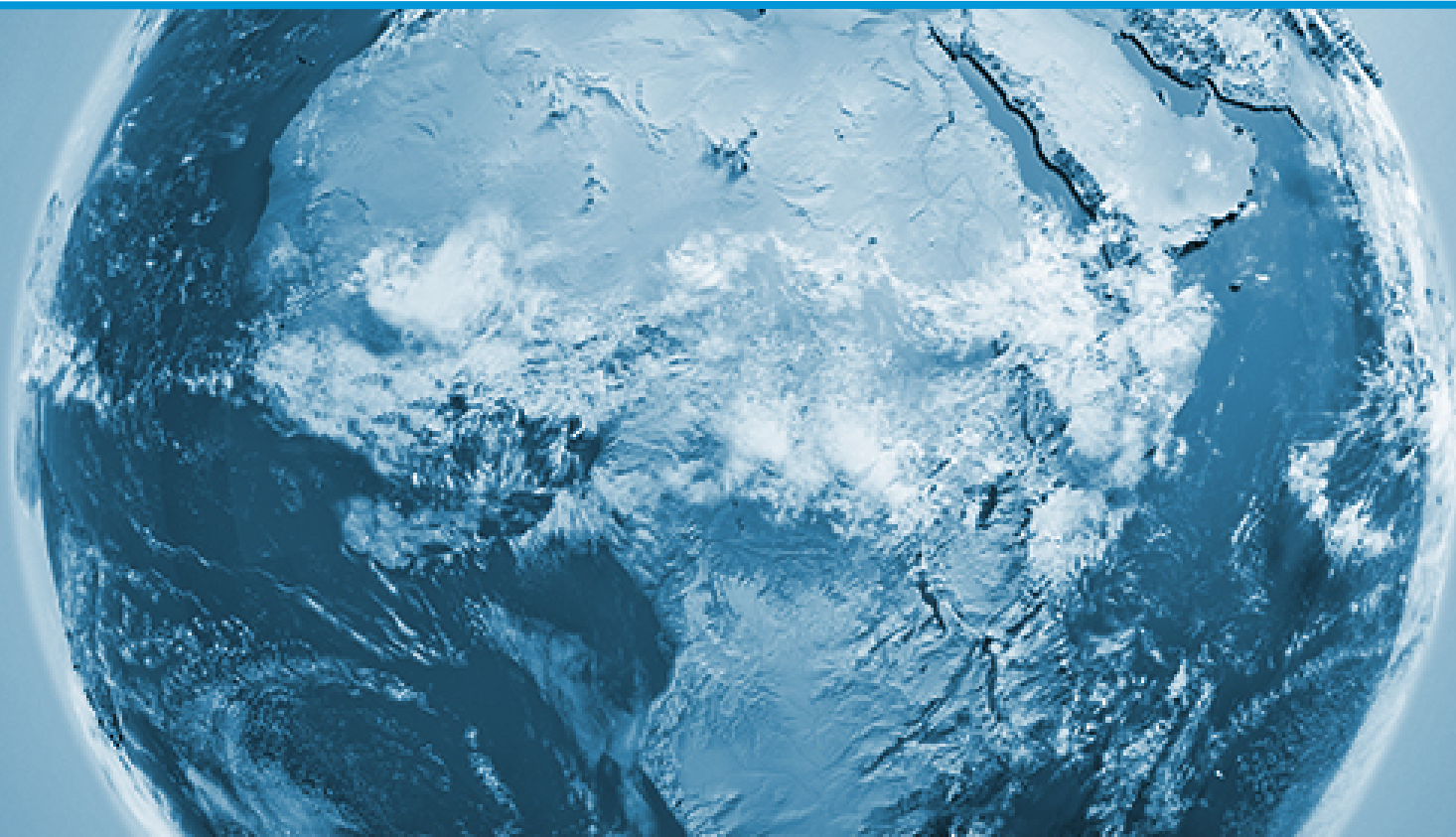


International Energy Outlook 2018

Energy implications of higher economic growth in Africa



Independent Statistics & Analysis
U.S. Energy Information
Administration

#IEO2018

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www.eia.gov/ieo



Key takeaways

- Higher economic growth in Africa leads to an expansion of the manufacturing sector and an increase in industrial energy use because of possible regional competitive advantages.
- Higher assumed economic growth over the projection period leads to African energy consumption per capita that is about 30% higher than in the IEO2018 Reference case in 2040.
- The IEO2018 Africa side case highlights the need to further explore the relationship between projected changes in GDP and the response of energy consumption, particularly in the industrial end-use sector.



Overview

- EIA's *International Energy Outlook 2018* (IEO2018) is a supplement to the IEO2017. The IEO2018 Reference case updates the IEO2017 Reference case with macroeconomic information, but there are no modeling changes to other end-use sectors.
- IEO2018 focuses on macroeconomic uncertainty by conducting sensitivity analyses in three IEO regions: China, India, and Africa. These are projected to be three of the fastest growing and most populous regions in the IEO2018 Reference case, and there is significant uncertainty regarding their future economic growth.
- The economic structure of these three regions also varied substantially in 2015: China was a manufacturing-based economy; Africa had relatively little manufacturing compared to services, and India had a relatively more balanced mix of manufacturing and services.
- EIA performed high economic growth sensitivity cases in each of these regions in IEO2018 by raising average annual growth in GDP between 2015 and 2040. The composition of economic growth was also varied in the cases for India and China.
- The graphics and results in this document focus on projections through 2040 for the Africa case. U.S. projections appearing in IEO2018 are consistent with those released in the *Annual Energy Outlook 2017*.



The *International Energy Outlook 2018* provides long-term energy projections for the major world regions

- Projections in *the International Energy Outlook 2018* (IEO2018) are not predictions of what will happen, but rather modeled projections of what may happen given certain assumptions under different cases.
- The IEO is developed using the World Energy Projection System Plus (WEPS+), an integrated model that captures various interactions of economic changes and energy supply, demand, and prices across regional markets.
- Energy market projections are subject to much uncertainty because the events that shape future developments in technology, demographic changes, economic trends, and resource availability that drive energy use cannot be projected with certainty.
- The IEO projections are published under the Department of Energy Organization Act of 1977, which requires the U.S. Energy Information Administration (EIA) to prepare reports on trends and projections for energy use and supply.

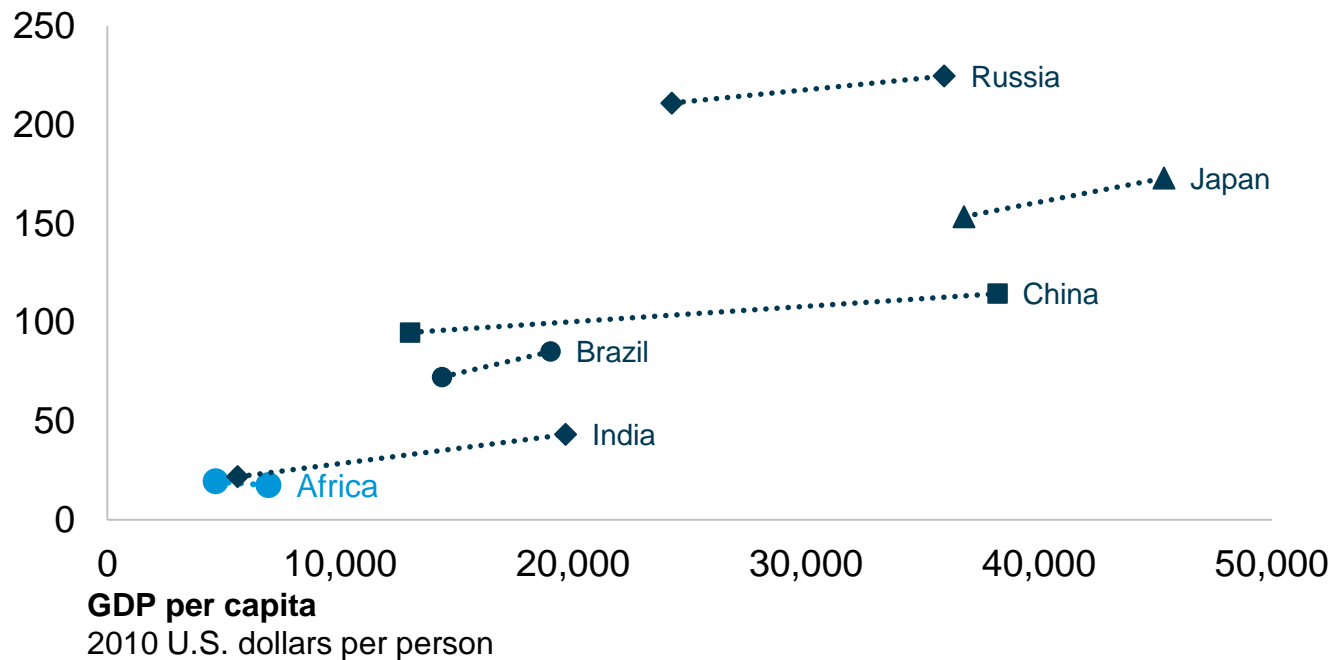


Africa's energy consumption per capita lags behind other regions in the IEO2018 Reference case—

energy consumption per capita

million Btu per person

2015-----2040 IEO2018 Reference case projection





—as population growth outpaces energy use

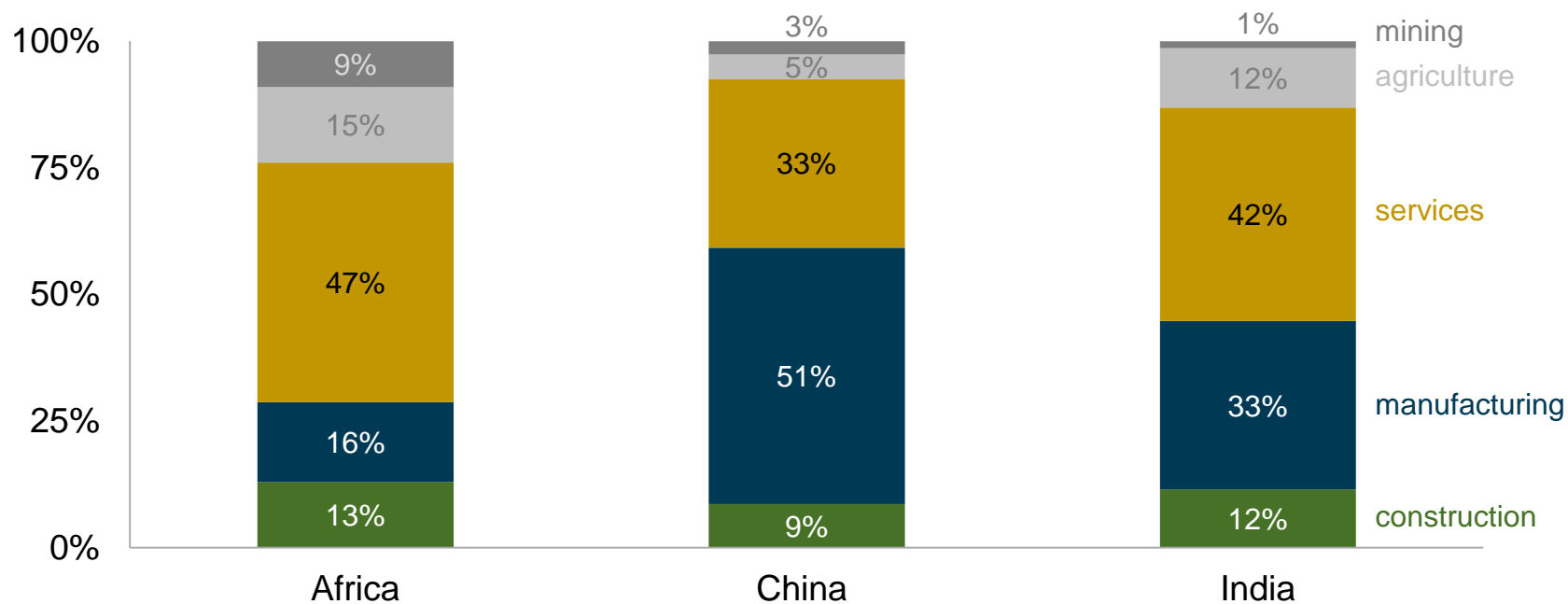
- The growing gap in GDP per capita between Africa and other regions highlights the potential for faster African economic growth.
- Further infrastructure development, particularly transportation network development and electrification, could alter this projection.



In 2015, Africa's manufacturing sector was relatively small, and its services sector was relatively large—

sector share of total gross output in 2015

percent





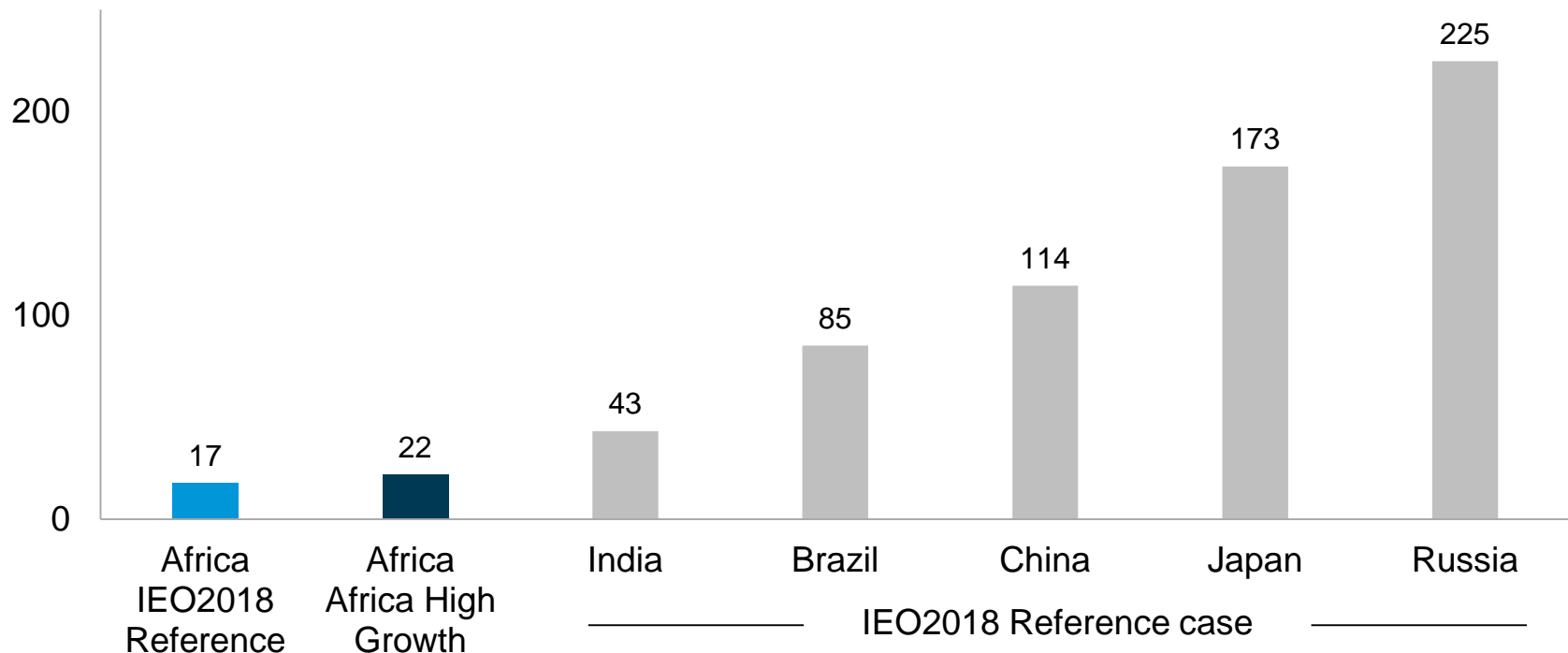
—which contributed to Africa's comparatively low energy use

- Africa's manufacturing sector share of total output was one-half the share in India and only one-third of China's share in 2015.
- Africa's construction, services, and agriculture output shares were similar to those shares in rapidly growing India in 2015.
- Africa's mining output share was larger than that of both China and India in 2015 because of abundant natural resources and the underdeveloped state of many African economies.



In the IEO2018 Africa High Growth case, energy use per capita in 2040 rises 30% compared with the IEO2018 Reference case—

energy consumption per capita in 2040
million Btu per person





—yet remains lower than in other major economies

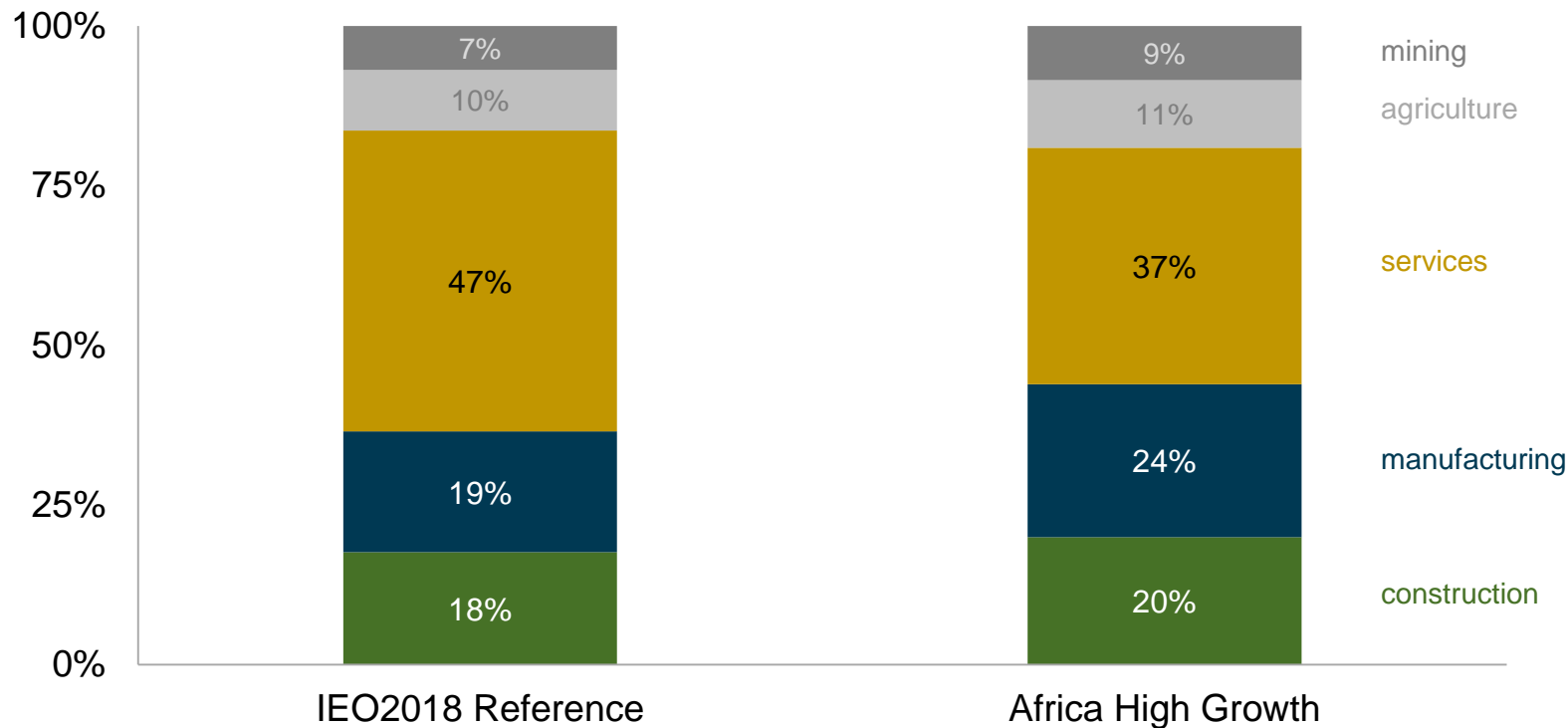
- EIA simulated an economic growth case where Africa's economy grows 5.0% per year on average through 2040 instead of the IEO2018 Reference case average of 3.8%.
- In the **Africa High Growth case**, higher GDP growth is primarily driven by higher private investment and personal consumption.
- Higher economic growth in Africa increases projected energy consumption per capita by 2040; however, it decreases in the IEO2018 Reference case.
- Even with additional growth in energy use, African energy consumption never reaches the level of other major economies in 2040.



High economic growth in Africa leads to an increased role for the manufacturing sector compared with the IEO2018 Reference case—

sector share of total gross output in 2040

percent





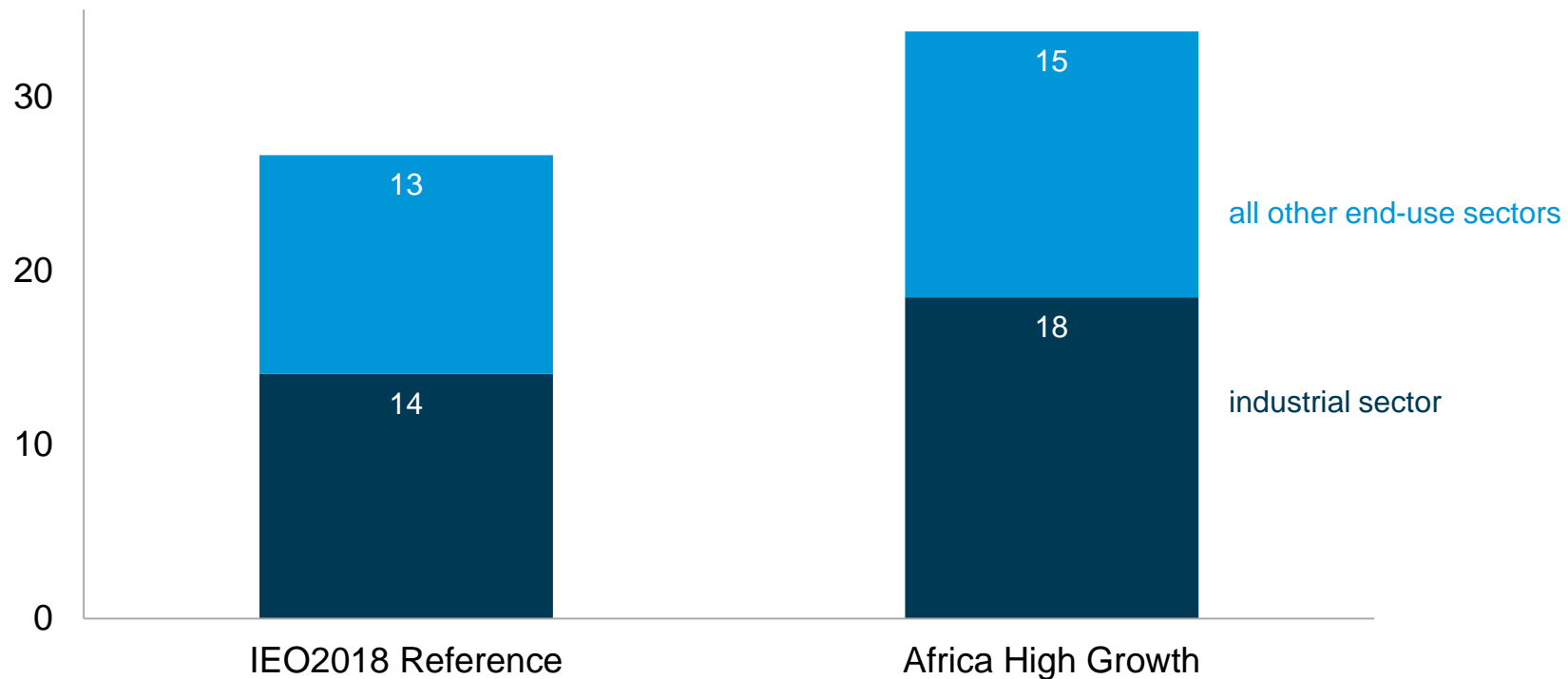
—and a reduced role for the services sector by 2040

- Africa's manufacturing sector share was the second lowest in the world in 2015.
- Increased investment associated with higher economic growth in Africa results in an increase in the share of the manufacturing sector relative to the services sector.
- The manufacturing share of output also increases because Africa has a quickly growing working age population, a large base of natural resources, and a trend toward urbanization.



Africa's industrial energy use increases more rapidly in the IEO2018 Africa High Growth case—

2040 African delivered energy consumption
quadrillion Btu





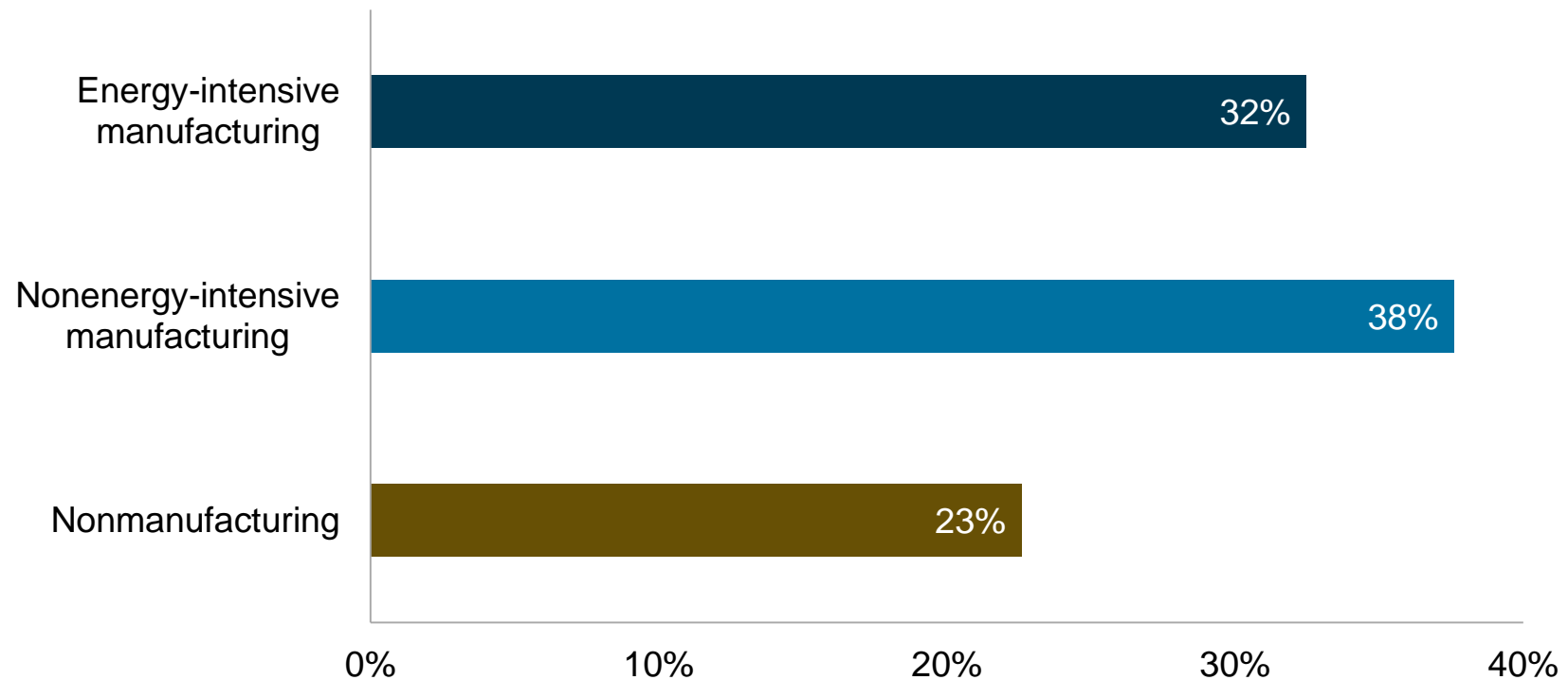
—compared with all other end-use sectors

- Energy use in the Africa High Growth case is 22% higher than the IEO2018 Reference case in 2040.
- The industrial sector accounts for more than half of the increase in energy use from 2015 to 2040 in both the IEO2018 Reference case and in the Africa High Growth case.
- Increased living standards as a result of higher economic growth increase energy use in other sectors.



Manufacturing output growth increases more than nonmanufacturing by 2040 when compared with the IEO2018 Reference case—

sector gross output compared to the IEO2018 Reference case in 2040
percent change





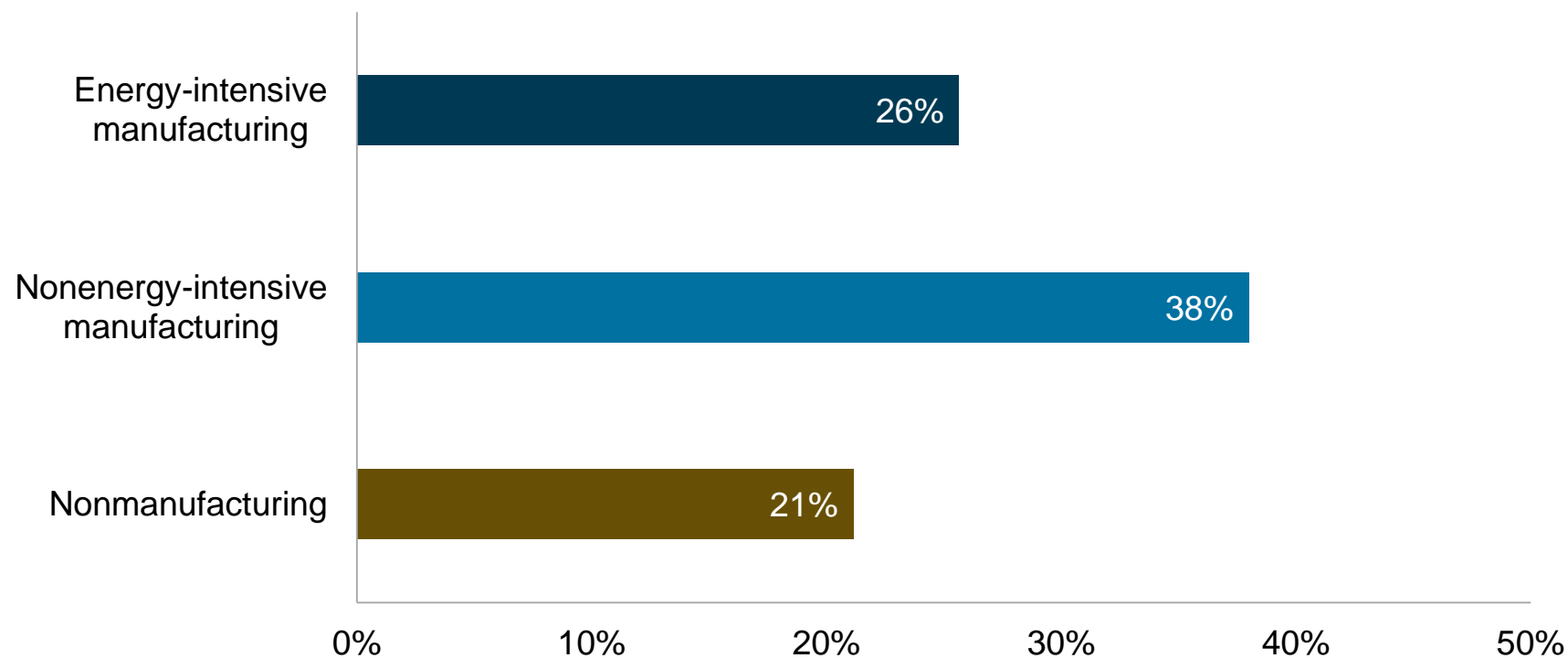
—energy-intensive and nonenergy-intensive manufacturing growth increases are both above 30%

- African economies account for a larger manufacturing share in 2040, with percentage increases in output for both energy-intensive and nonenergy-intensive manufacturing industries that exceed 30% compared to the IEO2018 Reference case.
- Nonmanufacturing industrial output grows more slowly, rising by 23% compared to the IEO2018 Reference case in 2040.



Manufacturing drives the largest energy changes by 2040 compared with the IEO2018 Reference case—

energy consumption compared to the IEO2018 Reference case in 2040
percent change





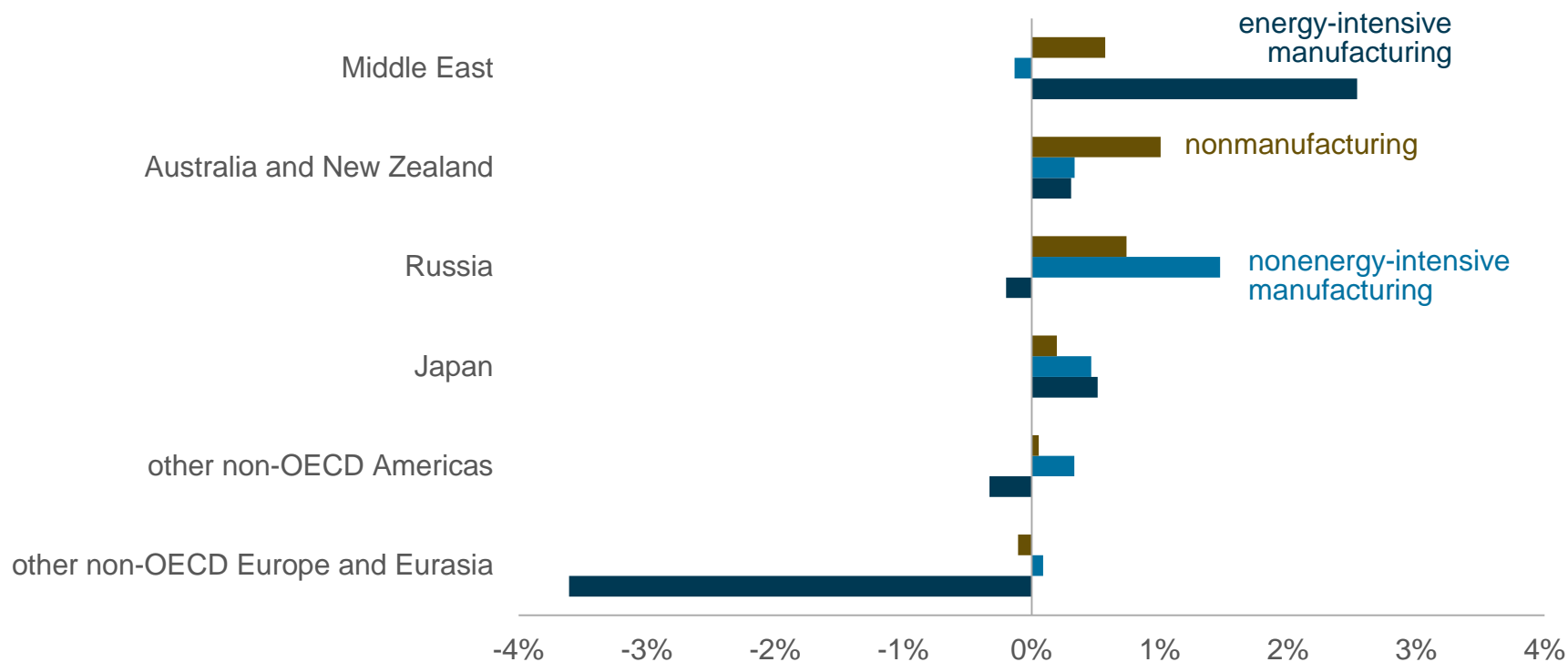
—and the nonmanufacturing sector consumes about 21% more energy than in the IEO2018 Reference case

- Manufacturing drives the largest energy changes by 2040 in the Africa High Growth case.
- Energy use for nonenergy-intensive manufacturing increases the most as a percentage.



African industrial output growth is associated with higher energy-intensive manufacturing in the Middle East—

regional gross output compared with the IEO2018 Reference case in 2040
percent change





—and a reduction of energy-intensive manufacturing output in non-OECD Europe and Eurasia

- African countries have a competitive advantage in manufacturing because of low-cost labor and natural resource availability, which can displace output in other regions of the world.
- Higher African economic growth decreases manufacturing output in competing regions such as other non-OECD Europe and Eurasia.
- Industrial economic activity in the Middle East in 2040 increases relative to the IEO2018 Reference case as higher African growth increases demand for fossil fuels.



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Acronyms and abbreviations used in this report

AEO = Annual Energy Outlook

Btu = British thermal units

EIA = U.S. Energy Information Administration

GDP = gross domestic product (in purchasing power parity (PPP) dollars)

IEO = International Energy Outlook

WEPS+ = World Energy Projection System Plus

OECD = Organization for Economic Cooperation and Development

OPEC = Organization of the Petroleum Exporting Countries = Algeria, Angola, Ecuador, Equatorial Guinea, Gabon, Iran, Iraq, Kuwait, Libya, Nigeria, Qatar, Saudi Arabia, United Arab Emirates, and Venezuela. (Note: Equatorial Guinea became a member of OPEC on May 25, 2017, but their membership is not yet reflected in the IEO2018 projections.)



IEO regional definitions – OECD Regions

OECD Americas = United States, Canada, Chile, and Mexico.

OECD Europe = Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, and United Kingdom. (Note: Israel is included in OECD Europe for statistical reporting purposes. Latvia became an OECD member country on July 16, 2016, but it is not reported in OECD Europe for IEO2018.)

OECD Asia = Australia, Japan, New Zealand, and South Korea.



IEO regional definitions – non-OECD Regions

Non-OECD Europe and Eurasia = Albania, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Faroe Islands, Georgia, Gibraltar, Kazakhstan, Kosovo, Latvia, Lithuania, Macedonia, Malta, Moldova, Montenegro, Romania, Russia, Serbia, Tajikistan, Turkmenistan, Ukraine, and Uzbekistan. (Note: Latvia became an OECD member country on July 16, 2016, but it is reported in non-OECD Europe and Eurasia for IEO2018.)

Non-OECD Asia = Afghanistan, American Samoa, Bangladesh, Bhutan, Brunei, Burma (Myanmar), Cambodia (Kampuchea), China, Cook Islands, Fiji, French Polynesia, Guam, Hawaiian Trade Zone, Hong Kong, India, Indonesia, Kiribati, Laos, Macau, Malaysia, Maldives, Mongolia, Nauru, Nepal, New Caledonia, Niue, North Korea, Pakistan, Papua New Guinea, Philippines, Samoa, Singapore, Solomon Islands, Sri Lanka, Taiwan, Thailand, Timor-Leste (East Timor), Tonga, U.S. Pacific Islands, Vanuatu, Vietnam, and Wake Islands.

Middle East = Bahrain, Iran, Iraq, Jordan, Kuwait, Lebanon, Oman, Palestinian Territories, Qatar, Saudi Arabia, Syria, United Arab Emirates, and Yemen.



IEO regional definitions – non-OECD Regions

Africa = Algeria, Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Congo (Brazzaville), Congo (Kinshasa), Côte d'Ivoire, Djibouti, Egypt, Equatorial Guinea, Eritrea, Ethiopia, Gabon, The Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia, Libya, Madagascar, Malawi, Mali, Mauritania, Mauritius, Morocco, Mozambique, Namibia, Niger, Nigeria, Reunion, Rwanda, Sao Tome and Principe, Senegal, Seychelles, Sierra Leone, Somalia, South Africa, South Sudan, St. Helena, Sudan, Swaziland, Tanzania, Togo, Tunisia, Uganda, Western Sahara, Zambia, and Zimbabwe

Non-OECD Americas = Antarctica, Antigua and Barbuda, Argentina, Aruba, The Bahamas, Barbados, Belize, Bermuda, Bolivia, Brazil, British Virgin Islands, Cayman Islands, Colombia, Costa Rica, Cuba, Dominica, Dominican Republic, Ecuador, El Salvador, Falkland Islands, French Guiana, Greenland, Grenada, Guadeloupe, Guatemala, Guyana, Haiti, Honduras, Jamaica, Martinique, Montserrat, Netherlands Antilles, Nicaragua, Panama, Paraguay, Peru, Puerto Rico, St. Kitts and Nevis, St. Lucia, St. Pierre and Miquelon, St. Vincent/Grenadines, Suriname, Trinidad and Tobago, Turks and Caicos Islands, Uruguay, United States Virgin Islands, and Venezuela.



Map of regions used in the International Energy Outlook

