

ExxonMobil

2017 Outlook for Energy: A View to 2040 *Highlights*



2017 Outlook for Energy:

A View to 2040

Our energy to 2040: Seven things to know

Modern energy is one of mankind's most complex endeavors, and its path is shaped by countless forces.

However, we see seven key themes that will play a major role in defining our global energy landscape through 2040.



Energy underpins economic growth

High levels of growth mean rising living standards. Across the world, the middle class will more than double in the next 15 years. As this growth accelerates so does consumption. Demand for energy increases with more people expecting access to air-conditioned homes, cars and appliances like refrigerators, dishwashers and smartphones.



Non-OECD countries lead the way for energy demand

Continuing urbanization in China and India, with people moving from rural areas to cities, will help to drive economic growth. China is likely to be the largest contributor of Gross Domestic Product (GDP) gains. India is also growing strongly with its share of global GDP doubling.



The global energy mix is evolving

As global economies grow and government policies change, the energy mix will continue to diversify. Nuclear and renewables will grow strongly with natural gas growing the most. The diversification of energy supplies reflects economics and advanced technologies as well as policies aimed at reducing emissions.

The *Outlook for Energy* is ExxonMobil's global view of energy demand and supply through 2040. We use the data and findings in the book to help guide our long-term investments. It also highlights the dual challenge of ensuring the world has access to affordable and reliable energy supplies while reducing emissions to address the risk of climate change. We share the *Outlook* with the public to help promote a better understanding of the issues shaping the world's energy needs.

Why is this important? Because energy is fundamental to modern life. It is critical to human progress and to improving living standards for billions of people across the globe.



Oil remains the world's primary energy source

Oil will continue to play a leading role in the energy mix with demand being driven by fuel for transportation and feedstock for the chemicals industry. These feedstocks help to make plastics and other advanced materials that provide advantages to manufacturers and consumers including energy efficiency gains.



Natural gas leads growth in energy

Natural gas is the largest growing fuel source, providing a quarter of global energy demand by 2040. The abundance and versatility of natural gas is helping the world shift to less carbon-intensive energy for electricity generation while also providing an emerging option as a fuel for certain types of transportation.



Cost-effective options to reduce CO₂ emissions

Delivering on the increased demand for energy needs to go hand in hand with finding constructive solutions that mitigate the risk of climate change. This is supported by the continuing shift to less carbon-intensive energy for power generation and increased energy efficiency in every sector. Global energy-related CO₂ emissions are likely to peak during the 2030s, even as global GDP doubles by 2040.



The potential of technology

As the pace of technology development continues to accelerate, new – and still uncertain – solutions are likely to emerge to contribute to meeting energy and environmental goals. Recent advances in technology are promoting energy efficiency gains to slow demand growth, and also opening up new energy supply options including unconventional oil and natural gas, nuclear and renewables.

Fundamentals

What will the world's energy picture look like in the future?



To find the answer, start by studying the world's long-term demographic and economic trends. By 2040, world population is expected to reach 9.1 billion, up from 7.3 billion today.

Over that same period, global GDP will effectively double, with non-member countries of the Organisation of Economic Co-operation and Development (OECD) seeing particularly high levels of economic growth. This means rising living standards in essentially every corner of the world, and billions of people joining the global middle class.

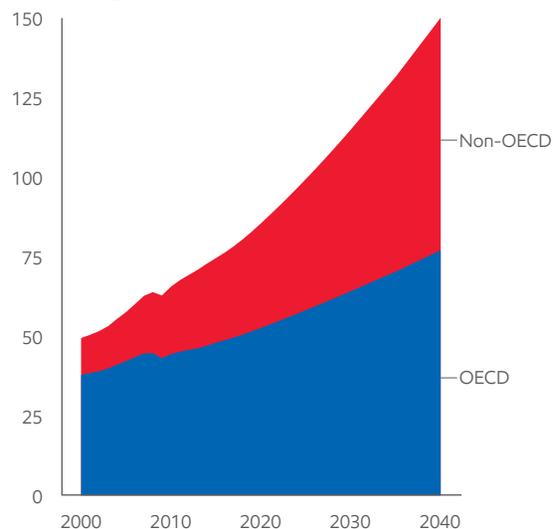
This economic expansion, coupled with growing numbers of people, will help drive up global energy demand by about 25 percent by the year 2040, similar to adding another North America and Latin America to the world's current energy demand.

The world will need to pursue all economic energy sources to keep up with this considerable demand growth. Oil and natural gas will likely be nearly 60 percent of global supplies in 2040, while nuclear energy and renewables will grow about 50 percent and be approaching a 25 percent share of the world's energy mix.

Global fundamentals – projections

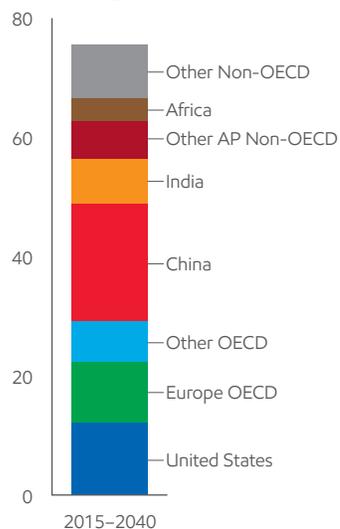
World GDP doubles

Trillions of 2010 dollars



World GDP growth

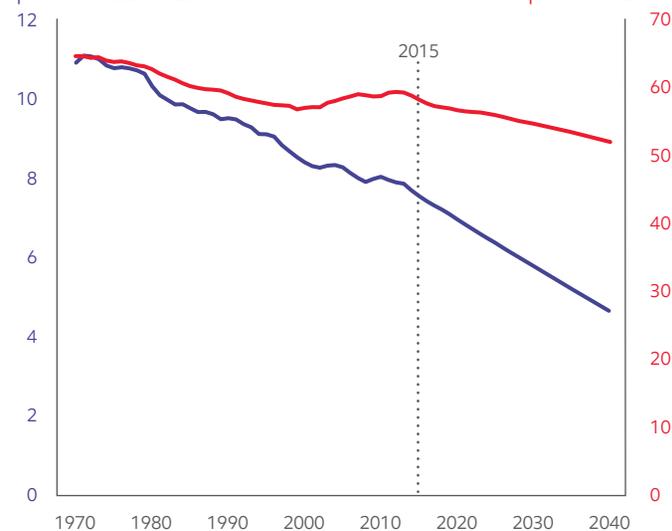
Trillions of 2010 dollars



Technology helps us do more with less

Energy: Thousand BTUs per dollar GDP in 2010 dollars

CO₂: Tonnes CO₂ per billion BTUs



- World GDP doubles from 2015 to 2040, with non-OECD GDP increasing 175 percent and OECD GDP growing 60 percent
- Non-OECD share of global GDP will rise to about 50 percent by 2040, up from about 35 percent in 2015
- China is likely to be the largest contributor of GDP gains, with its share of global GDP in 2040 similar to that of Europe OECD and the U.S. at close to 20 percent
- India will grow strongly with its share of global GDP doubling

- Technology helps the world use energy more efficiently by reducing energy intensity (the amount of energy used per unit of economic output)
- Since 1970, global energy intensity has fallen about 1 percent per year on average; this decline is likely to average about 2 percent per year from 2015 to 2040
- Technology also helps moderate the carbon intensity of energy use, which will help lower the carbon intensity of the world economy (tonnes CO₂ per unit of GDP) by 45 percent by 2040

Demand

Global demand for energy is expected to climb about 25 percent by 2040, and would soar significantly higher – closer to a 100 percent increase – but for anticipated efficiency gains across the economy.



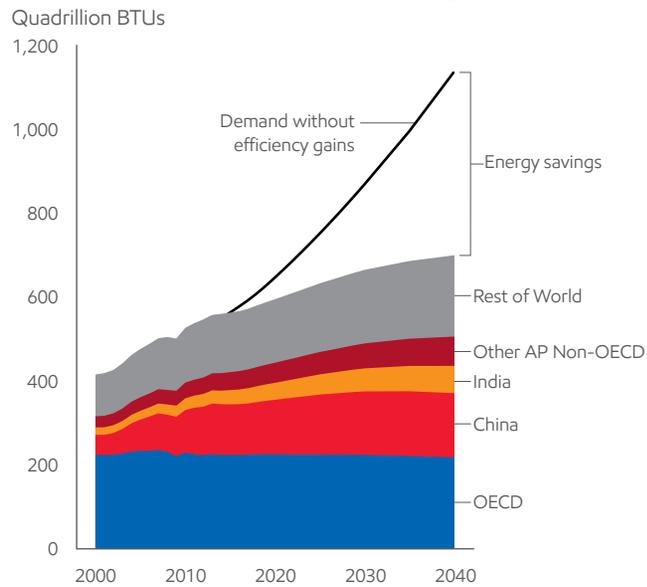
Essentially all of this demand growth will come from non-OECD nations, particularly the expanding economies in the Asia Pacific region.

Continuing urbanization and a significant expansion of the middle class, particularly in China and India, will help drive this trend, highlighted by greater access to modern energy in homes, rising industrial demand, and significant increases in personal and commercial transportation needs.

Growth in global energy demand will be led by the increasing electrification of the global economy; 55 percent of the world's energy demand growth over the next quarter century will be tied to power generation to support our increasingly digital and plugged-in lives. A consequence of this trend will be a large uptick in demand for many types of energy used to generate electricity, notably less carbon-intensive sources such as natural gas, nuclear, solar and wind.

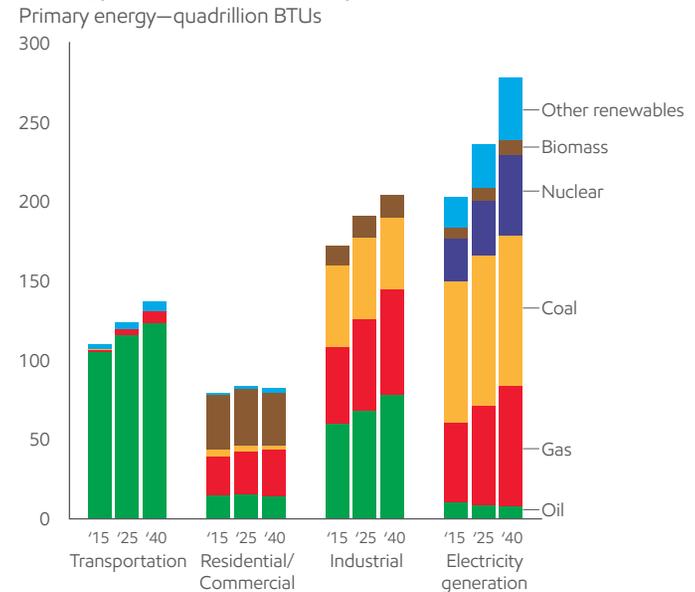
Demand – projections

Global efficiency limits demand growth



- Without efficiency improvements, global energy demand would increase significantly
- Actual demand is expected to increase about 25 percent from 2015 to 2040, reflecting large savings due to efficiency improvements
- Demand growth will come from non-OECD nations, where energy use will rise about 40 percent, led by Asia Pacific
- Demand in Africa, Latin America and the Middle East will also grow strongly

Energy demand varies by sector

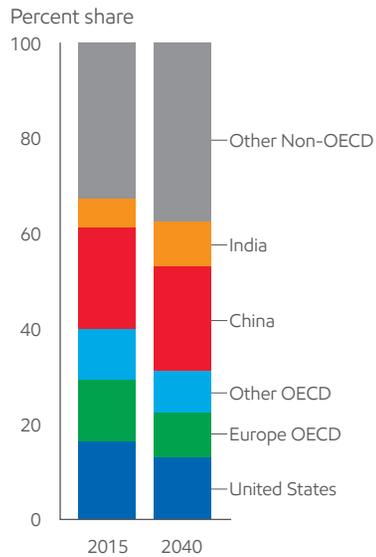


- Energy used in each sector reflects economic supply options and their general fitness for purpose
- Electricity generation is the largest and fastest growing demand sector, reflecting strong growth in global electricity demand
- A wide variety of energy types will support electricity generation, with natural gas, nuclear and renewables increasing their share
- Natural gas demand increases significantly and gains share in all sectors
- Oil demand grows to support commercial transportation and chemical needs

02 Demand

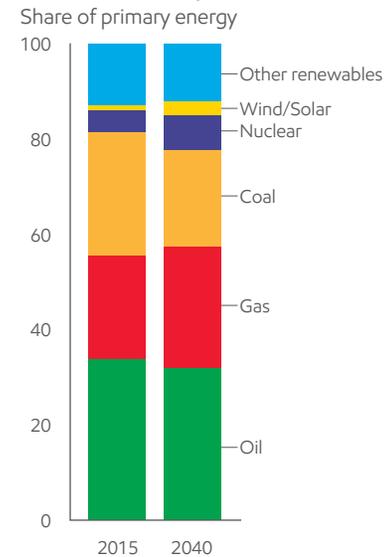
Demand – projections

Global energy demand shifts toward non-OECD



- Global demand reaches 700 quadrillion BTUs in 2040, up about 25 percent
- Non-OECD share of global energy demand reaches about 70 percent in 2040, as efficiency gains and modest economic growth help keep OECD energy demand relatively flat
- China and India contribute about 45 percent of world energy demand growth to 2040
- The combined share of energy used in the U.S. and Europe OECD nations will decline from 30 percent in 2015 to close to 20 percent in 2040, similar to China's share of world energy demand

Global energy mix evolves

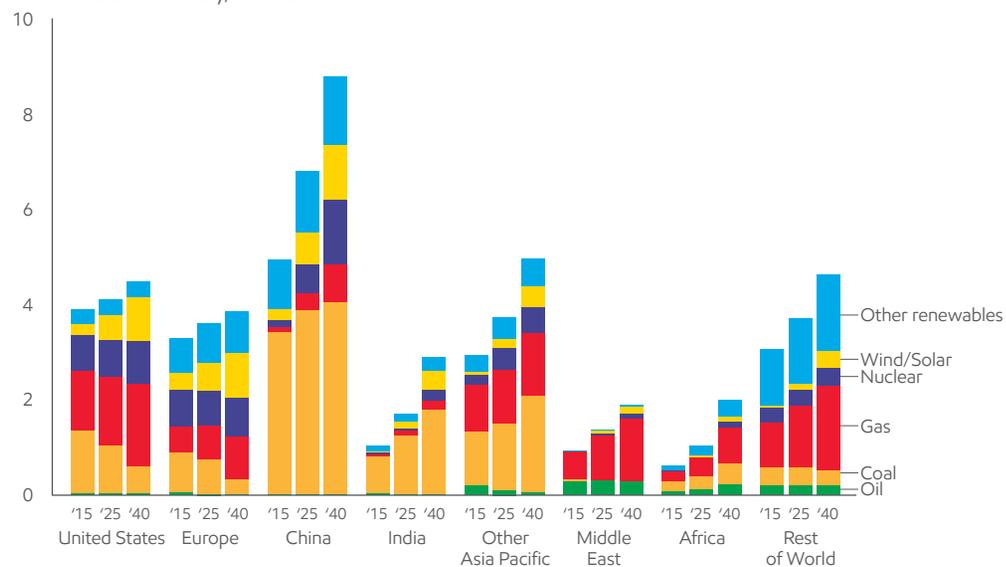


- Oil remains the world's primary energy source through 2040, meeting about one-third of demand
- Natural gas grows the most of any energy type, reaching a quarter of all demand
- Coal remains important in parts of the world, but loses significant share as the world transitions toward energy sources with lower emissions
- Nuclear and renewables see strong growth, contributing close to 40 percent of incremental energy supplies to meet demand growth

Electricity and power generation – projections

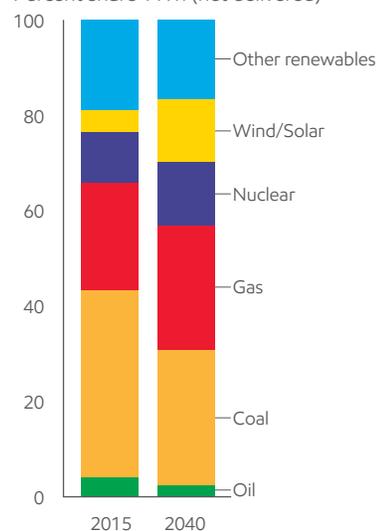
Electricity generation by region highlights diversity

Net delivered electricity, thousand TWh



Electricity supply mix shifts

Percent share TWh (net delivered)



- 60 percent of the rise in electricity demand will come from Asia Pacific
- Mix of electricity generation sources will vary significantly by region
- The U.S. and Europe lead shift from coal, with significant gains in gas, wind and solar
- China's coal share of power generation falls; looks to nuclear, renewables and gas to meet electricity growth
- Middle East, Africa and Rest of World draw on gas when domestically available
- Coal-fired electricity use grows in Asia Pacific; India's use of coal for electricity more than doubles from 2015-2040

- World shifts to less carbon-intensive energy for electricity generation, led by gas, renewables (wind, solar) and nuclear
- Electricity supplies from coal plateau around 2035 as natural gas, nuclear, wind and solar continue to grow
- Coal provides less than 30 percent of world's electricity in 2040 versus about 40 percent in 2015
- Wind and solar electricity supplies grow about 360 percent, approaching 15 percent of global electricity by 2040
- Renewables growth supported by policies to reduce CO₂ emissions

Emissions

The challenge of providing the energy supplies that power the global economy is coupled with the need to do so in ways that reduce energy-related greenhouse gas emissions and mitigate the risk of climate change.



The next quarter century will witness a number of developments driven by technology advances and policy decisions that will substantially influence the world's greenhouse gas emissions profile.

As policymakers develop mechanisms to meet the goals set forth in the 2015 Paris climate agreement, the research and development efforts of the world's scientists, engineers and entrepreneurs will propel energy's evolution. Advances will promote not only new energy supply options and greater energy efficiency, but also emerging opportunities for technologies like carbon capture and storage (CCS).

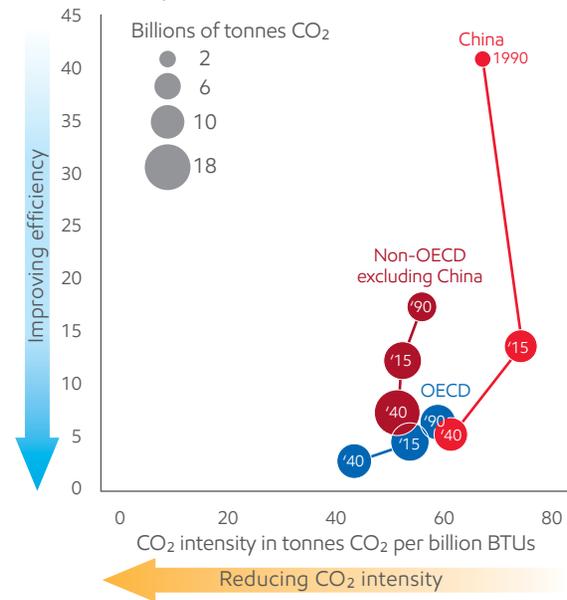
Between 2015 and 2040, innovation in the transportation sector will deliver significant increases in fuel economy for cars and commercial vehicles. We will also see a shift in the types of energy used for electricity generation, led by natural gas and renewables. Coal's share of global power generation has been falling recently and will continue to drop, with gains being made by less carbon-intensive energy sources such as natural gas, nuclear, wind and solar.

The initial result will be a continued slowdown in the growth of global carbon dioxide emissions. Global energy-related CO₂ emissions are likely to peak during the 2030s and begin to decline – all the more remarkable considering the fact that global GDP is expected to double in the period from 2015 to 2040.

Emissions – projections

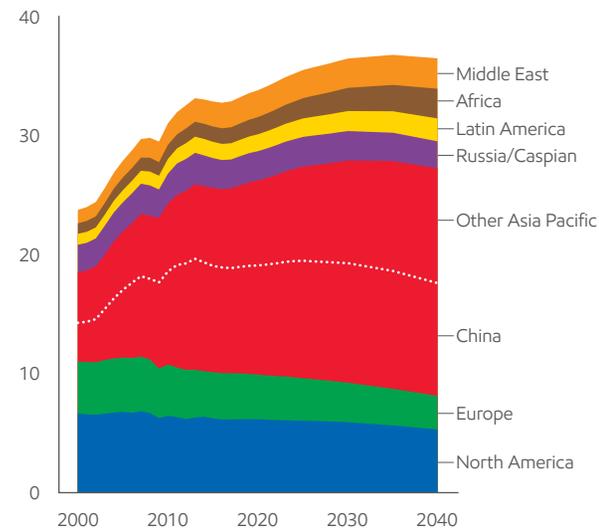
Restraining energy-related CO₂ emissions

Thousand BTUs per dollar of GDP, in 2010 dollars



Energy-related CO₂ emissions peak

Billion tonnes



- Improving efficiency and decreasing the CO₂ intensity of energy use help stem emissions as populations and GDP grow
- China's GDP rose about 1,000 percent from 1990-2015 but energy efficiency gains kept a rise in CO₂ emissions to about 300 percent; efficiency gains and lower CO₂ intensity will help emissions peak around 2030
- OECD nations improved efficiency and CO₂ intensity from 1990 to 2015, keeping emissions relatively flat; accelerating gains will help reduce emissions 20 percent by 2040
- CO₂ emissions in other non-OECD nations rose about 50 percent from 1990 to 2015, and are likely to increase 50 percent by 2040 despite a 40 percent gain in efficiency across these emerging economies

- Global CO₂ emissions rose close to 40 percent from 2000 to 2015, despite a modest decline in OECD nations
- From 2015 to 2040, global CO₂ emissions are likely to peak and gradually decline, ending about 10 percent above the level in 2015
- Emissions are declining in the OECD; will drop about 20 percent from 2015-2040
- China contributed about 60 percent of the growth in emissions from 2000-2015; its emissions peak about 2030, higher than North America and Europe combined
- Emissions outside North America, Europe and China rise about 35 percent from 2015-2040, with the share of global emissions reaching 50 percent by 2040

Supply

What resources will be available to meet the world's increasing demand for more energy?



Recent technology advancements have provided an abundance of supply and unprecedented range of energy choices – from the oil and natural gas in America's shale regions to the deepwater fields off the African coast; from new nuclear reactors in China to wind turbines and solar arrays in nations around the world.

The global energy supply mix will shift over the next two-and-a-half decades. Society's push for lower-emission energy sources will drive substantial increases for nuclear power as well as renewables such as wind and solar. By 2040 nuclear and all renewables will be approaching 25 percent of global energy supplies.

Oil will remain an essential energy source for transportation and chemicals production. Natural gas, increasingly used for power generation as utilities look to switch to lower-emissions fuels, will expand its share of the energy mix. Gas will overtake coal as the world's second-largest fuel in about a decade.

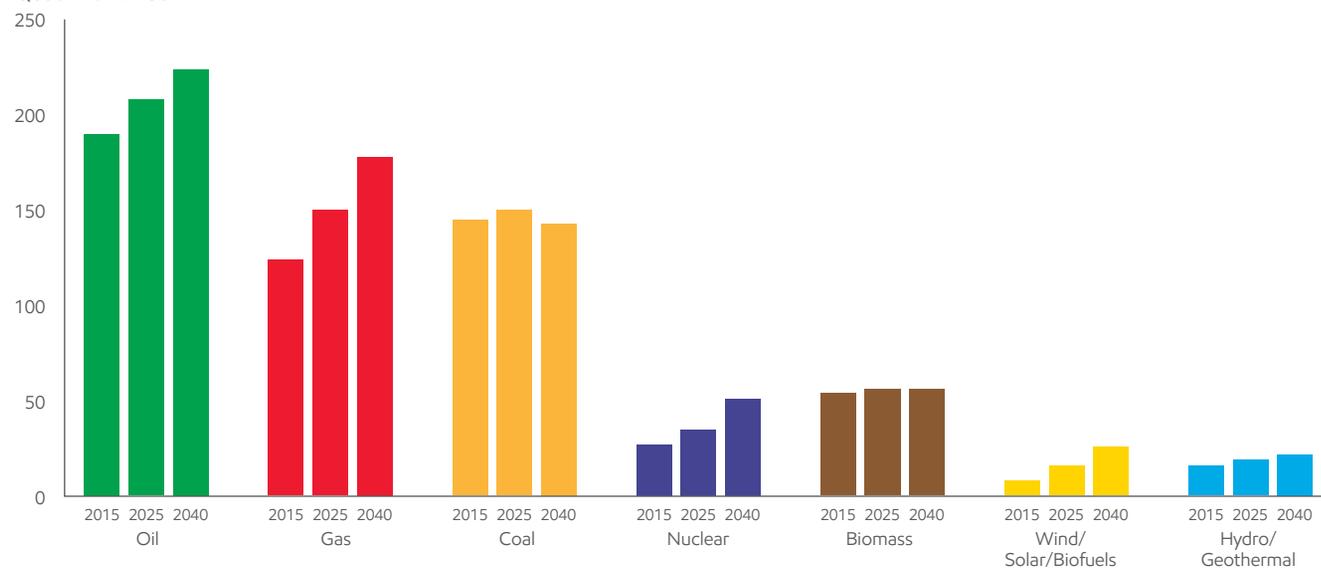
The world has been undergoing an energy supply revolution in recent years, with significant oil and natural gas production increases from American shale fields rewriting the narrative of scarcity and limits that has prevailed since the 1970s. North America, which has been an oil importer for decades, is on pace to become a net exporter of oil in just a few years.

These advances have stimulated a new "age of abundance" in energy supplies, which is good news for billions of people seeking to advance their standards of living.

Supply – projections

Energy supply evolves to meet diverse demand

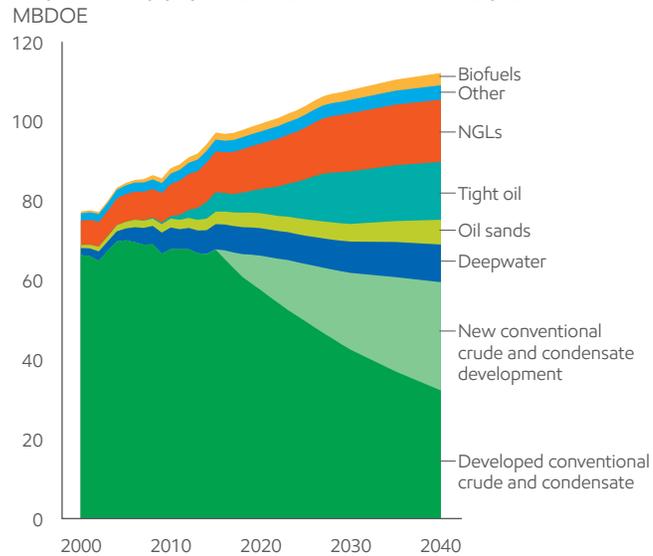
Quadrillion BTUs



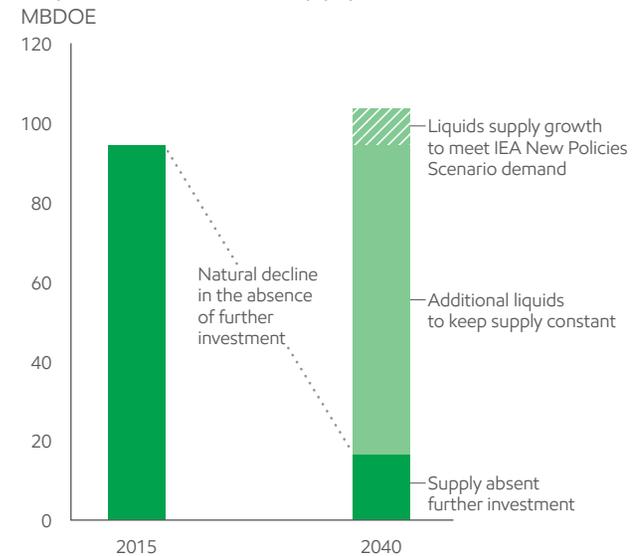
- Oil remains the primary fuel, essential in transportation and chemicals
- Gas demand rises the most, largely to help meet increasing needs for electricity and to support rising industrial demand
- Oil and gas continue to supply about 55 percent of the world's energy needs through 2040
- Coal's share falls as the OECD and China turn to lower emission fuels
- Nuclear demand almost doubles 2015-2040 led by China
- Wind, solar and biofuels average combined growth of about 5 percent per year, reaching about 4 percent of global energy demand

Liquids – projections

Liquids supply highlights technology gains



Liquids demand & supply warrant investment



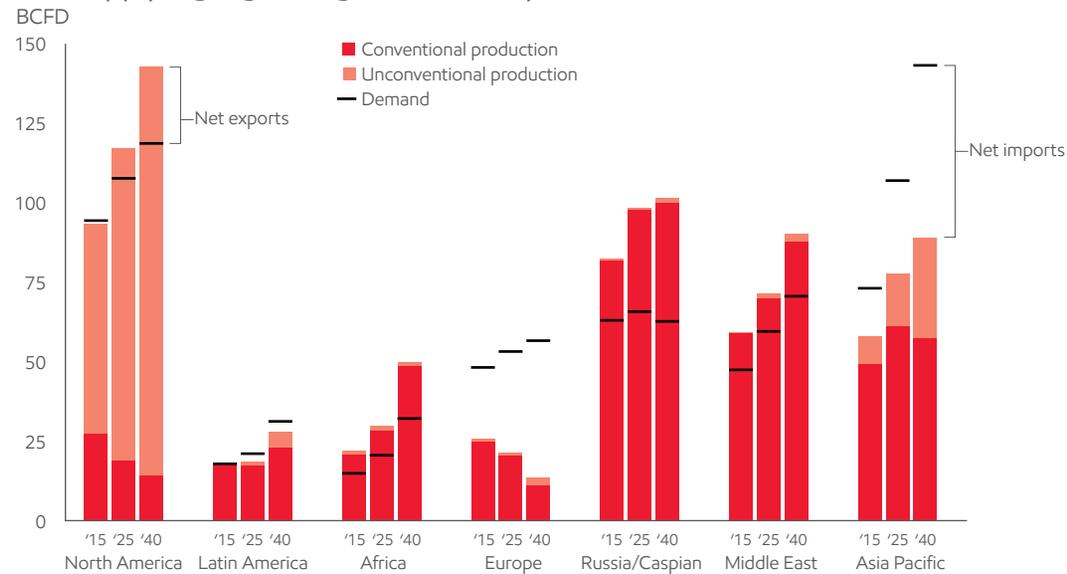
Source: IEA, excludes biofuels

- Global liquids production rises to meet demand growth
- Technology-enabled NGLs, tight oil, deepwater and oil sands see strong gains
- Tight oil plus NGLs exceed 25 percent of global liquids supply in 2040
- Continued investment in conventional oil is needed to mitigate decline in existing fields and meet demand for liquid fuels

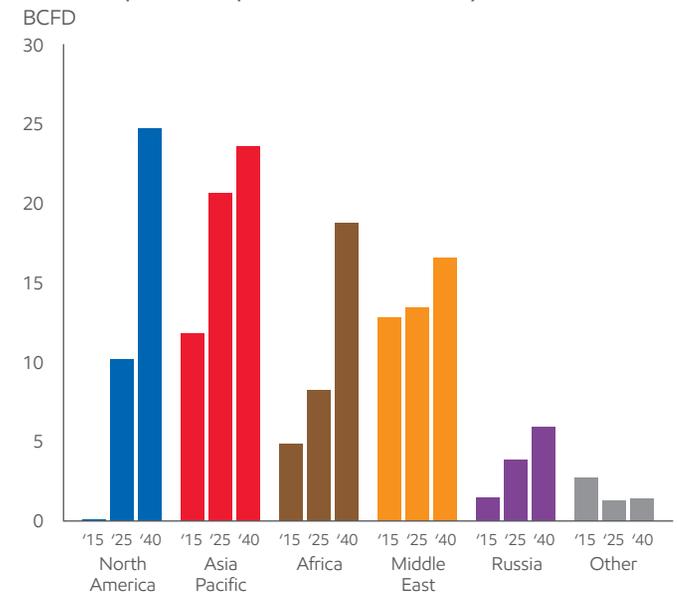
- Upward of \$450 billion a year of upstream oil investment is needed to meet demand
- Without further investment, liquids supply would decline steeply
- Over 80 percent of new liquids supply needed to offset natural decline

Natural gas – projections

Gas supply highlights regional diversity



LNG exports expand and diversify



- Gas trade balances shift as supply and demand evolve
- North America becomes a natural gas exporter as unconventional production grows
- Russia/Caspian expands lead as top gas exporter
- Asia Pacific gas production and imports grow to meet rapidly rising demand
- Asia Pacific becomes the largest importer as gas demand doubles by 2040
- By 2040, unconventional gas will account for about one-third of gas production

- LNG export supplies diversify as demand grows
- Significant new exports expected from the United States, Canada, Australia and East Africa
- North America becomes the largest LNG exporter from growth in unconventional gas production
- LNG will remain highly competitive due to abundant gas resources and many aspiring exporters
- Low-cost LNG supply sources will be advantaged in the marketplace

Energy matters

With more people using energy to improve their lives, we estimate that global energy demand will be about 25 percent higher in 2040 than it was in 2015.



Meeting energy demand safely, reliably and affordably – while also minimizing risks and environmental impacts – will require advanced technology and expanded trade and investment. It will require innovation. And it also will require smart, practical energy choices by governments, individuals and businesses.

Understanding the factors that drive the world's energy needs – and likely choices to meet those needs – is the mission of the *Outlook*. By sharing the *Outlook* with the public, we hope to broaden that understanding among individuals, businesses and governments. Energy matters to everyone, and we all play a role in shaping its future.

Data

Energy demand (quadrillion BTUs, unless otherwise noted)														
Regions	2000	2010	2015	2025	2040	Average annual change			% change			Share of total		
						2015 2025	2025 2040	2015 2040	2015 2025	2025 2040	2015 2040	2015	2025	2040
World	416	527	564	634	700	1.2%	0.7%	0.9%	12%	11%	24%	100%	100%	100%
OECD	225	230	224	225	219	0.0%	-0.2%	-0.1%	0%	-3%	-3%	40%	36%	31%
Non-OECD	191	298	339	408	482	1.9%	1.1%	1.4%	20%	18%	42%	60%	64%	69%
Africa	22	30	34	43	60	2.4%	2.3%	2.3%	27%	40%	78%	6%	7%	9%
Asia Pacific	126	205	234	281	322	1.8%	0.9%	1.3%	20%	15%	38%	42%	44%	46%
China	47	102	120	143	153	1.7%	0.5%	1.0%	19%	7%	27%	21%	23%	22%
India	18	28	34	48	65	3.5%	2.0%	2.6%	41%	35%	91%	6%	8%	9%
Europe	79	81	76	74	70	-0.2%	-0.5%	-0.4%	-2%	-7%	-9%	14%	12%	10%
European Union	72	73	68	65	60	-0.4%	-0.6%	-0.5%	-4%	-9%	-12%	12%	10%	9%
Latin America	20	27	29	33	41	1.3%	1.5%	1.4%	14%	25%	42%	5%	5%	6%
Middle East	18	30	35	42	49	1.9%	1.1%	1.4%	21%	17%	41%	6%	7%	7%
North America	114	113	113	116	115	0.3%	0.0%	0.1%	3%	-1%	2%	20%	18%	16%
United States	96	93	93	94	91	0.1%	-0.2%	-0.1%	1%	-3%	-2%	16%	15%	13%
Russia/Caspian	38	43	43	45	43	0.4%	-0.2%	0.0%	4%	-4%	0%	8%	7%	6%
Energy by type - World														
Primary	416	527	564	634	700	1.2%	0.7%	0.9%	12%	11%	24%	100%	100%	100%
Oil	157	178	190	208	224	0.9%	0.5%	0.7%	9%	8%	18%	34%	33%	32%
Gas	89	116	124	150	178	1.9%	1.1%	1.5%	21%	19%	44%	22%	24%	25%
Coal	91	138	145	150	143	0.3%	-0.3%	-0.1%	3%	-5%	-2%	26%	24%	20%
Nuclear	27	29	27	35	51	2.7%	2.6%	2.6%	31%	47%	92%	5%	5%	7%
Biomass/waste	40	49	54	56	56	0.5%	0.0%	0.2%	5%	0%	5%	10%	9%	8%
Hydro	9	12	13	16	18	1.7%	0.8%	1.2%	18%	14%	34%	2%	2%	3%
Other renewables	3	7	11	19	31	5.5%	3.3%	4.2%	71%	63%	179%	2%	3%	4%
End-use sectors - World														
Residential and commercial														
Total	99	116	120	134	147	1.1%	0.6%	0.8%	12%	10%	23%	100%	100%	100%
Oil	16	15	15	15	14	0.2%	-0.4%	-0.2%	2%	-6%	-4%	12%	11%	10%
Gas	21	24	24	27	29	1.1%	0.5%	0.8%	12%	8%	21%	20%	20%	20%
Biomass/waste	29	33	35	35	33	0.2%	-0.5%	-0.2%	2%	-7%	-5%	29%	26%	22%
Electricity	23	32	35	45	60	2.5%	2.0%	2.2%	28%	34%	72%	29%	33%	41%
Other	10	11	11	12	11	0.4%	-0.5%	-0.1%	4%	-7%	-3%	9%	9%	7%
Transportation														
Total	81	101	111	125	139	1.2%	0.7%	0.9%	13%	11%	25%	100%	100%	100%
Oil	80	96	105	116	123	1.0%	0.4%	0.7%	10%	7%	18%	94%	93%	89%
Biofuels	0	3	3	5	6	2.6%	2.3%	2.4%	30%	40%	82%	3%	4%	5%
Gas	0	1	2	3	7	7.9%	5.1%	6.2%	114%	111%	353%	1%	3%	5%
Other	1	1	1	1	2	2.4%	3.4%	3.0%	27%	65%	109%	1%	1%	2%
Industrial														
Total	148	198	214	240	262	1.2%	0.6%	0.8%	12%	9%	23%	100%	100%	100%
Oil	49	56	60	68	78	1.3%	0.9%	1.1%	14%	15%	31%	28%	28%	30%
Gas	37	45	48	57	66	1.8%	0.9%	1.3%	20%	15%	37%	22%	24%	25%
Coal	27	49	52	52	45	0.0%	-0.9%	-0.5%	0%	-12%	-12%	24%	21%	17%
Electricity	22	30	35	43	52	2.0%	1.3%	1.6%	22%	22%	49%	16%	18%	20%
Other	14	17	19	20	20	0.4%	0.2%	0.3%	4%	3%	6%	9%	8%	8%
Power generation - World														
Primary	144	188	203	236	278	1.5%	1.1%	1.3%	17%	18%	37%	100%	100%	100%
Oil	12	10	10	9	8	-1.7%	-0.8%	-1.1%	-16%	-11%	-25%	5%	4%	3%
Gas	31	46	50	62	76	2.2%	1.3%	1.7%	25%	22%	51%	25%	26%	27%
Coal	61	84	89	94	95	0.6%	0.0%	0.2%	6%	0%	6%	44%	40%	34%
Nuclear	27	29	27	35	51	2.7%	2.6%	2.6%	31%	47%	92%	13%	15%	18%
Hydro	9	12	13	16	18	1.7%	0.8%	1.2%	18%	14%	34%	7%	7%	6%
Wind	0	1	3	6	11	8.6%	4.0%	5.8%	128%	80%	309%	1%	3%	4%
Other renewables	4	7	10	14	19	2.9%	2.2%	2.5%	33%	38%	84%	5%	6%	7%
Electricity demand (terawatt hours)														
World	13216	18574	20787	26090	33551	2.3%	1.7%	1.9%	26%	29%	61%	100%	100%	100%
OECD	8601	9680	9614	10443	11432	0.8%	0.6%	0.7%	9%	9%	19%	46%	40%	34%
Non-OECD	4615	8894	11174	15647	22119	3.4%	2.3%	2.8%	40%	41%	98%	54%	60%	66%

General note on data tables: Rounding may lead to minor differences between totals and the sum of their individual parts.

Glossary

Billion cubic feet per day (BCFD): This is used to define volumetric rates of natural gas. One billion cubic feet per day of natural gas is enough to meet about 2 percent of the natural gas used in homes around the world. Six billion cubic feet per day of natural gas is equivalent to about 1 million oil-equivalent barrels per day.

British thermal unit (BTU): A BTU is a standard unit of energy that can be used to measure any type of energy source. The energy content of one gallon of gasoline is about 125,000 BTUs. “Quad” refers to a quadrillion (10^{15}) BTUs.

Conventional vehicle: A type of light-duty vehicle with an internal combustion engine, typically either a gasoline-fueled spark ignition engine or a diesel-fueled compression ignition engine. Conventional includes vehicles with advanced technologies such as turbocharging and “mild hybrid” features such as a stop start engine.

Hybrid vehicle: A “full” hybrid is a type of light-duty vehicle that has a battery (usually a nickel metal hydride) and an electric motor, as well as a conventional internal combustion engine. When brakes are applied, the energy of the moving vehicle is stored in the battery and can be used later, thus saving fuel.

Hydrogen fuel cell vehicle: A type of light-duty vehicle where hydrogen is the fuel and is stored onboard. This hydrogen is passed through a fuel cell that then provides electricity to power the vehicle.

Light-duty vehicle (LDV): A classification of road vehicles that includes cars, light-trucks and sport utility vehicles (SUVs). Motorcycles are not counted in the light-duty vehicle fleet size or fuel-economy, but the fuel used in motorcycles is included in light-duty transportation demand.

Liquefied natural gas (LNG): Natural gas (predominantly methane) that has been super-chilled for conversion to liquid form for ease of transport.

Liquefied petroleum gas (LPG): A classification of hydrocarbon fuel including propane, butane and other similar hydrocarbons with low molecular weight.

Million oil-equivalent barrels per day (MBOE): This term provides a standardized unit of measure for different types of energy sources (oil, gas, coal, etc.) based on energy content relative to a typical barrel of oil. One million oil-equivalent barrels per day is enough energy to fuel about 4 percent of the light-duty vehicles on the world’s roads today.

Natural gas liquids (NGL): Liquid fuels produced chiefly in association with natural gas. NGLs are components of natural gas that are separated from the gaseous state into liquid form during natural gas processing. Ethane, propane, butane, isobutane and pentane are all NGLs.

Organisation for Economic Co-operation and Development (OECD): A forum for about 35 member nations from across the world that work with each other, as well as with many more partner nations, to promote policies that will improve the economic and social well-being of people around the world. Note: OECD data in this report reflects OECD member countries as of June 2016.

Plug-in Hybrid Electric Vehicle (PHEV): A type of light-duty vehicle that typically uses an electric motor to drive the wheels. Unlike other electric vehicles, a PHEV also has a conventional internal combustion engine that can charge its battery using petroleum fuels if needed, and in some cases drive the wheels.

PPP: Purchasing power parity

Primary energy: Includes energy in the form of oil, natural gas, coal, nuclear, hydro, geothermal, wind, solar and bioenergy sources (biofuels, municipal solid waste, traditional biomass). It does not include electricity or market heat, which are secondary energy types reflecting conversion/production from primary energy sources.

Secondary energy: Energy types, including electricity and market heat, which are derived from primary energy sources. For example, electricity is a secondary energy type generated using natural gas, wind or other primary energy source.

TCF: Trillion cubic feet

Watt: A unit of electrical power, equal to one joule per second. A 1-gigawatt power plant can meet the electricity demand of more than 500,000 homes in the U.S. (Kilowatt (kW) = 1,000 watts; Gigawatt (GW) = 1,000,000,000 watts; Terawatt (TW) = 10^{12} watts).

Watt-hour: A unit of electrical energy. 300 terawatt hours is equivalent to about 1 quadrillion BTUs (Quad). (Kilowatt-hour (kWh) = 1,000 watt-hours; Gigawatt-hour (GWh) = 1,000,000,000 watt-hours; Terawatt-hour (TWh) = 10^{12} watt-hours).

Stay energy informed.

At ExxonMobil, we continually provide information and insight to help broaden your understanding of the issues shaping the world's energy needs. You can stay informed by following us online and through our social channels.

🖱️ Visit exxonmobil.com

📡 Subscribe to energyfactor.com

🖱️ Visit exxonmobilperspectives.com

🐦 Follow [@exxonmobil](https://twitter.com/exxonmobil)

🌐 Follow linkedin.com/company/exxonmobil

📘 Follow facebook.com/exxonmobil



Exxon Mobil Corporation

Corporate Headquarters
5959 Las Colinas Blvd.
Irving, Texas 75039-2298
exxonmobil.com

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 report 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. This material is not to be used or reproduced without the permission of Exxon Mobil Corporation. All rights reserved.