International Energy Outlook 2013

for

Center for Strategic and International Studies

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by

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Key findings of the International Energy Outlook 2013

- With world GDP rising by 3.6 percent per year, world energy use will grow by 56 percent between 2010 and 2040. Half of the increase is attributed to China and India.

- Renewable energy and nuclear power are the world's fastest-growing energy sources, each increasing by 2.5 percent per year; however, fossil fuels continue to supply almost 80 percent of world energy use through 2040.

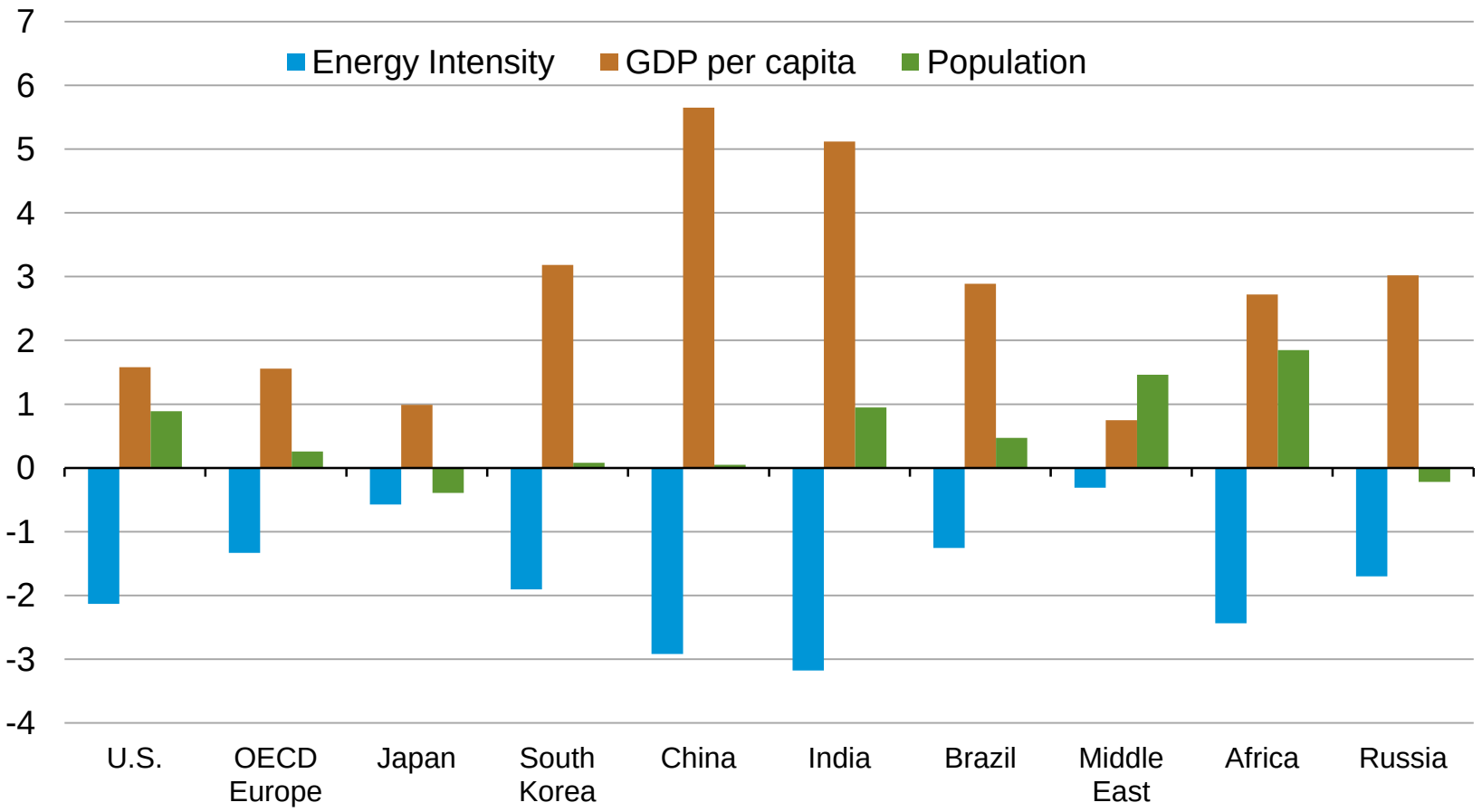
- Natural gas is the fastest growing fossil fuel in the outlook, supported by increasing supplies of shale gas, particularly in the United States.

- Coal grows faster than petroleum consumption until after 2030, mostly due to increases in China's consumption of coal, and slow growth in oil demand in OECD member countries.

- Given current policies and regulations, worldwide energy-related carbon dioxide emissions are projected to increase 46% by 2040, reaching 45 billion metric tons in 2040.

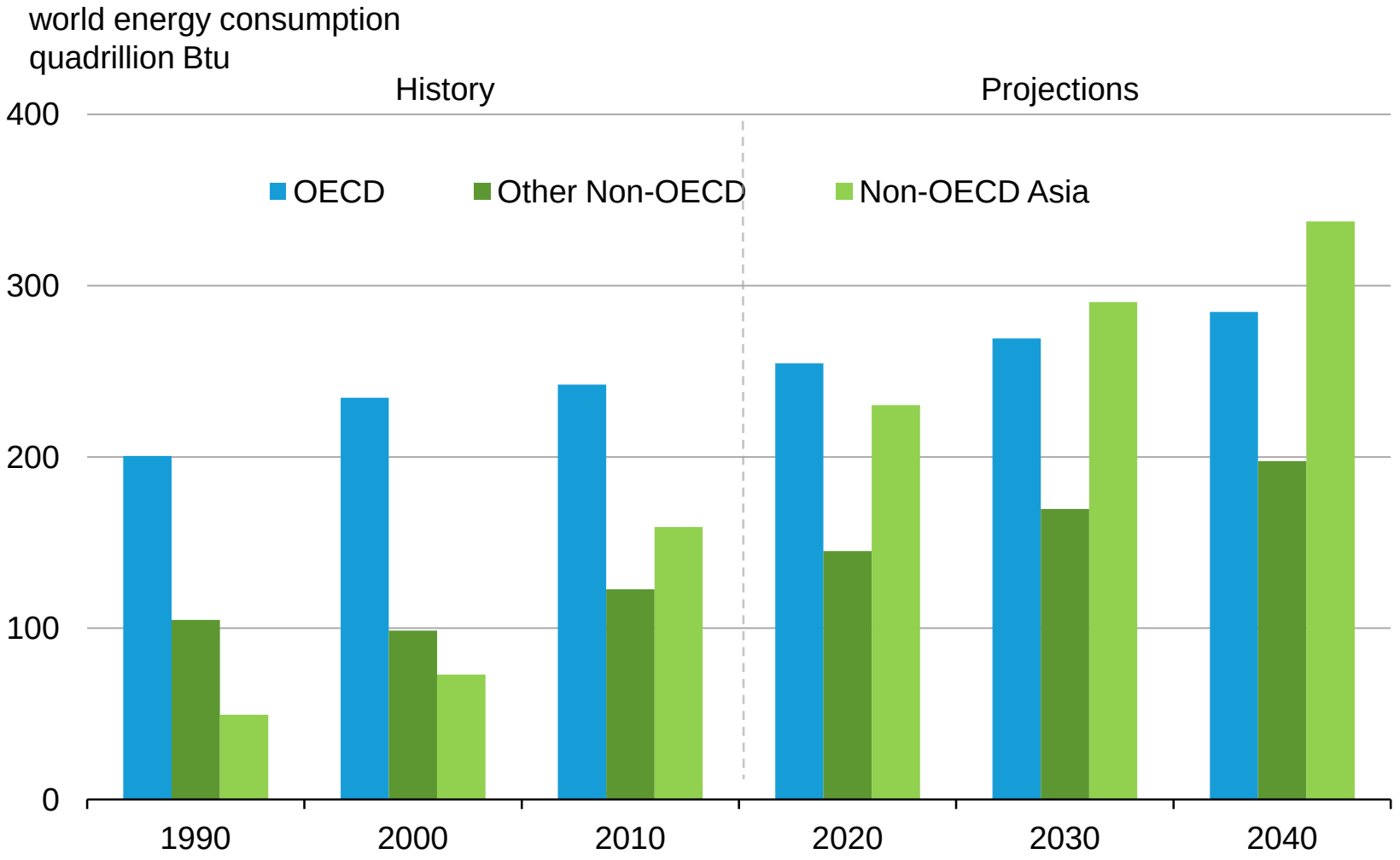
Economic activity and population drive increases in energy use; energy intensity improvements moderate this trend

average annual change (2010-2040)
percent per year



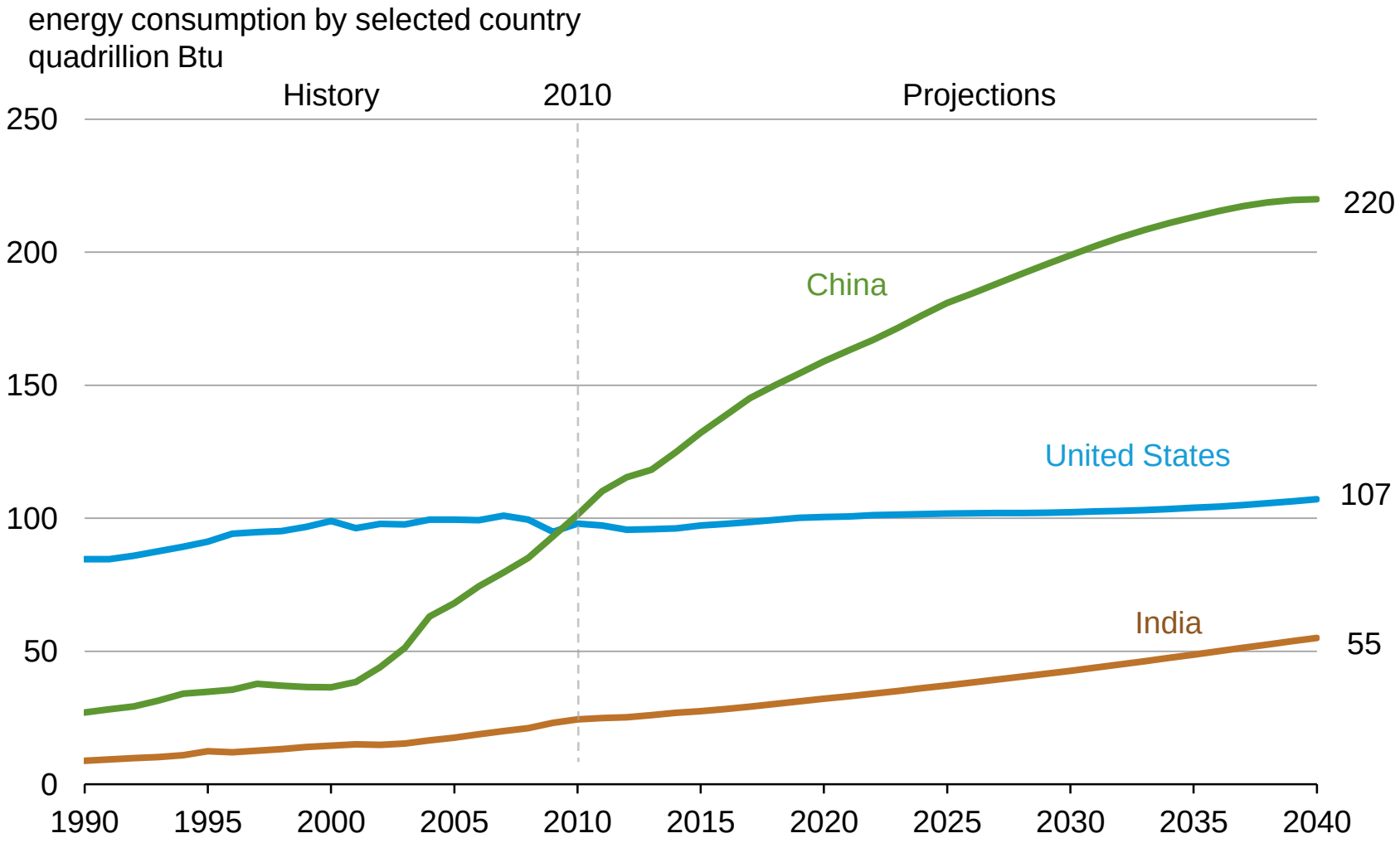
Source: EIA, International Energy Outlook 2013

Non-OECD Asia accounts for 60 percent of the world increase in energy use



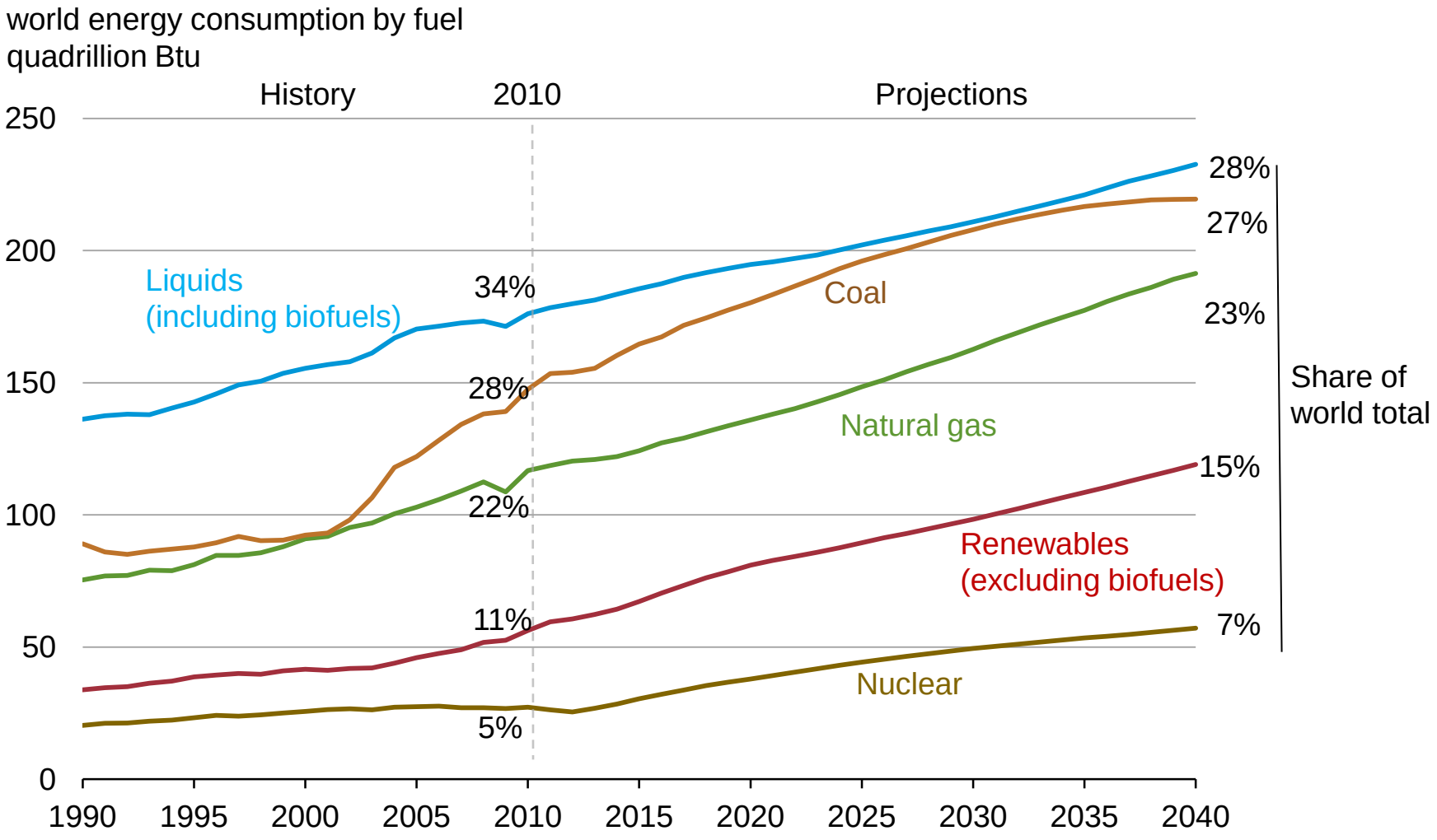
Source: EIA, International Energy Outlook 2013

By 2040, China's energy use will be double the U.S. level; India's a little more than half despite its faster GDP growth



Source: EIA, International Energy Outlook 2013

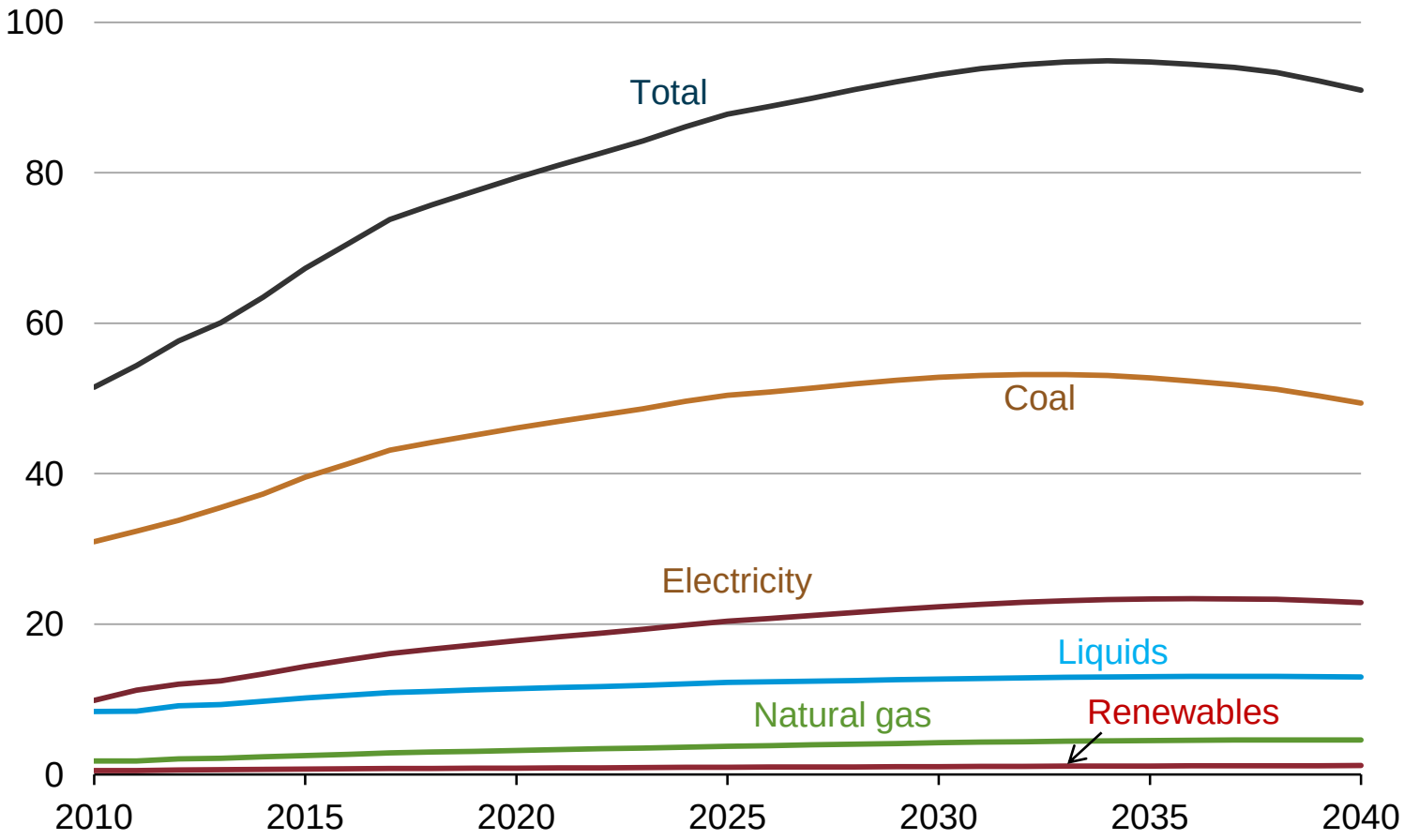
Renewable energy and nuclear power are the fastest growing source of energy consumption



Source: EIA, International Energy Outlook 2013

Industrial sector energy consumption in China

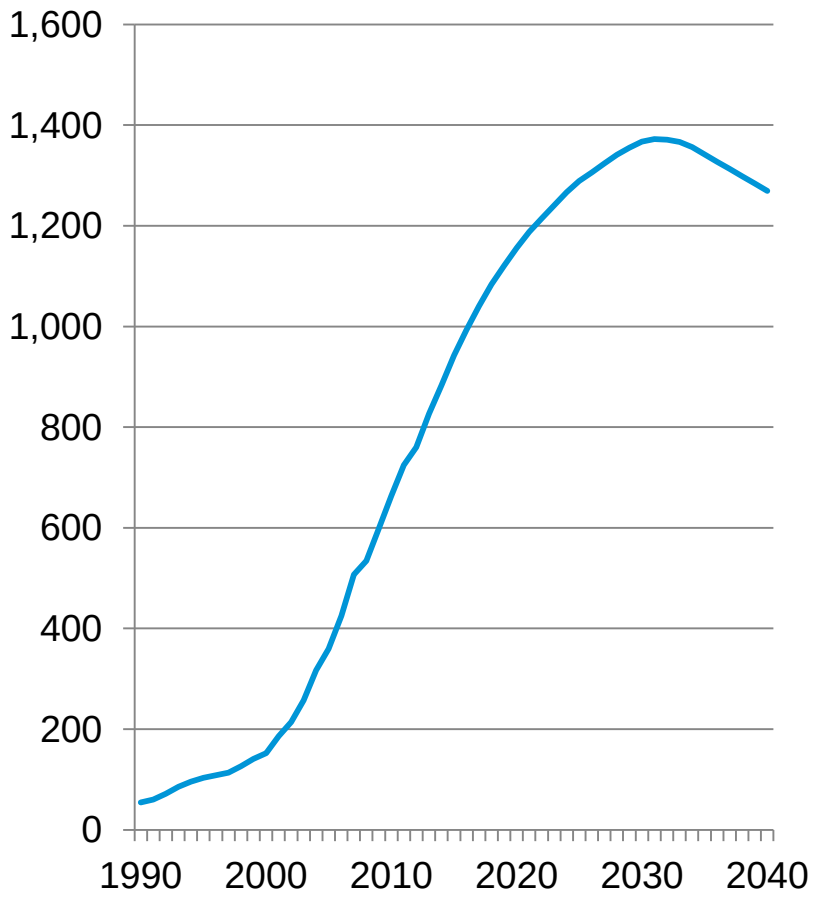
China industrial sector energy consumption by fuel
quadrillion Btu



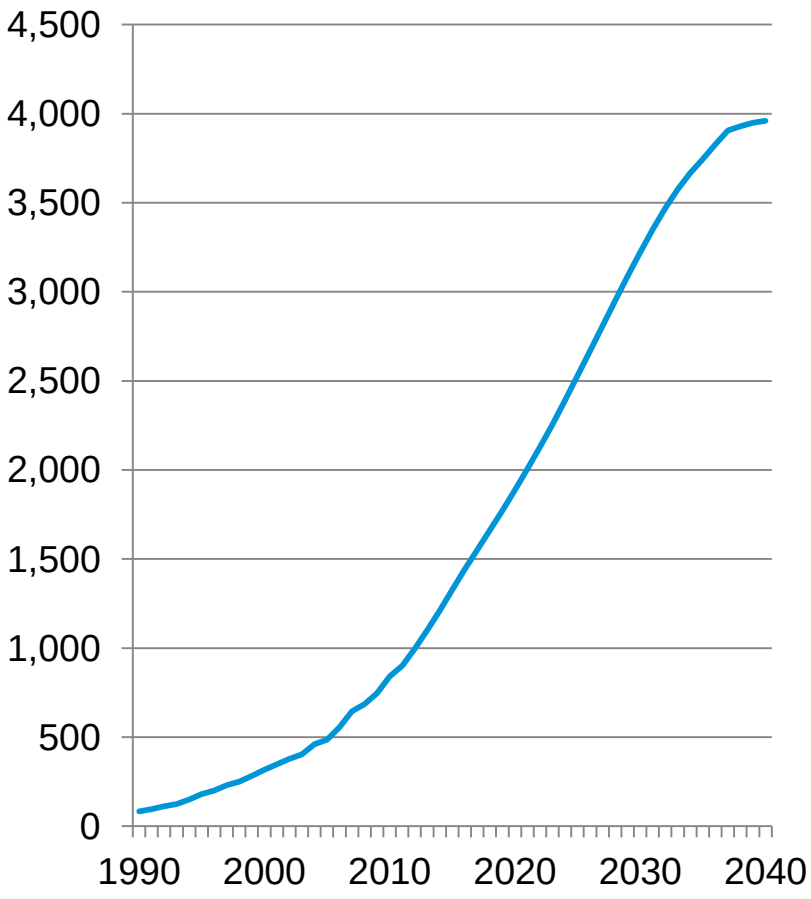
Source: EIA, International Energy Outlook 2013

Gross output curves shape China's industrial coal and oil use

China gross output for iron production



China gross output for chemical production

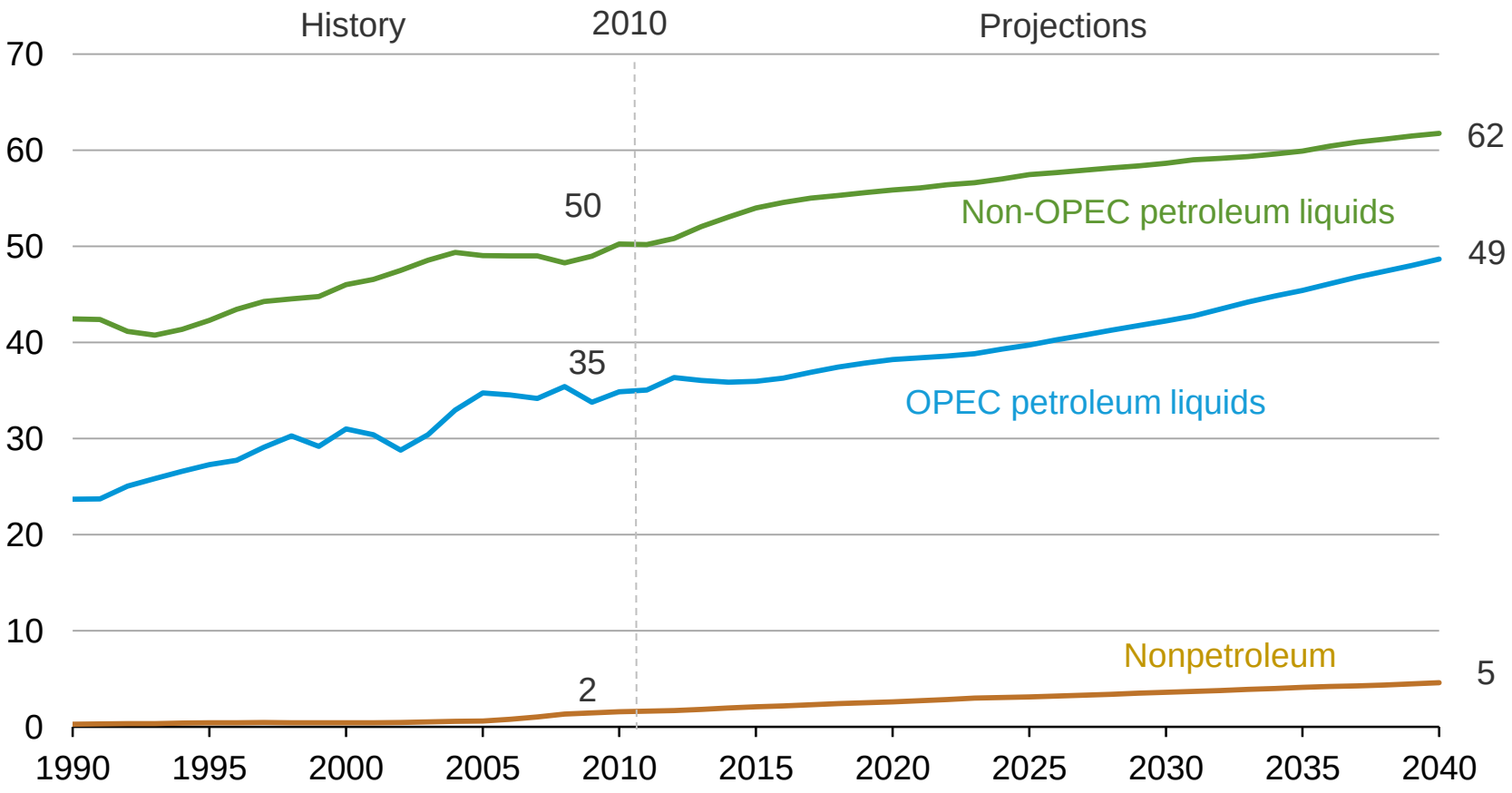


Source: Oxford Industrial Model

Liquid Fuels Markets

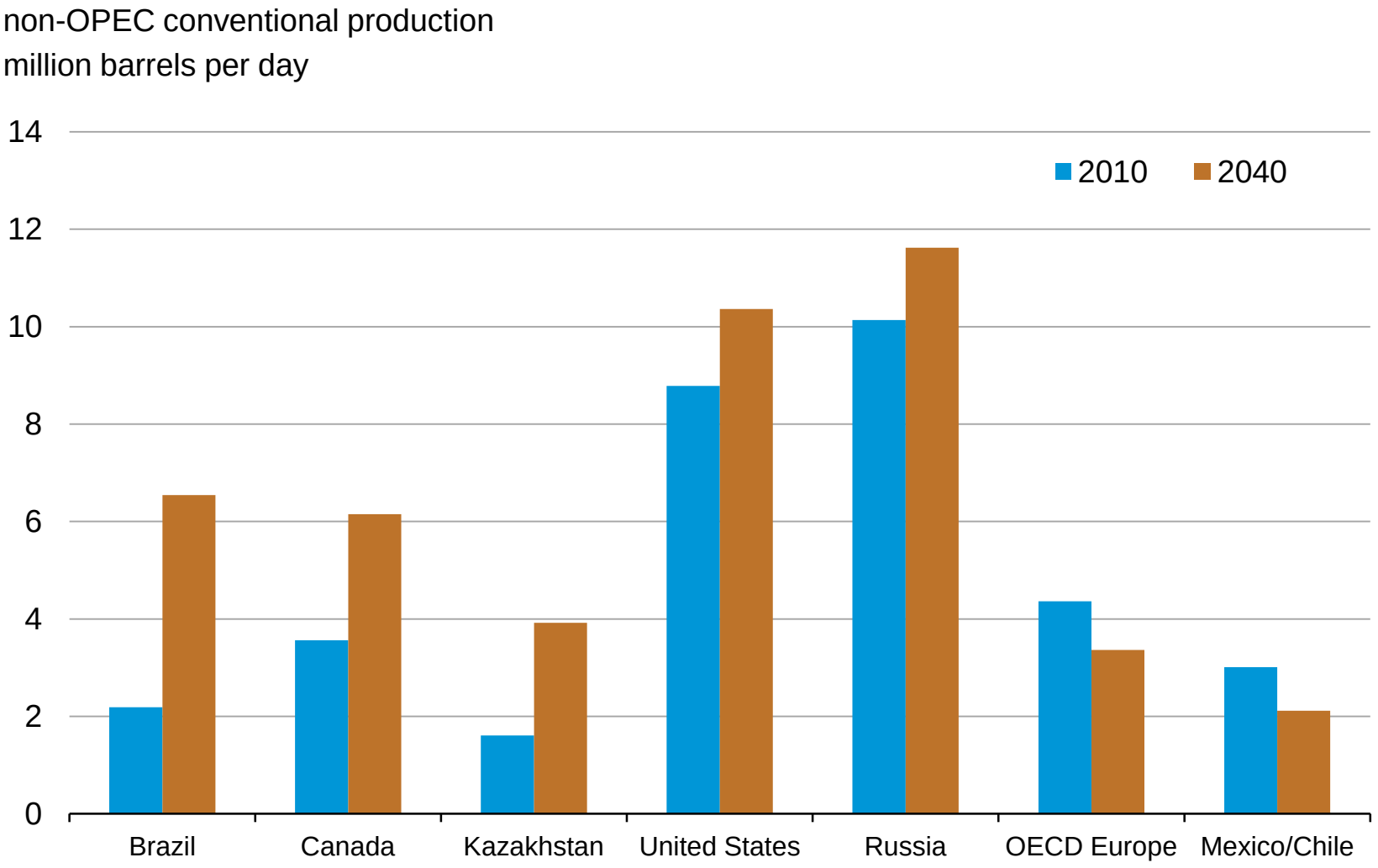
OPEC member countries contribute almost half of the total increase in world liquid supplies

world liquids production
million barrels per day



Source: EIA, International Energy Outlook 2013

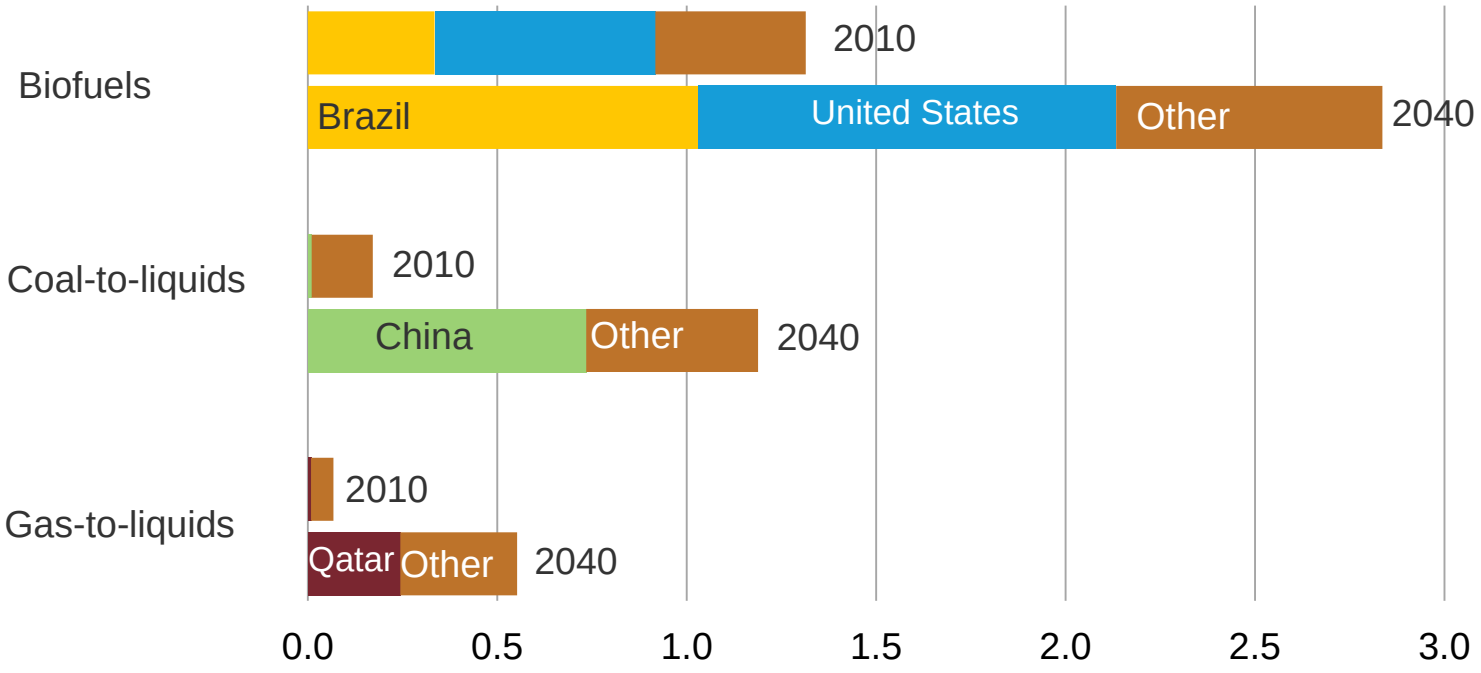
Non-OPEC petroleum supply growth is concentrated in five countries



Source: EIA, International Energy Outlook 2013

Brazilian and U.S. biofuels and Chinese CTL account for nearly 65 percent of the total increase in nonpetroleum supplies

world nonpetroleum liquids production in 2010 and 2040
million barrels per day



Source: EIA, International Energy Outlook 2013

Production profiles of the three most petroleum-rich countries in the Middle East are uncertain

liquids production in Middle East OPEC in four Reference case scenarios

million barrels per day

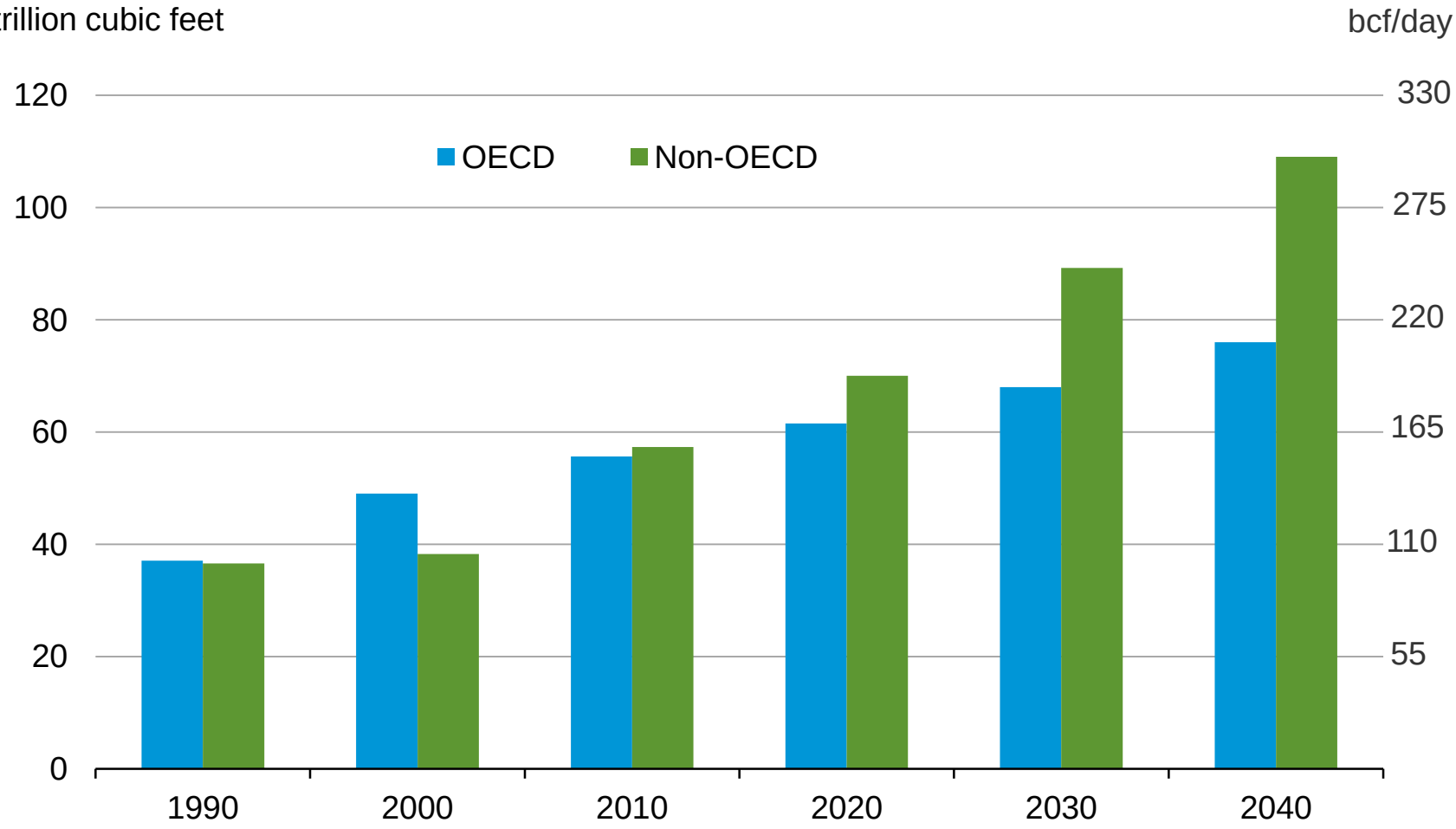
Country	2011	2040				
		Past as prologue	Iraq success	Iran success	Iran & Iraq success; Saudi Arabia takes the rest	2040 production range
Saudi Arabia	11.1	15.5	10.2	13.8	6.0	9.5
Iran	4.2	5.9	3.9	8.1	8.1	4.2
Iraq	2.6	3.7	11.0	3.3	11.0	7.7
Other Middle East OPEC	7.5	10.7	10.7	10.7	10.7	–
Total Middle East OPEC	25.4	35.8	35.8	35.8	35.8	–

Source: EIA, IEO2013

Natural Gas Markets

Non-OECD nations account for over 70 percent of the growth in natural gas consumption

world natural gas consumption

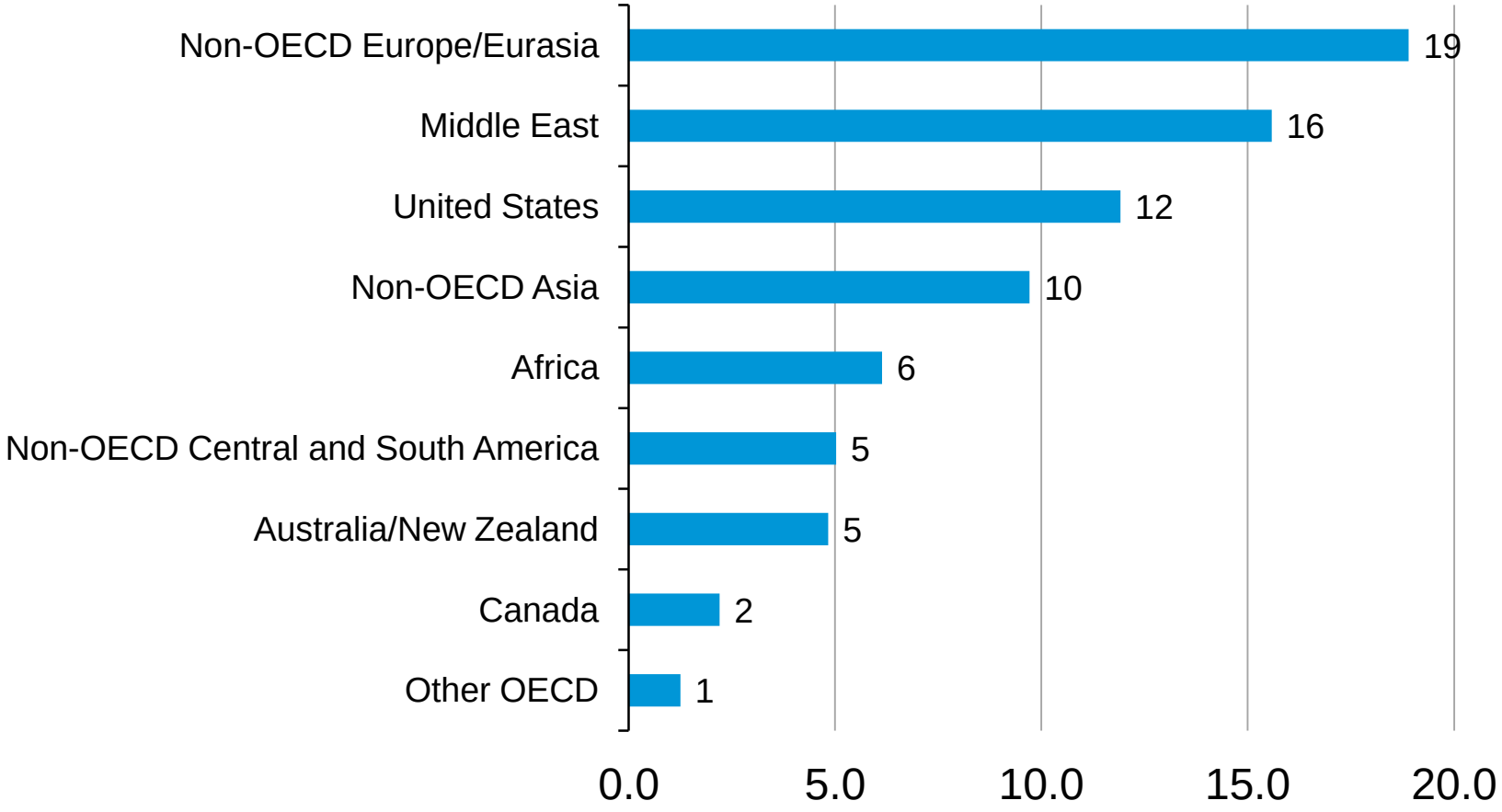


Source: EIA, International Energy Outlook 2013

Non-OECD Europe/Eurasia, Middle East, and the United States account for the largest increases in natural gas production

growth in natural gas production 2010-2040

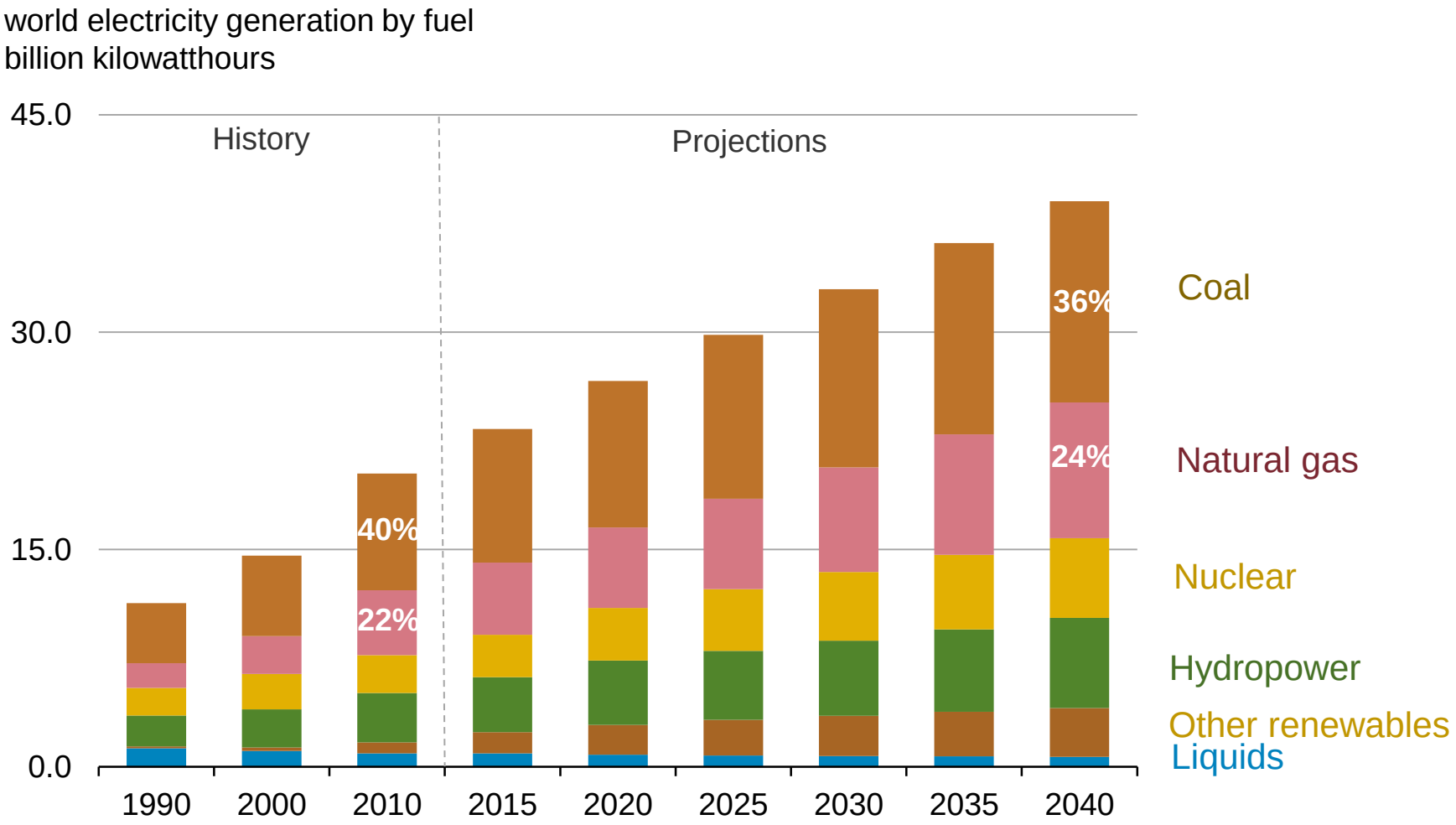
trillion cubic feet



Source: EIA, International Energy Outlook 2013

Electricity Markets

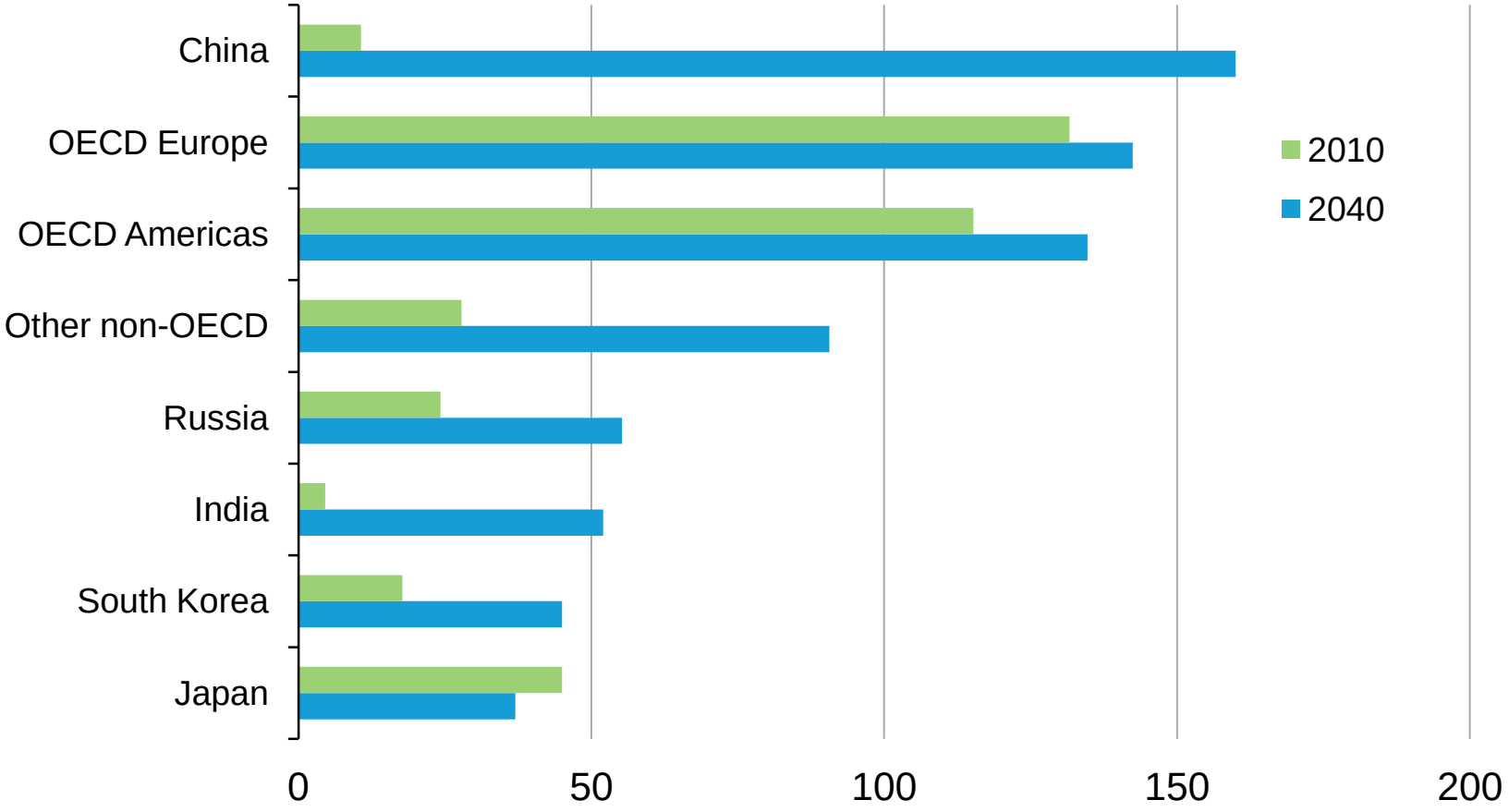
In electricity generation, renewables and natural gas are the fastest growing sources, but coal still fuels the largest share in 2040



Source: EIA, International Energy Outlook 2013

China accounts for more than 40 percent of the global net increase in nuclear capacity

world nuclear electricity generating capacity, 2010 and 2040
gigawatts

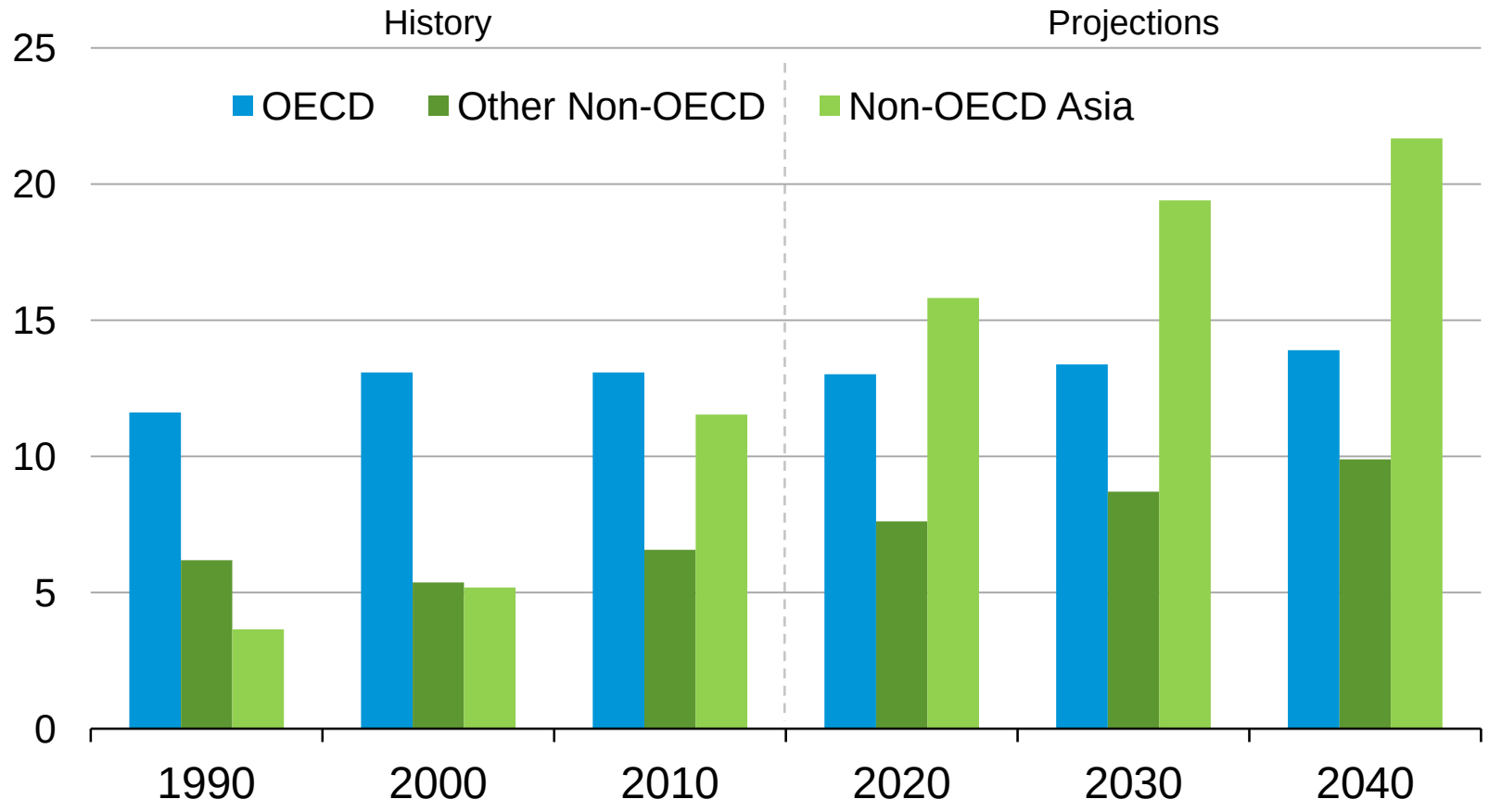


Source: EIA, International Energy Outlook 2013

Energy-Related Carbon Dioxide Emissions

Non-OECD Asia accounts for over 70 percent of the world increase in energy-related carbon dioxide emissions

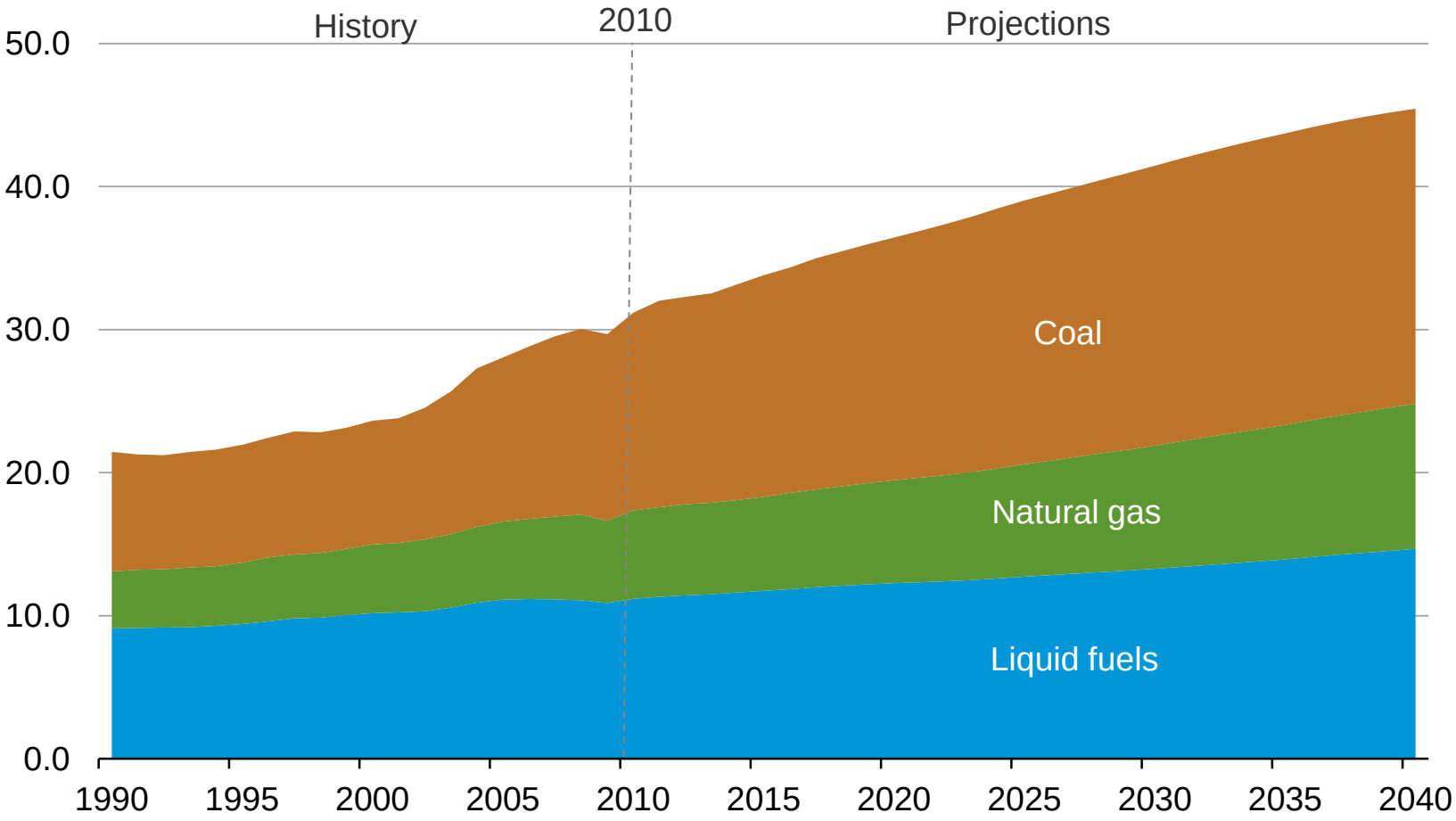
world energy-related carbon dioxide emissions
billion metric tons



Source: EIA, International Energy Outlook 2013

Coal continues to account for the largest share of energy-related carbon dioxide emissions throughout the projection

world energy-related carbon dioxide emissions by fuel
billion metric tons



Source: EIA, International Energy Outlook 2013

There are many issues that increase uncertainty…

- Unresolved long-term effects of economic issues in the United States, Europe, and China
- The timing of Japan's full recovery from the impacts of the 2011 nuclear disaster at Fukushima
- Social unrest in the Middle East and North Africa, and the potential for unrest elsewhere
- Shale gas and shale oil production potential
- OPEC market share decisions
- Climate policies

For more information

U.S. Energy Information Administration home page | www.eia.gov

Short-Term Energy Outlook | www.eia.gov/steo

Annual Energy Outlook | www.eia.gov/aeo

International Energy Outlook | www.eia.gov/ieo

Monthly Energy Review | www.eia.gov/mer

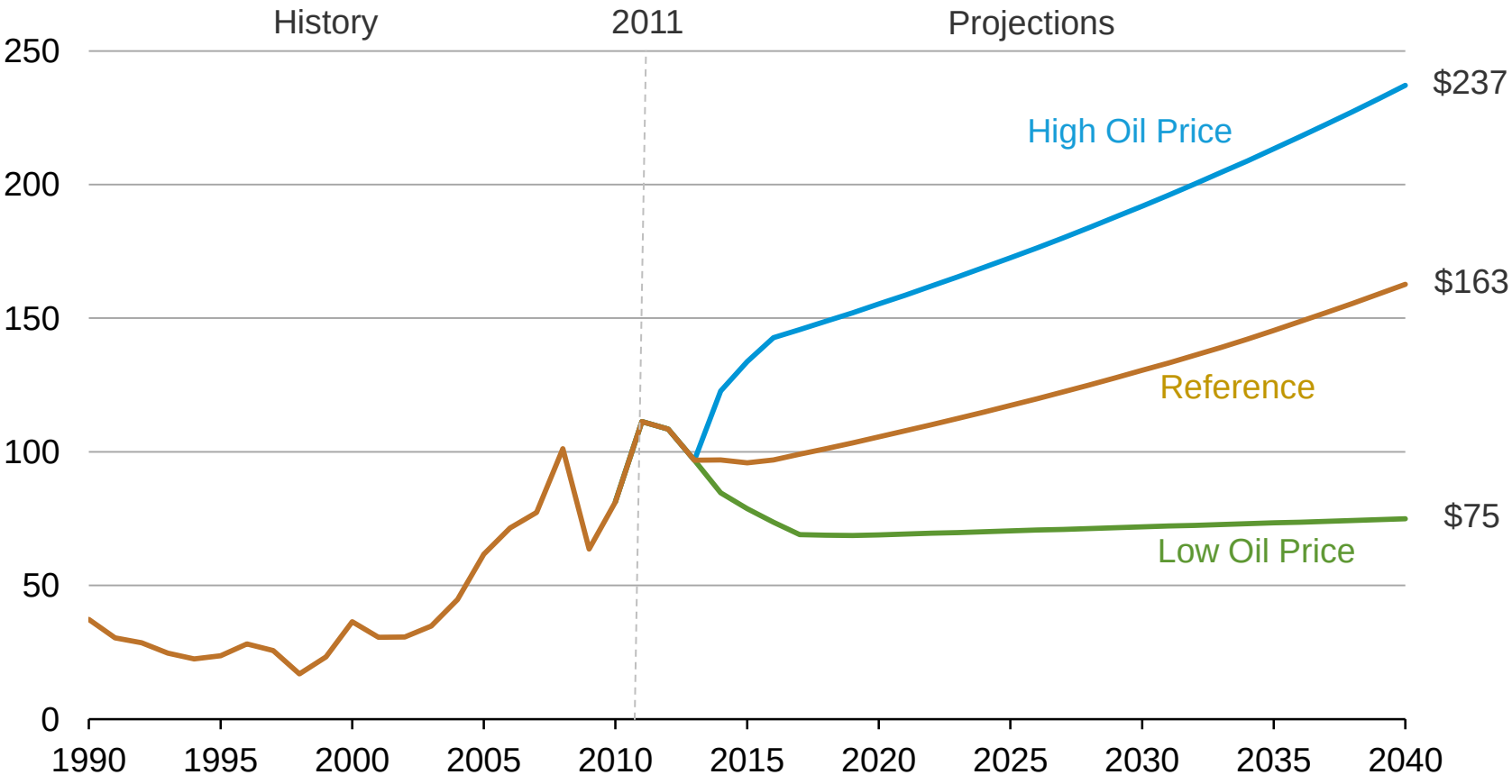
Supplementary Slides

IEO2013 includes 4 alternative cases that examine the sensitivity to different GDP growth and oil prices

- Reference case
  - World GDP increases by 3.6 percent per year between 2010 and 2040 and energy consumption rises to 820 quadrillion Btu (quads) in 2040
  - Oil prices reach $163 (Brent in 2011 dollars) and the OPEC share of liquids production is 43% in 2040
- High Economic Growth case
  - World GDP increases by 4.0 percent per year and consumption grows to 946 quads in 2040
- Low Economic Growth case
  - World GDP increases by 3.1 percent per year and consumption grows to 733 quads in 2040
- High Oil Price case
  - Oil prices rise to $237 per barrel as a result of high non-OECD demand and the OPEC share is 38% in 2040
- Low Oil Price case
  - Oil prices are $75 per barrel as a result of low non-OECD GDP growth and the OPEC share is 51% in 2040

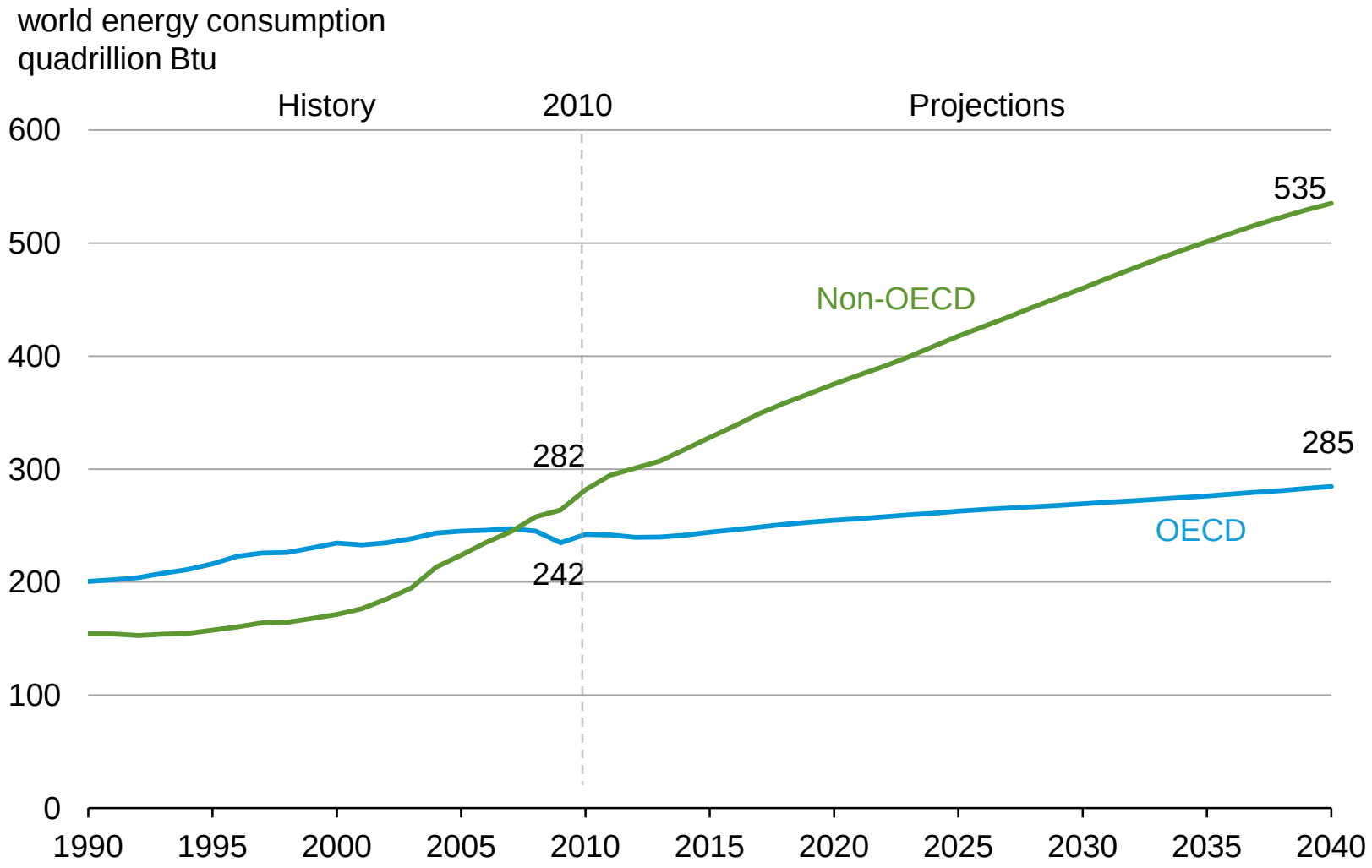
Oil prices in the Reference case rise steadily as the global economy expands and the call on OPEC rises

Brent crude oil price paths
real 2011 dollars per barrel



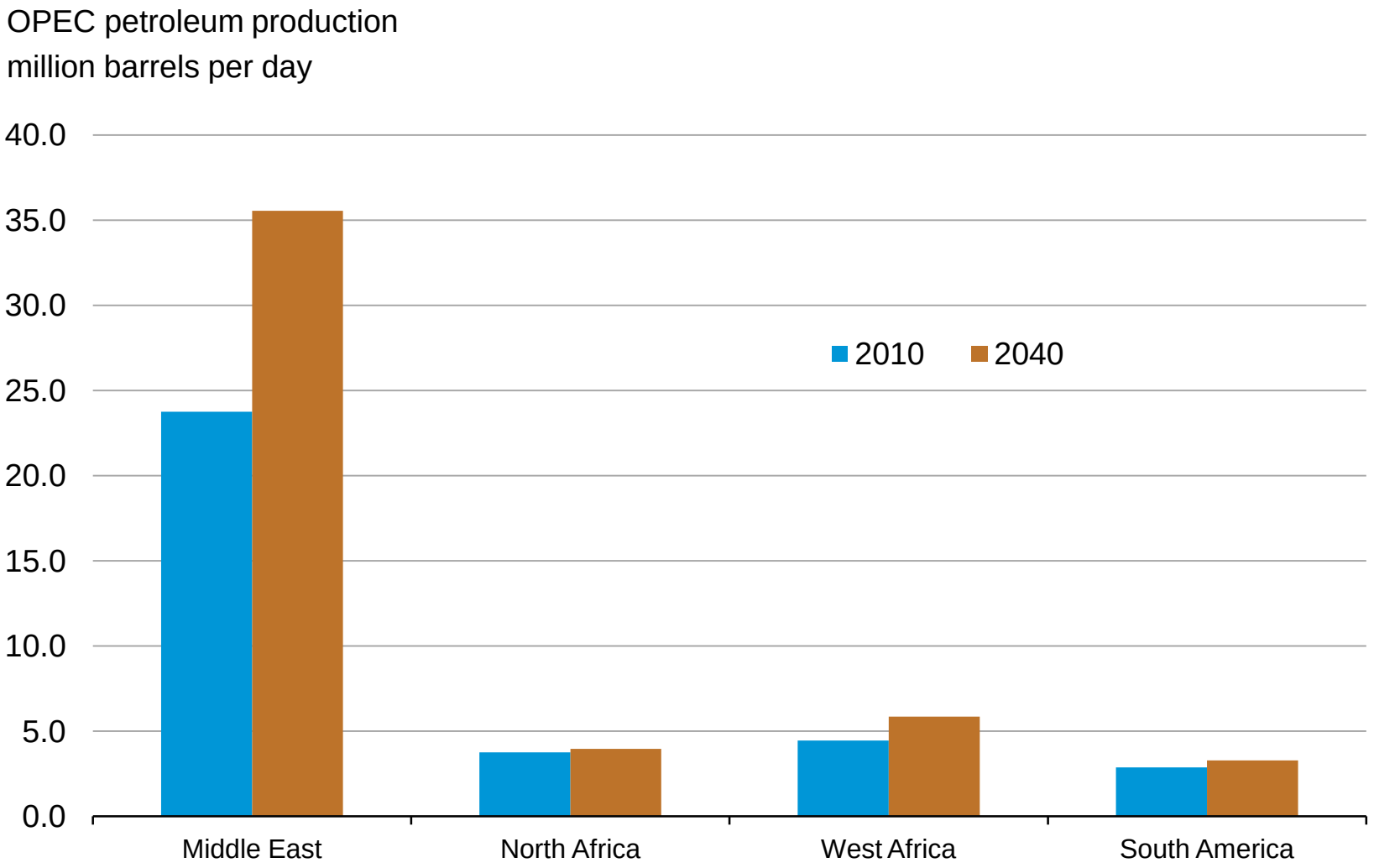
Source: EIA, International Energy Outlook 2013

Non-OECD nations drive the increase in energy demand



Source: EIA, International Energy Outlook 2013

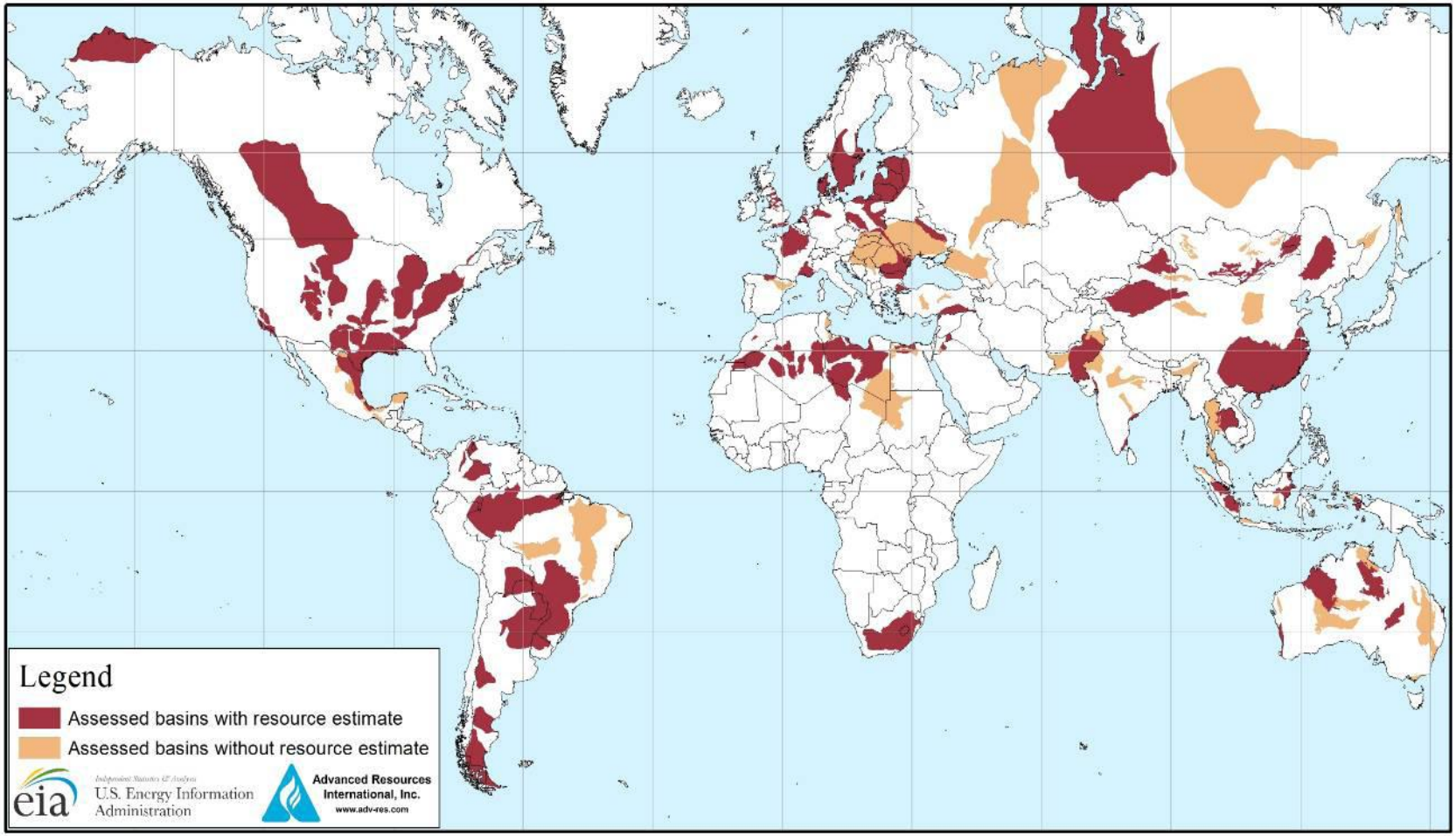
Growth in OPEC production comes mainly from the Middle East



Source: EIA, International Energy Outlook 2013

Shale oil and gas have the potential to dramatically alter world energy markets

map of basins with assessed shale oil and gas formations, as of May 2013



Source: United States: EIA and USGS; Other basins: ARI

Top ten countries with technically recoverable shale resources

Shale oil

Rank	Country	Billion barrels
1	Russia	75
2	United States	58
3	China	32
4	Argentina	27
5	Libya	26
6	Venezuela	13
7	Mexico	13
8	Pakistan	9
9	Canada	9
10	Indonesia	8
	World total	**345**

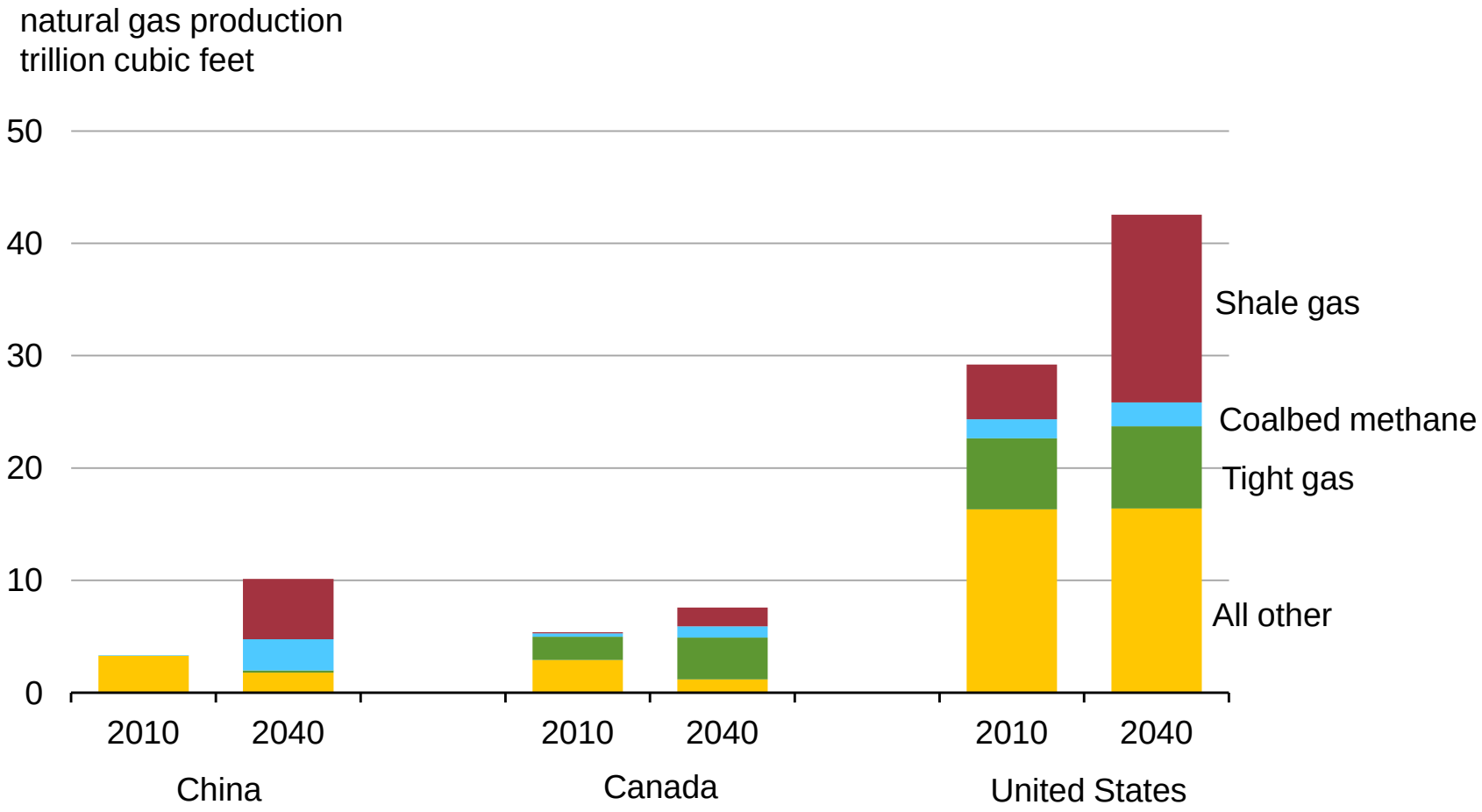
Shale gas

Rank	Country	Trillion cubic feet
1	China	1,115
2	Argentina	802
3	Algeria	707
4	United States	665
5	Canada	573
6	Mexico	545
7	Australia	437
8	South Africa	390
9	Russia	285
10	Brazil	245
	World total	**7,299**

Source: United States: EIA and USGS; Other basins: ARI.

Note: ARI estimates U.S. shale oil resources at 48 billion barrels and U.S. shale gas resources at 1,161 trillion cubic feet.

Shale gas, tight gas, and coalbed methane are increasingly important to the United States, China and Canada



Source: EIA, International Energy Outlook 2013

Btu or British thermal units, can be used as an energy measurement across different energy sources

- One Btu is approximately equal to the energy released in the burning of a wood match.
- One million Btu equals about 8 gallons of motor gasoline.
- One trillion Btu is equal to 500 100-ton railroad cars of coal.
- One quadrillion Btu is equal to 172 million barrels of crude oil.