

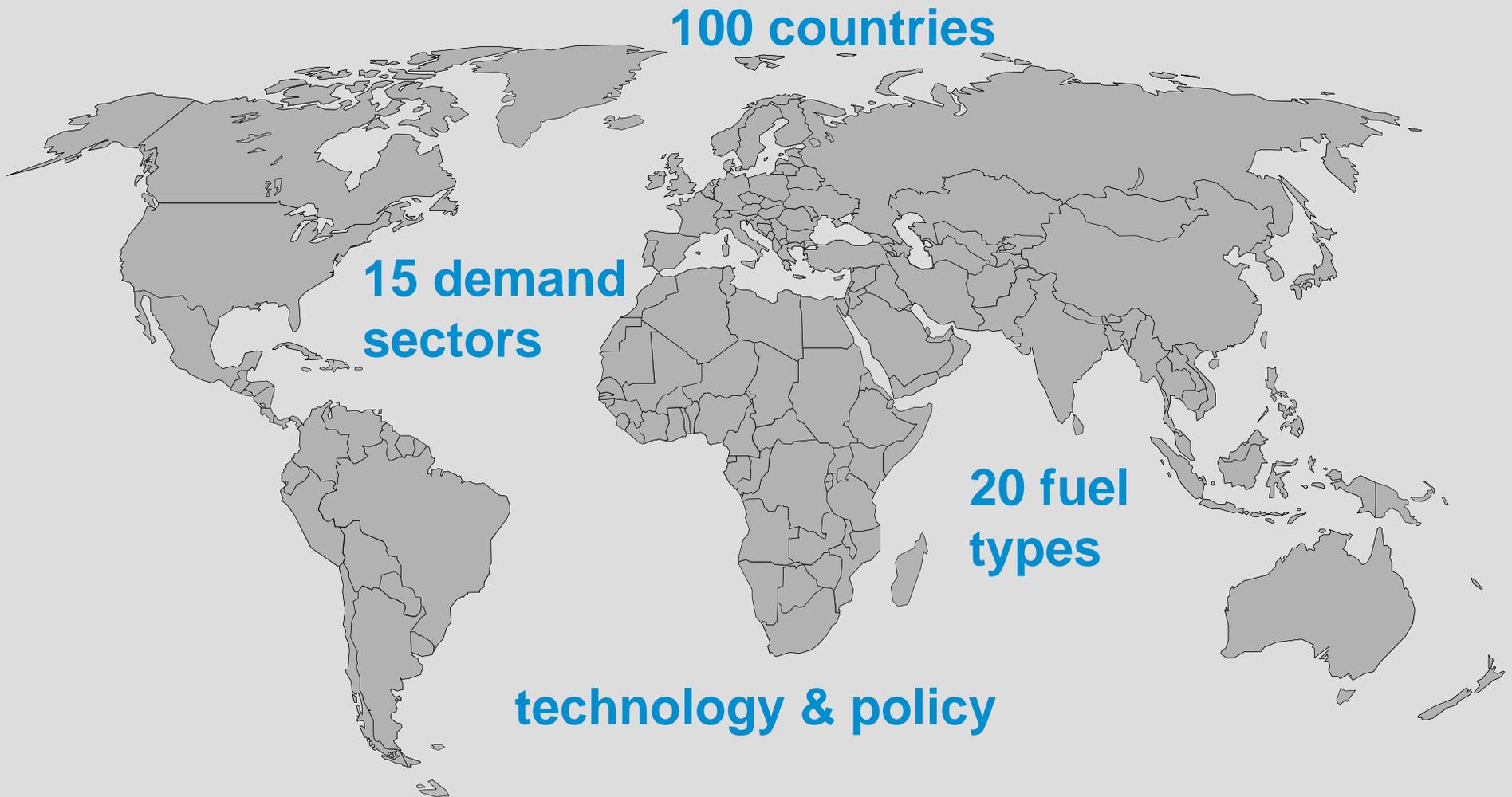
The Outlook for Energy: A View to 2040

Dr. David Khemakhem
Carnegie Mellon Electricity Industry Center
Scott Energy Innovation Institute
Pittsburgh, May 3, 2013

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 publically-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.

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Energy Outlook Model

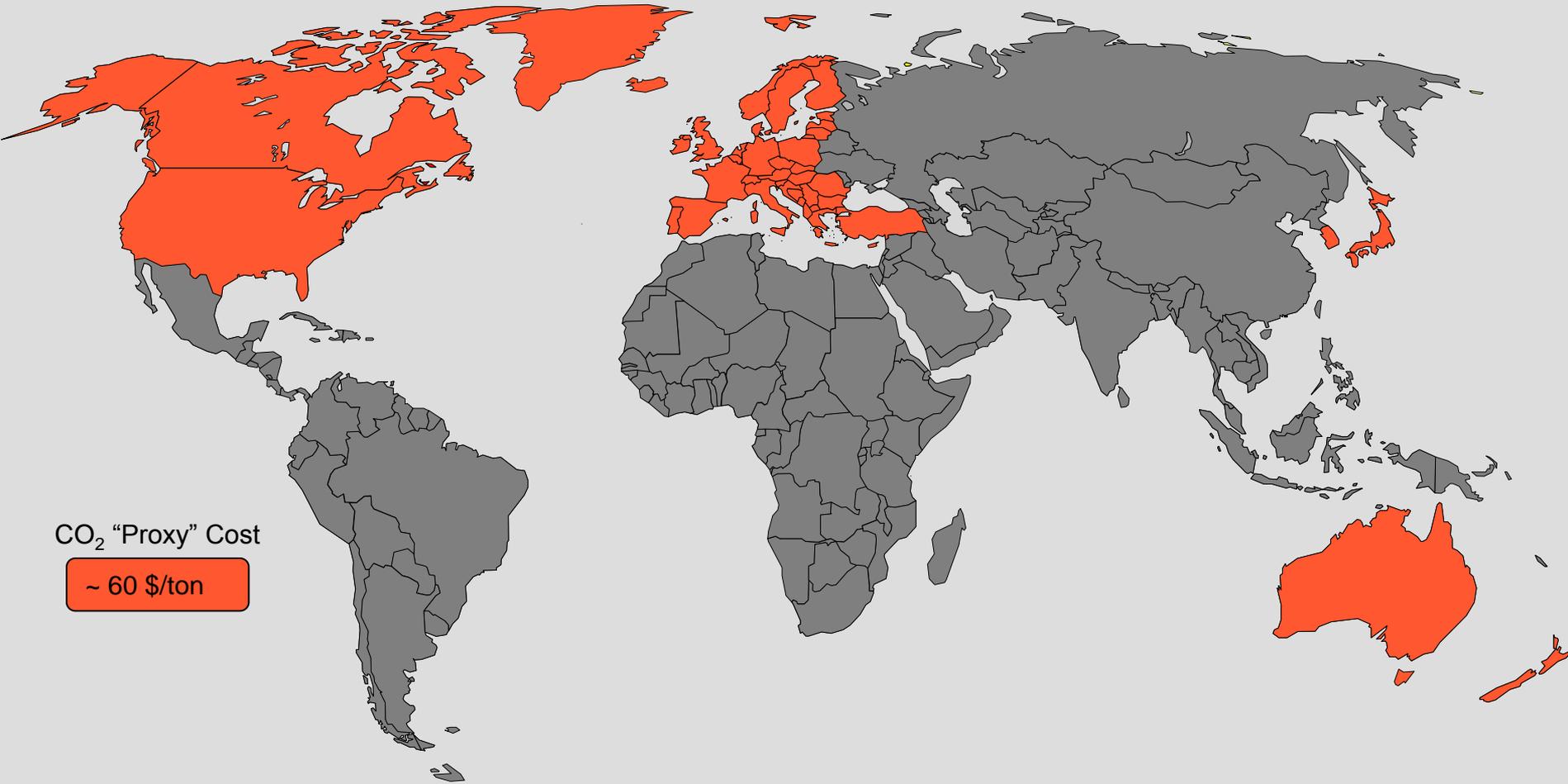


CO₂ Policies

2030

CO₂ "Proxy" Cost

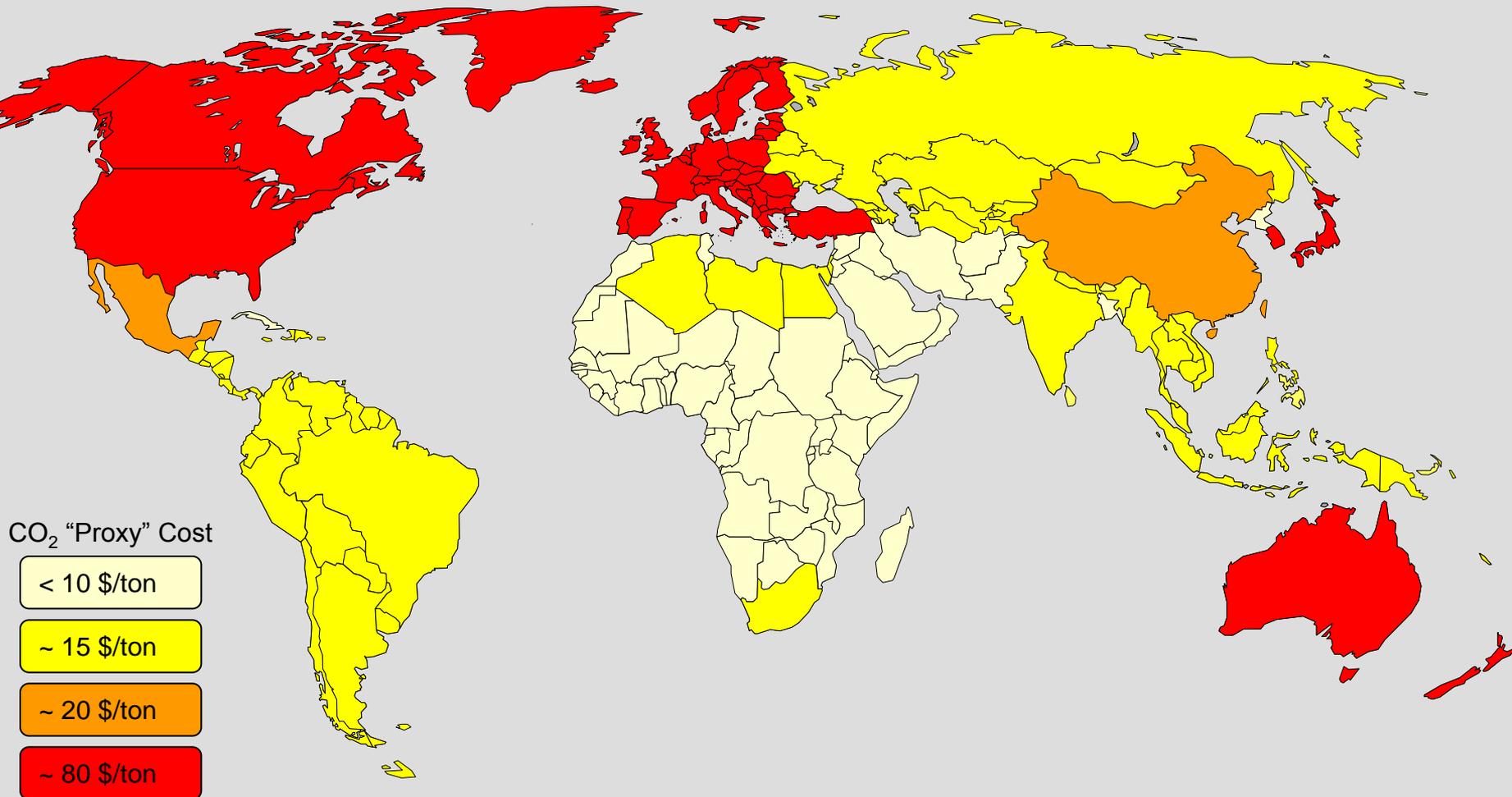
~ 60 \$/ton



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CO₂ Policies

2040



Global fundamentals

9 billion

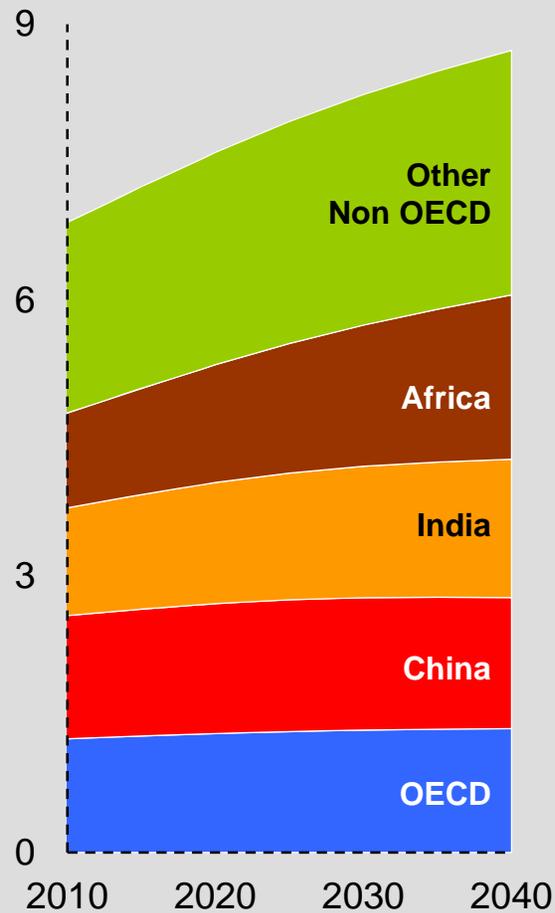
The world's population will rise by more than 25 percent from 2010 to 2040, reaching nearly 9 billion.



Population Trends Impacts Energy Use

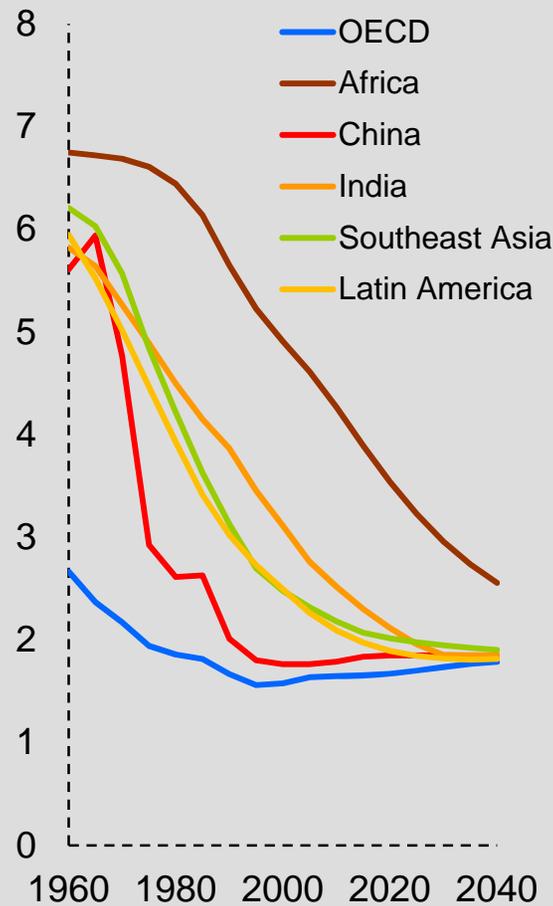
Population

Billion



Fertility Rate*

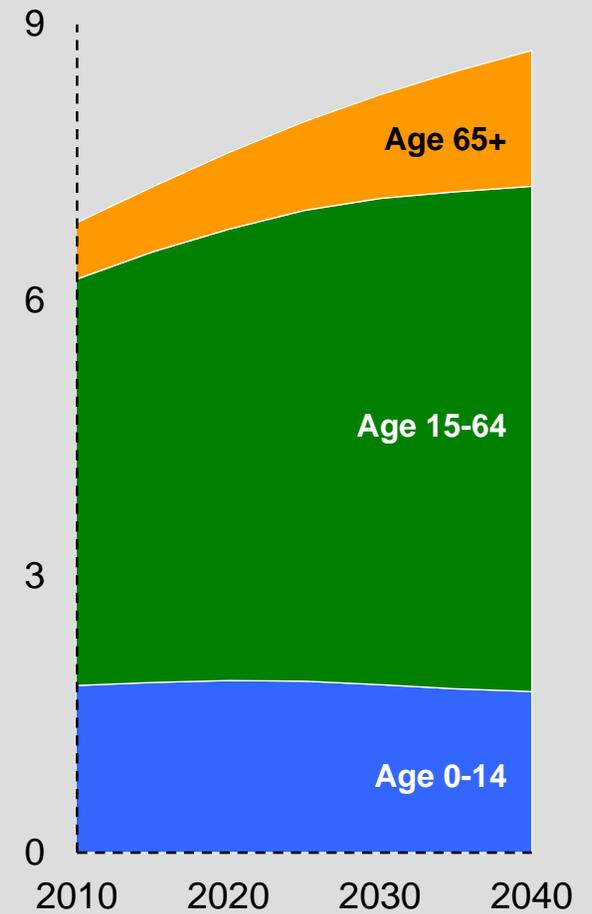
Children per Woman



* Source: World Bank & United Nations

Global Demographics*

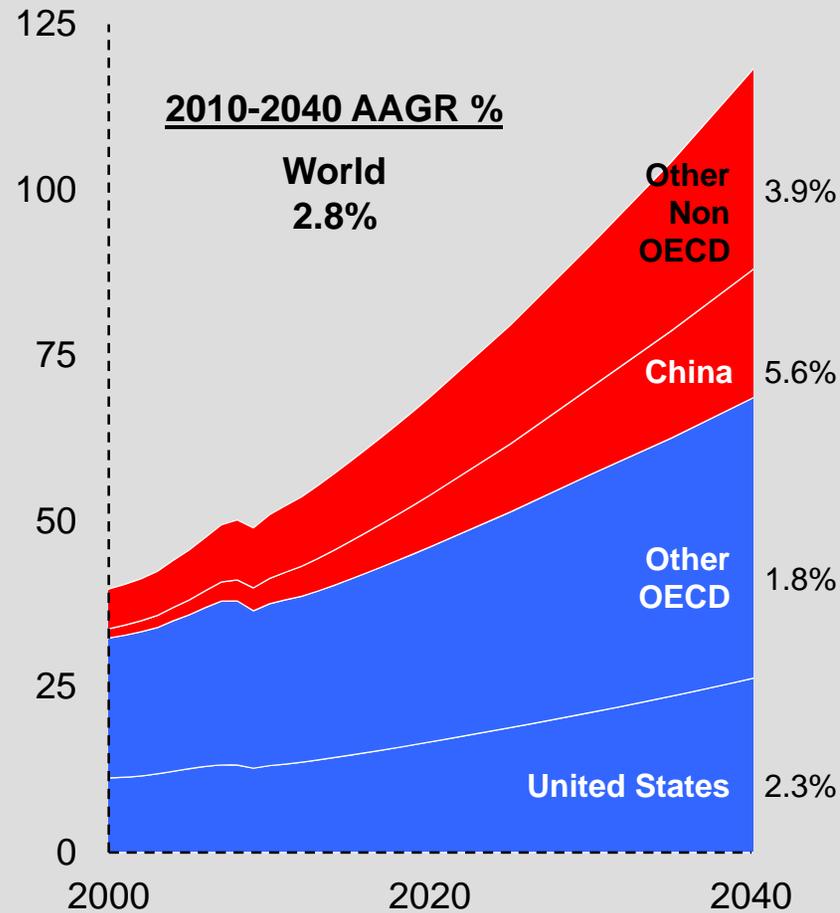
Billion



Economic Growth Drives Energy Demand

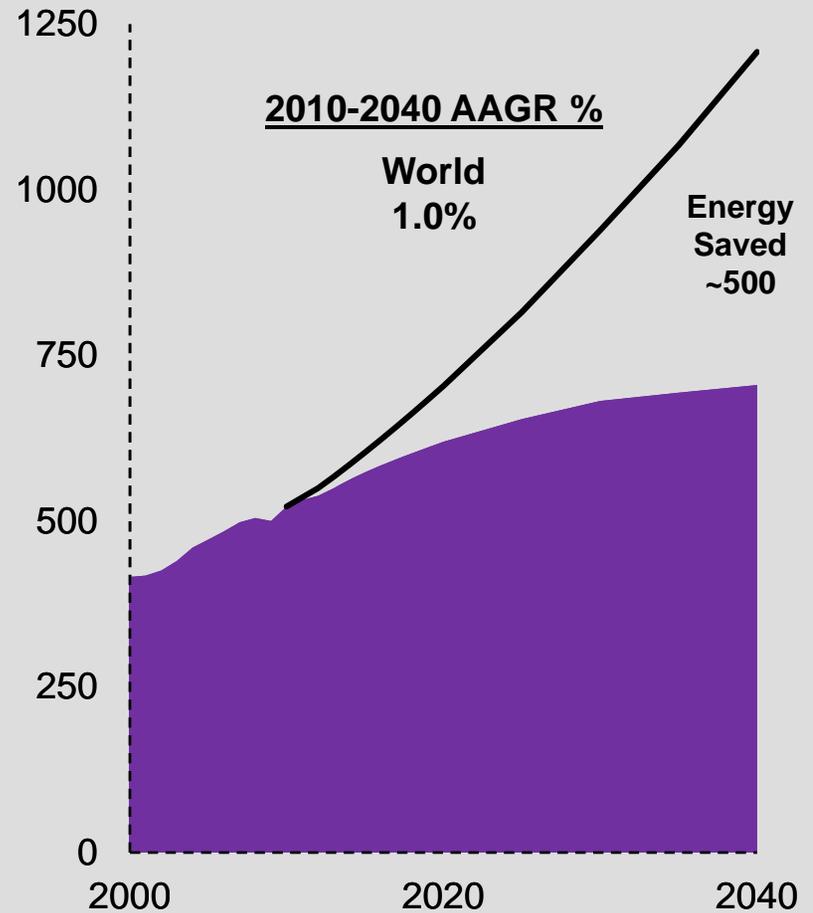
GDP

Trillion 2005\$



Energy Demand

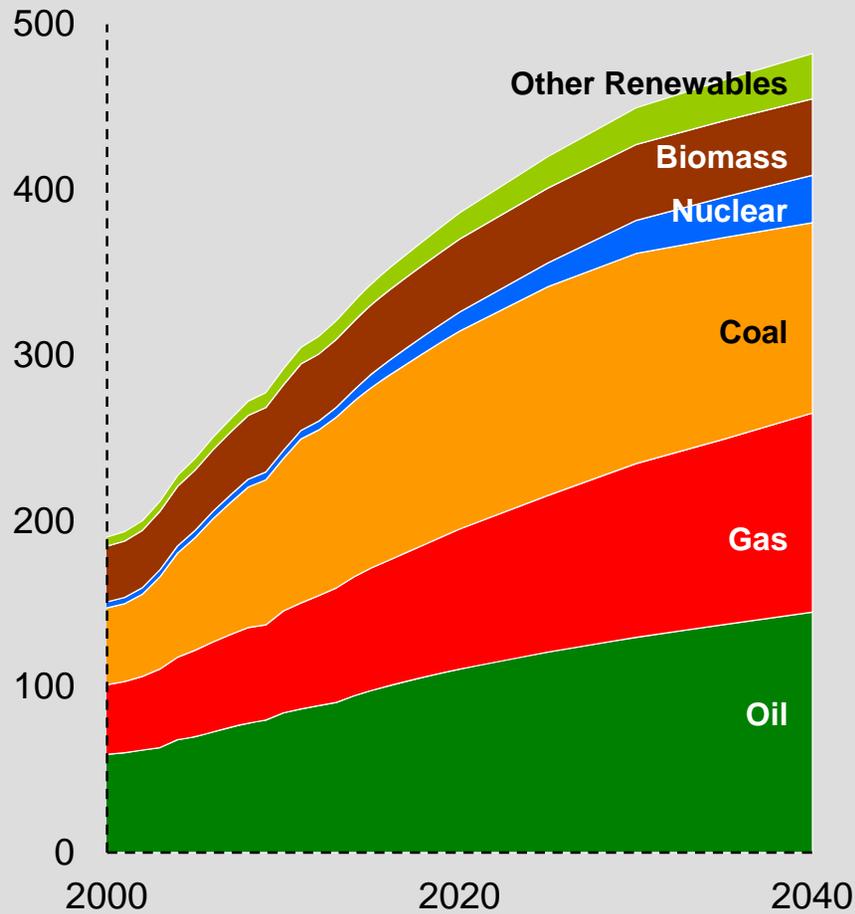
Quadrillion BTUs



Tale of Two Worlds

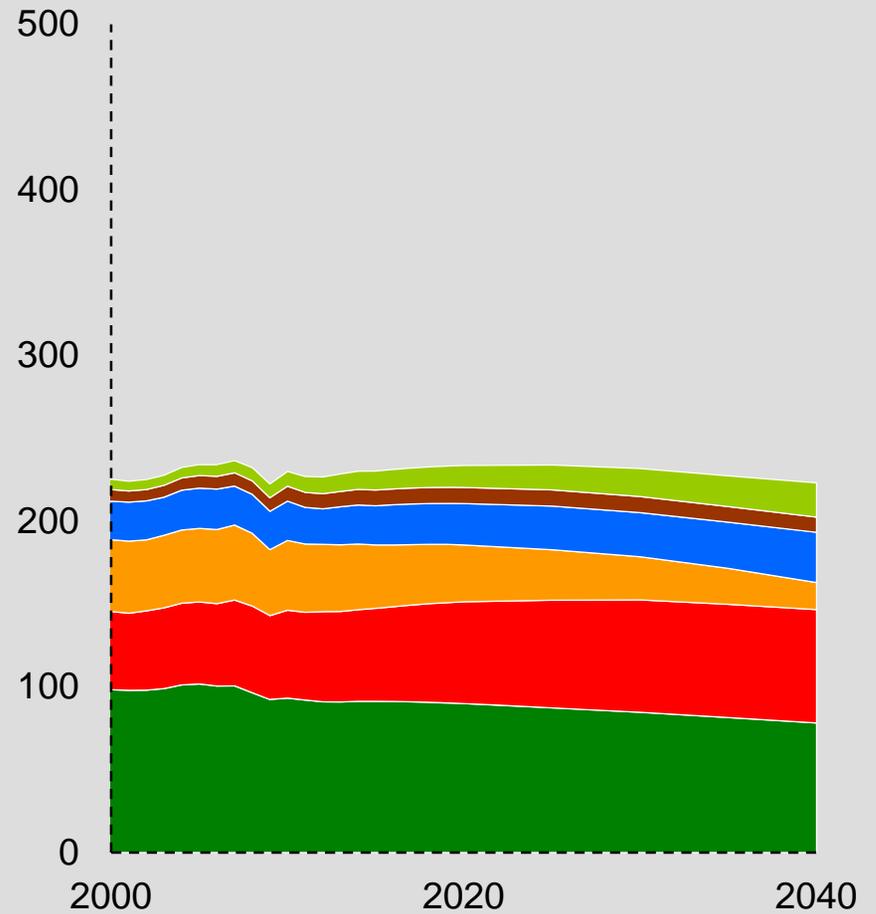
Non OECD

Quadrillion BTUs

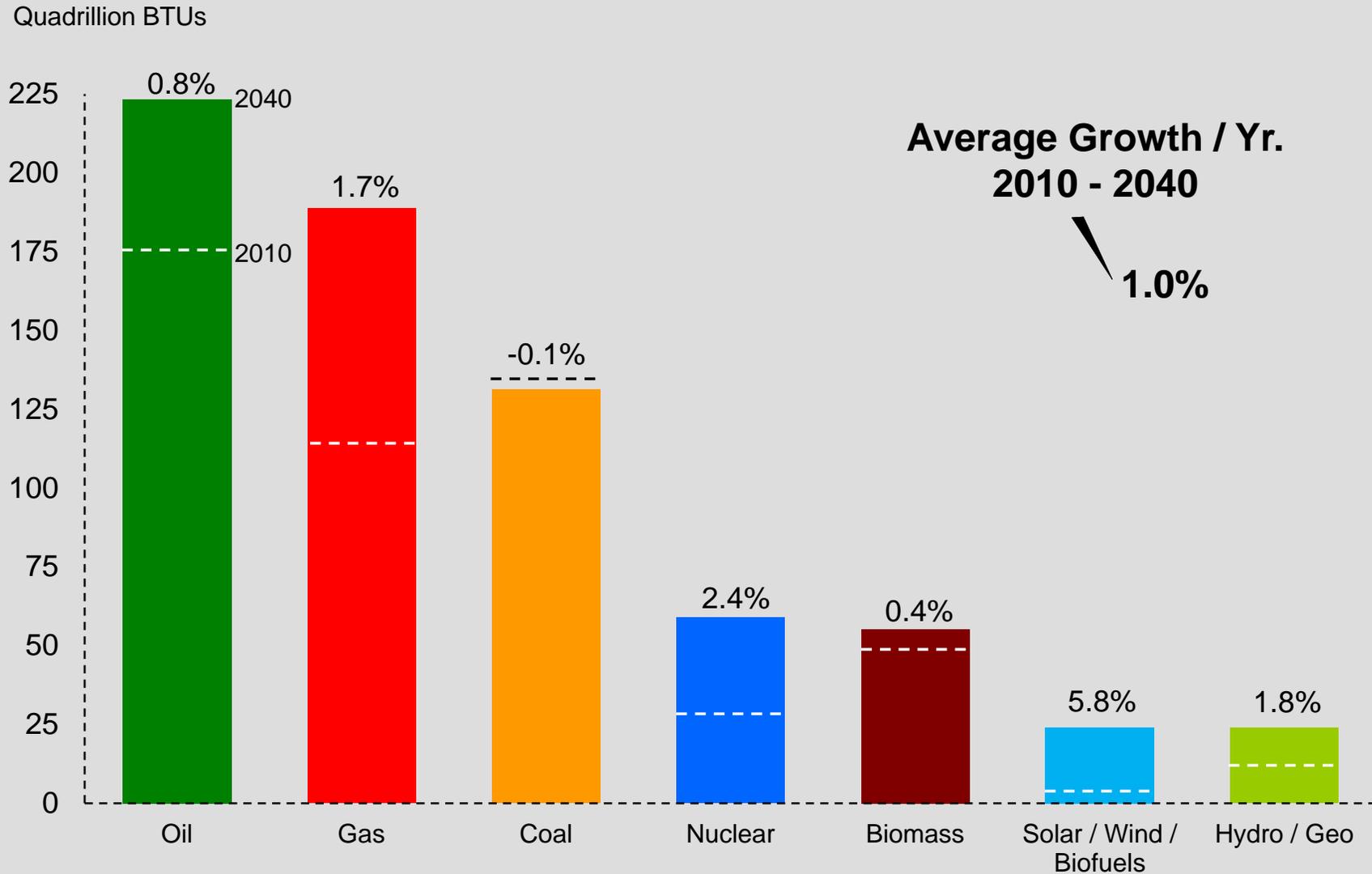


OECD

Quadrillion BTUs



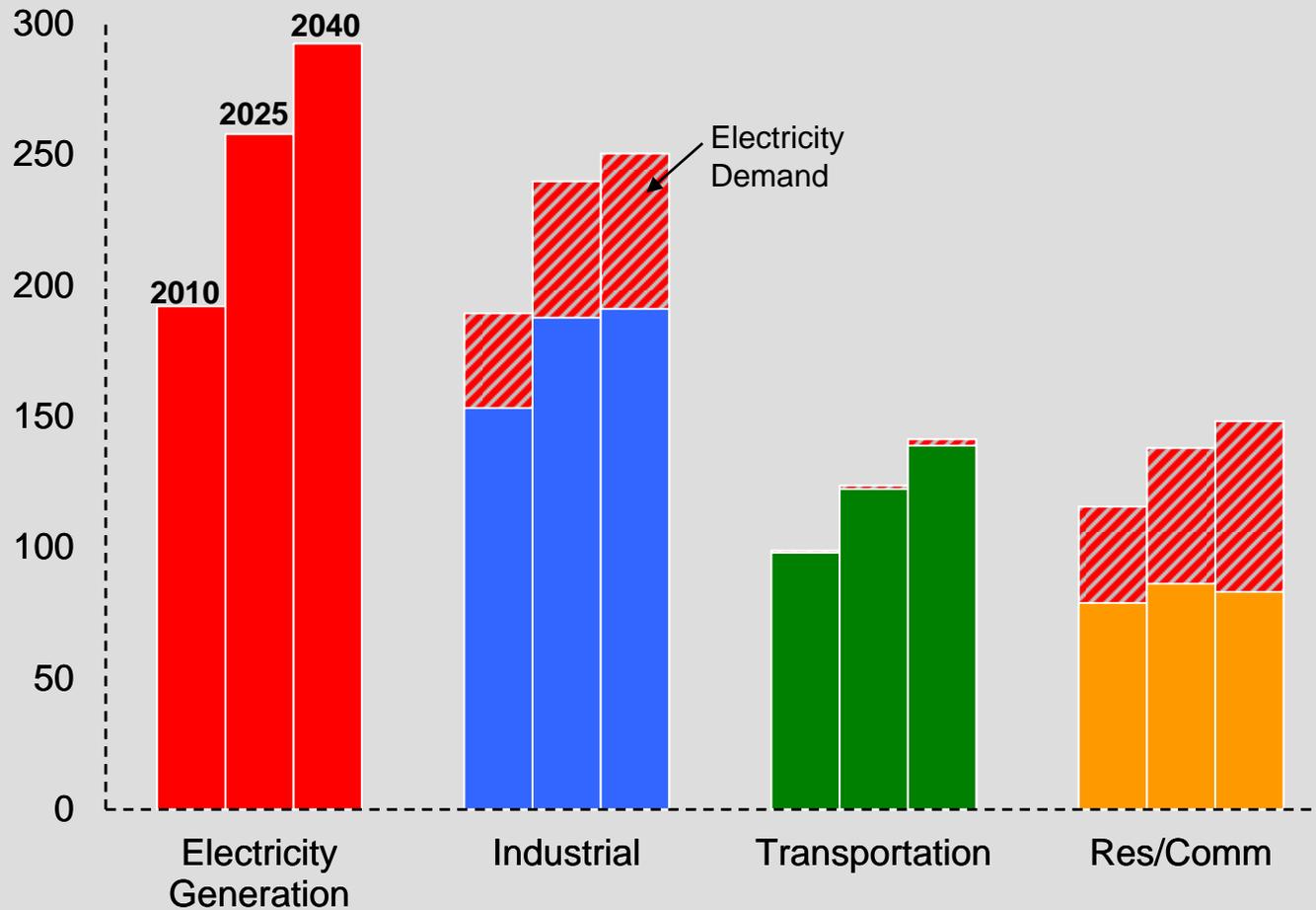
Energy Mix Continues to Evolve

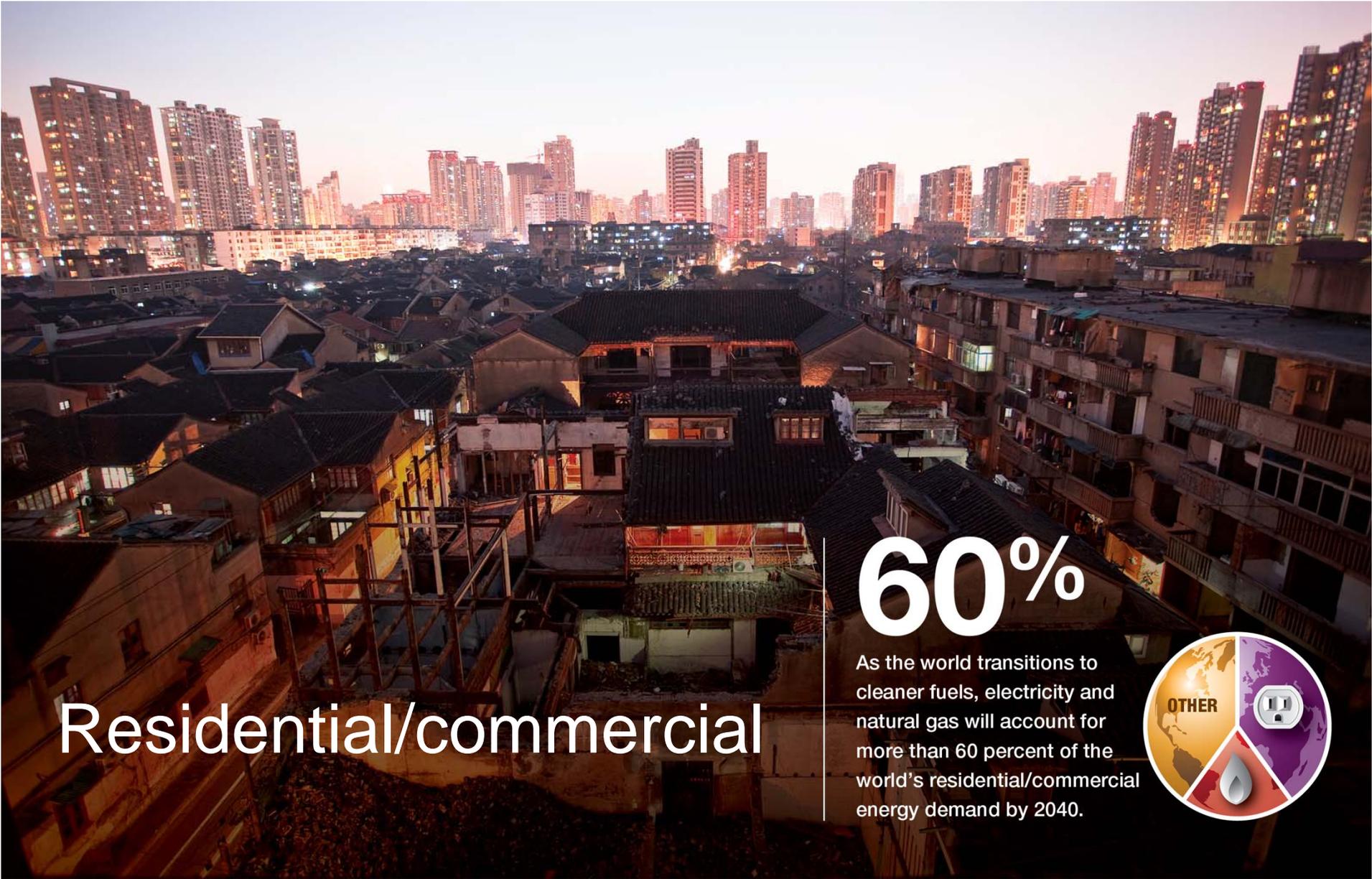


Electricity Generation Leads Growth

Energy Demand by Sector

Quadrillion BTUs





Residential/commercial

60%

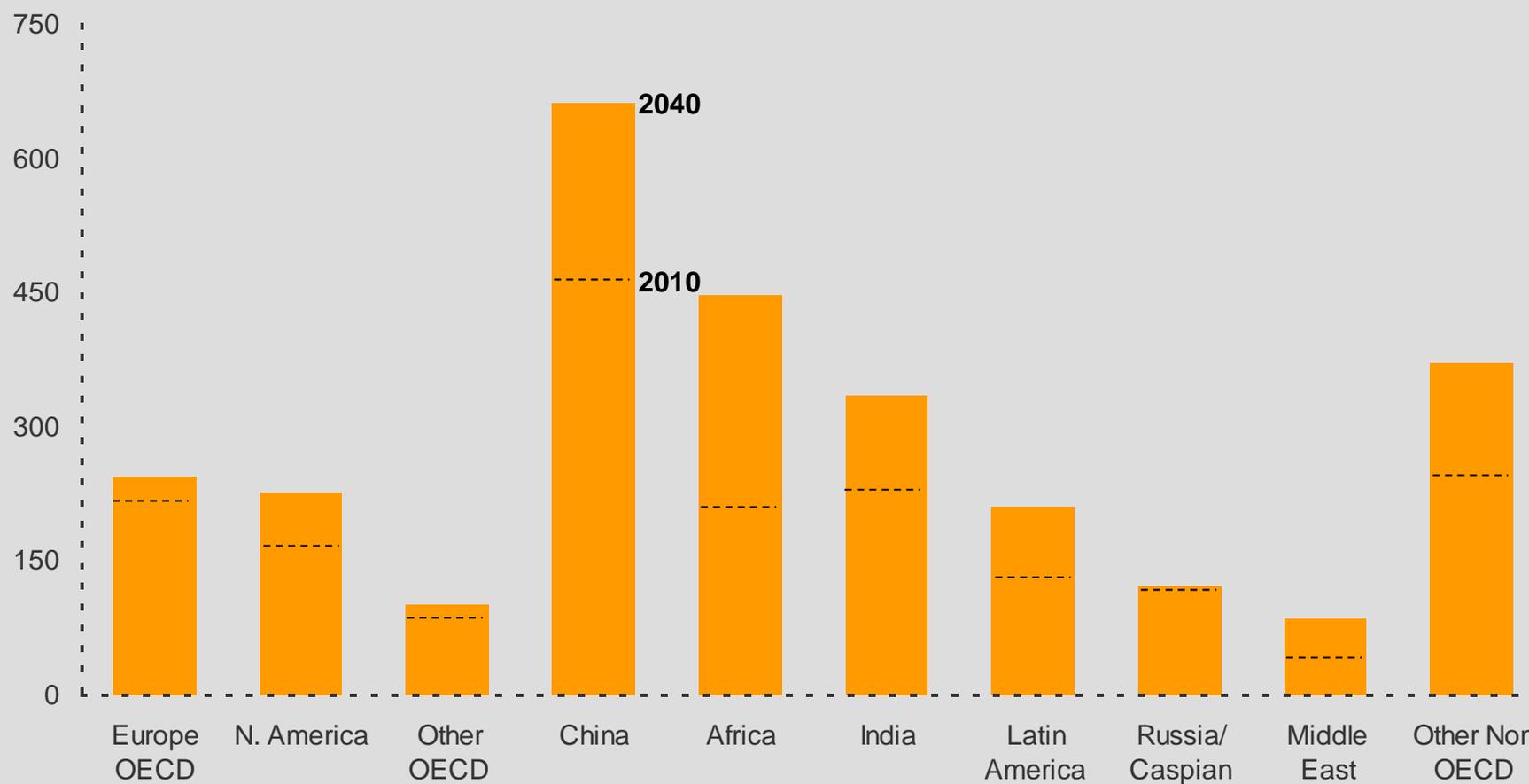
As the world transitions to cleaner fuels, electricity and natural gas will account for more than 60 percent of the world's residential/commercial energy demand by 2040.



Household Growth Drives Residential Demand

2040

Million Households

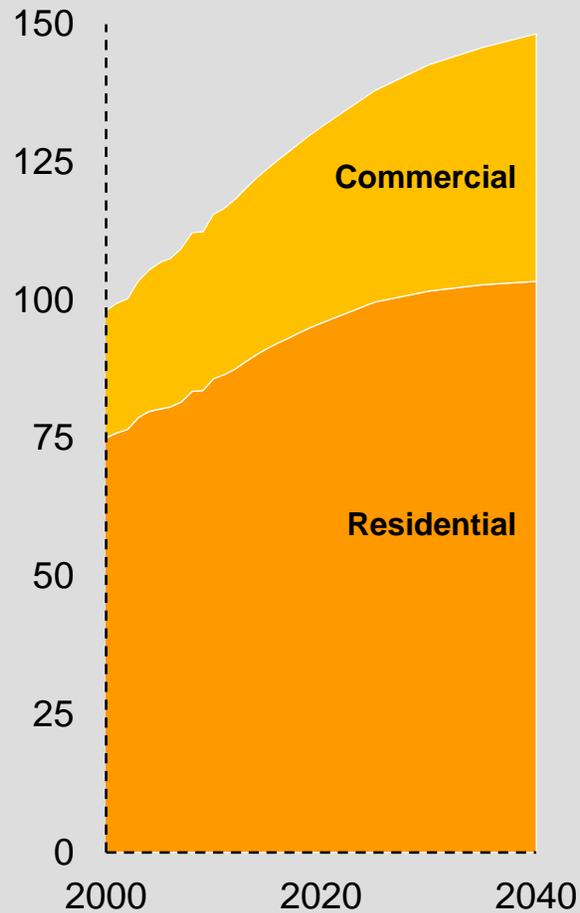


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Residential/Commercial Outlook

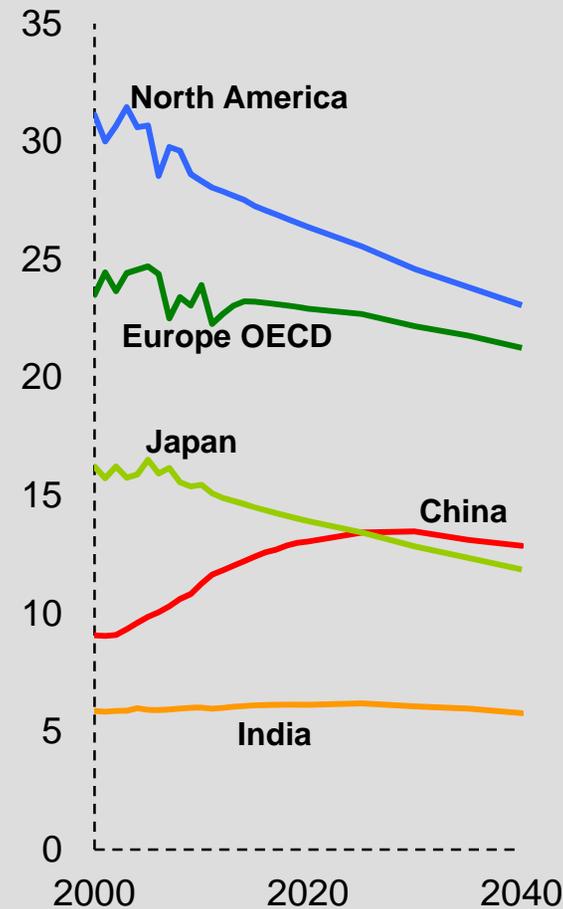
By Sector

Quadrillion BTUs



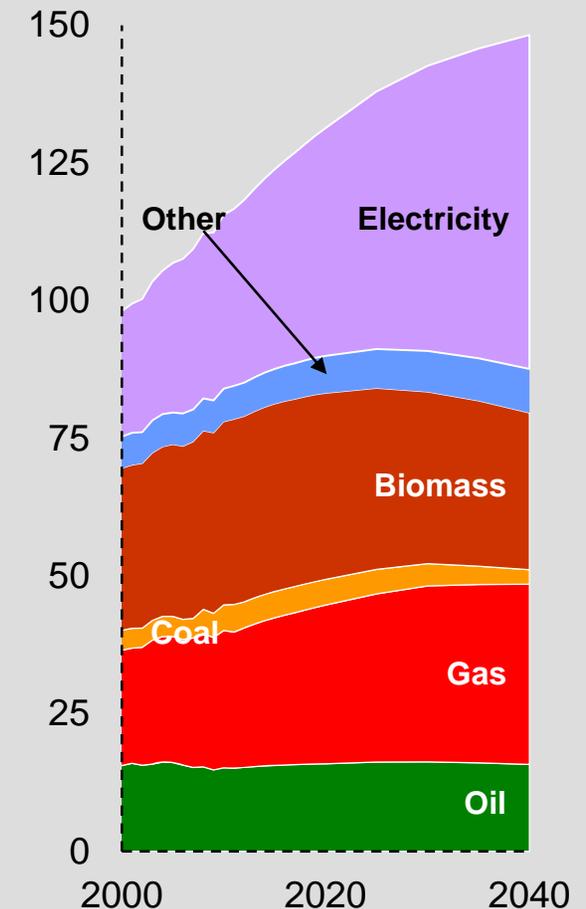
Residential Energy Intensity

Million BTUs per Person



Fuel Demand

Quadrillion BTUs



Industrial

50%

Energy demand,
including feedstocks,
for chemical
production grows
by 50 percent.



2010

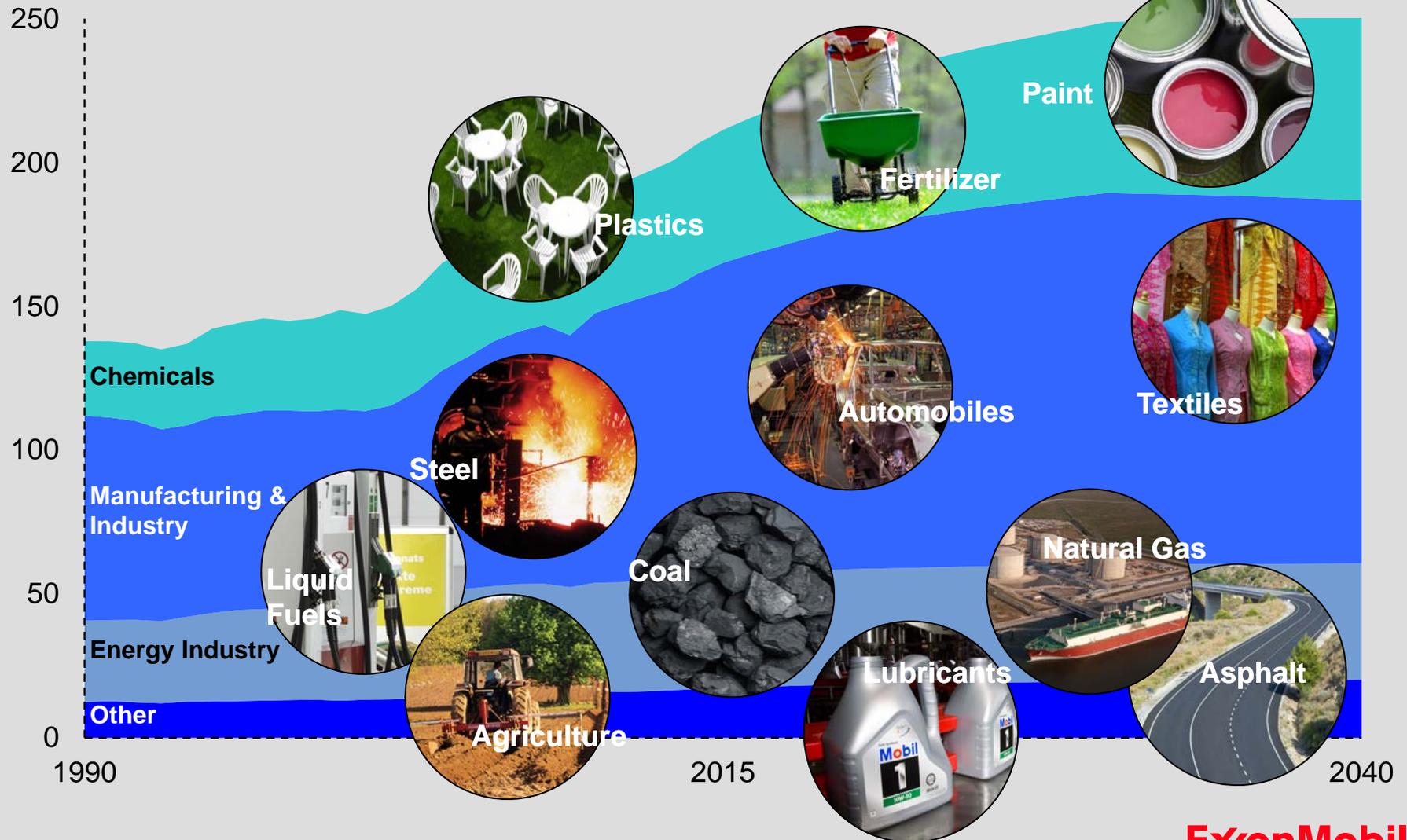


2040



Industry Energy Demand Increases

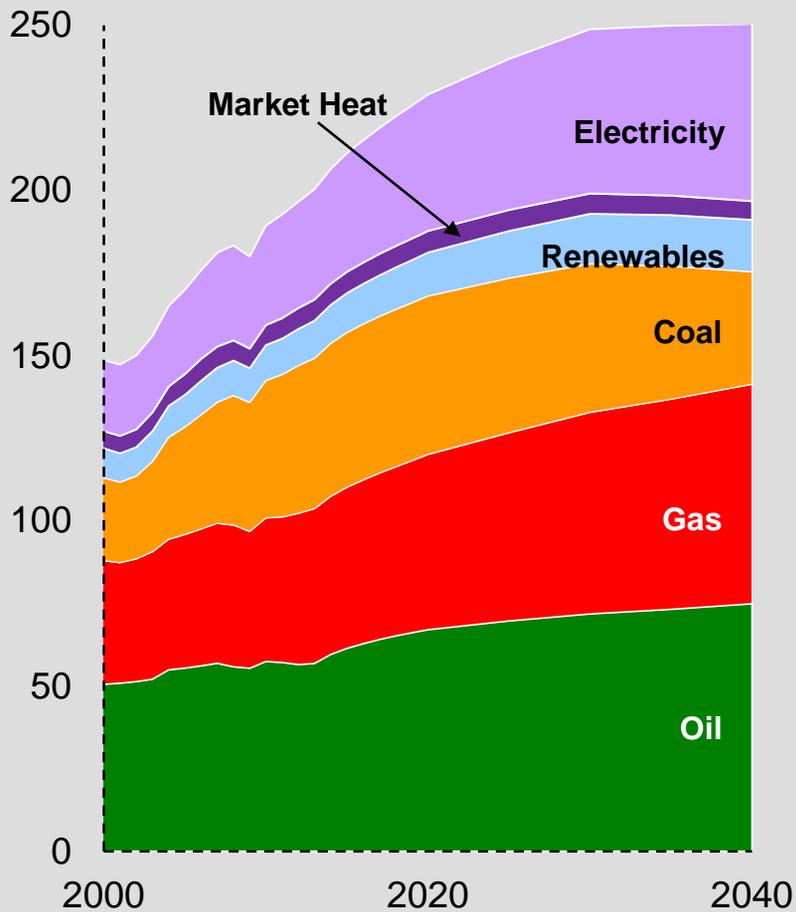
Quadrillion BTUs



Industrial Energy Demand

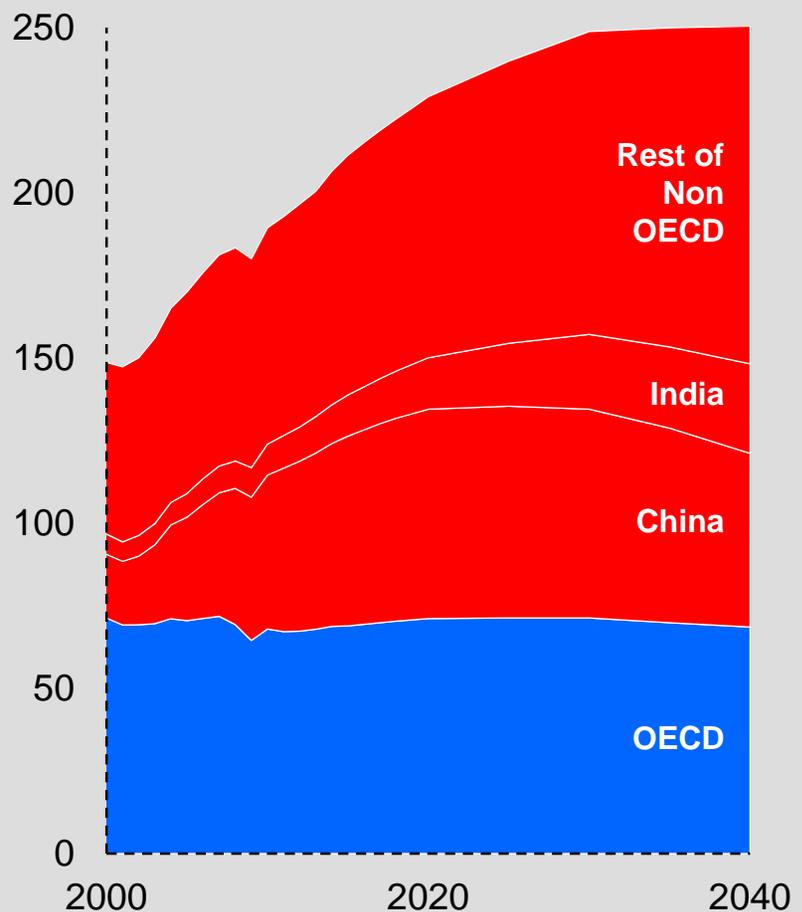
By Fuel

Quadrillion BTUs



By Region

Quadrillion BTUs





Electricity generation

85%

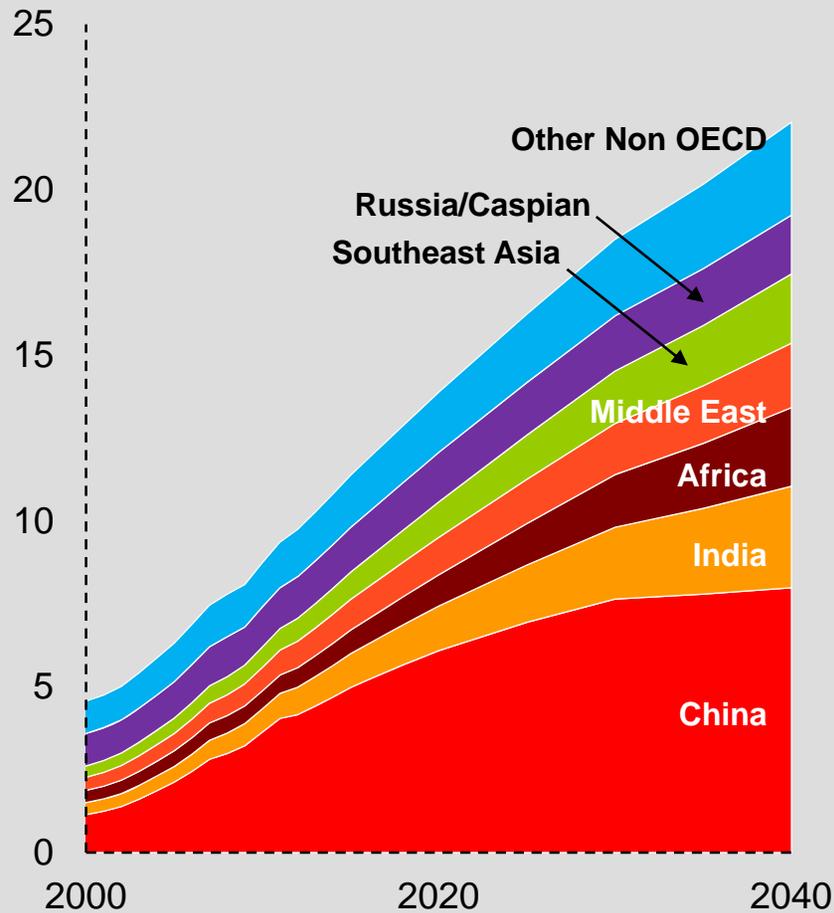
Global electricity demand will grow by 85 percent over the *Outlook* period.



Electricity Demand by Region

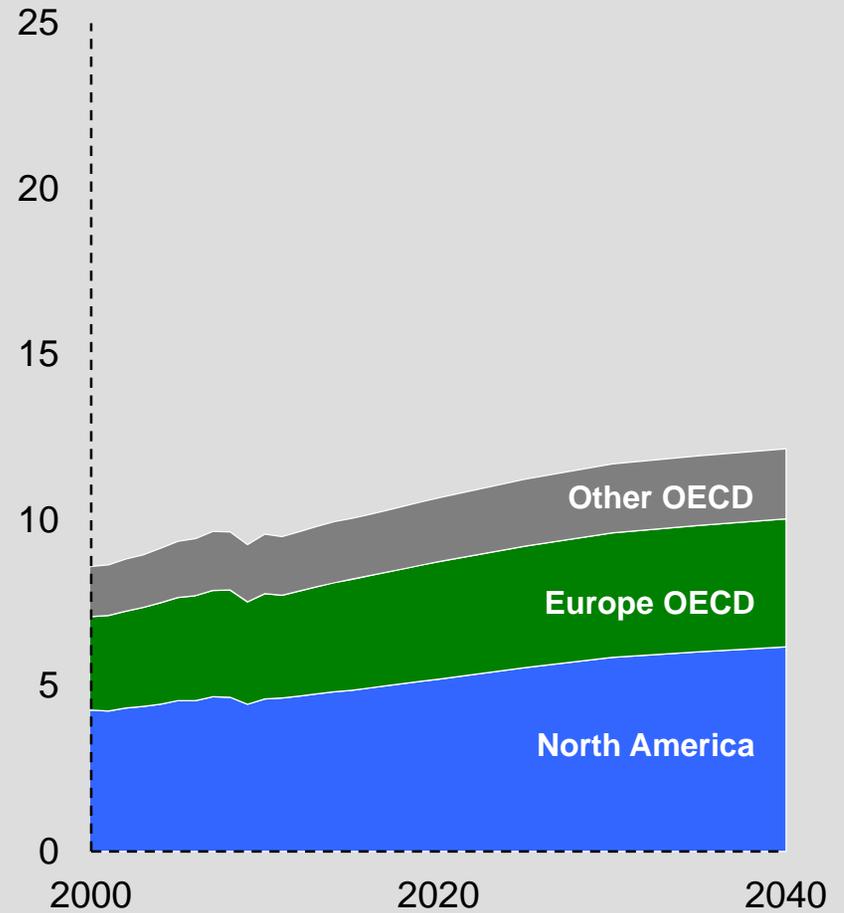
Non OECD

Thousand TWh



OECD

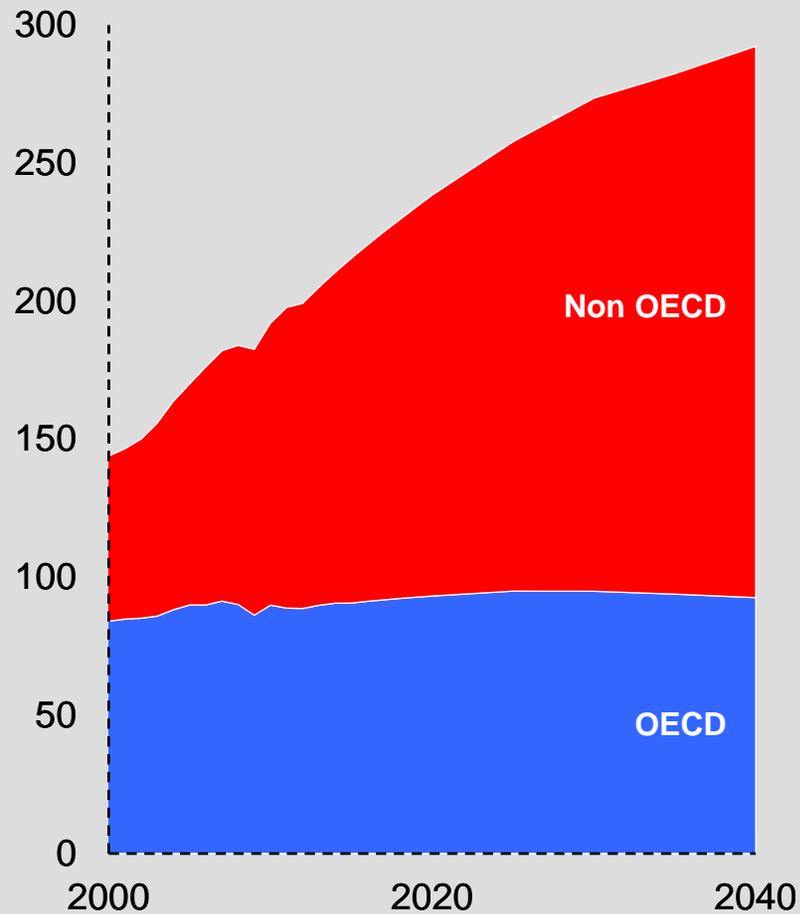
Thousand TWh



Fueling Electricity Generation Varies by Region

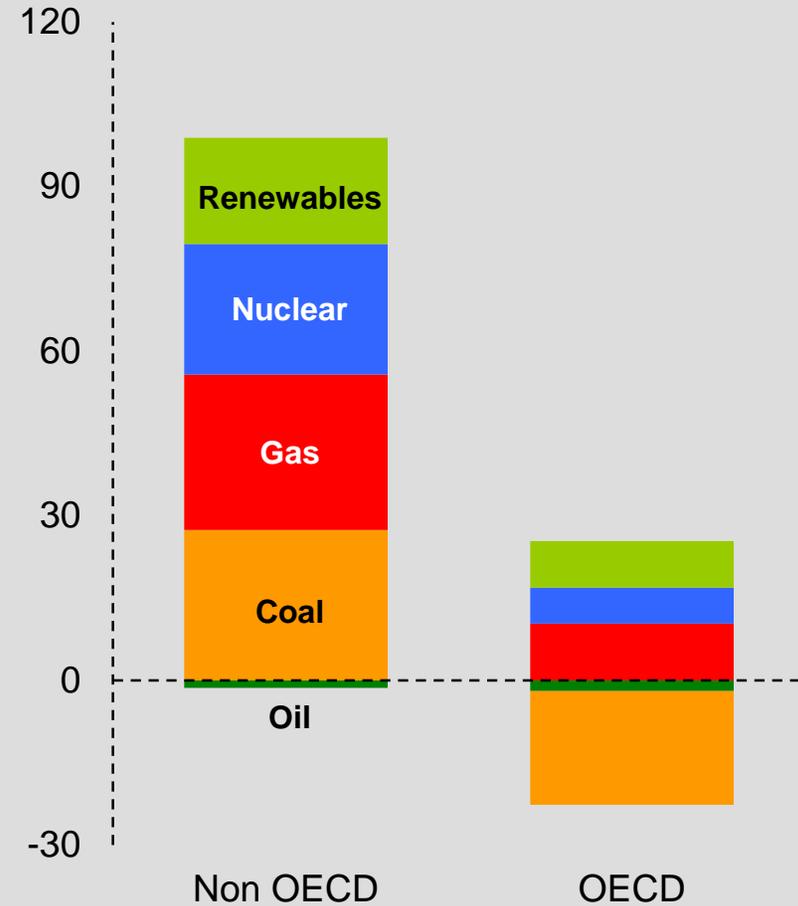
Electricity Generation

Quadrillion BTUs



Growth in Fuels from 2010 to 2040

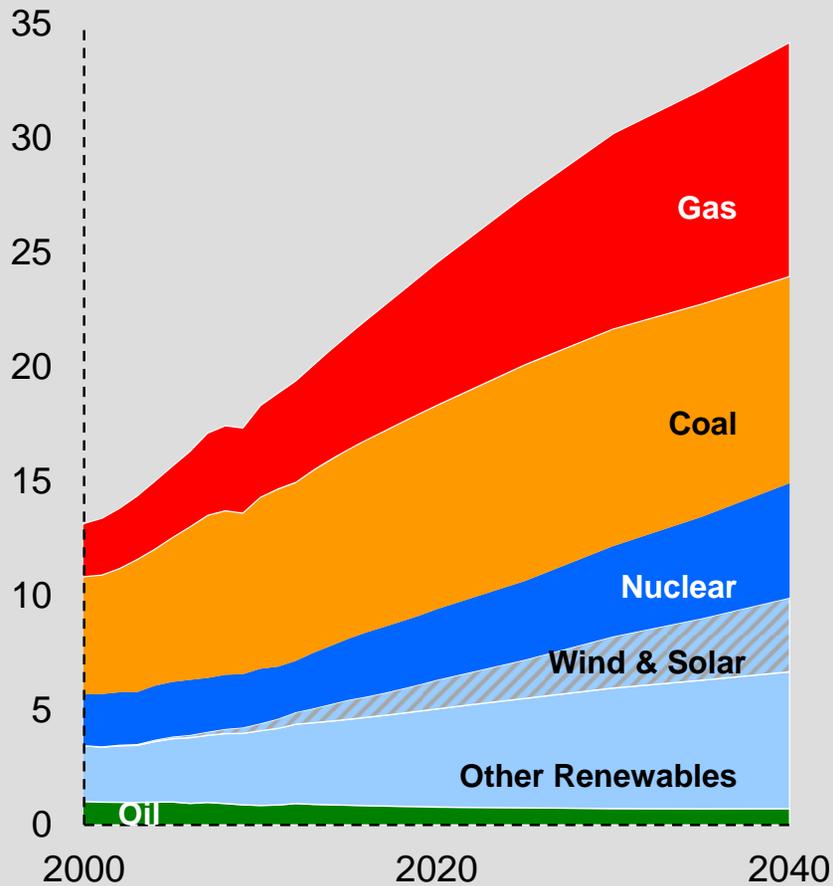
Quadrillion BTUs



Global Electricity Generation Mix Evolves

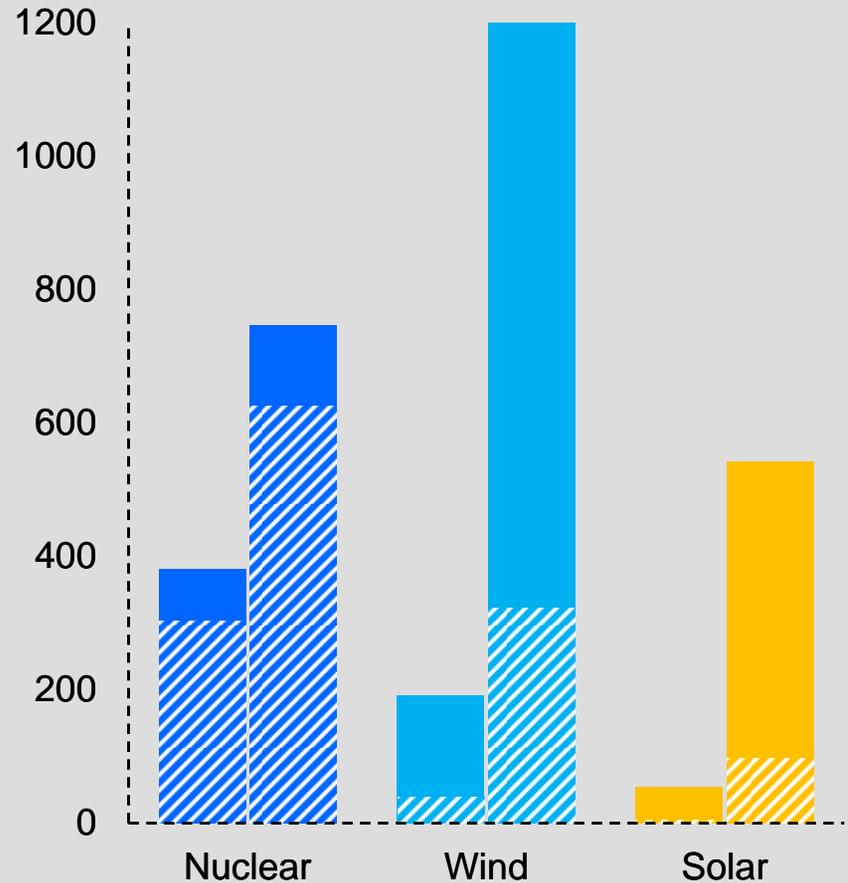
By Generation

k TWh



Global Capacity Utilized

GW





Transportation

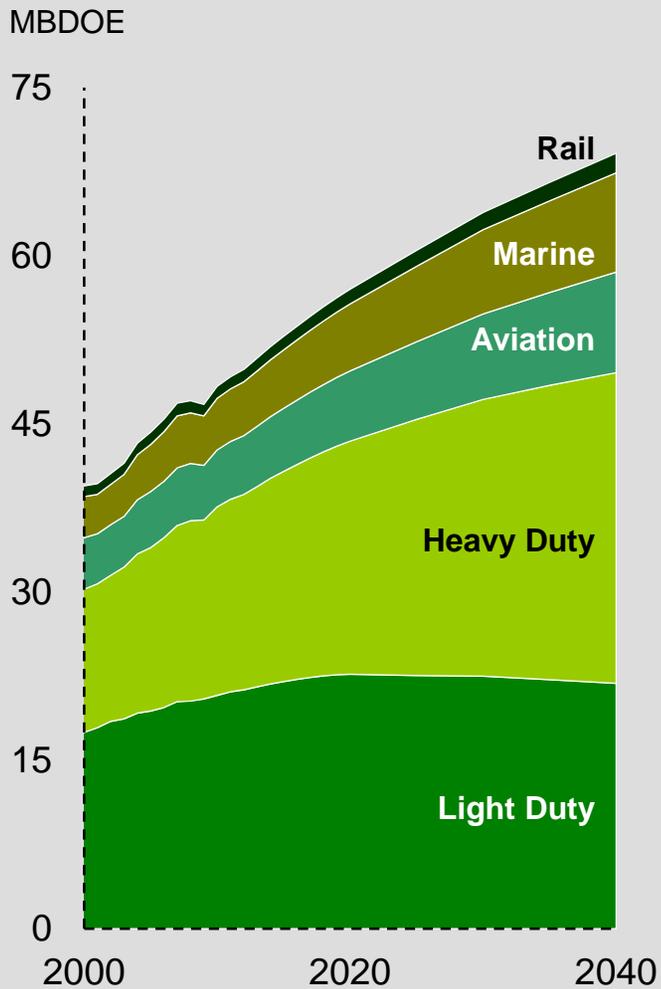
65%

Heavy duty transportation demand grows 65 percent by 2040.

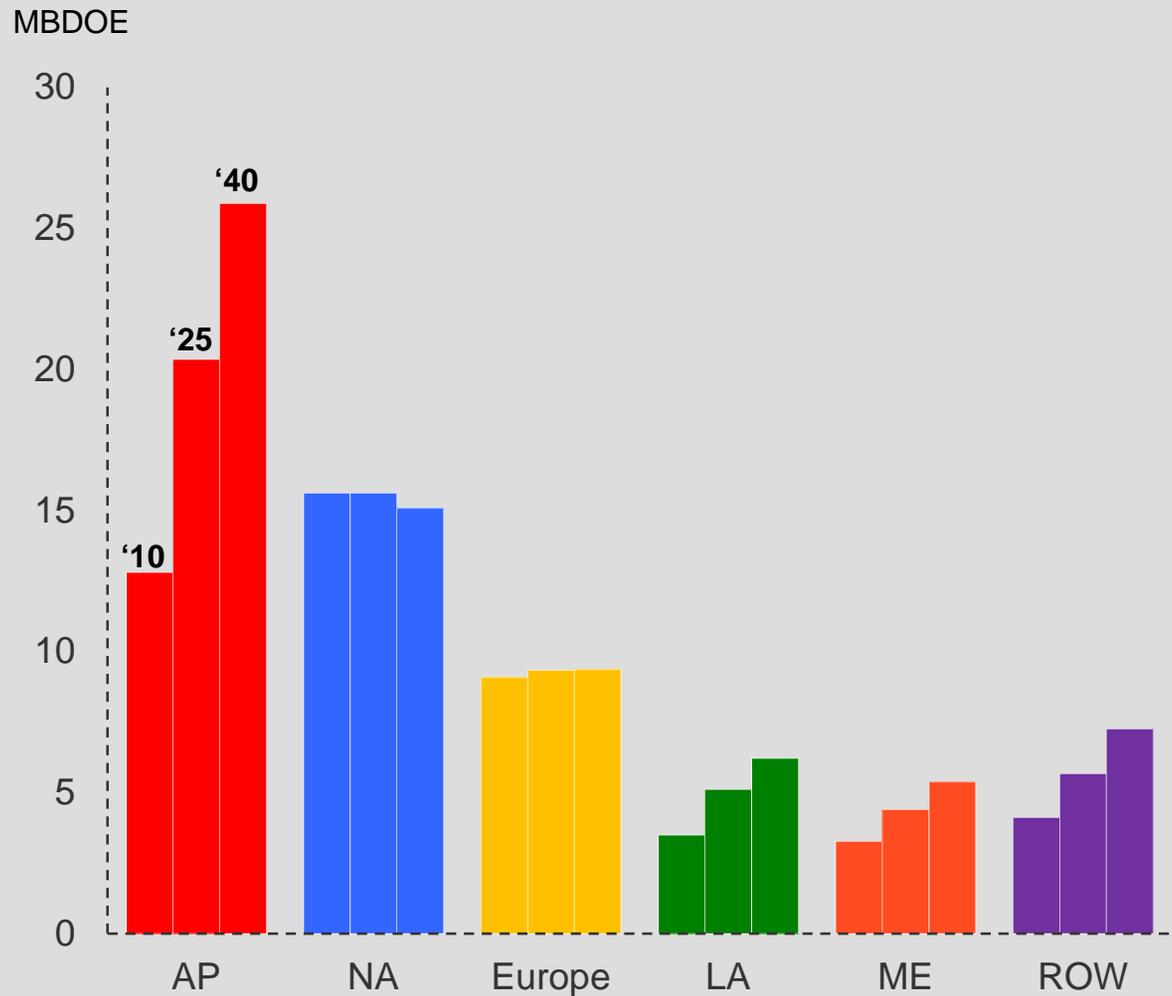


Transportation Demand

Sector Demand



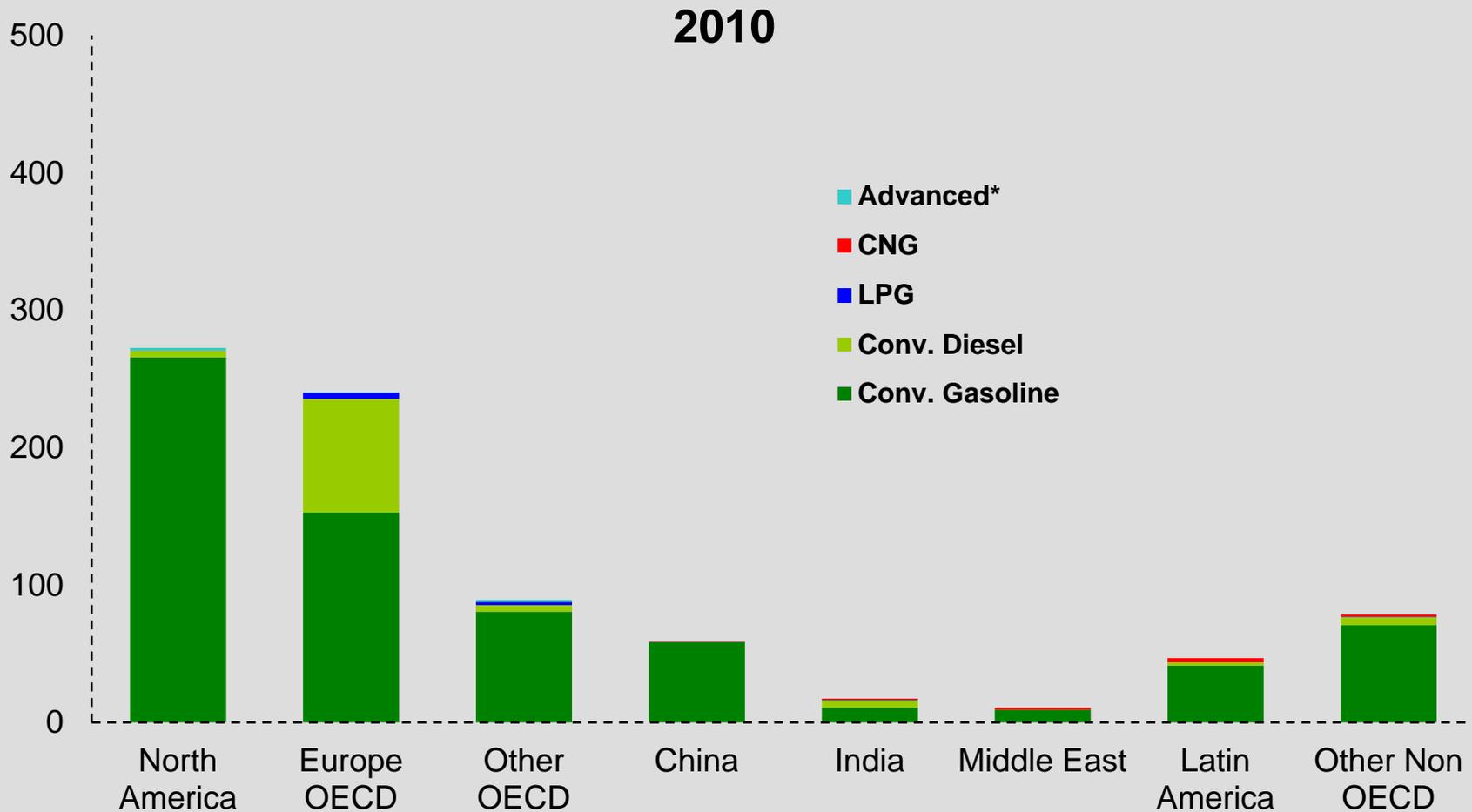
Demand by Region



Light Duty Vehicle Fleet Grows, Mix Changes

Powertrain Technology

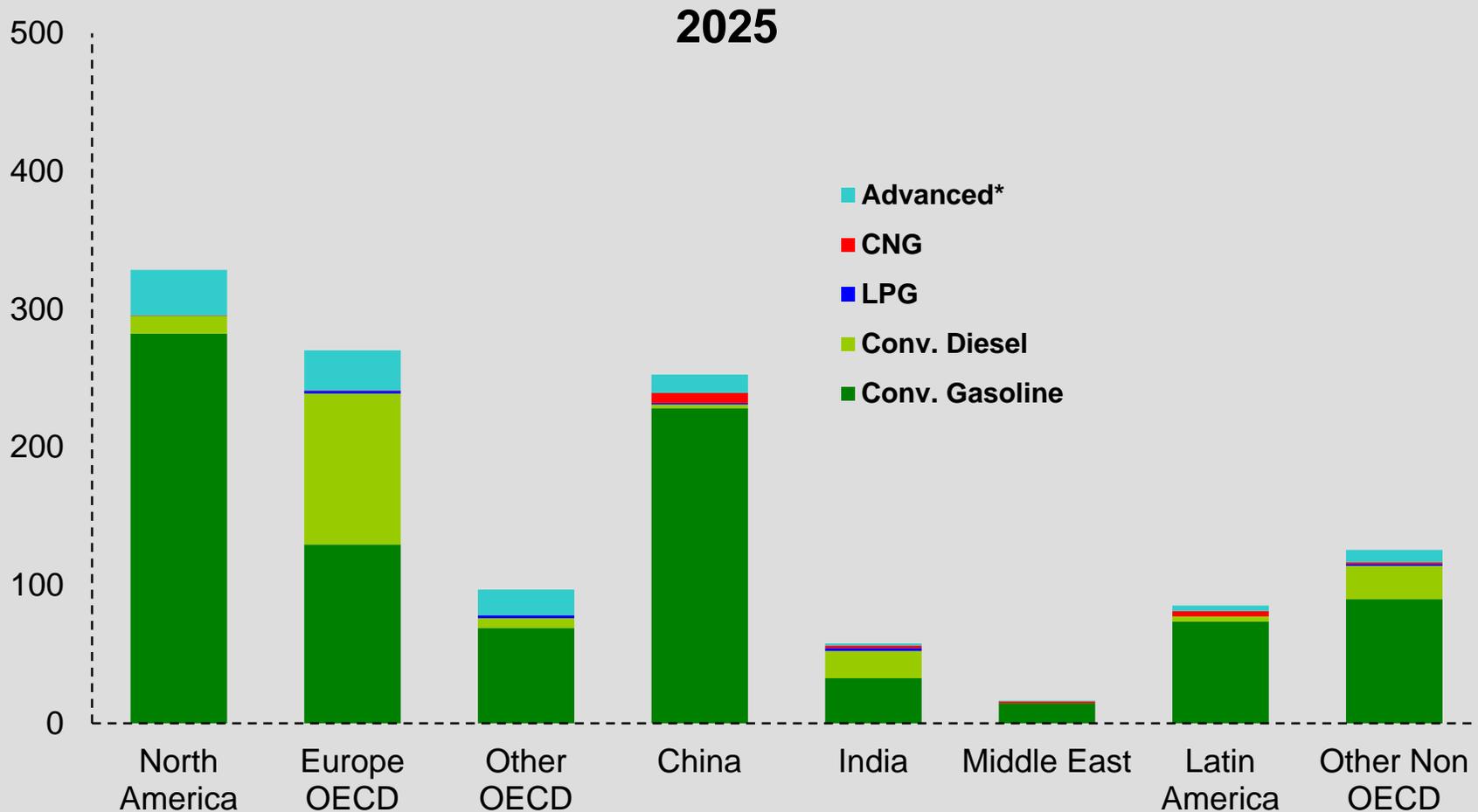
Millions of Vehicles



Light Duty Vehicle Fleet Grows, Mix Changes

Powertrain Technology

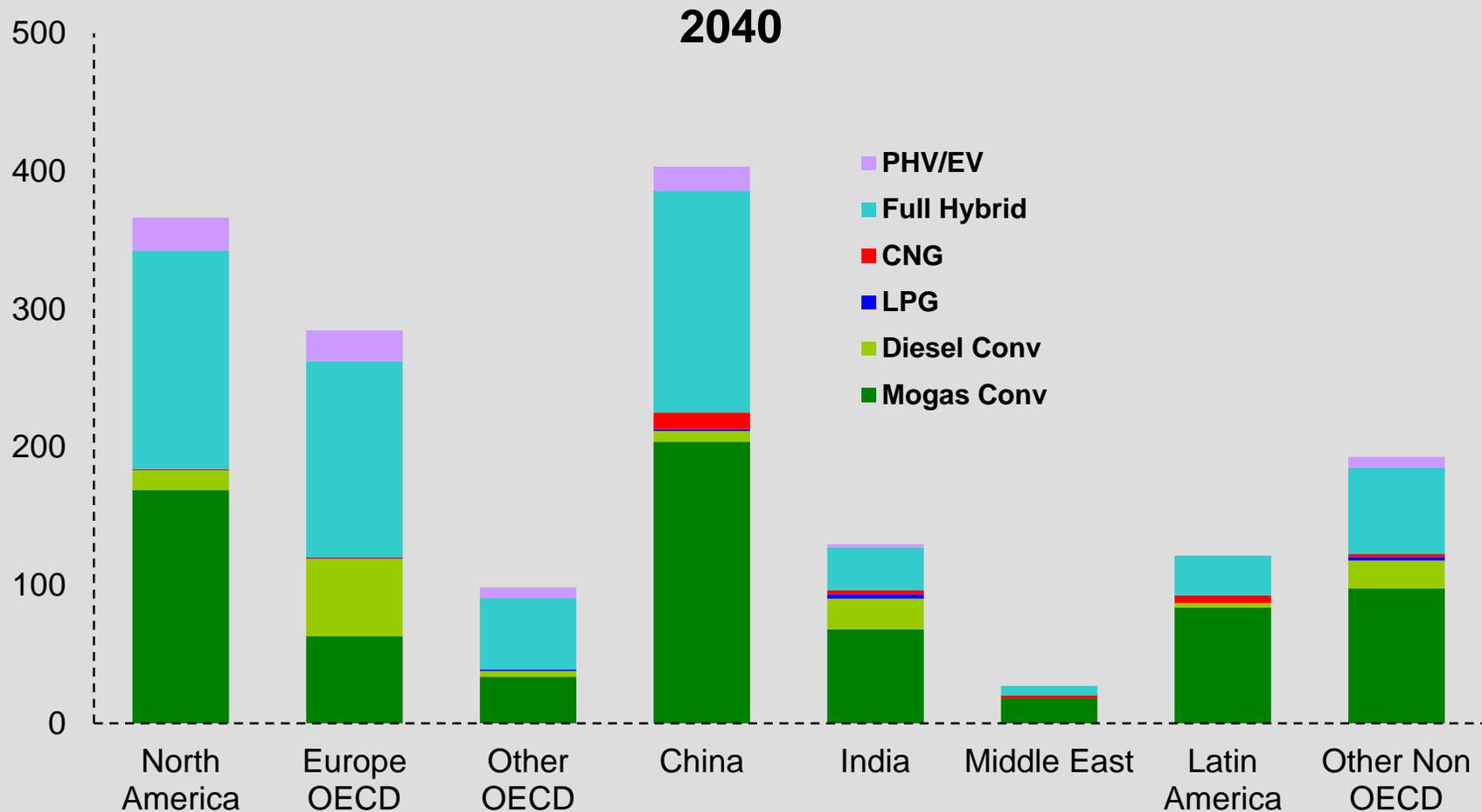
Millions of Vehicles



Light Duty Vehicle Fleet Grows, Mix Changes

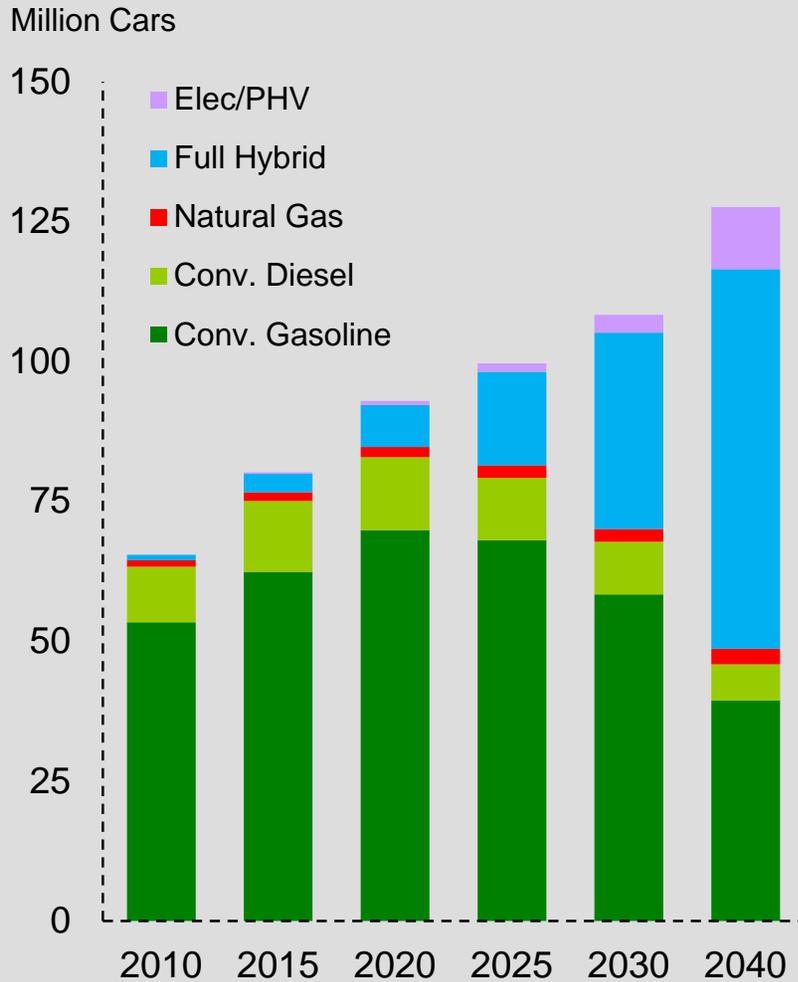
Powertrain Technology

Millions of Vehicles

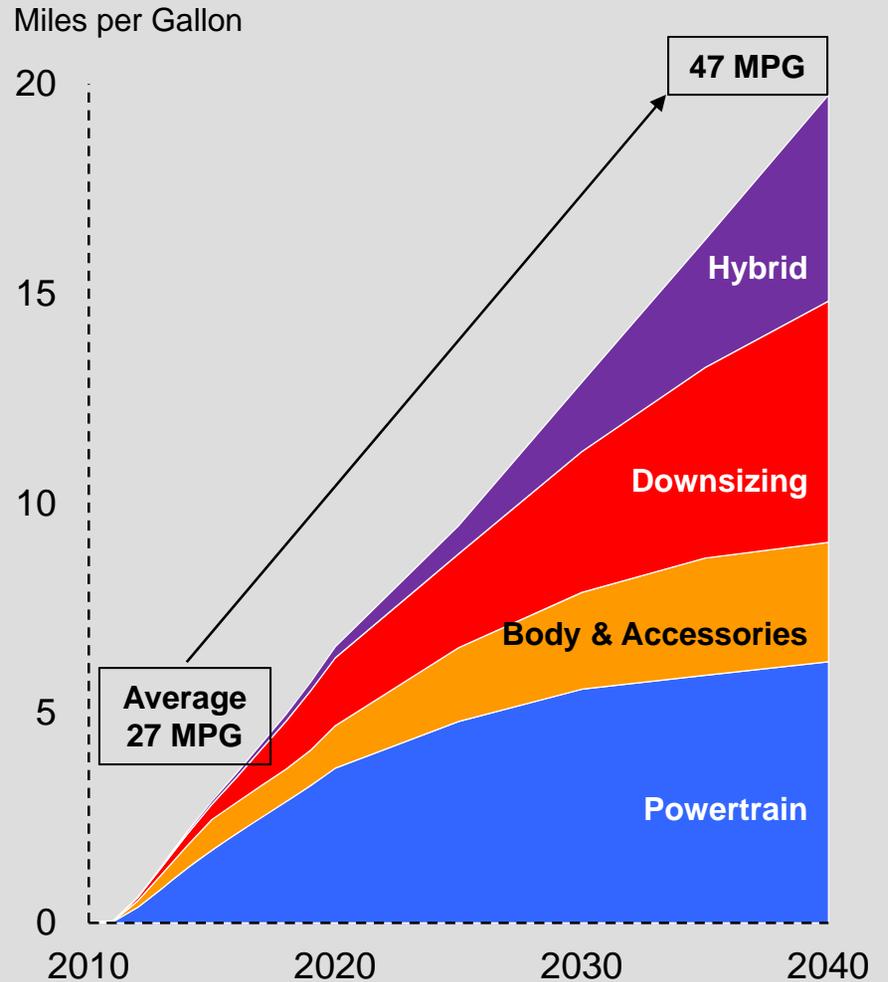


Light Duty Vehicle Sales & Efficiency

Annual New Car Sales by Type



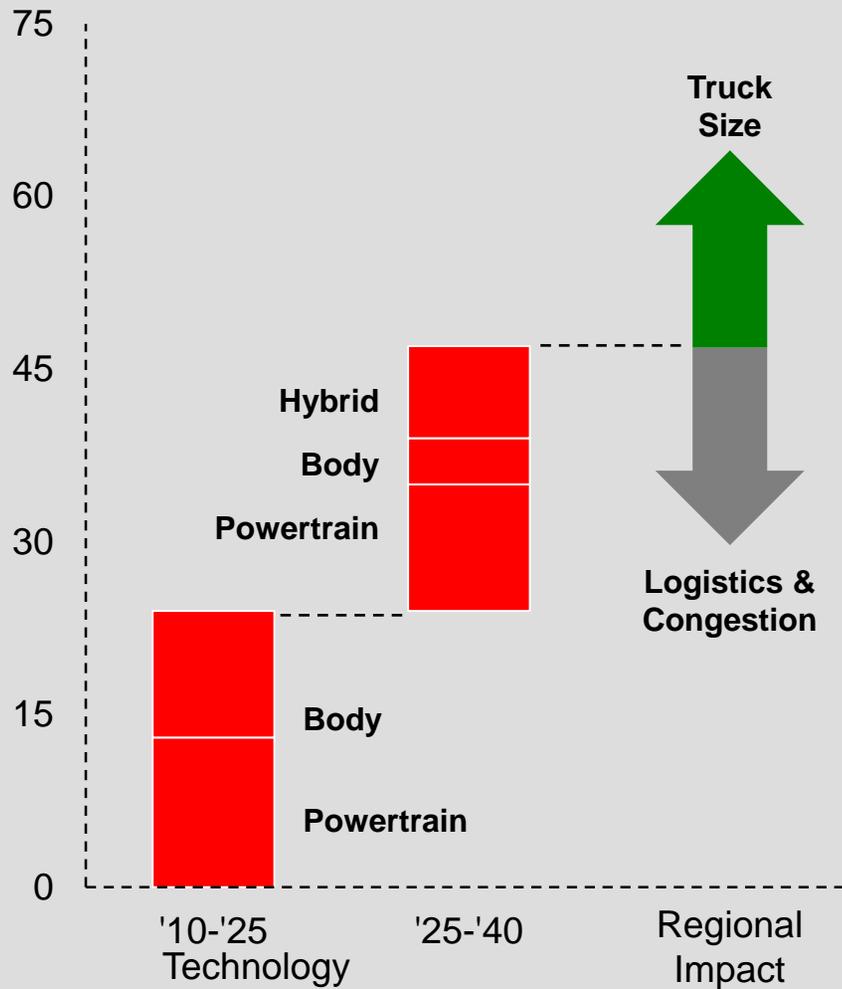
Incremental Vehicle Efficiency Gains



Heavy Duty Transportation Efficiency

New Truck Efficiency

% Improvement, 2010-2040



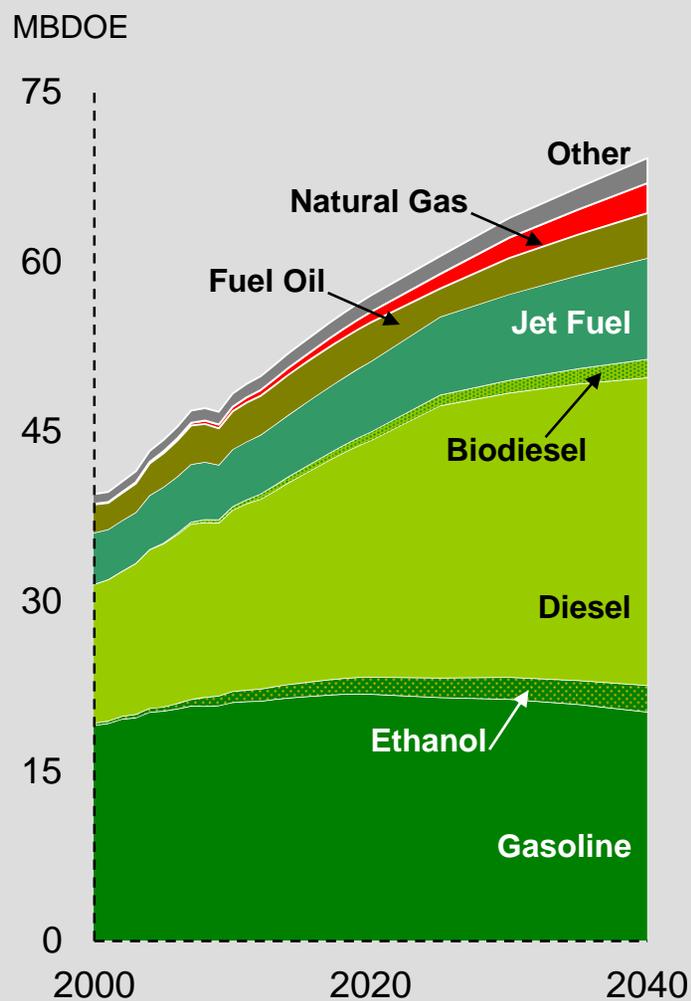
Efficiency Impact

MBDOE

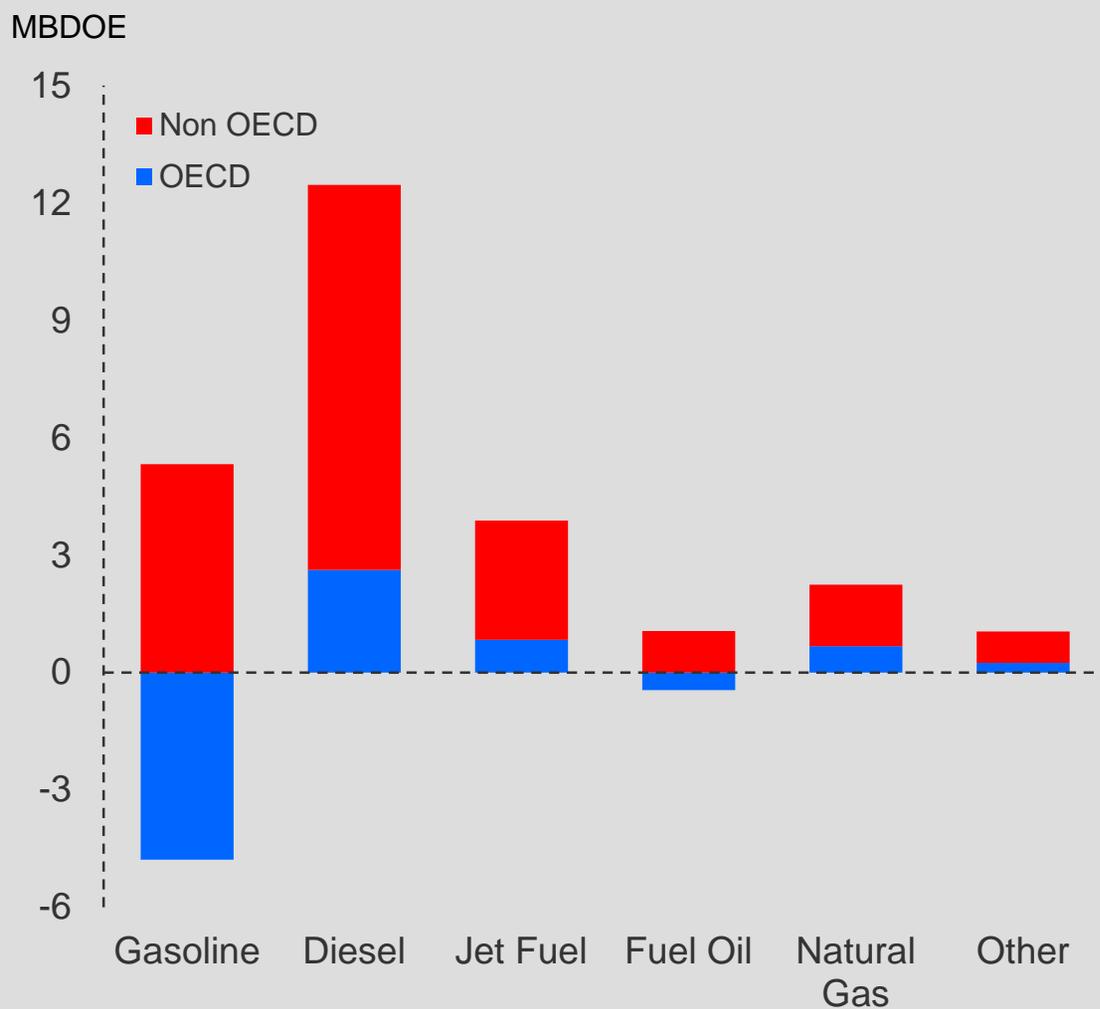


Transportation Fuel Mix

Fuel Demand

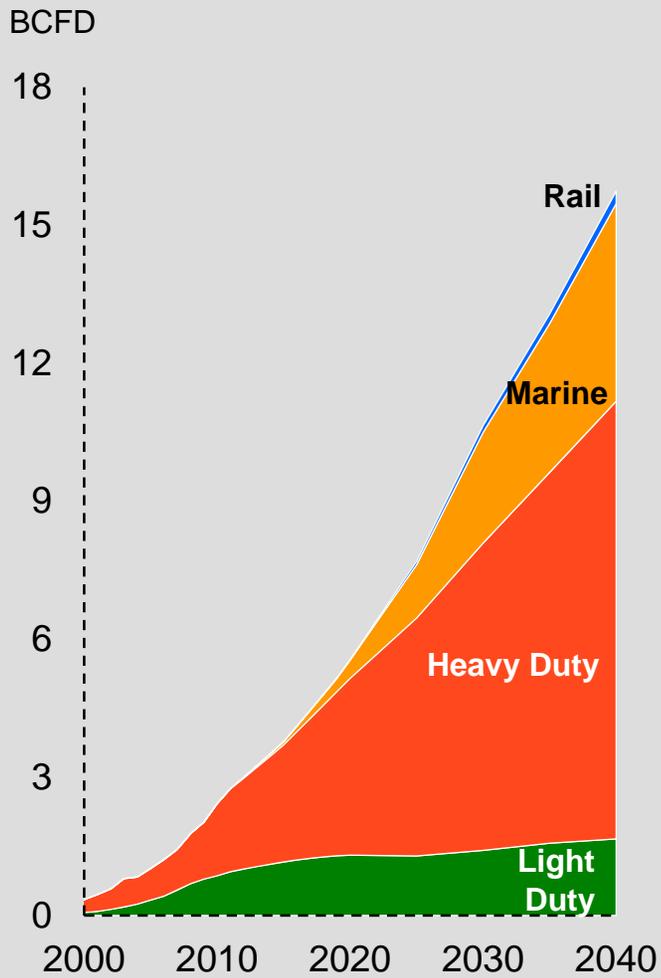


Growth in Demand from 2010 to 2040

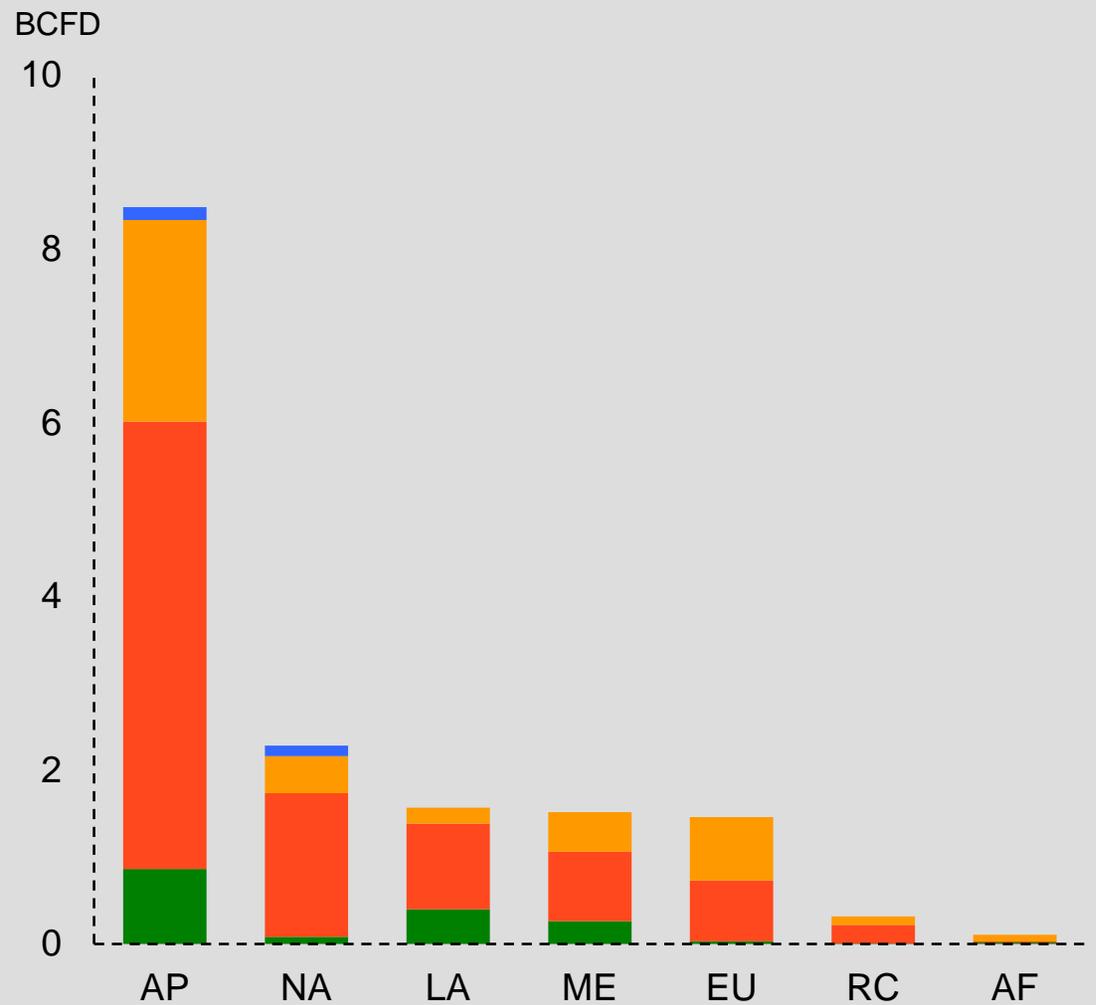


Gas Into Transportation

By Sector



2040 by Region



Supply



60%

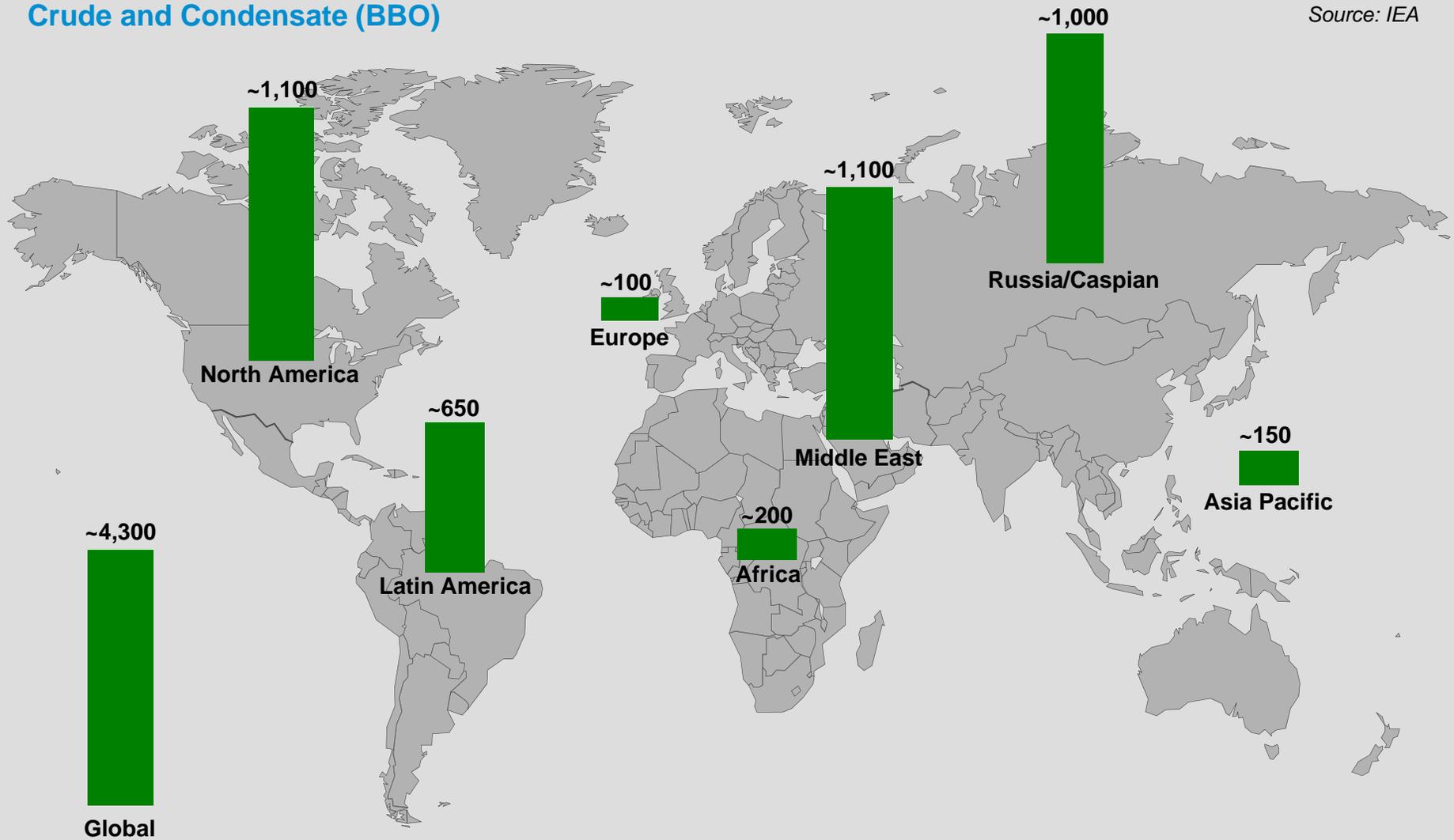
Oil and gas will supply about 60 percent of global energy demand in 2040, up from 55 percent in 2010.



Remaining Oil Resource

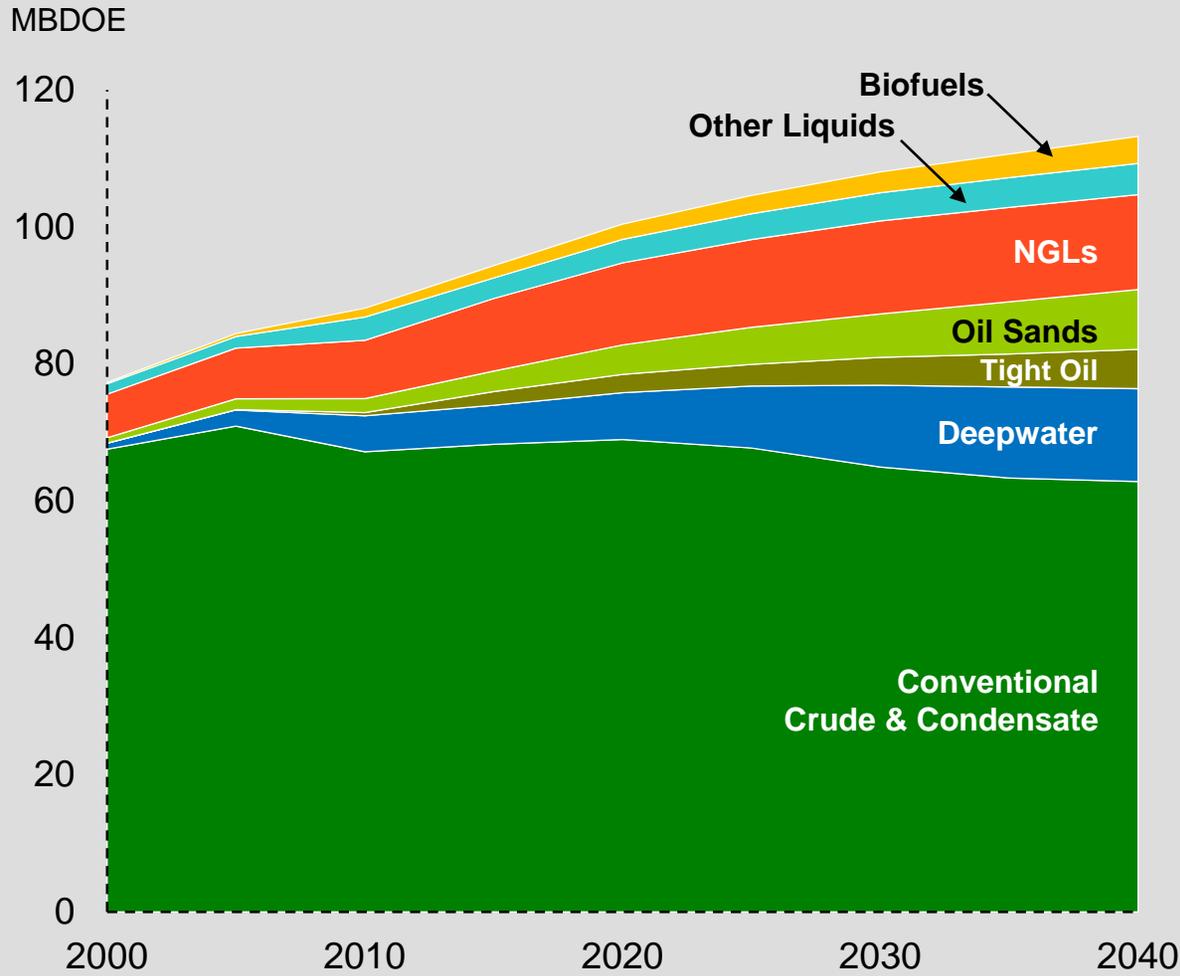
Crude and Condensate (BBO)

Source: IEA

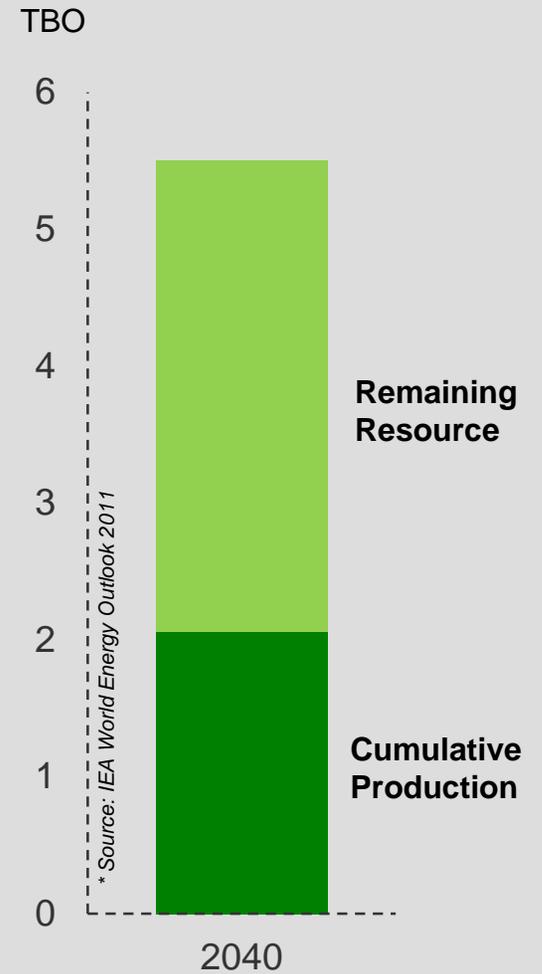


Liquids Supply

Supply by Type

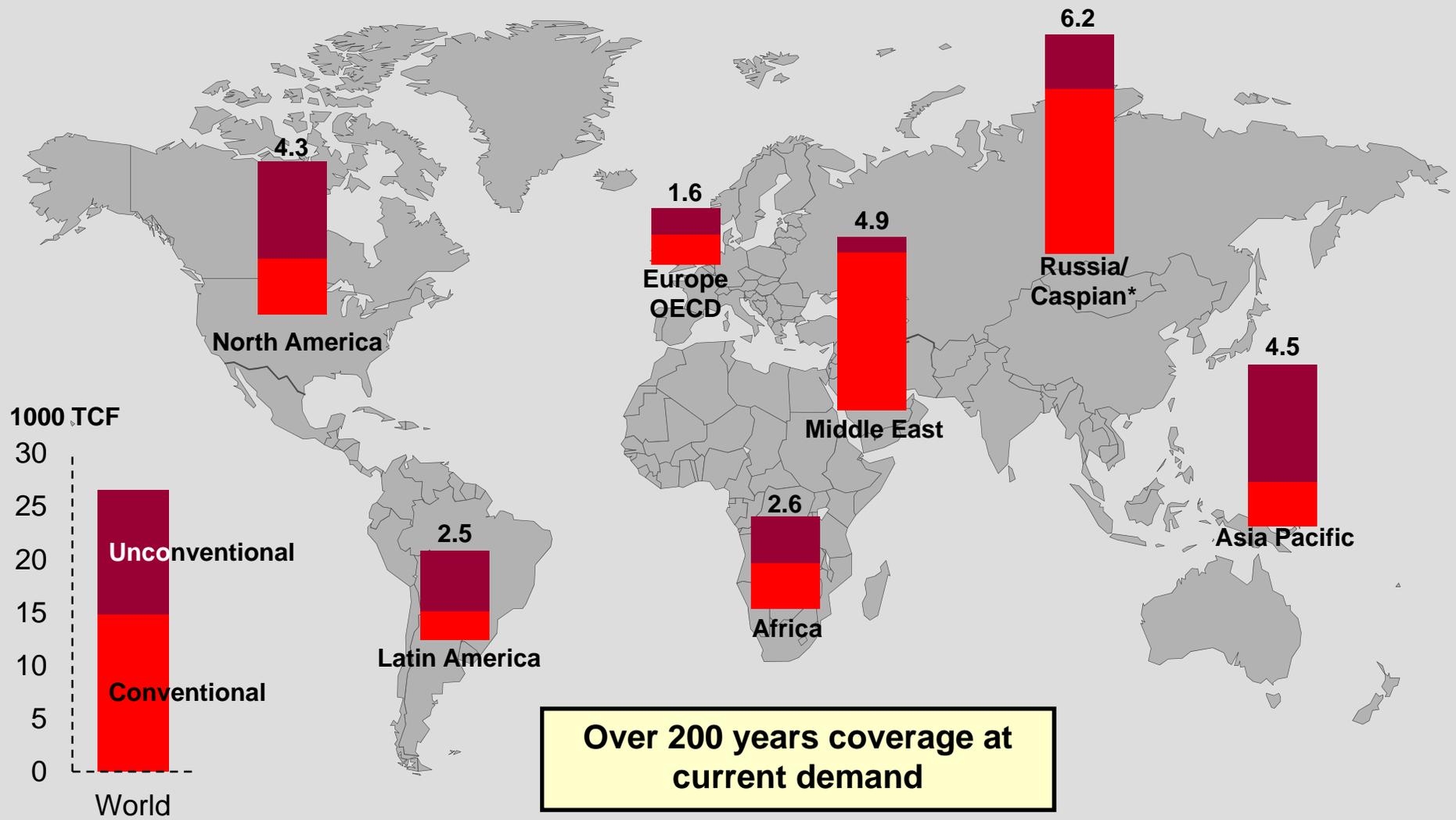


Resource*



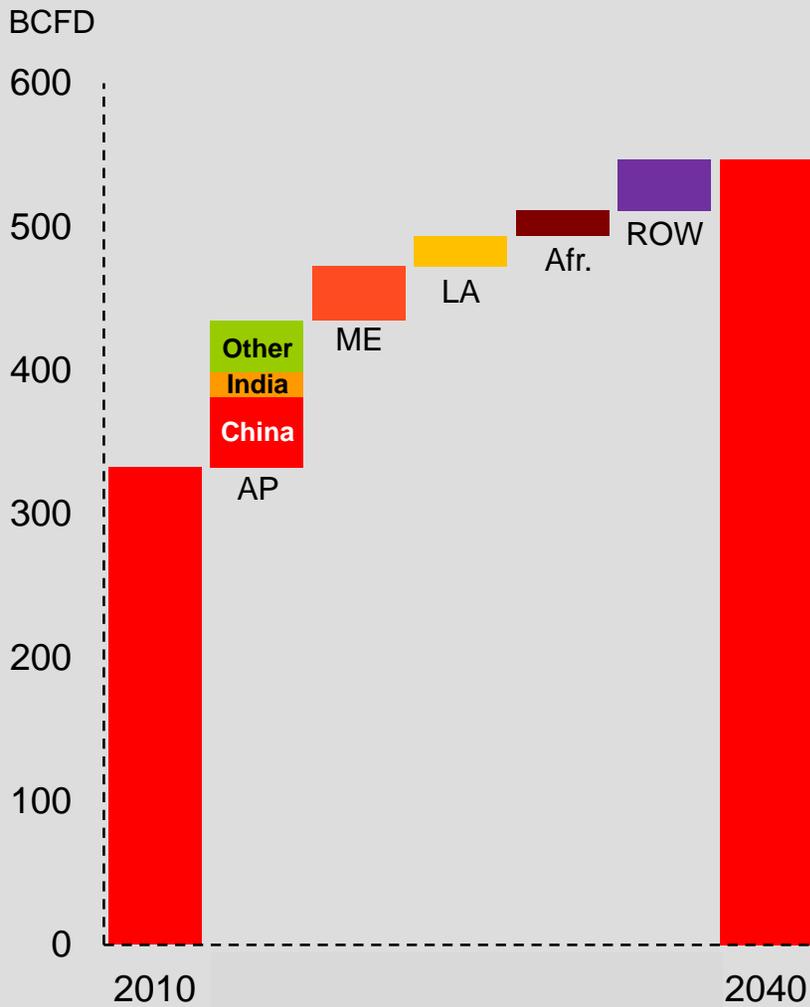
Global Gas Resource

Source: IEA; *Includes Europe Non OECD

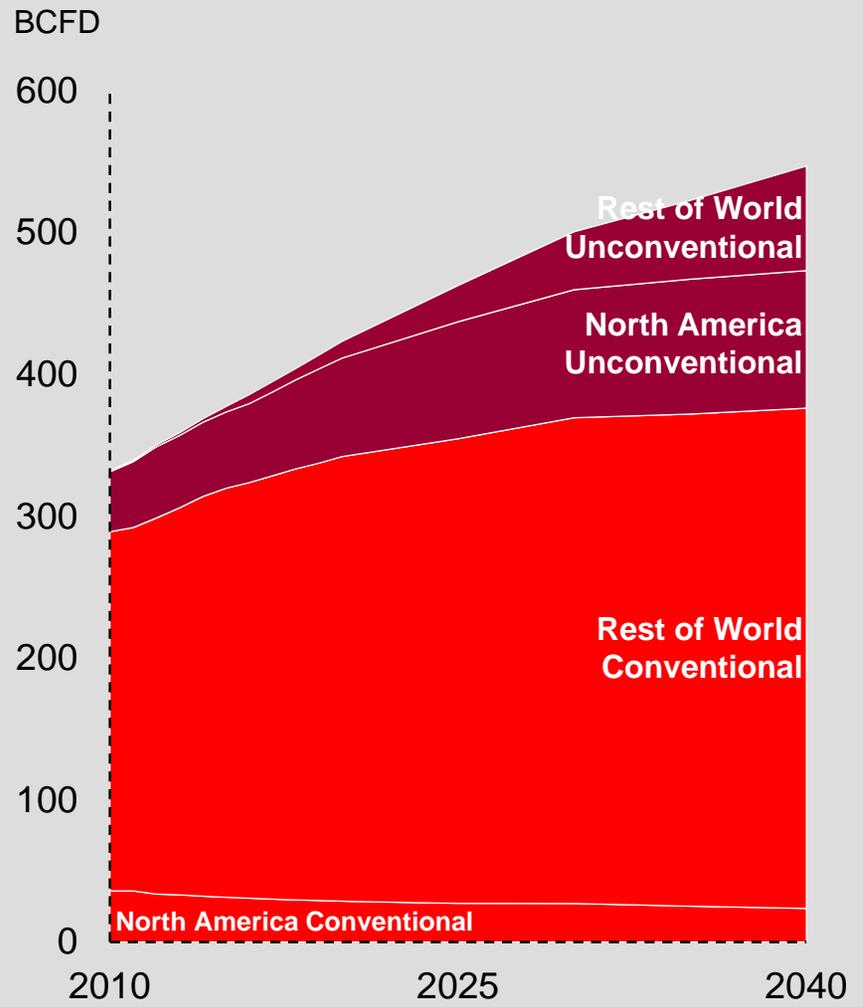


Natural Gas Supply and Demand Shifts

Global Gas Demand

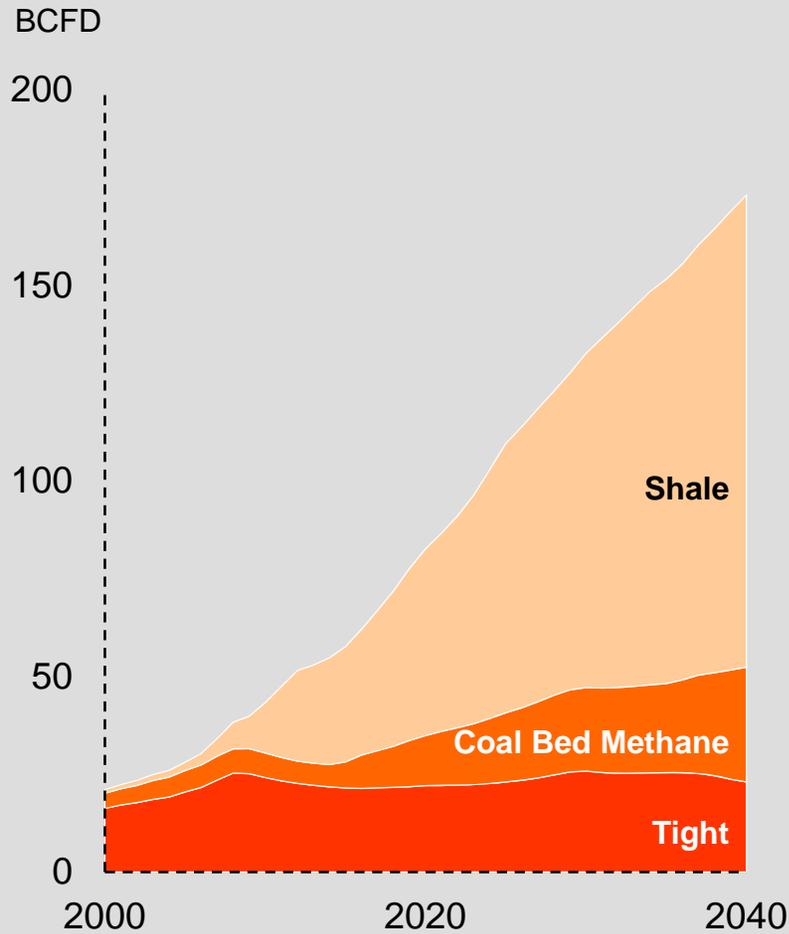


Global Gas Supply

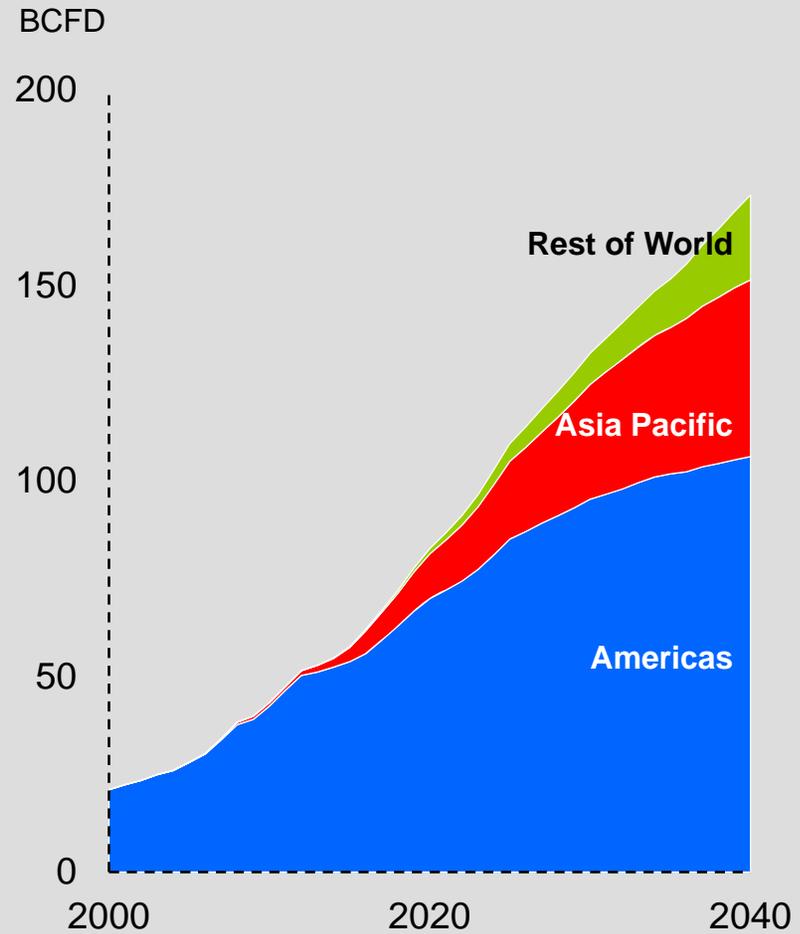


Growth in Unconventional Production

Production by Type



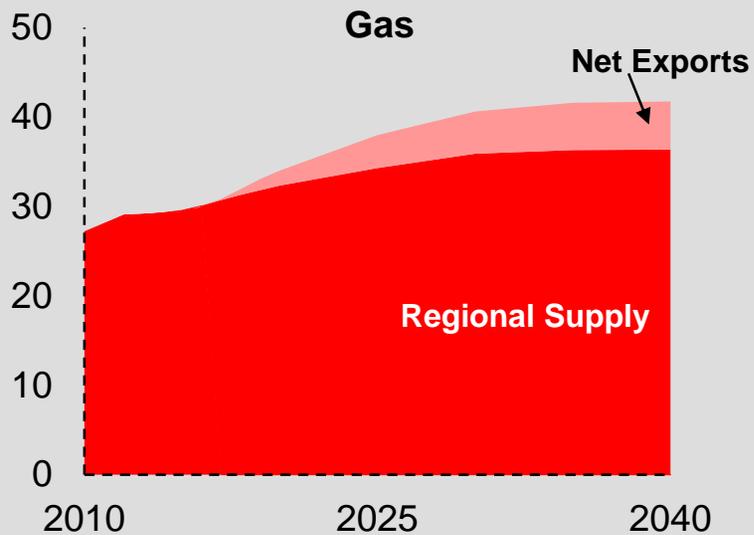
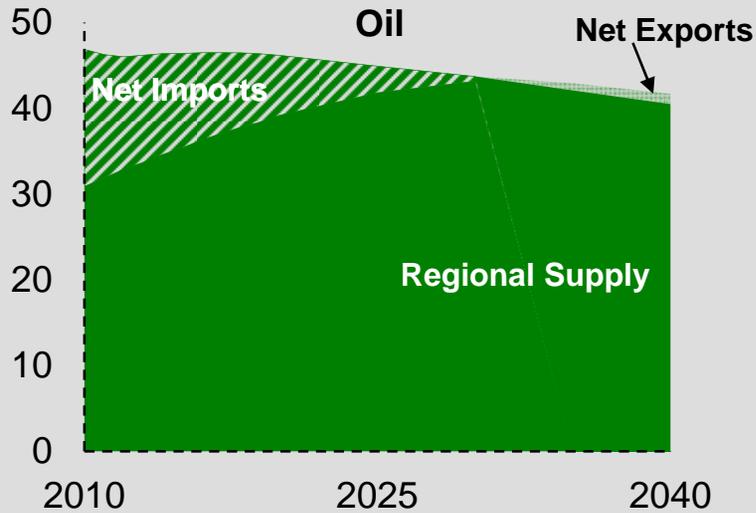
Production by Region



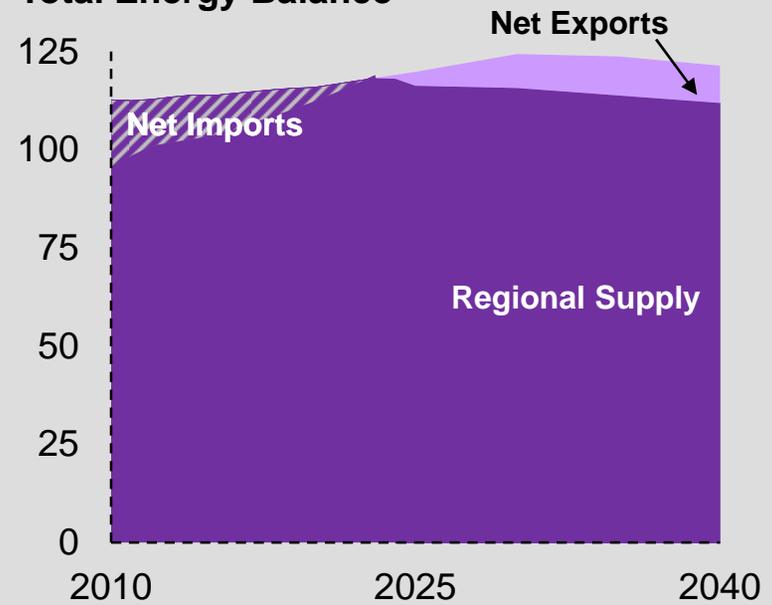
North America Energy Balance



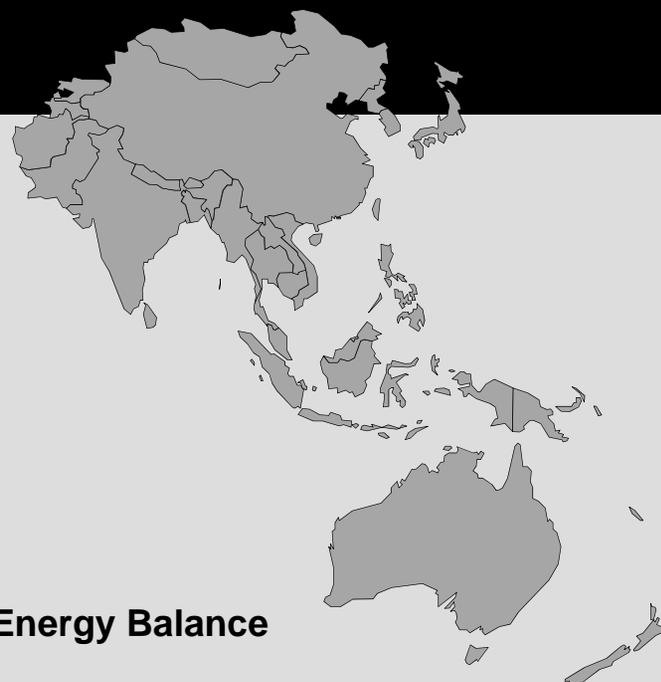
Quadrillion BTUs



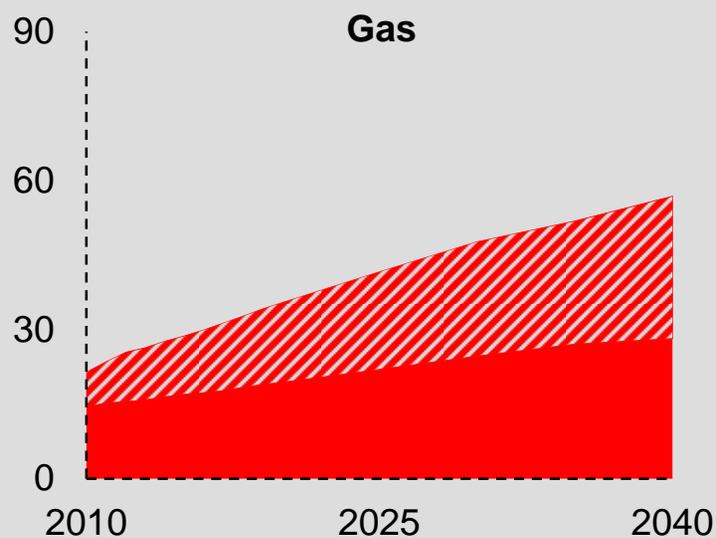
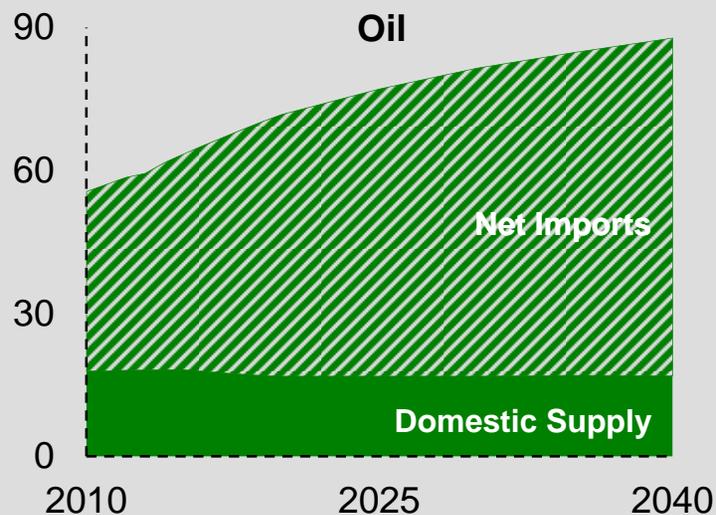
Total Energy Balance



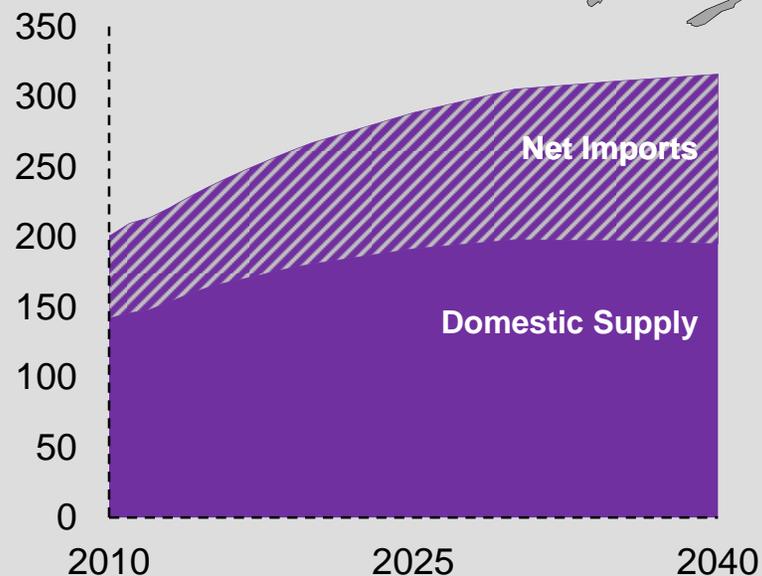
Asia Pacific Energy Balance



Quadrillion BTUs



Total Energy Balance



Conclusions

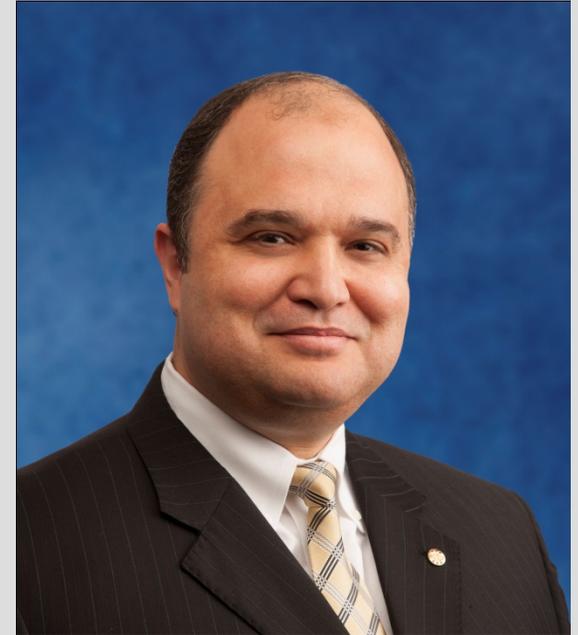


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Bio for David Khemakhem (k'mak'm)

- David Khemakhem is an Energy and Technology Advisor at ExxonMobil. He is a member of the Corporate Strategic Planning Department, where he is responsible for assessing energy trends, emerging energy technologies, and related market and public policy issues around the world. He is one of the principal contributors to ExxonMobil's long-term global Energy Outlook. He is also active in communicating ExxonMobil's view of the future of energy to a wide variety of audiences.
- David has worked with Exxon then ExxonMobil since 1997 in numerous technical and management assignments covering activities in the United States and around the world.
- He started his career with Exxon Production Research Company in the area of Wellbore Design and eventually became Team Lead for the Well Integrity Group at ExxonMobil Upstream Research.
- In 2001, he transferred to ExxonMobil Production Company as a Subsurface Engineer overseeing completion and workover operations in Colorado, Wyoming, California and South Texas.
- In 2003, David relocated to Qatar, where he spent six years in a variety of assignments, including Drilling and Completions Engineering Manager. In this role he led a team of engineers working on RasGas's 14 drilling rigs during the development of the North Field.
- In 2009, David transferred back to Houston, joining the ExxonMobil Upstream Research Company as Well Performance Manager and then in 2010, he became the Unconventional Gas Recovery Manager.
- The following year, in 2011, David moved to ExxonMobil Headquarters to join the Corporate Strategic Planning team where he is helping in the development of the Energy Outlook for 2013 and beyond.
- David holds a Ph.D. in Mechanical Engineering from the University of Minnesota.



Text in Box: Short Bio

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