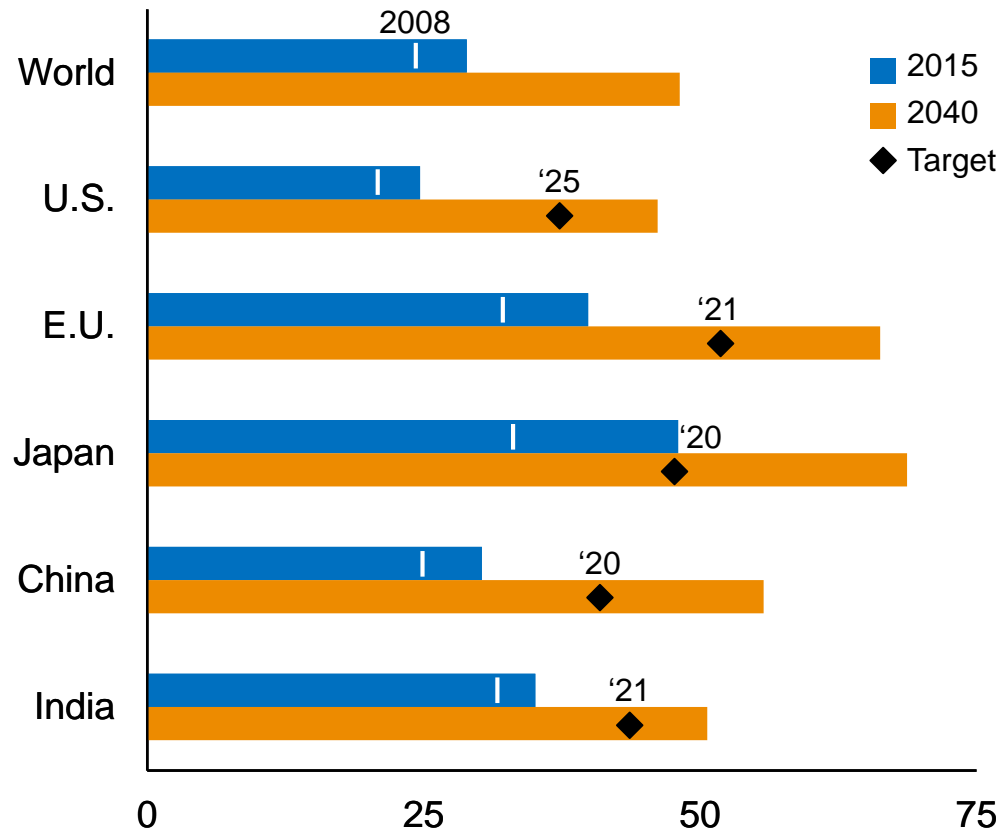




# New Car Fuel Economy Improves Rapidly

## Average New Car Fuel Economy

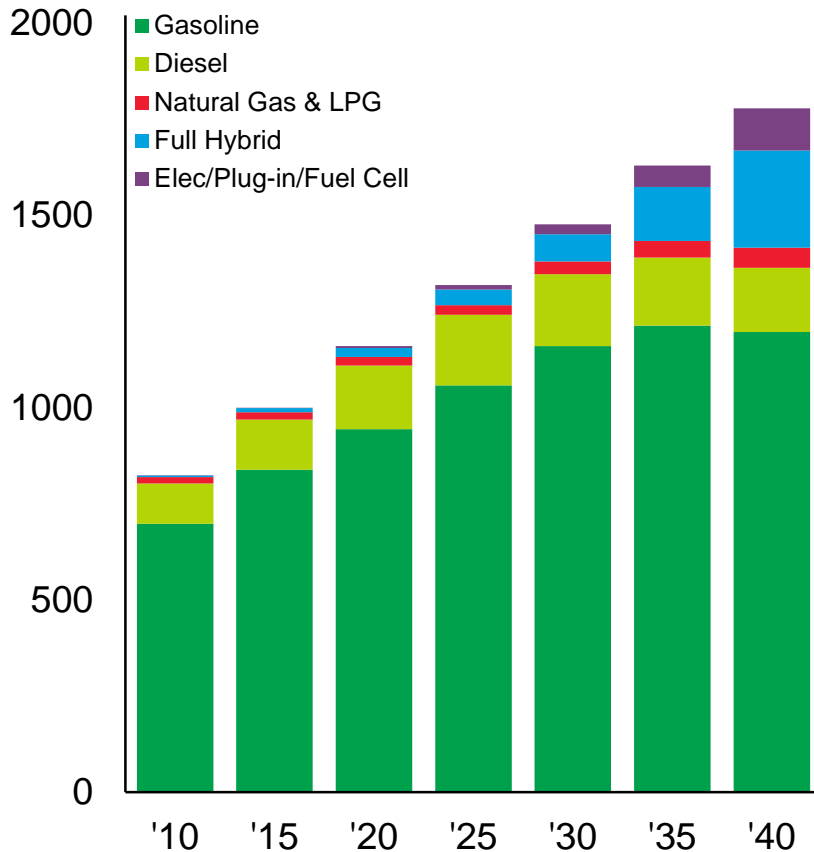
Miles per Gallon



# Consumer Preference and Policy Determine Fleet Mix

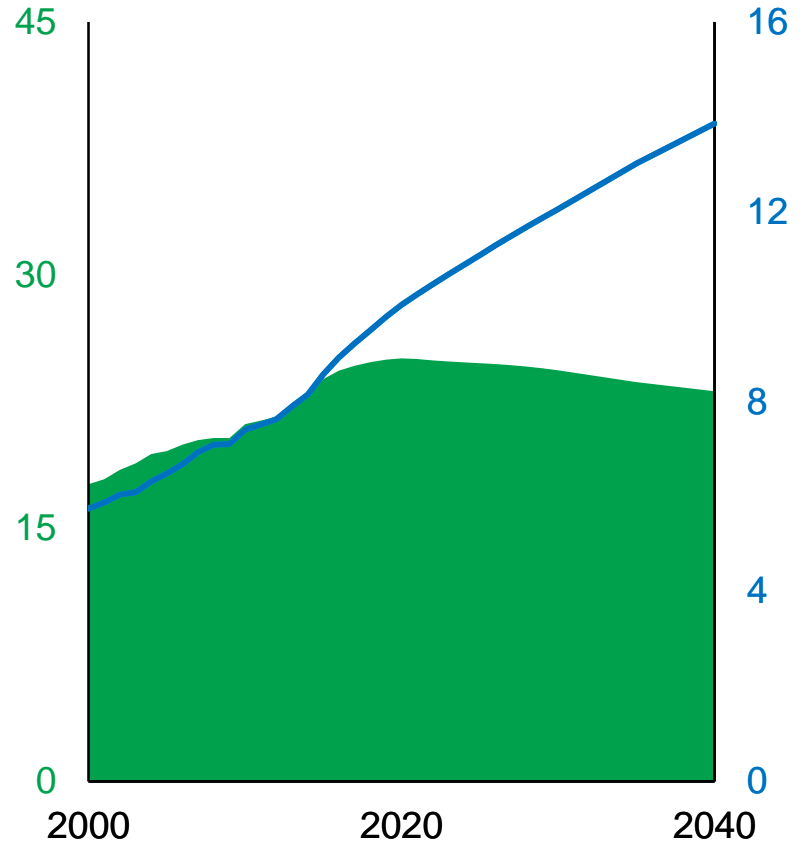
## Fleet by Type

Million Cars



## Light Duty Vehicle Demand

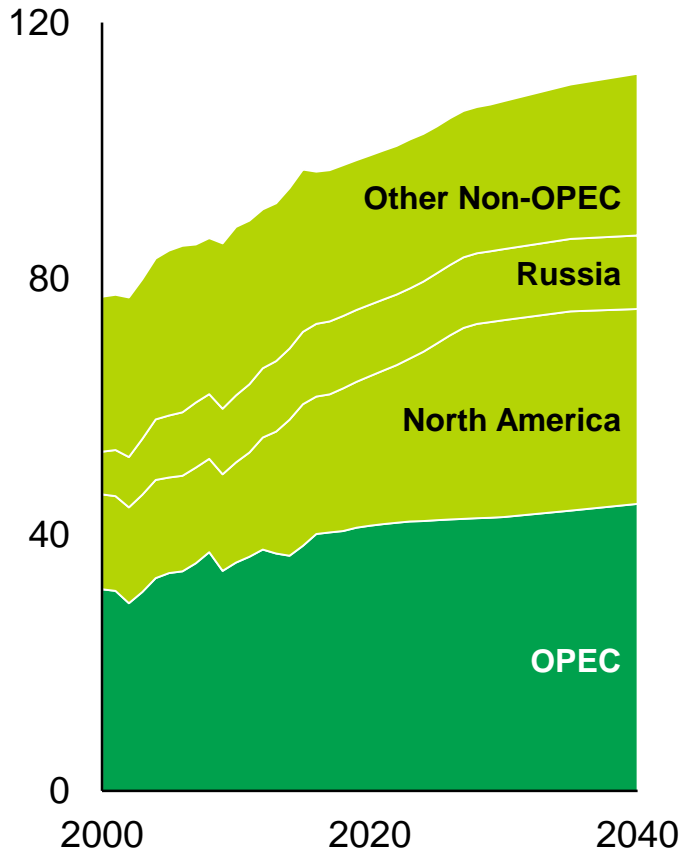
MBDOE



# Liquids Supply Highlights Technology Gains

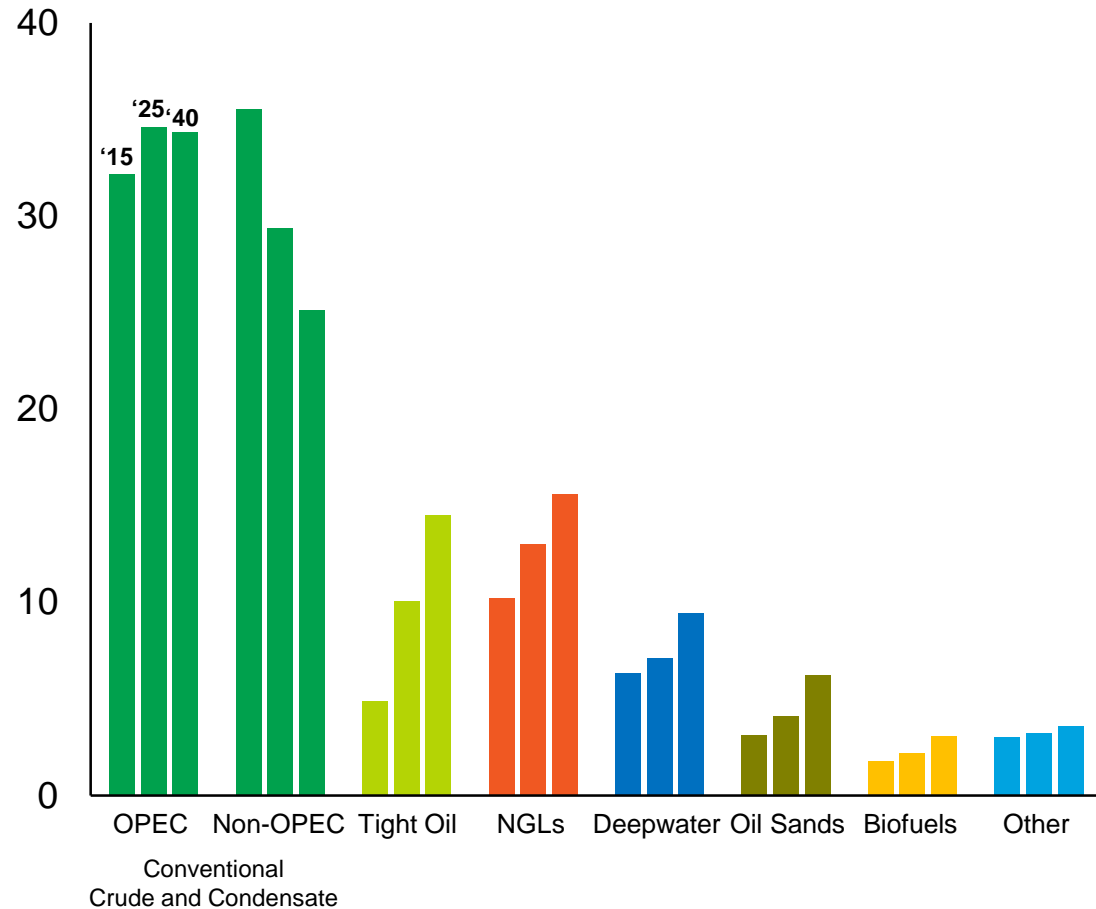
By Region

MBDOE



By Type

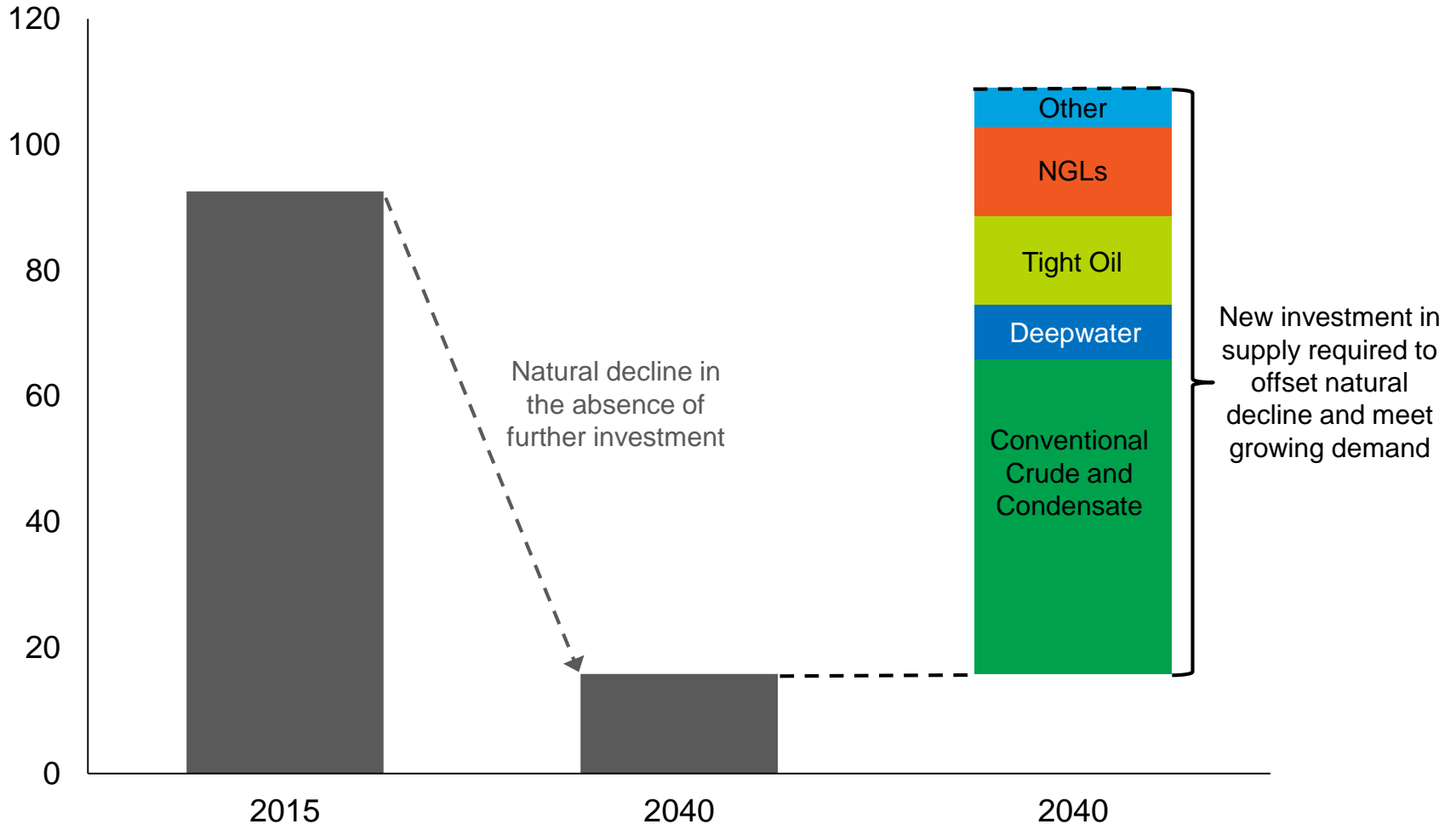
MBDOE



# All Scenarios Require Ongoing Development

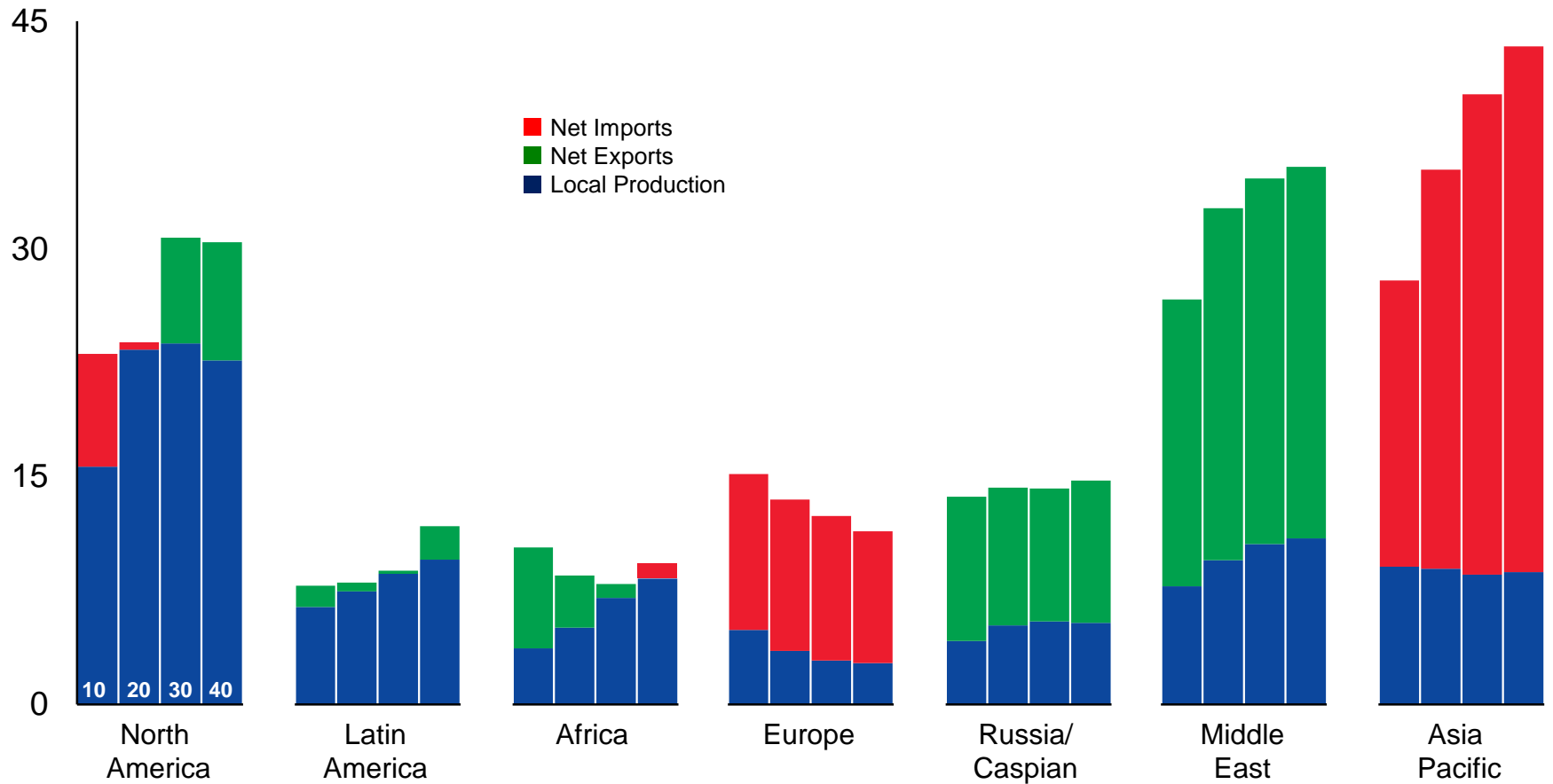
## Liquids Supply/Demand

MBDOE



# Liquids Trade Balance by Region

MBDOE



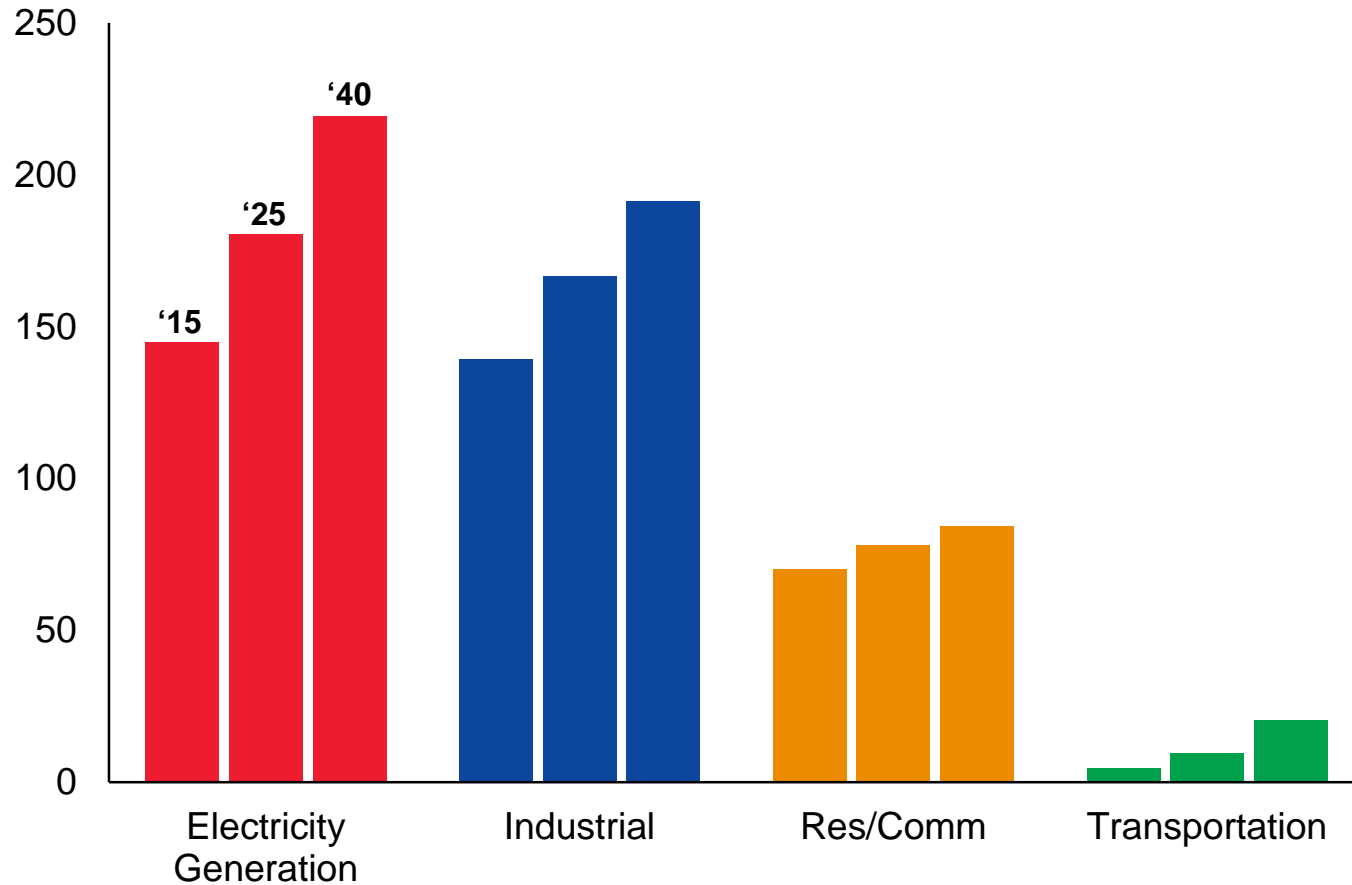


**Natural gas** grows  
more than any other  
energy source.

# Gas Demand Grows in All Sectors

Gas Demand by Sector

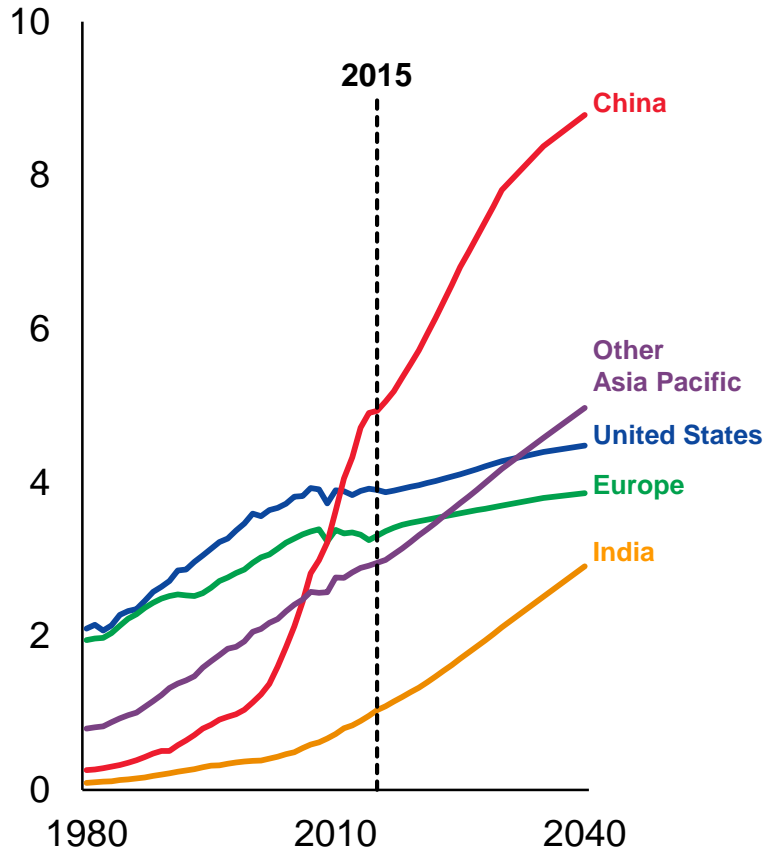
BCFD



# Electricity Demand Continues to Surge

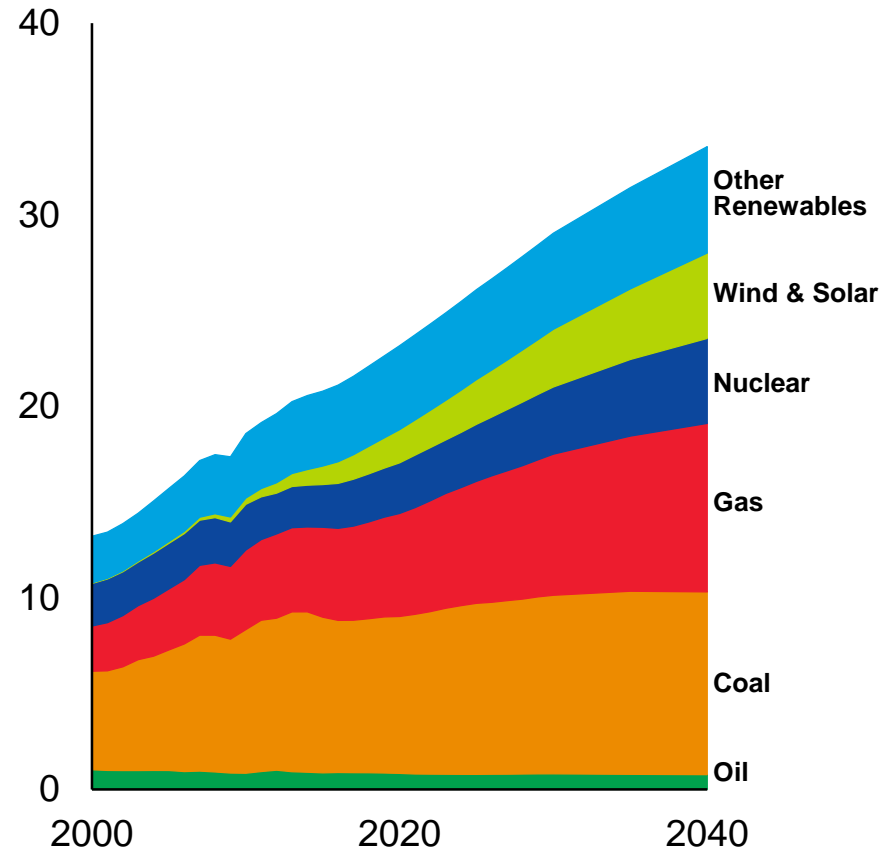
## Electricity Demand by Region

Thousand TWh



## Electricity Net Delivered by Type

Thousand TWh

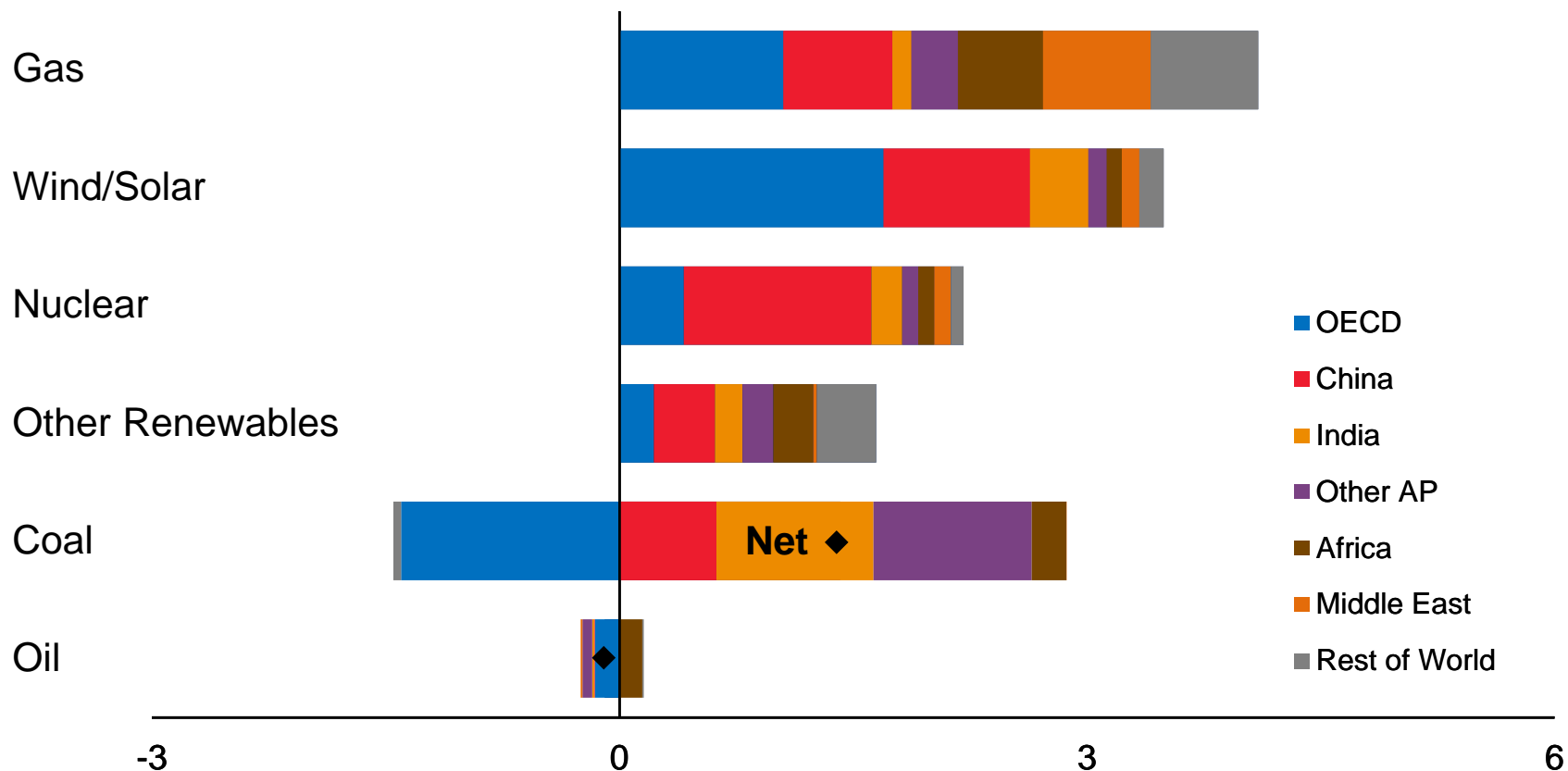




# Electricity Sources Shift Regionally

## Change in Net Delivered Electricity 2015-2040

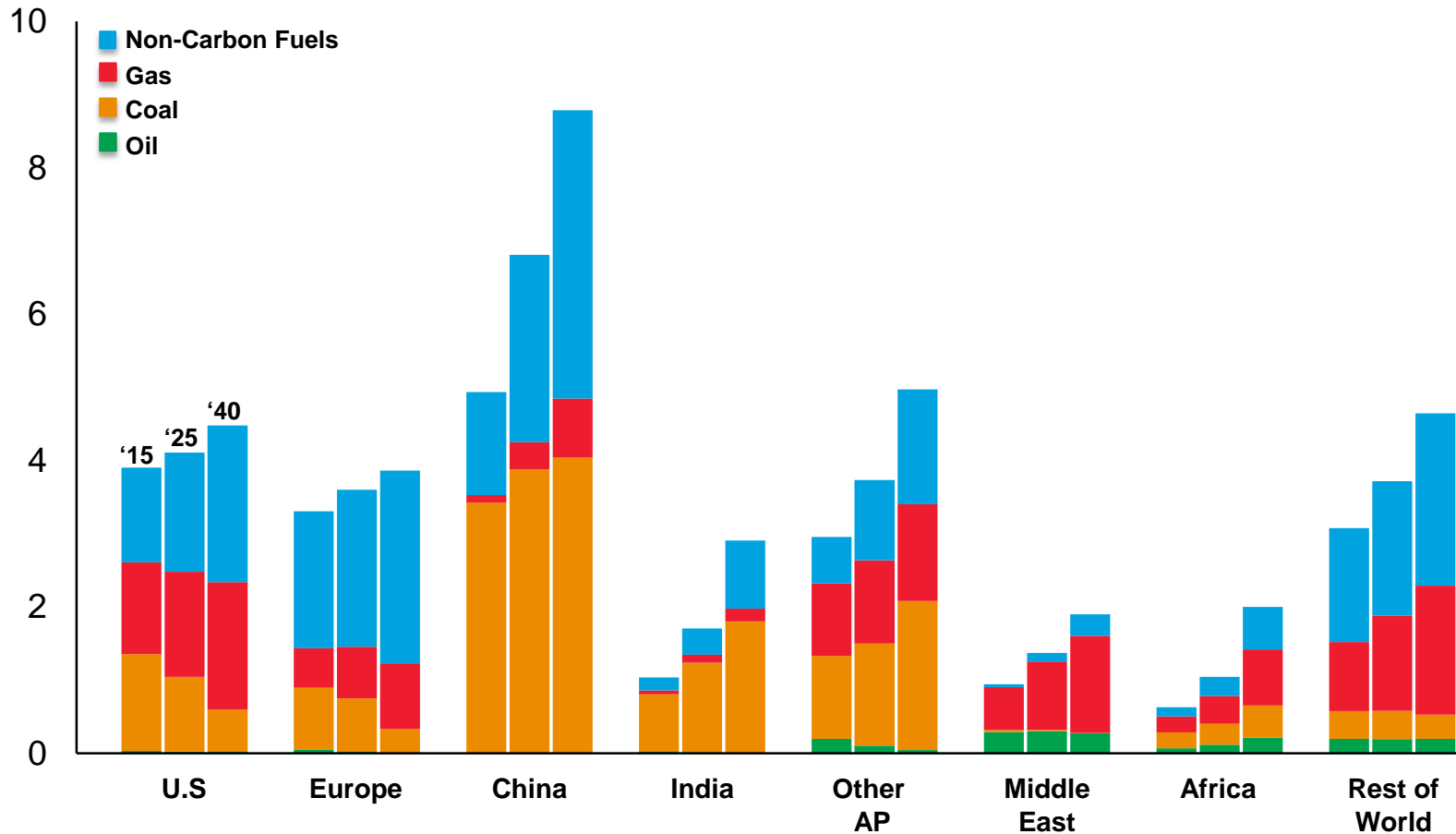
Thousand TWh



# Fuel for Electricity Transitions

## Net Delivered Electricity 2015-2040

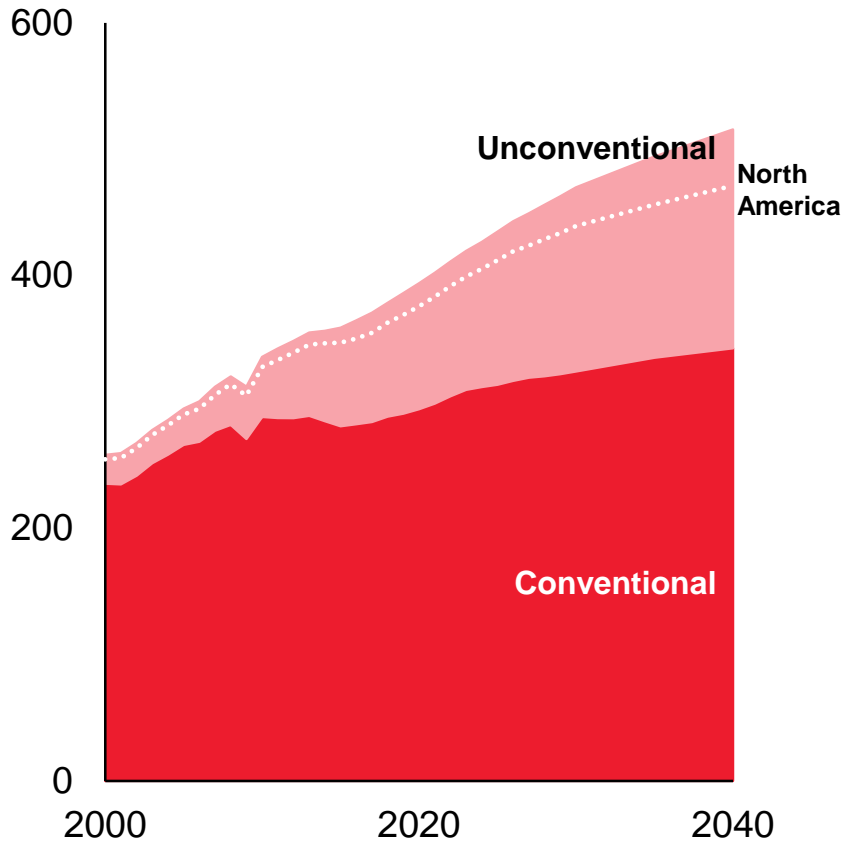
Thousand TWh



# Natural Gas Supply

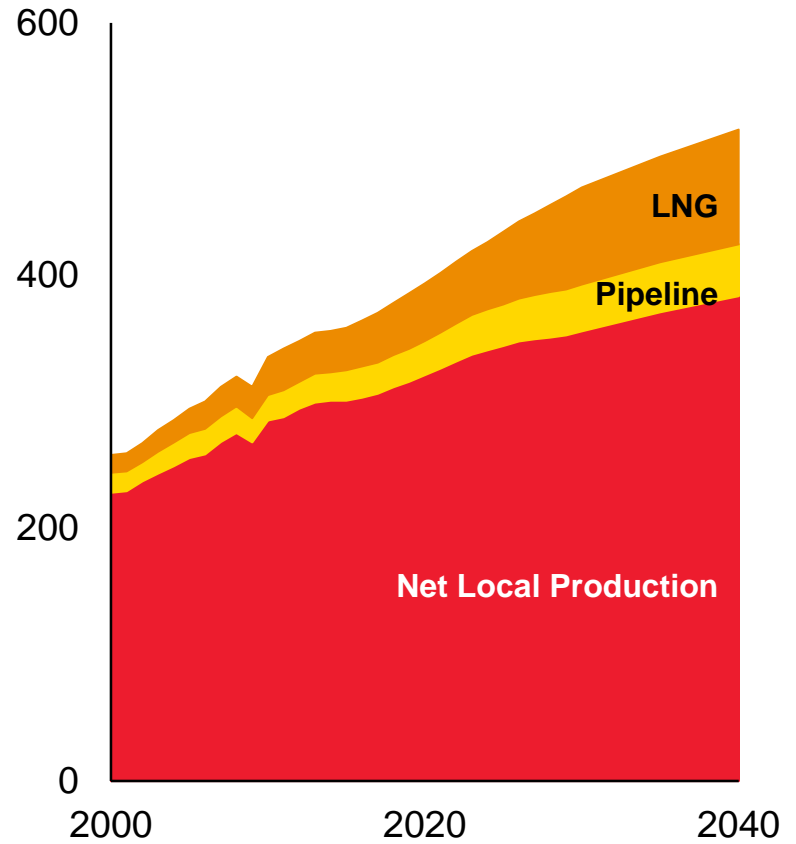
## By Production Type

BCFD

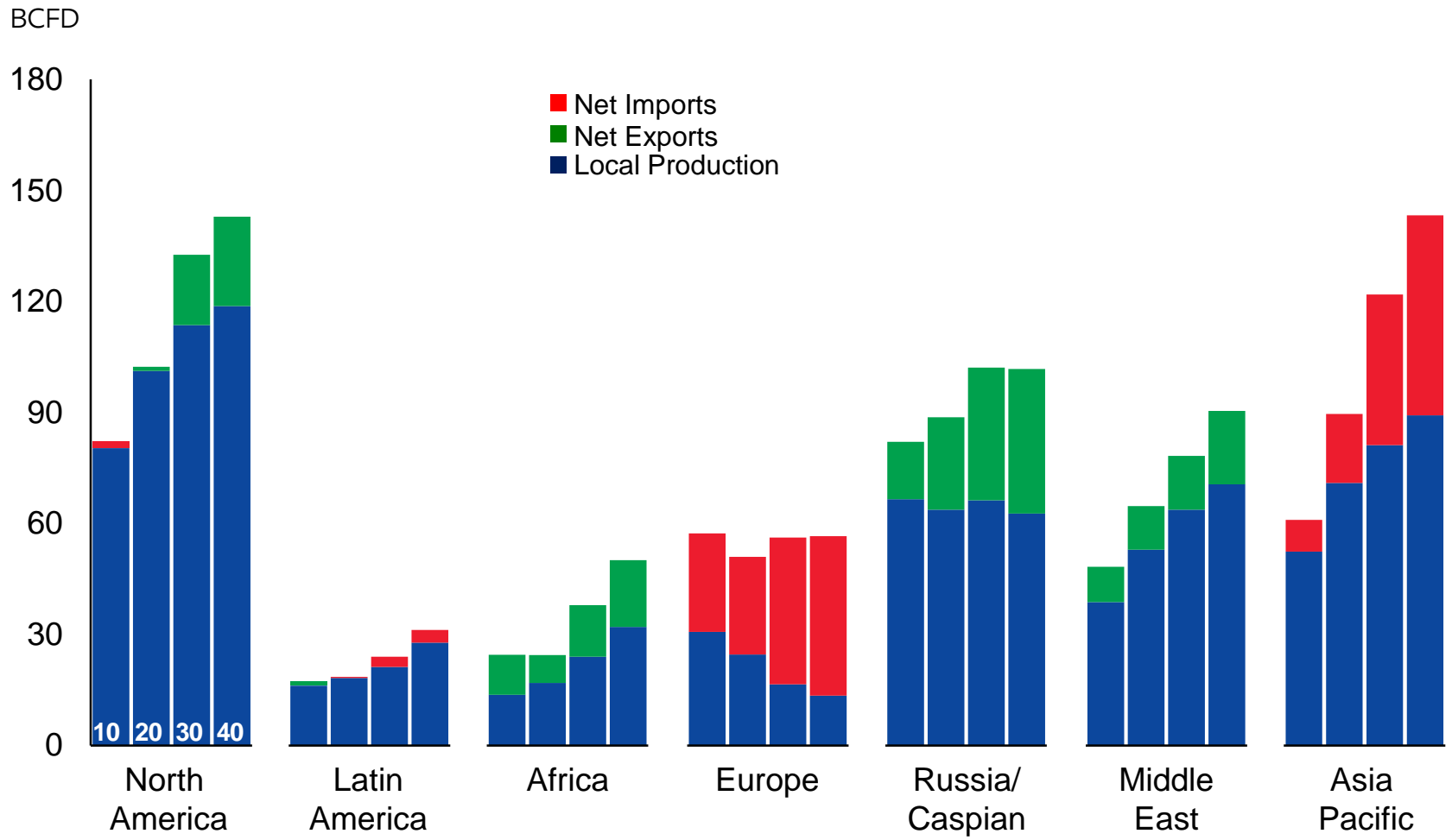


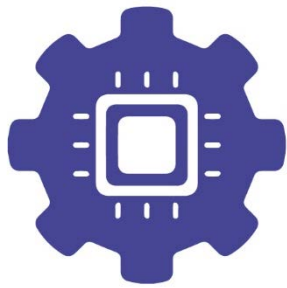
## By Delivery Type

BCFD



# Gas Trade Balance by Region



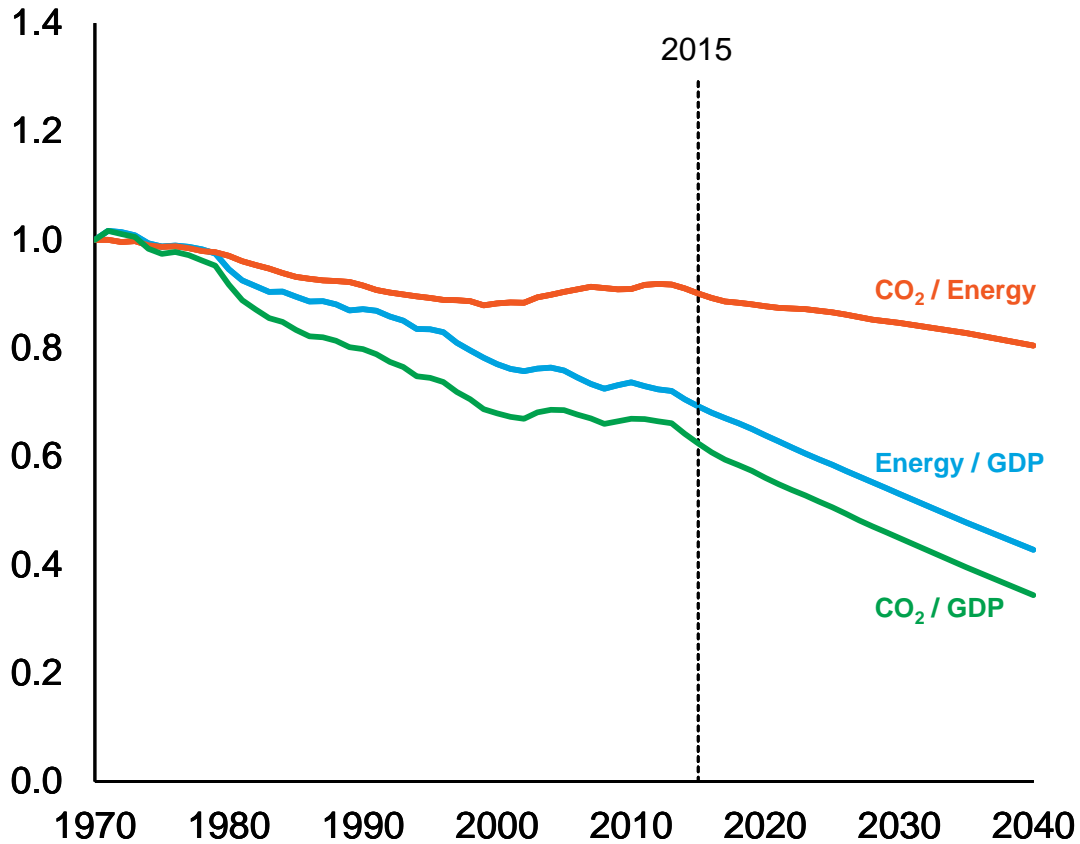


**Technology** has the highest potential and greatest uncertainty.

# Technology Helps Us Do More With Less

## Global Average Intensity

Index



# CO<sub>2</sub> Abatement Costs



Coal



Gas

CO<sub>2</sub> Abated

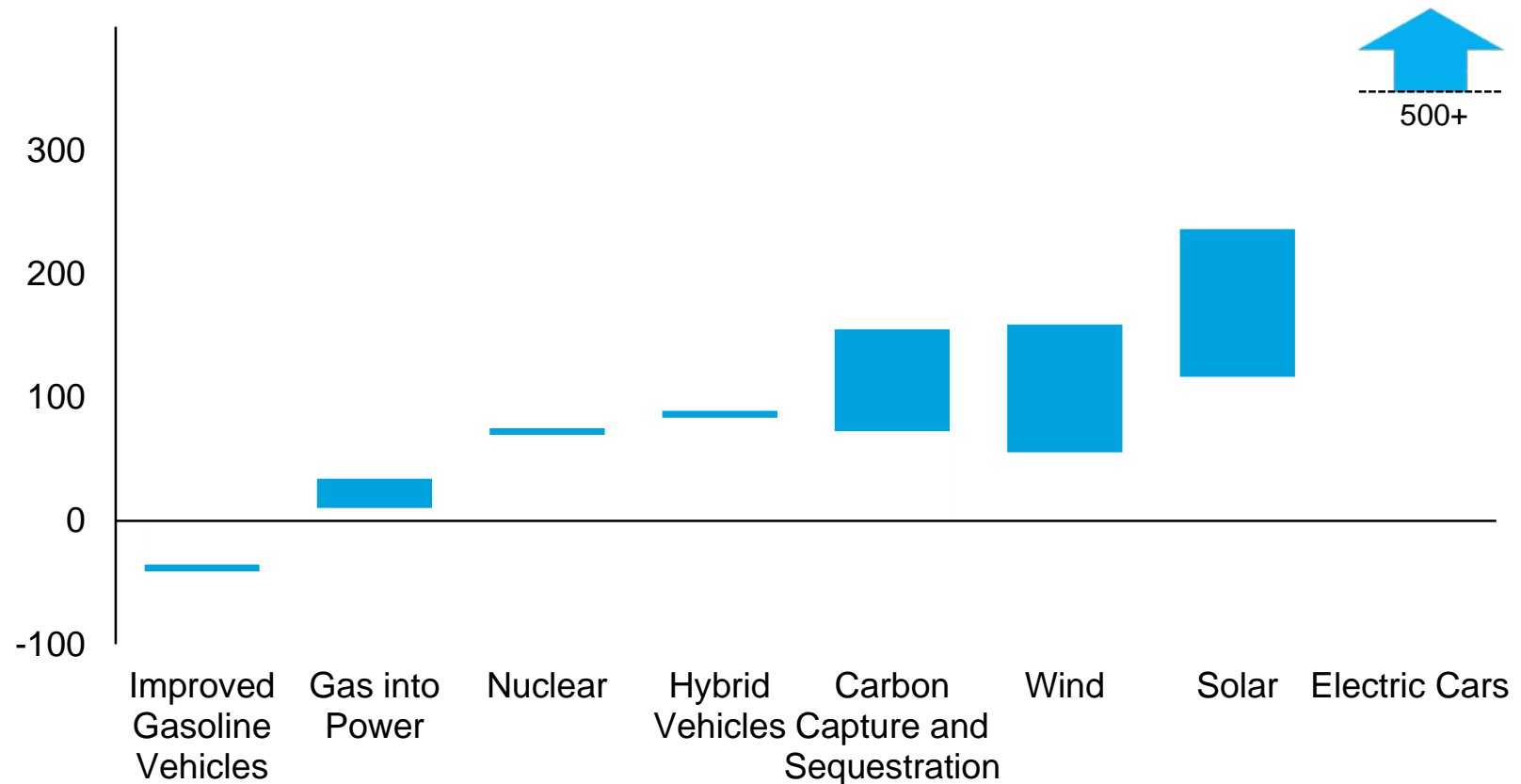
Abatement Cost =

$$\frac{\$ \text{ Capital} + \$ \text{ Operating Costs}}{\text{Tonne}} \text{ Dollars}$$

# Clarifying Options to Reduce CO<sub>2</sub> Emissions

## Average U.S. CO<sub>2</sub> Abatement Costs

2016 - Dollars per tonne

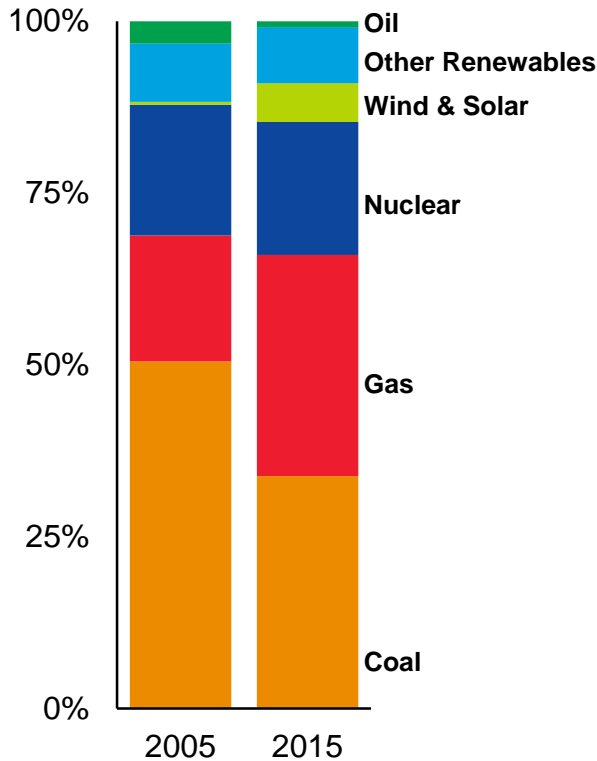




# Two Paths to CO<sub>2</sub> Reduction

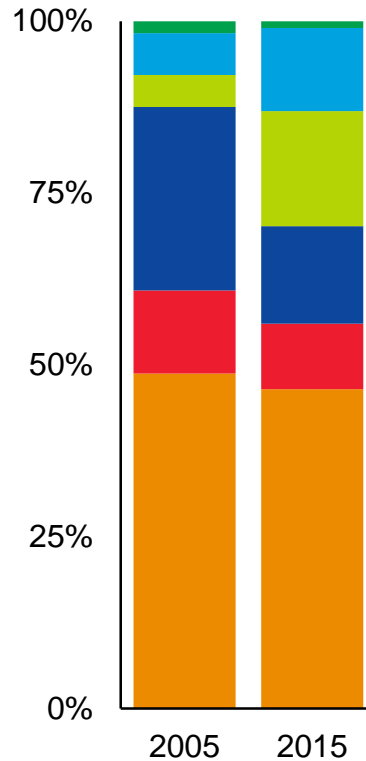
**United States Generation Share**

Percent



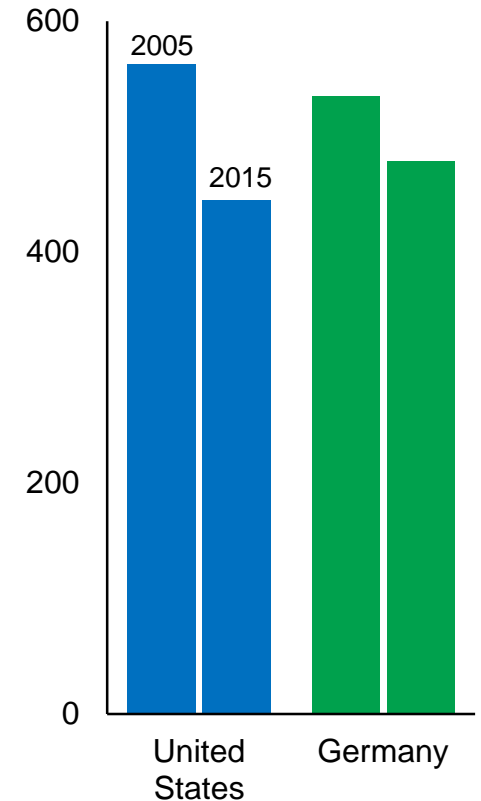
**Germany Generation Share**

Percent



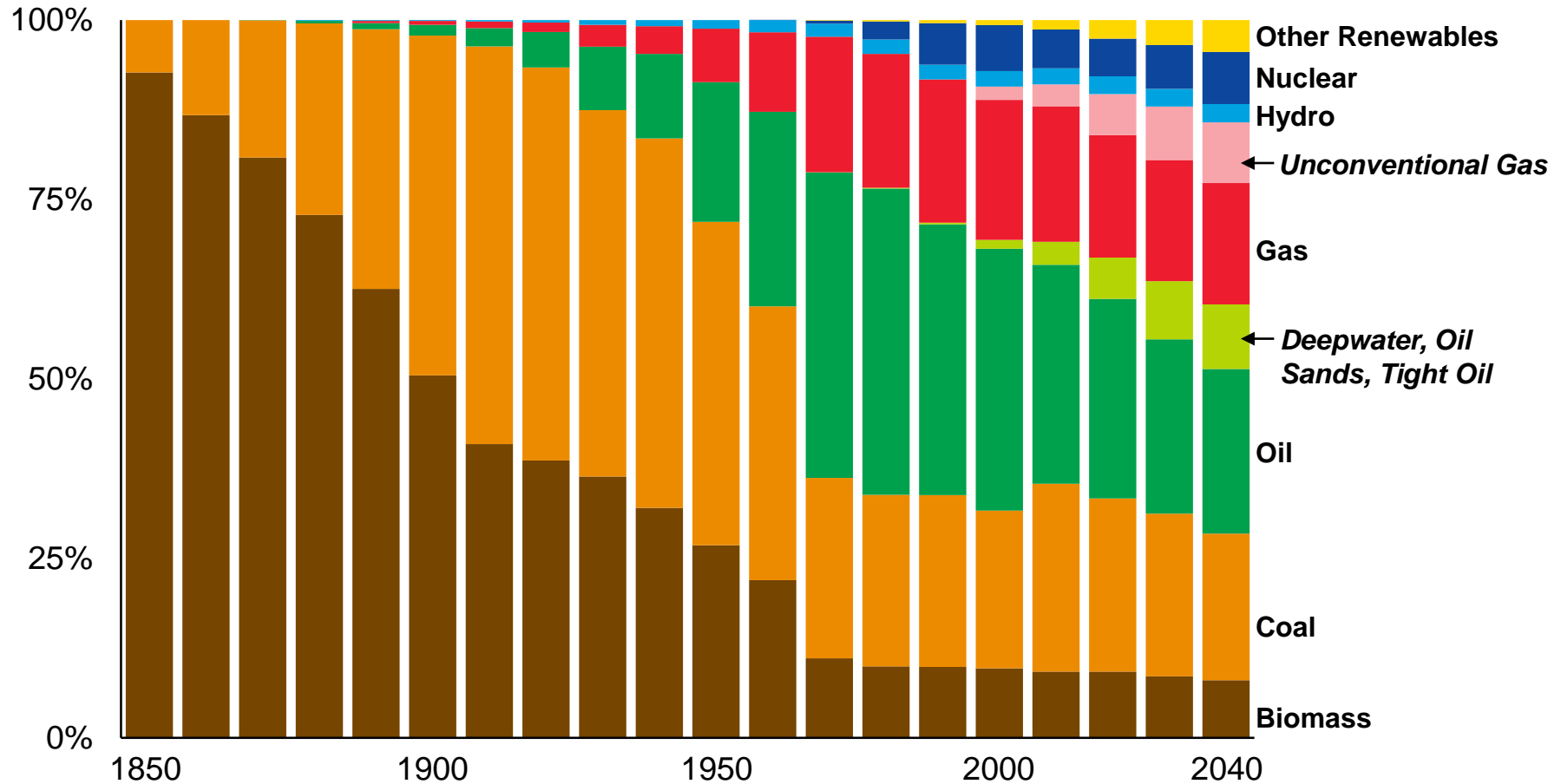
**CO<sub>2</sub> Intensity of Generation**

g CO<sub>2</sub>/kWh generation



# Technology Contributes to the Fuel Mix

Global Mix of Fuels

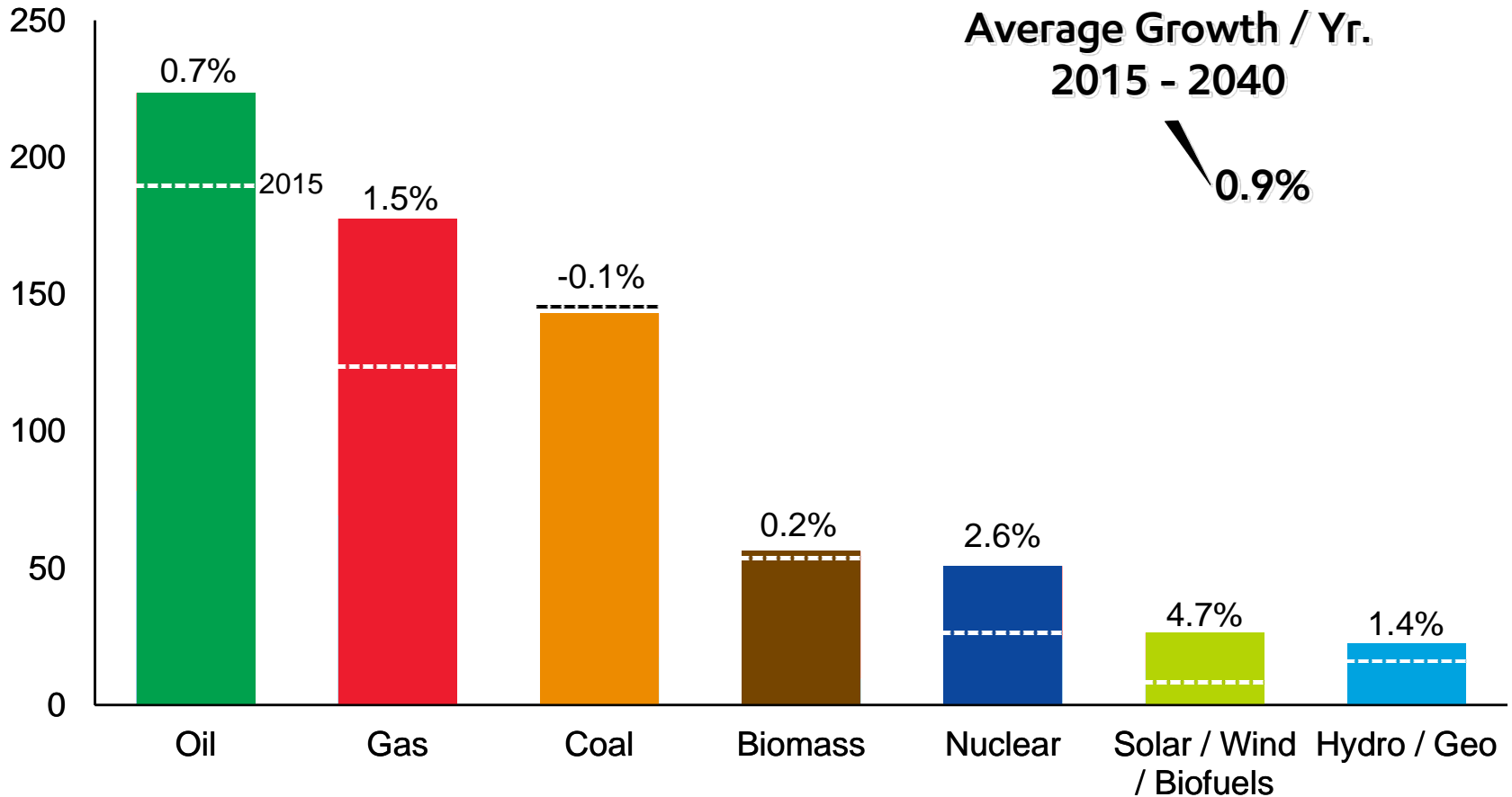


Source: Smil, Energy Transitions (1800-1960)

# Global Demand

## 2040 By Fuel

Quadrillion BTUs



For more information, visit [exxonmobil.com/energyoutlook](http://exxonmobil.com/energyoutlook) or download the ExxonMobil app



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