Oil and Gas

Maximizing Flow Control and Treatment Revenues in a Volatile Market

Improving the right to win position in oil and gas

Position	Build up Asian position
Execution	Differentiate from competitors and focus on total solutions
Adaptation	Pursue the fast growing niches
Concentration	Focus on products offering lowest total cost of ownership
Creation	Help create a format where customers can easily determine lowest total cost of ownership

The oil and gas industry will continue to be subject to wild swings in capital spending as oil prices rise and fall. A flow control and treatment company needs to combine 5 right to win strategies in order to maximize success in this volatile industry. Here are ways to maximize the results in each of the five strategies

Include game plan for down cycles and adapt for high growth segments

- In general there will be continued growth but with major fluctuations as oil and gas companies over compensate in both up and down markets. So the execution strategy includes a game plan for the down cycles. Liquid fuel usage in 2015 was under 200 quadrillion btu. By 2040 world usage will be close to 250 quadrillion btu or a 25% growth rate for the 25 years. Gas consumption will grow from 130 quads to 210 quads for a growth of over 60% during the period
- So part of the adaptation strategy is to focus on the high growth areas both by geography and process. Non OECD Asia is expected to account for 55% of the worlds energy increase in the period to 2040. The production of natural gas plant liquids is expected to increase by 10 million barrels per day compared to gains of less than 3 million barrels per day for refined oil. U.S production of non conventional gas including shale gas, tight gas and coalbed methane will increase by 10 trillion cubic feet. So this will be a major opportunity for flow control and treatment companies

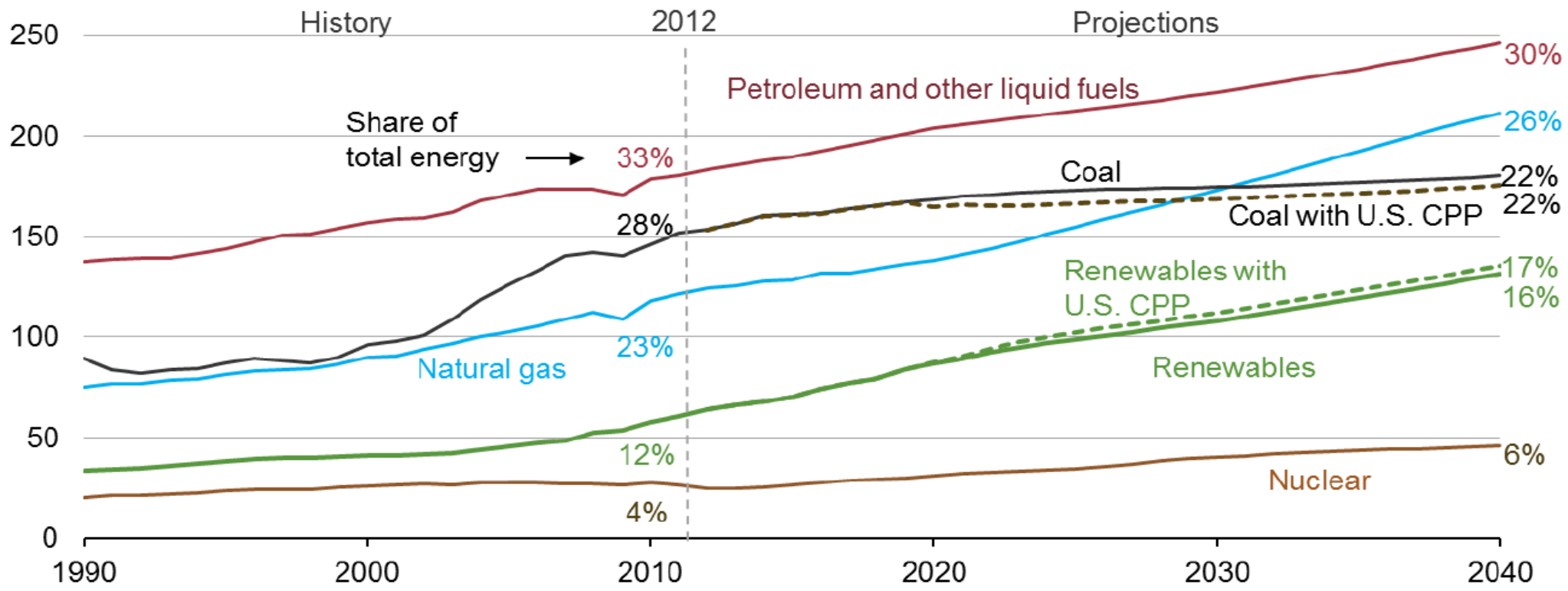
Expand to total solutions and support decision systems which facilitate accurate total cost of ownership analyses

- The expense of maintaining a valve used on an offshore oil rig is considerably higher for the same service as a valve used in a land based application. Adaptation strategies take advantage of this fact by creating valves with higher prices and margins which can be justified based on total lowest cost of ownership
- The worlds relevant information is doubling every few years while the individual using conventional decision making tools has a fixed ability to absorb information. This leads to two opportunities for flow control and treatment suppliers . One is in adaptation and one is in creation. The adaptation strategy dictates expanding the product line to provide total solutions and operational support. The creation strategy involves supporting companies such as Mcilvaine who are providing free decision guides to oil and gas companies to help them make decisions based on total cost of ownership. This includes more than just the evaluation of existing products but the ability to accurately evaluate the advantages of new products

Renewables grow fastest, coal use plateaus, natural gas surpasses coal by 2030, and oil maintains its leading share

world energy consumption

quadrillion Btu

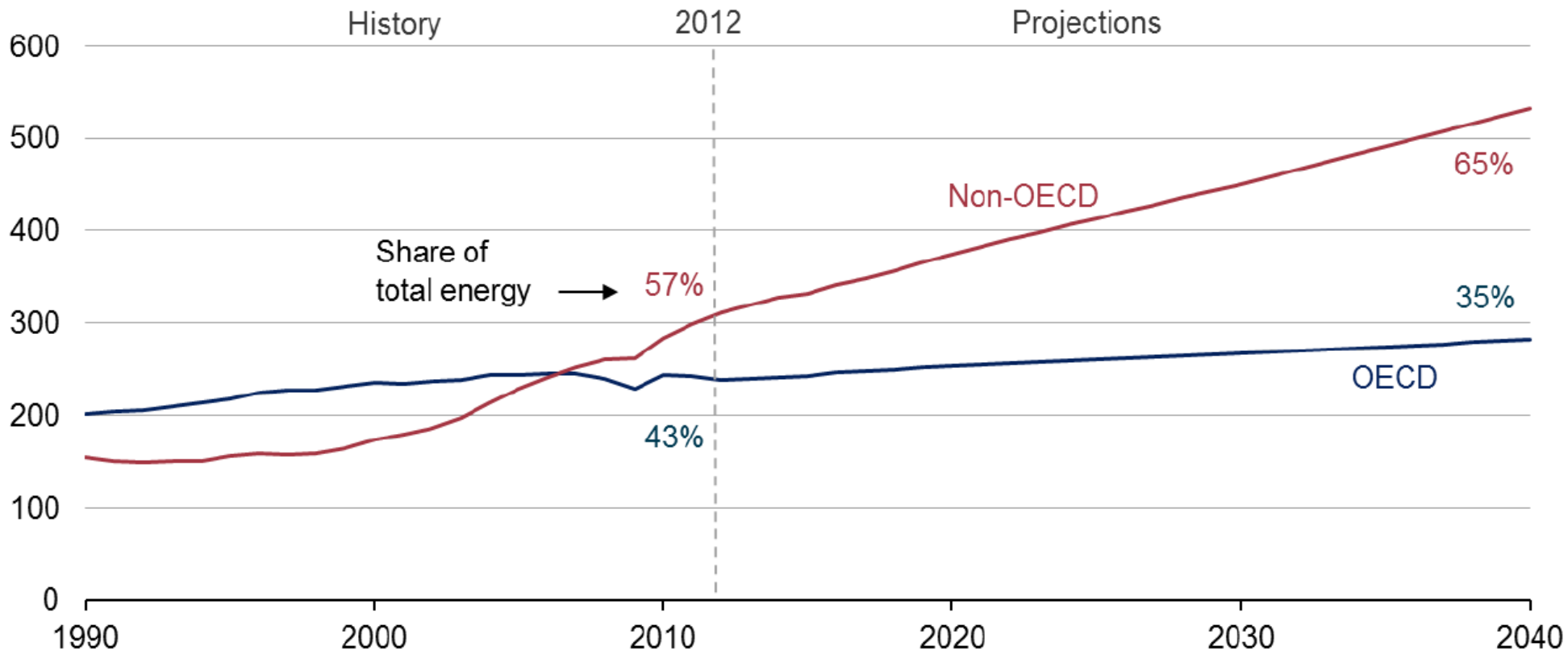


Source: EIA, International Energy Outlook 2016 and EIA, Analysis of the Impacts of the Clean Power Plan (May 2015)

Non-OECD nations drive the increase in total energy use

world energy consumption

quadrillion Btu

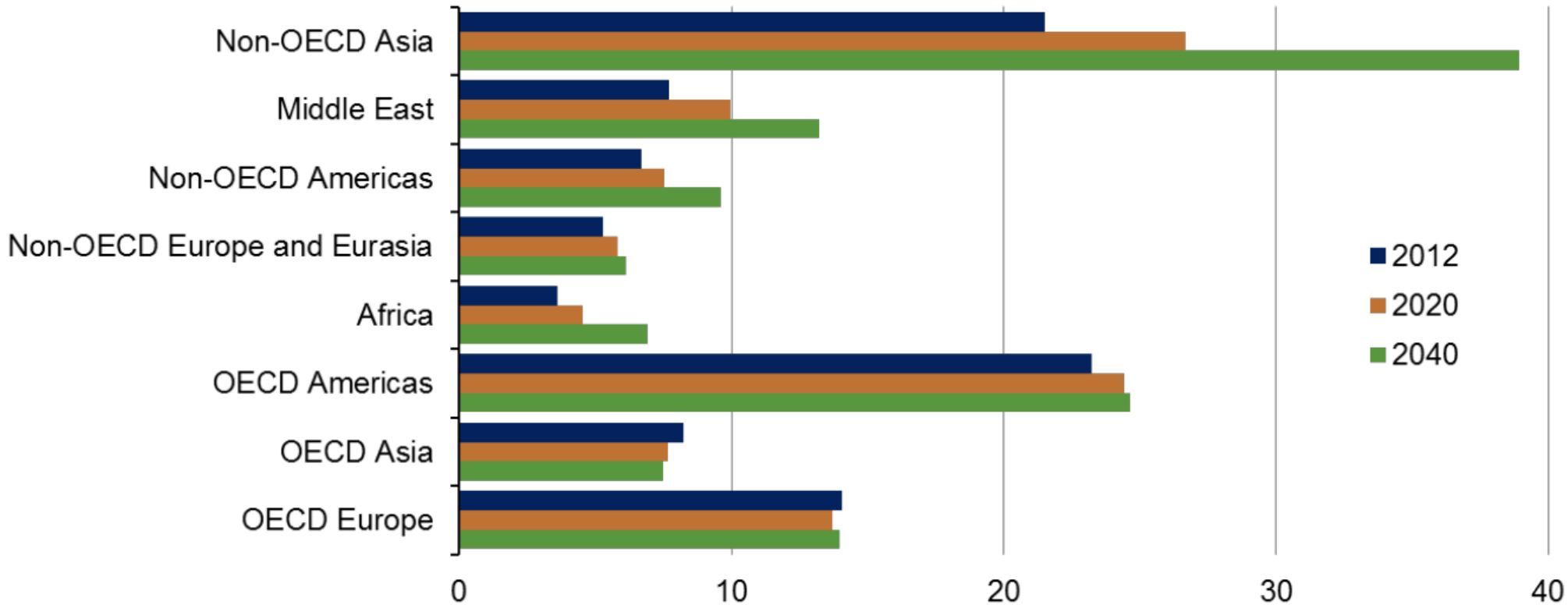


Source: EIA, International Energy Outlook 2016

Most of the growth in world oil consumption occurs in the non-OECD regions — especially Asia

world petroleum and other liquid fuels consumption

million barrels per day

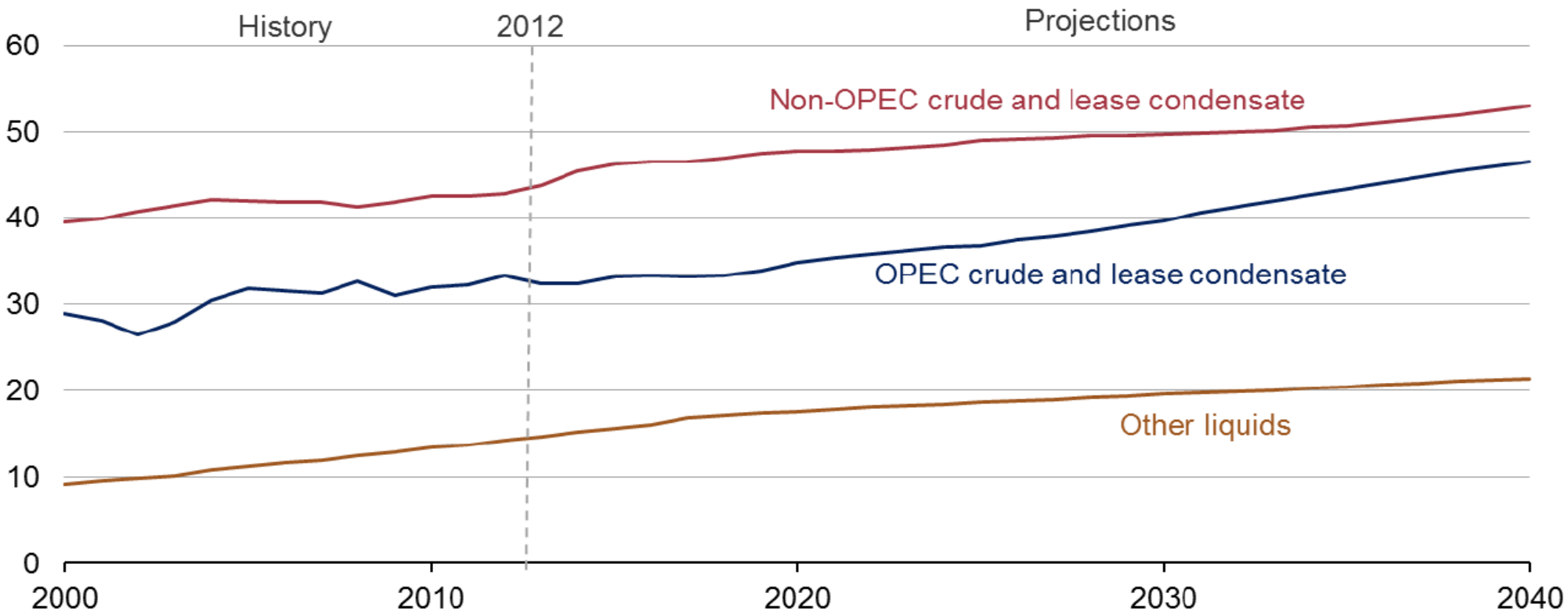


Source: EIA, International Energy Outlook 2016

Liquid fuels supplies from both OPEC and non-OPEC producers increase through 2040

world production of petroleum and other liquid fuels

million barrels per day

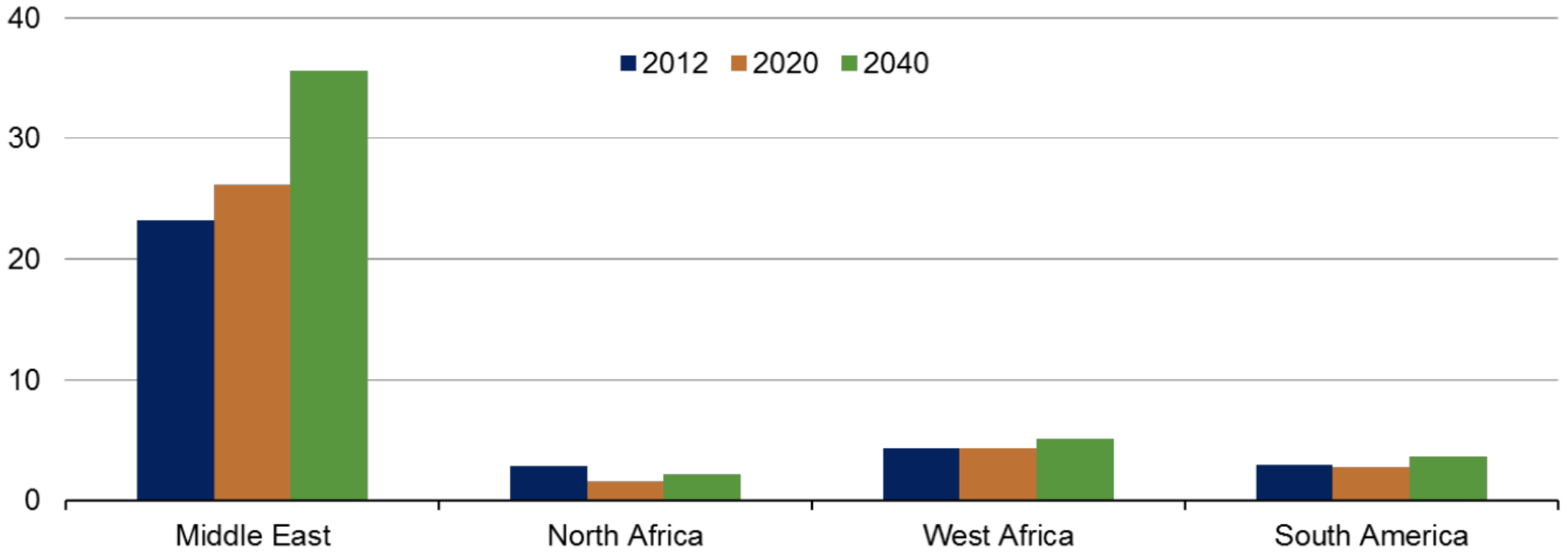


Source: EIA, International Energy Outlook 2016

Growth in OPEC production comes mainly from the Middle East

OPEC crude and lease condensate production

million barrels per day

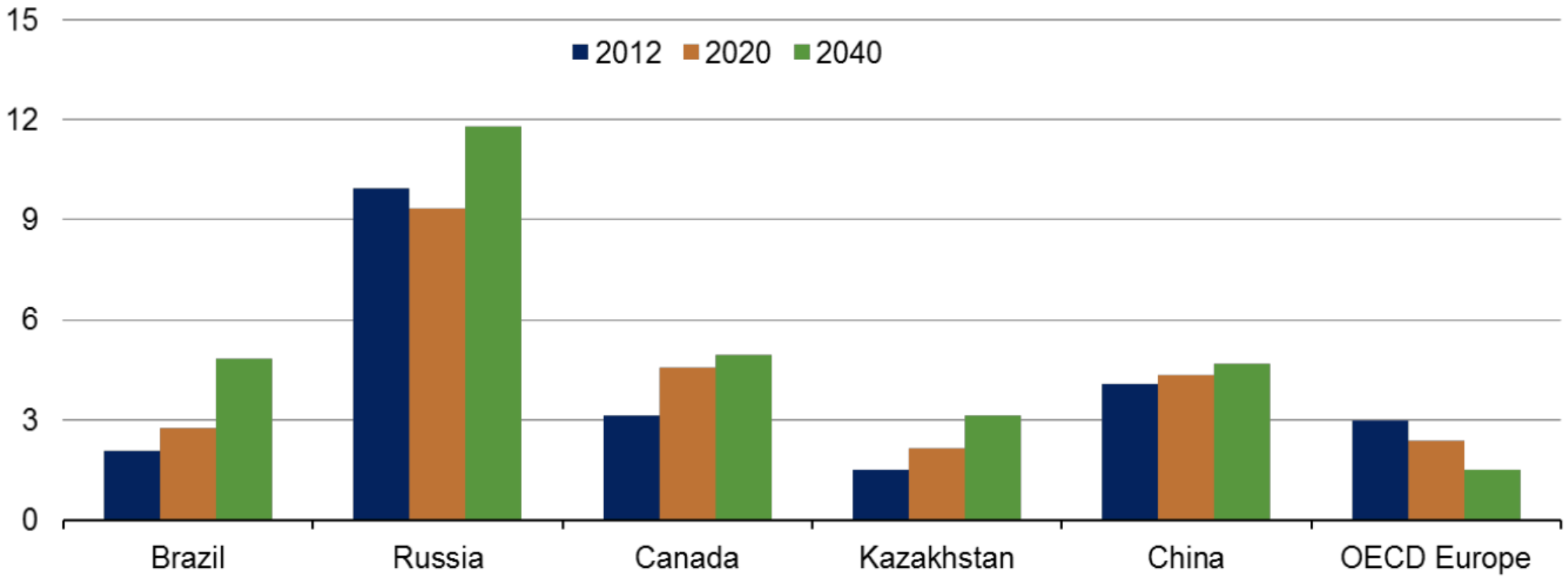


Source: EIA, International Energy Outlook 2016

Increases to non-OPEC oil supplies outside the United States are primarily from Brazil, Russia, Canada, and Kazakhstan

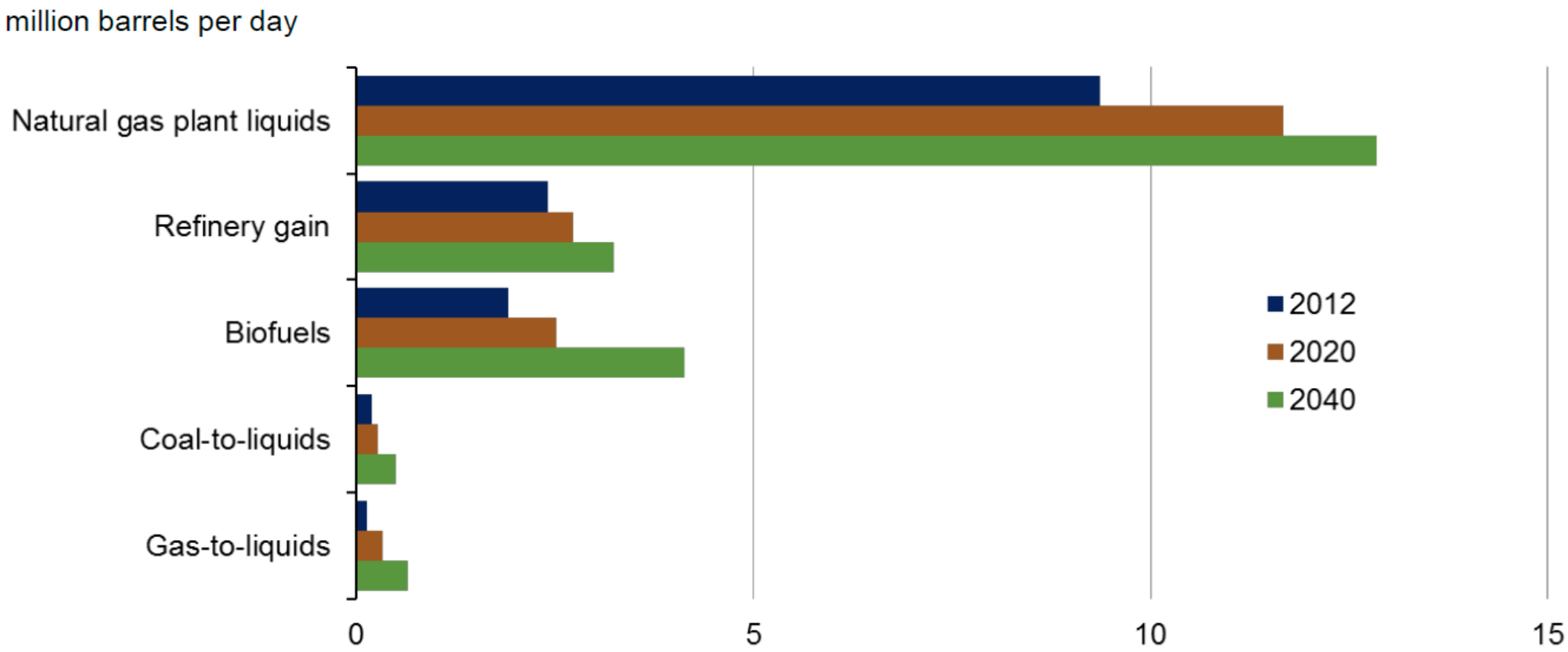
non-OPEC crude and lease condensate production in selected country groupings

million barrels per day



Source: EIA, International Energy Outlook 2016

The largest components of other liquid fuels are NGPL, refinery gain, and biofuels

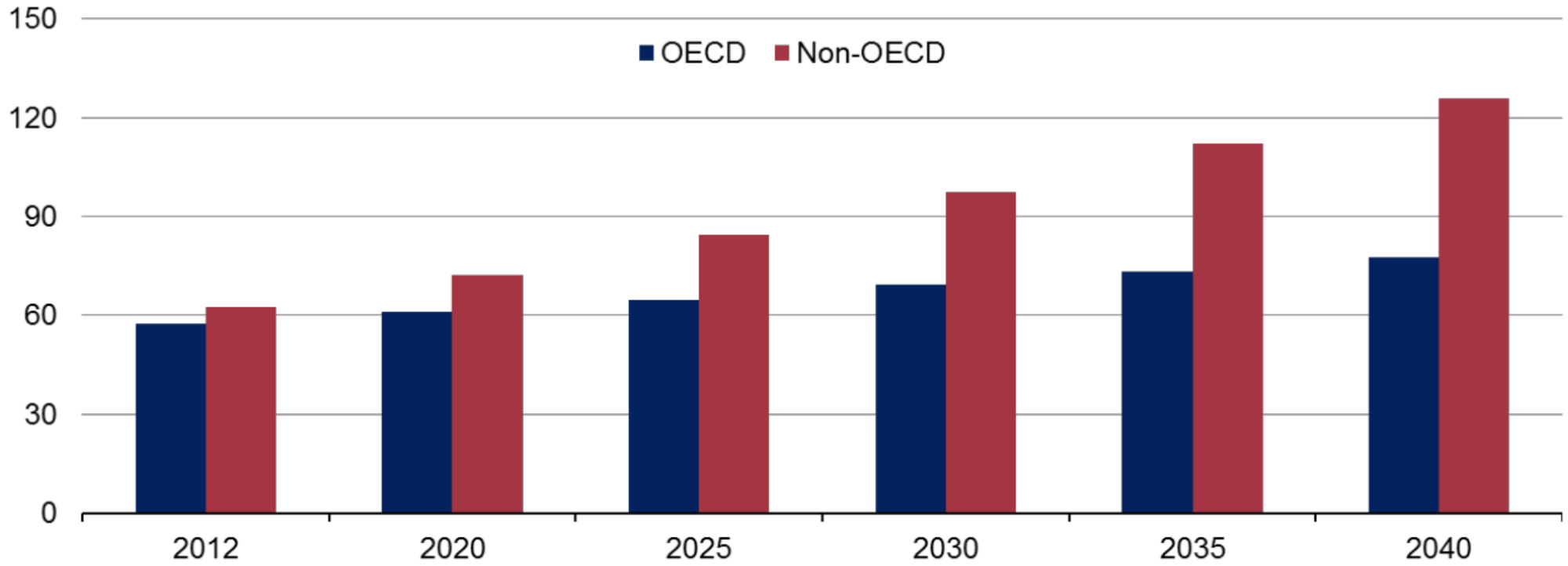


Source: EIA, International Energy Outlook 2016

Non-OECD nations will account for 76% of the growth in natural gas consumption

world natural gas consumption

trillion cubic feet

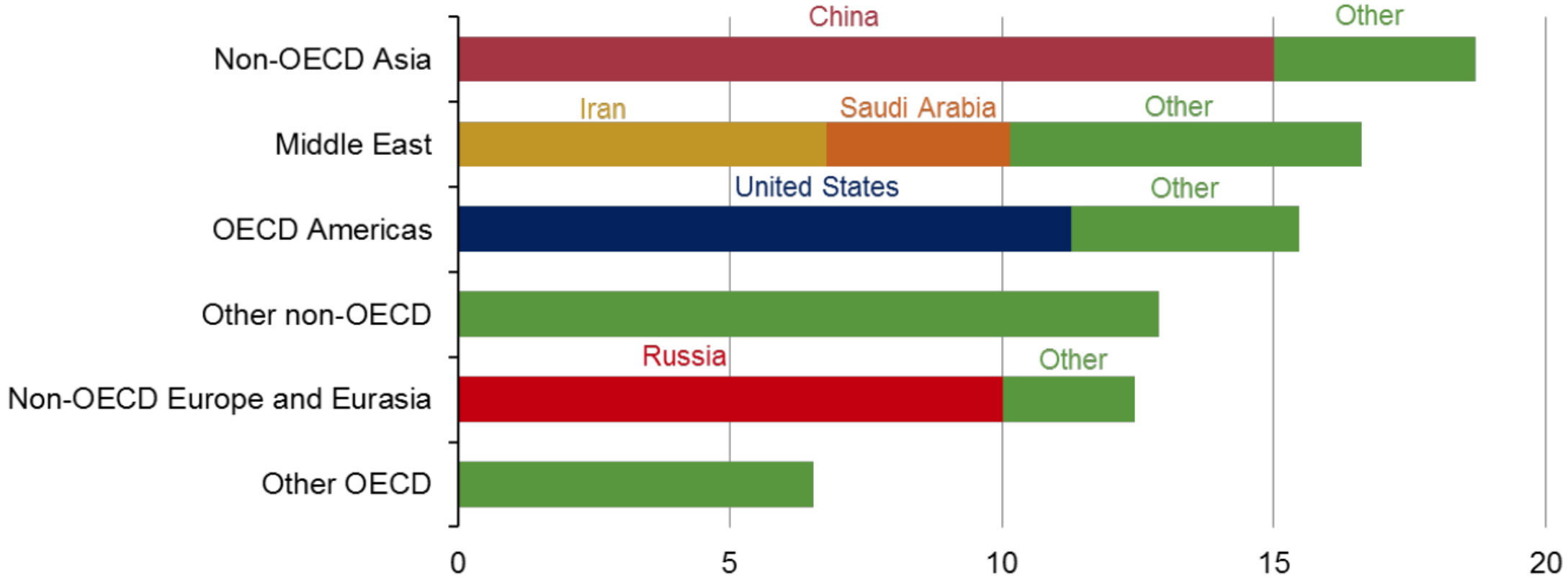


Source: EIA, International Energy Outlook 2016

Non-OECD Asia, Middle East, and OECD Americas account for the largest increases in natural gas production

world change in natural gas production, 2012–40

trillion cubic feet

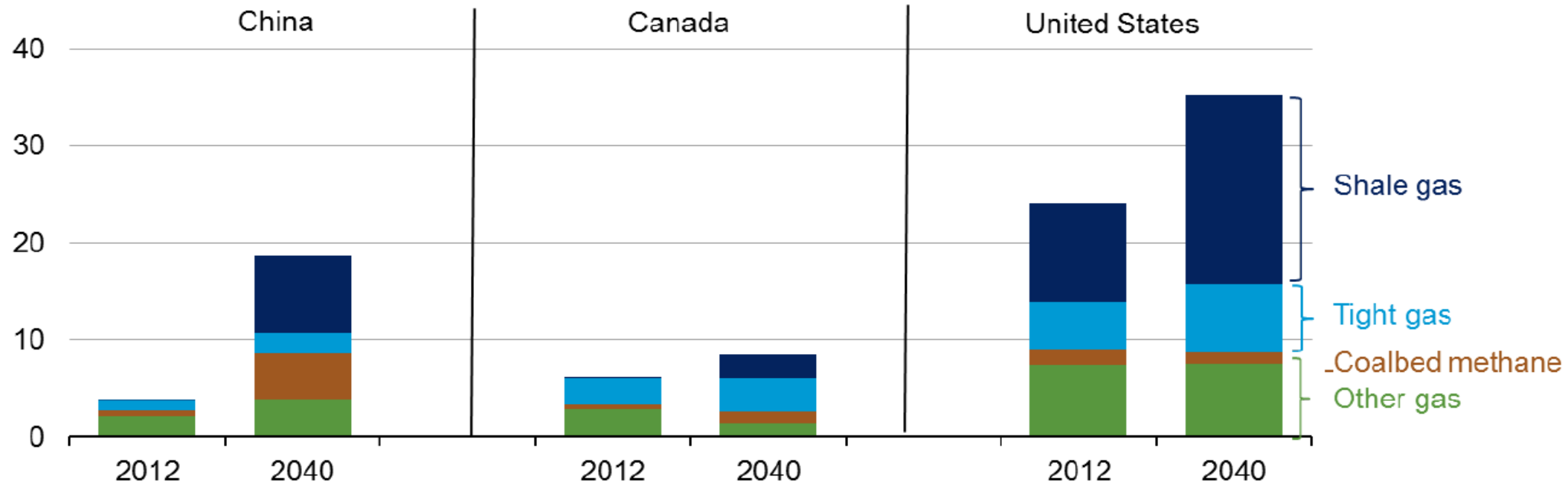


Source: EIA, International Energy Outlook 2016

Shale gas, tight gas, and coalbed methane will become increasingly important to gas supplies, not only for the U.S., but also China and Canada

natural gas production by type

trillion cubic feet



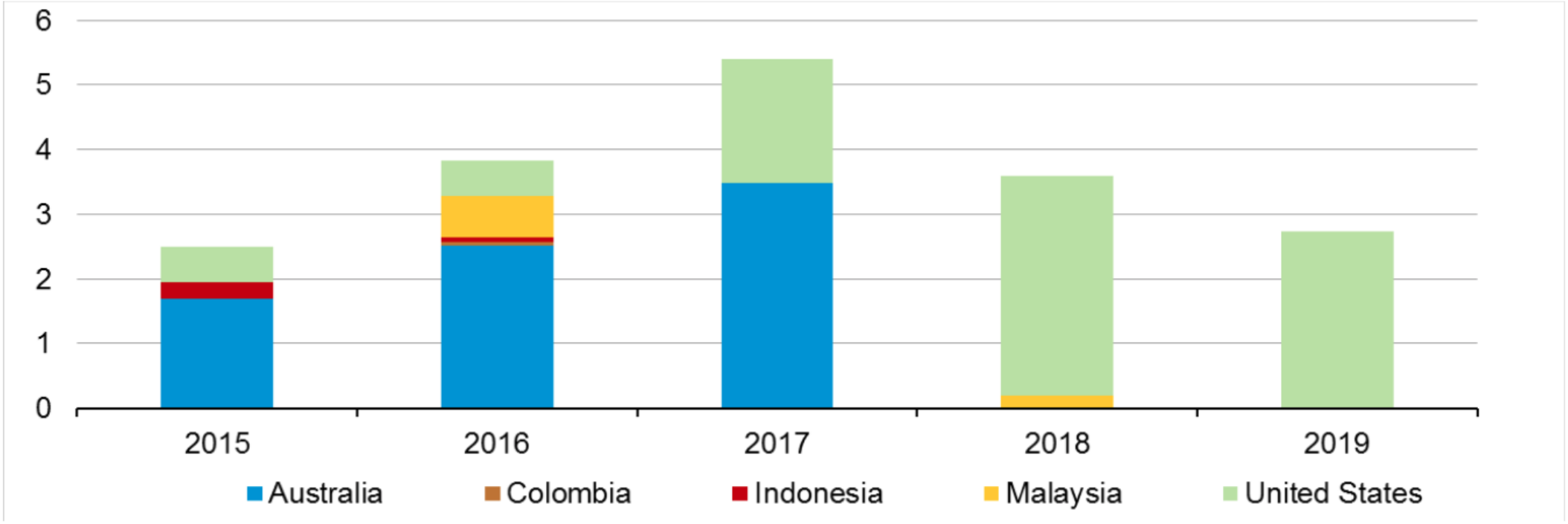
Note: Other natural gas includes natural gas produced from structural and stratigraphic traps (e.g. reservoirs), historically referred to as 'conventional' production.

Source: EIA, International Energy Outlook 2016

Liquefaction capacity additions over the 2015-19 time period will increase global capacity by over 30%

LNG capacity additions

billion cubic feet per day



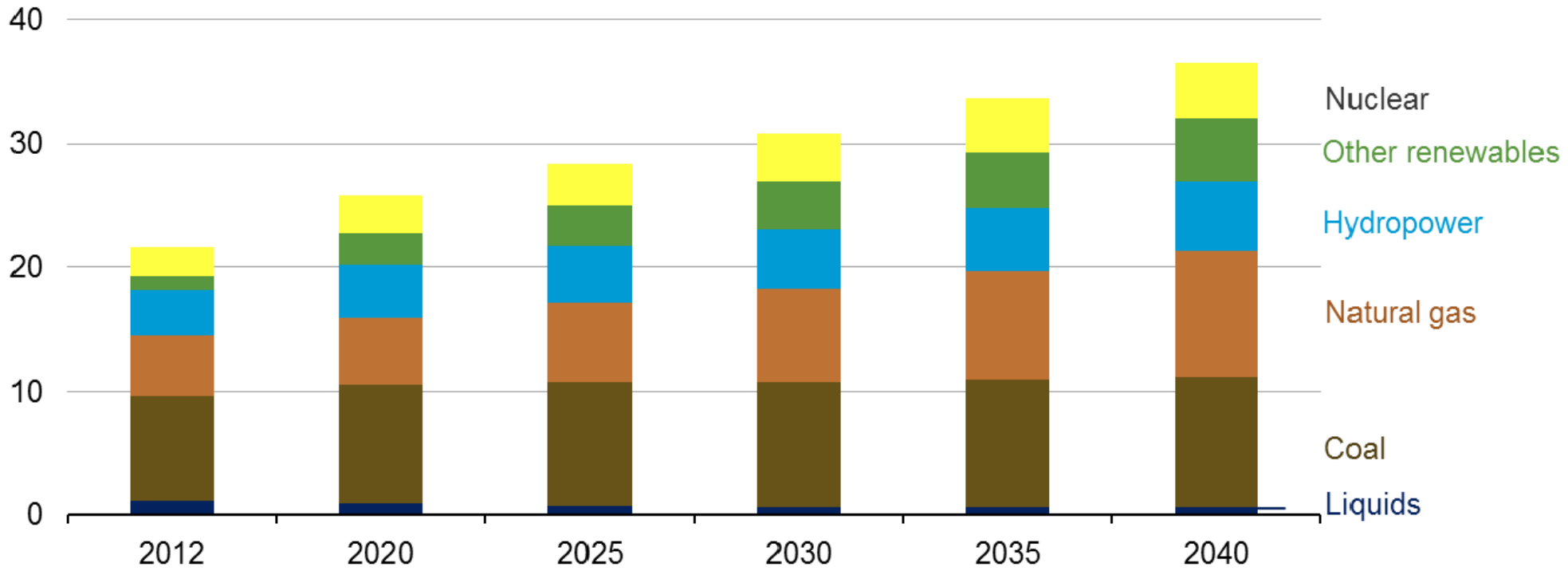
Note: Capacity additions in 2015-19 include projects currently under construction, and represent nameplate capacity, not adjusted for ramp-up

Source: U.S. Energy Information Administration estimates based on trade press

Renewables, natural gas, and coal all contribute roughly the same amount of global net electricity generation in 2040

world net electricity generation by source

trillion kilowatthours

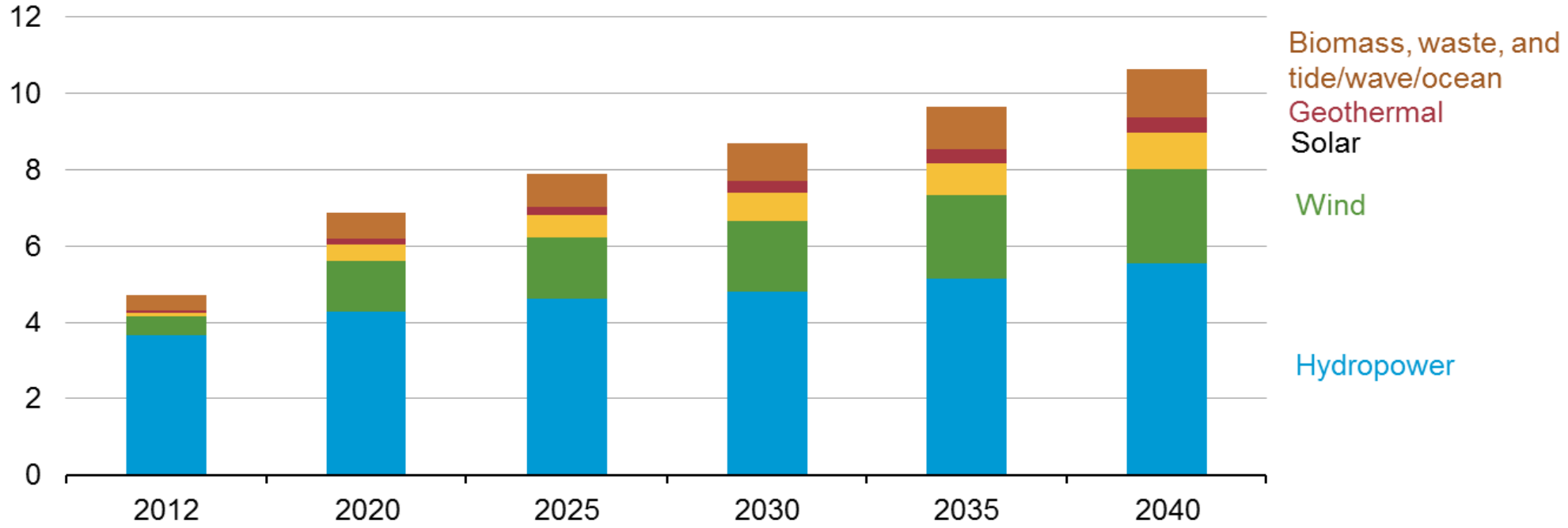


Source: EIA, International Energy Outlook 2016

Wind and hydropower each account for one third of the increase in renewable generation; solar is fastest-growing (8.3%/year)

world net electricity generation from renewable energy by source

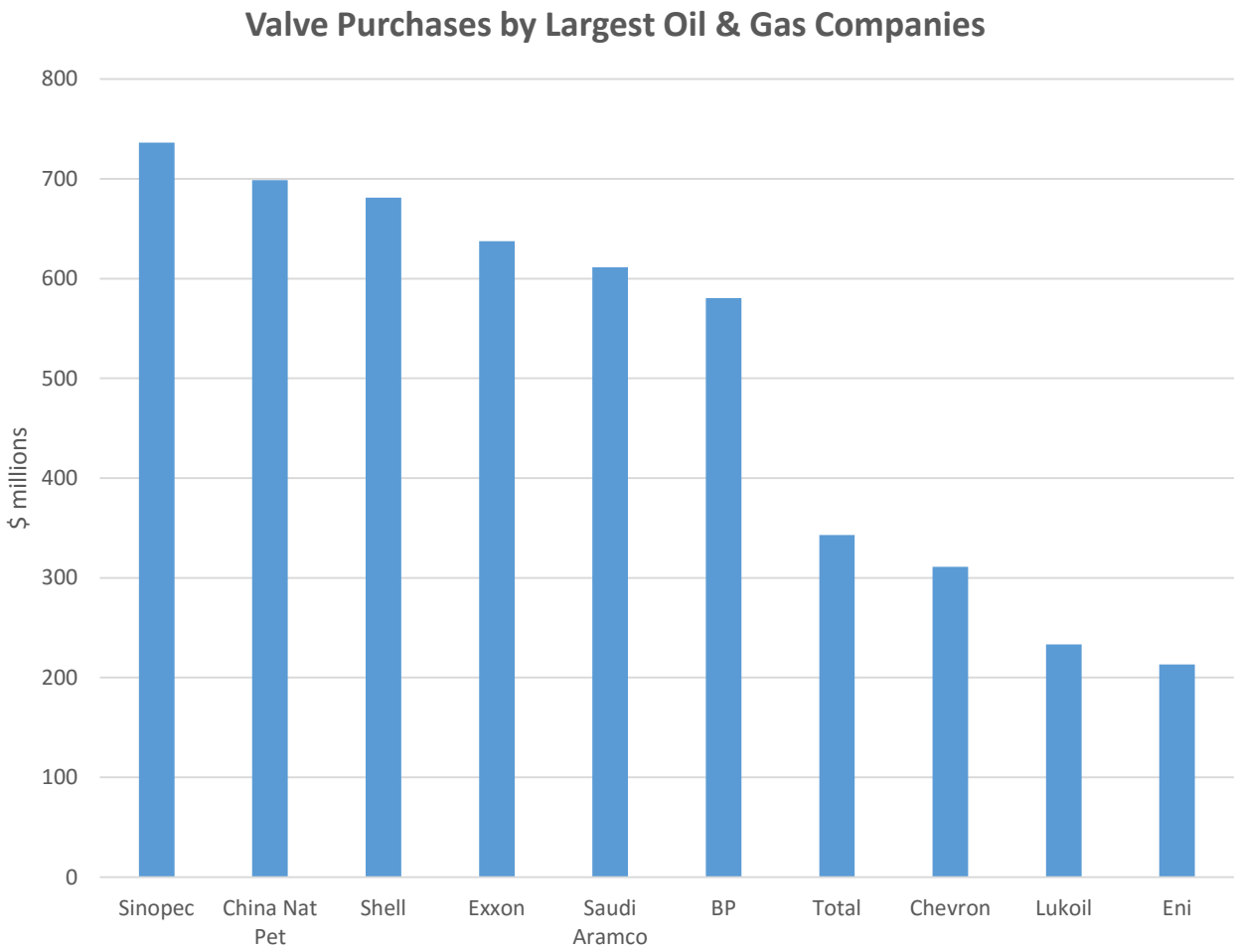
trillion kilowatthours



Source: EIA, International Energy Outlook 2016

Concentration of Purchasing in a few companies

Top 10 oil and gas companies buy more than 60% of valves in this industry



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Large Oil and Gas Projects are Tracked Daily with Opportunity ($ hundred million) = O and Order Date = T

Project Title	Application Location	Opportunity Size Order Date
Fairway Energy Partners to Build Houston Oil Storage Facility	Crude Petroleum USA	O6 T15
Global Marine Lands Subsea 7 Contract	Crude Petroleum UK	O6 T16
Top Canada Oil Sands Project Unlikely to Close, Despite Losing $6/bbl	Crude Petroleum Canada	O6
ConocoPhillips & total Start Production from their Alberta, Surmont 2 Oil Sands F	Crude Petroleum Canada	O6 T15
Aecon awarded $109 M Contract for Additional Work on Alberta Oil Sands Refinery	Crude Petroleum Canada	O7 T15
TransCanada expects BC Regulatory Decisions on 2 Pipelines in Q2	Crude Petroleum Canada	O7
Gibson Energy to build 900,000 Barrels of Crude Storage in Alberta	Crude Petroleum Canada	O7 T16
Southern Pacific Resources to “Hibernate” The STP-McKay Oilsands Project by End of July	Crude Petroleum Canada	O7
KBR wins Fort Hills Oil Sands Mining Work	Crude Petroleum Canada	O6 T16
ExxonMobil announces Cold Lake Project Expansion starts Production on Schedule	Crude Petroleum Canada	O8 T15

Global sourcing, OEMS and consultants cause 46% of the decisions to be made remotely

Decision maker	Small company purchases		Large company purchases	
	Local decision	Remote decision	Local decision	Remote decision
Large purchaser			20	40
Small purchaser	60	10		
OEM, EPC	5	10	5	15
Consultant	5	10	5	15
Total for category	70	30	30	70
Total for market which is 60/40 small	42	18	12	28
In the total market 54% of the decisions are locally and 46% made remotely				

China Syngas from coal program

- China has to balance the health and welfare of its citizens today with longer range impacts of climate change. the very ambitious program in the northern mining regions of China to convert coal to clean gas and transport it around the country. Sinopec is proceeding with a $20 billion pipeline. Various gasification projects are in the planning or construction stage. There has been international criticism of this program due to its climate change implications. Since smog in major cities has been very high on the list of citizen complaints, a program to economically reduce it has considerable support. The clean gas will be piped to cities around the country and will replace dirty fuels presently burned in residential, commercial and light industrial plants. New research substantiates this argument with evidence that in Beijing households are the major smog contributor
- In order to make the best decisions, China has to weigh the relative harm of CO_2, NO_x, $PM_{2.5}$, water depletion and other resource impacts. It also has to weigh present vs. future values e.g. smog today vs. climate change tomorrow. McIlvaine has a common metric to weigh all harm and good Sustainability Universal Rating System

Yes, gas engines will produce more poison ivy but also tomatoes

- A NY Times article warns of the impending growth of poison ivy. Yes, but this fertilization effect of CO_2 has been put to good use by thousands of greenhouses around the world. GE, Cummins and other engine manufacturers are activity pursuing CHP projects which provide greenhouses with electricity, heat, light and CO_2. Is it better to increase the production of tomatoes or retard the growth of poison Ivy?
- The Southcoast Air Quality Management District (SCAQMD) struggled with this question in the recent analysis of the 1110.2 biogas emission amendment. The question is whether landfill gas engines would be a better choice than just flaring. The Beverly Hills estate owner who can easily buy whatever tomatoes are desired but is struggling to keep poison ivy under control will have a completely different value judgment than a starving child in Sudan. Should SQAMD prioritize the desires of its residents above those of the starving people in the world? The answer is " Yes." But this does not mean that every government in the world should reflect the values of SCAQMD residents.
- There is a broader implication which greatly affects the market for reciprocating engines. These engines contribute to the increase of CO_2 in the world. A recent study by a number of collaborating universities now supports the long held theory that the earth is growing greener. Other studies have estimated that the increase in crop value is in the $billions and possibly even the $trillions. Many engines are being purchased by developing countries to provide critical power and in turn save lives and increase welfare of the residents.

The greening of the earth will create much more food in the short term. How do you reconcile present benefits to future harm.

- Decisions about the environmental impacts of these initiatives are being made on a simplistic basis. Engine manufacturers should support a more complex analysis which better represents the true desires of citizens. The three key analysis elements are (1) quality of life , (2) tribal values, (3) discounted future. The evaluation should not be based on the standard life quantity guide but on life quality. The highest honor gold medal goes to the soldiers who sacrificed decades of life quantity for one heroic life quality moment.
- The tribal value question is put to rest by the fact that no government provides more than a tiny fraction of a percent of GDP for foreign aid. The SCAQMD biogas analysis reflects the values of the district . It points out that the CO_2 from flaring and the biogas engine are the same but that organic emissions could be higher with the engine option. Since the SCAMQD residents are the ones primarily impacted by the organic emissions there is a tribal consideration which is contrasted to the CO_2 which is global.

The more energy or less CO_2 debate resonates differently depending on wealth

Little girl in a tomato pile in the U.S. Her mother is more concerned about poison ivy than finding one more tomato

Little starving girl in Sudan for whom one more tomato will make a difference

The analysis further points out that the potential lost electricity with the flaring is not consequential because the electricity furnished in the district is efficient and green. By contrast the starving Sudanese child lives in a district without any electricity. The potential to convert flared gas into electricity has enormous benefits to the child and other residents of the district.