

International Energy Outlook 2018

Energy implications of faster growth in India with
different economic compositions



Independent Statistics & Analysis
U.S. Energy Information
Administration

#IEO2018

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www.eia.gov/ieo



Key takeaways

- Regardless of economic development path, India is projected to have the world's largest population and the fastest-growing economy. Yet, under three high economic growth cases with an assumed GDP growth rate of 7.1% per year, Indian energy use does not reach that of China or the United States in the next two decades.
- The India Export-led case—where economic growth relies heavily on the expansion of exports—results in the largest increase in Indian energy use, with 33% more energy consumed in 2040 than in the IEO2018 Reference case. This side case also leads to nominal gross output from the energy-intensive manufacturing sector that is about 50% larger in 2040 than in the IEO2018 Reference case.
- The industrial sector remains the largest energy-consuming end-use sector through 2040 across all India side cases considered in IEO2018.
- The IEO2018 India side cases highlight the need to further explore the relationship between changes in economic growth and the relative sizes of the services and manufacturing sectors.



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 India cases. U.S. projections appearing in IEO2018 are consistent with those released in the *Annual Energy Outlook 2017*.



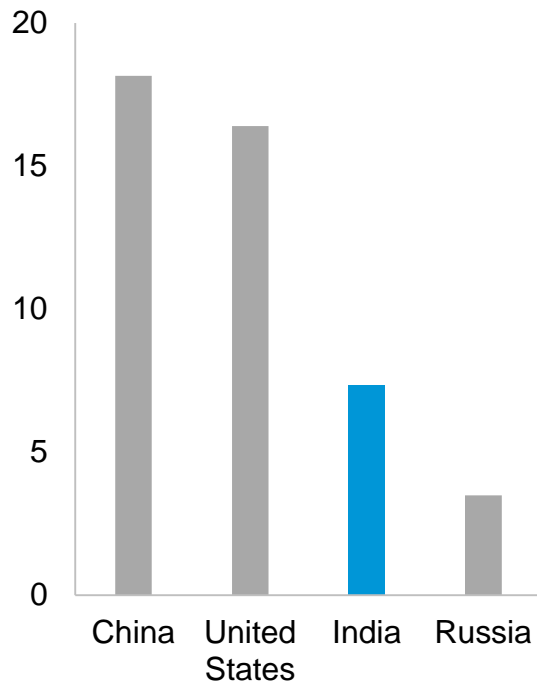
The *International Energy Outlook 2018* provides long-term energy projections for the major world regions

- Projections in *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.

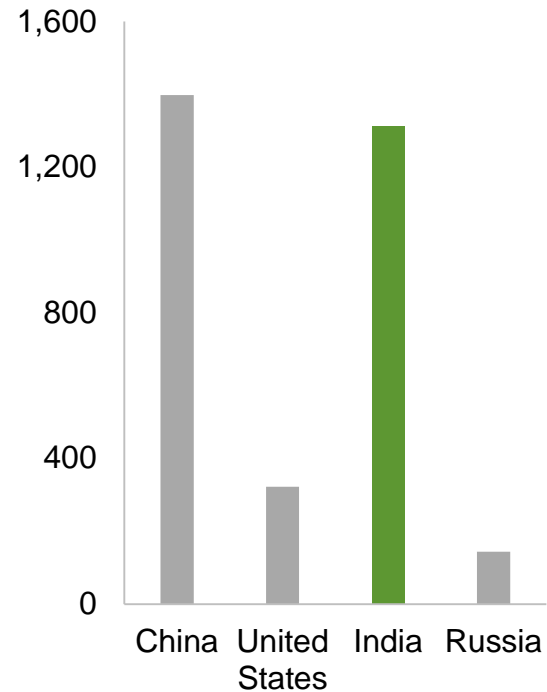


In 2015, India had the third-largest economy, the second-largest population—

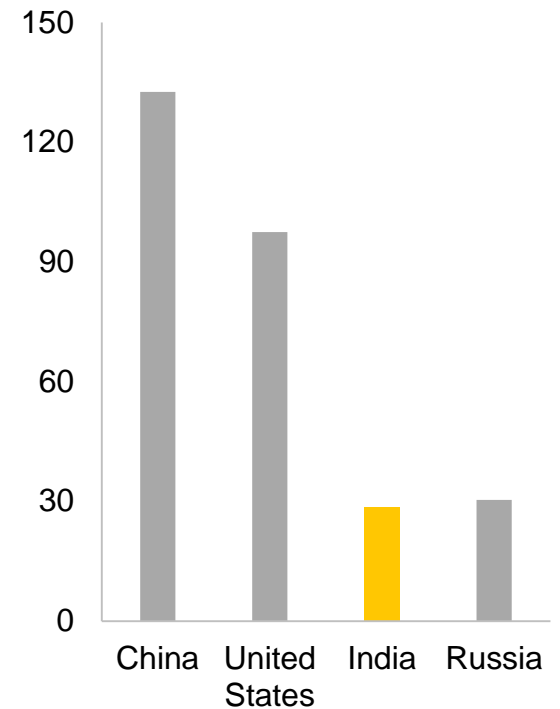
GDP
trillion 2010 U.S. dollars



population
million persons



energy consumption
quadrillion Btu





—and the fourth-largest level of energy consumption

- Only China and the United States had larger economies than India in 2015.
- India had the world's second-largest population in 2015 and is projected to have the largest of any single country by 2040.
- China, the United States, and Russia were the only countries to consume more energy than India in 2015.

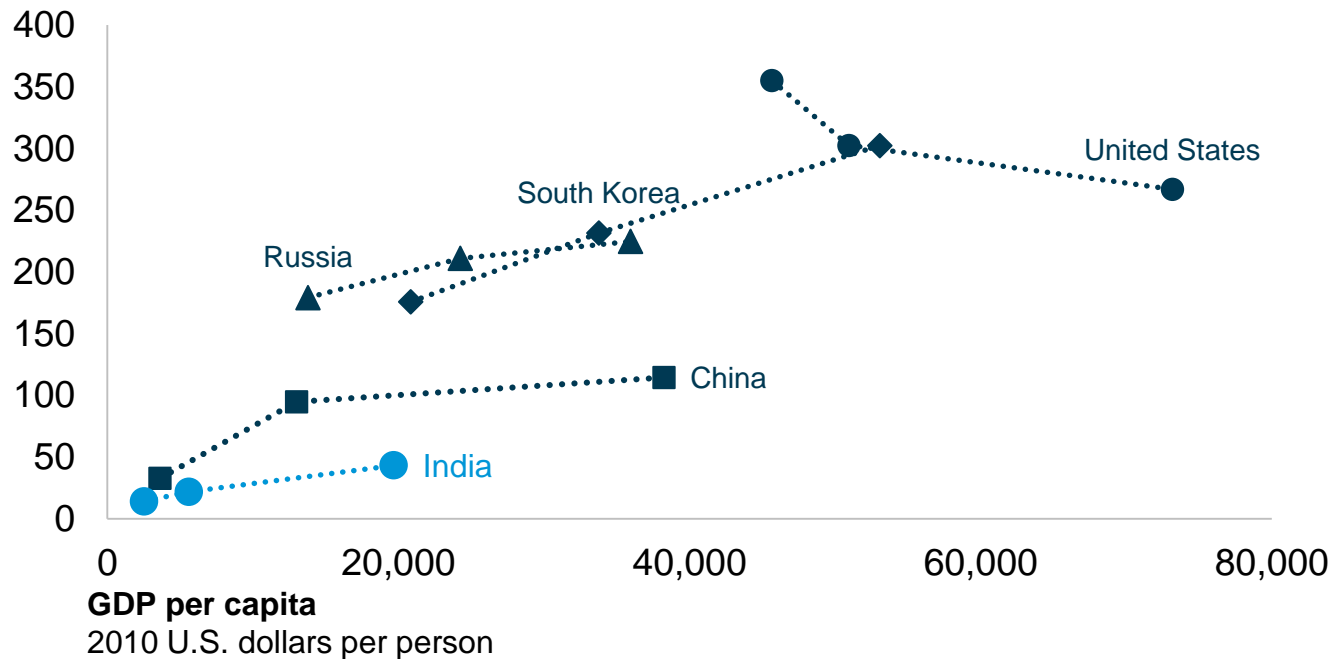


India's income and energy use per capita are lower than in other major economies—

energy consumption per capita

million Btu per person

2000-----2015-----2040 IEO2018 Reference case projection





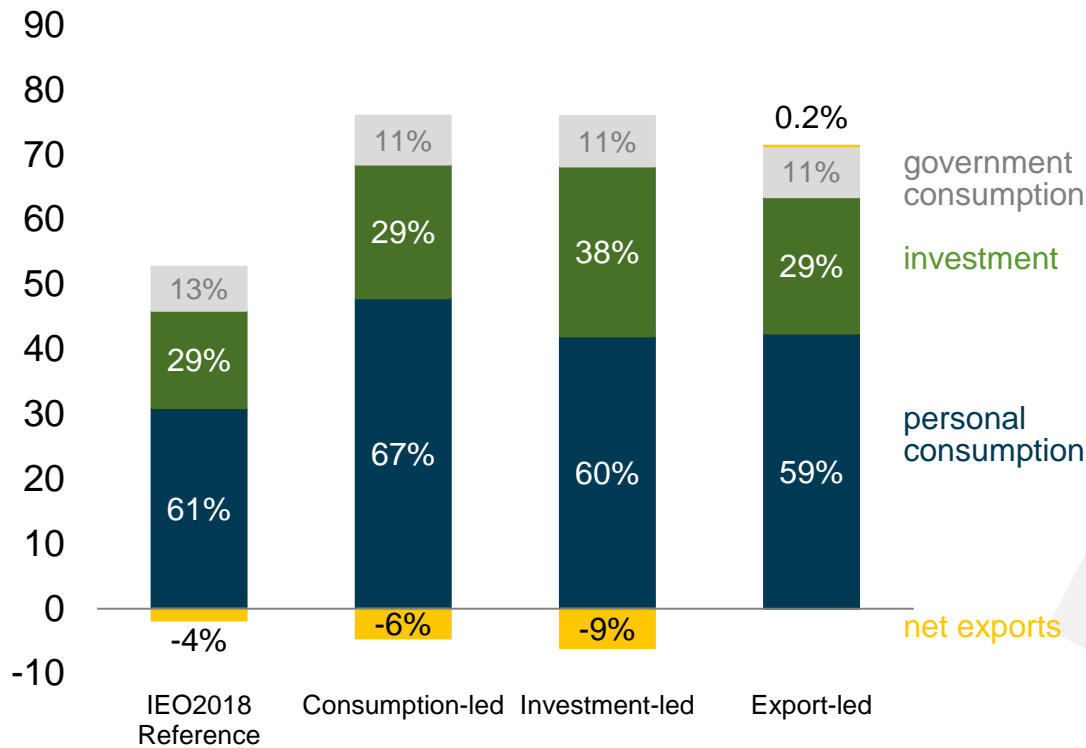
—in both 2015 and 2040 in the IEO2018 Reference case

- India's low energy use per capita is partly attributable to infrastructure constraints, a lack of investment in the energy sector, and use of traditional, non-marketed fuels such as charcoal.
- India's GDP per capita was \$7,400 lower than China's in 2015.
- Neither India's GDP nor its energy use per capita are projected to catch up to China's by 2040 in the IEO2018 Reference case.

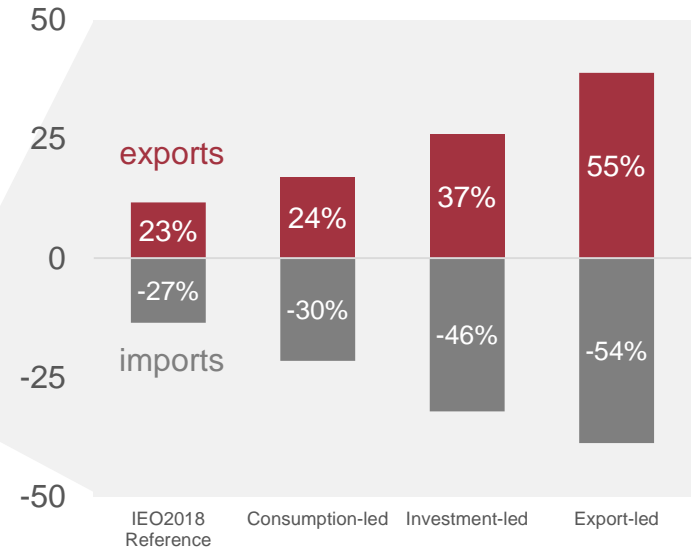


High economic growth cases for India include increases in different components of GDP—

components of GDP
trillion 2010 U.S. dollars



net trade breakout
trillion 2010 U.S. dollars





—either consumption, investment, or export shares

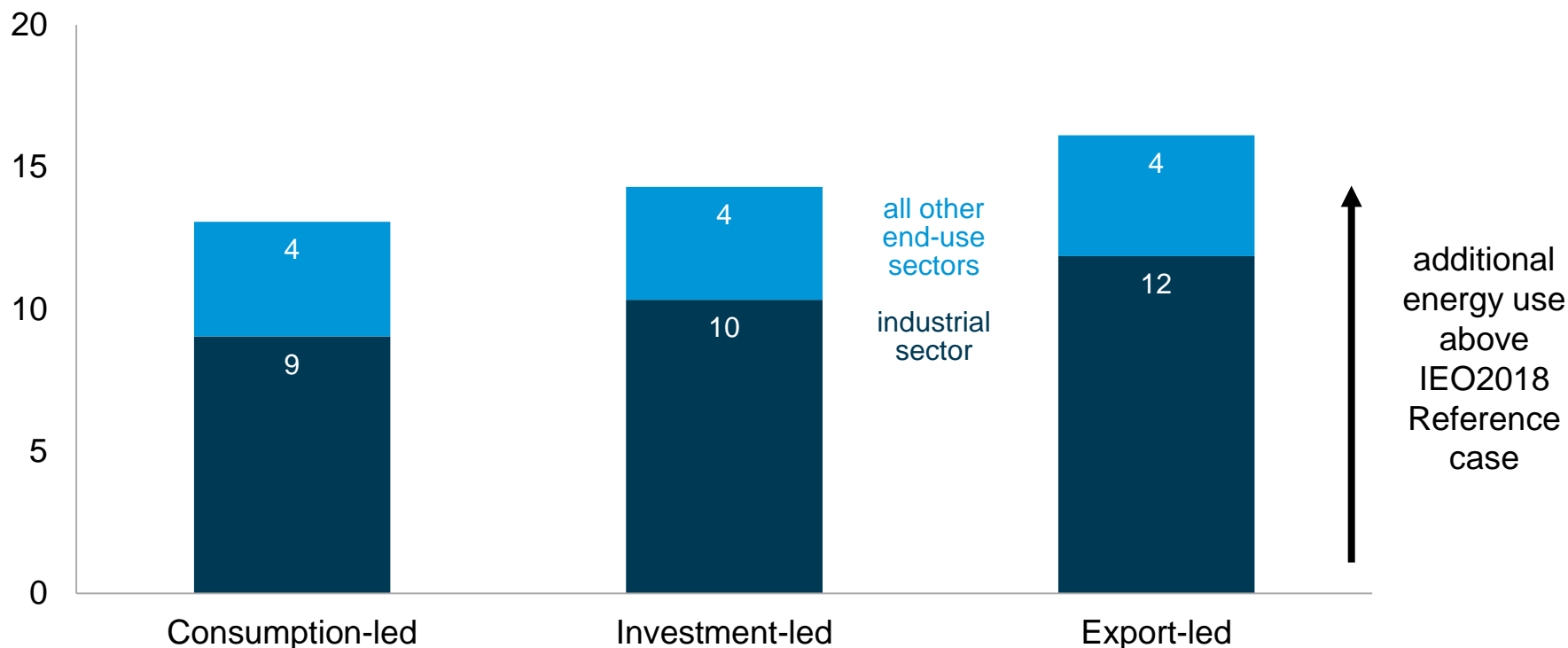
- EIA performed three IEO2018 high economic growth sensitivity cases, where India's economy grows about 7.1% per year on average through 2040 instead of the IEO2018 Reference case average of 6.0%.
- Gross Domestic Product (GDP) can be divided into four different components: personal consumption, investment, government consumption, and net exports (exports minus imports). Each case increases a different component's share higher than the IEO2018 Reference case.
- **Consumption-led case**—the consumption share of GDP rises from 61% to 67% in 2040.
- **Investment-led case**—the investment share of GDP rises from 29% to 38% in 2040.
- **Export-led case**—the export share of GDP rises from 23% to 55% in 2040.



Compared with IEO2018 Reference case energy use, IEO2018 high economic growth cases project increased energy consumption—

2040 Indian energy consumption

quadrillion Btu difference from the IEO2018 Reference case





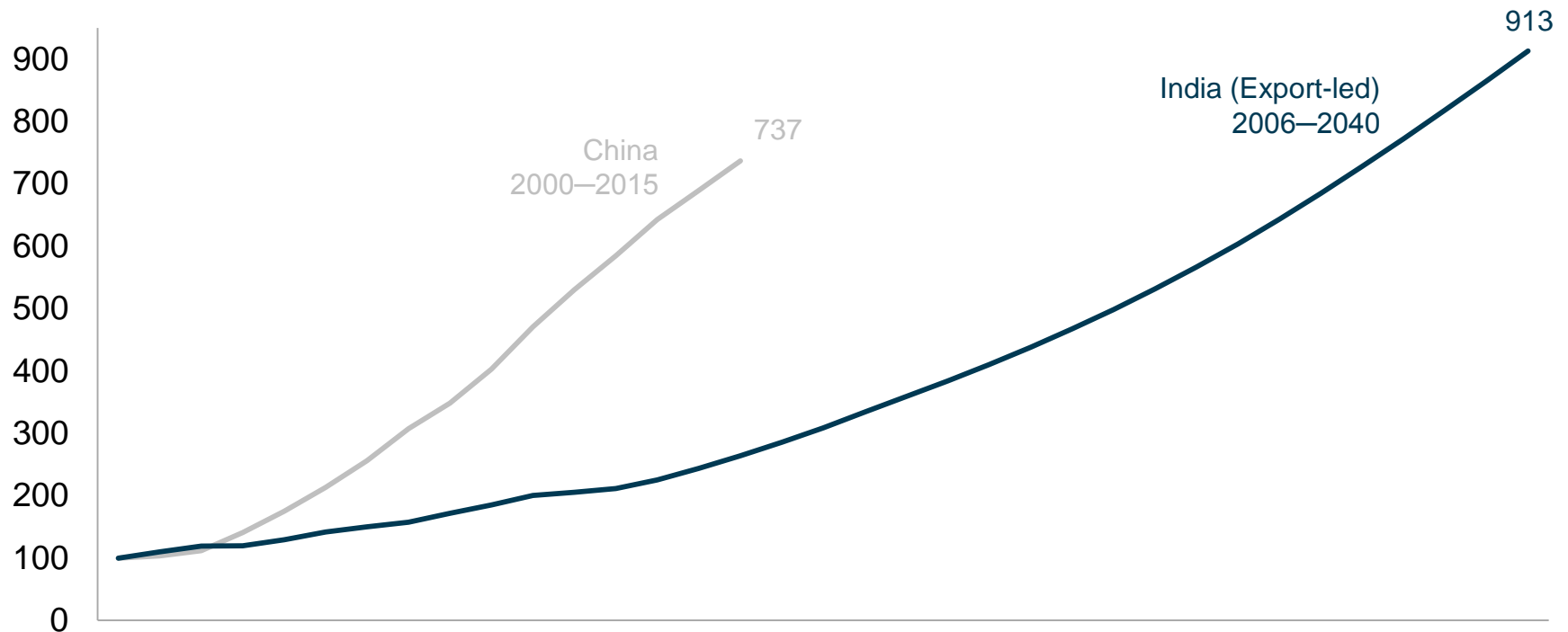
—between 26% to 33% higher in 2040

- In each case, energy use is higher than in the IEO2018 Reference case in 2040.
- **In the Consumption-led case**, energy use is 26% higher, and increases in industrial sector energy use are more than double all other end uses.
- **In the Investment-led case**, energy use is 29% higher, and increases in industrial sector energy use are only slightly higher than in the Consumption-led case.
- **In the Export-led case**, energy use is 33% higher, and increases in industrial sector energy use are triple all other end uses.



In the Export-led case, which has the highest manufacturing output growth rate, Indian energy-intensive manufacturing output grows—

energy-intensive manufacturing gross output
2010 U.S. dollar index, selected start year = 100





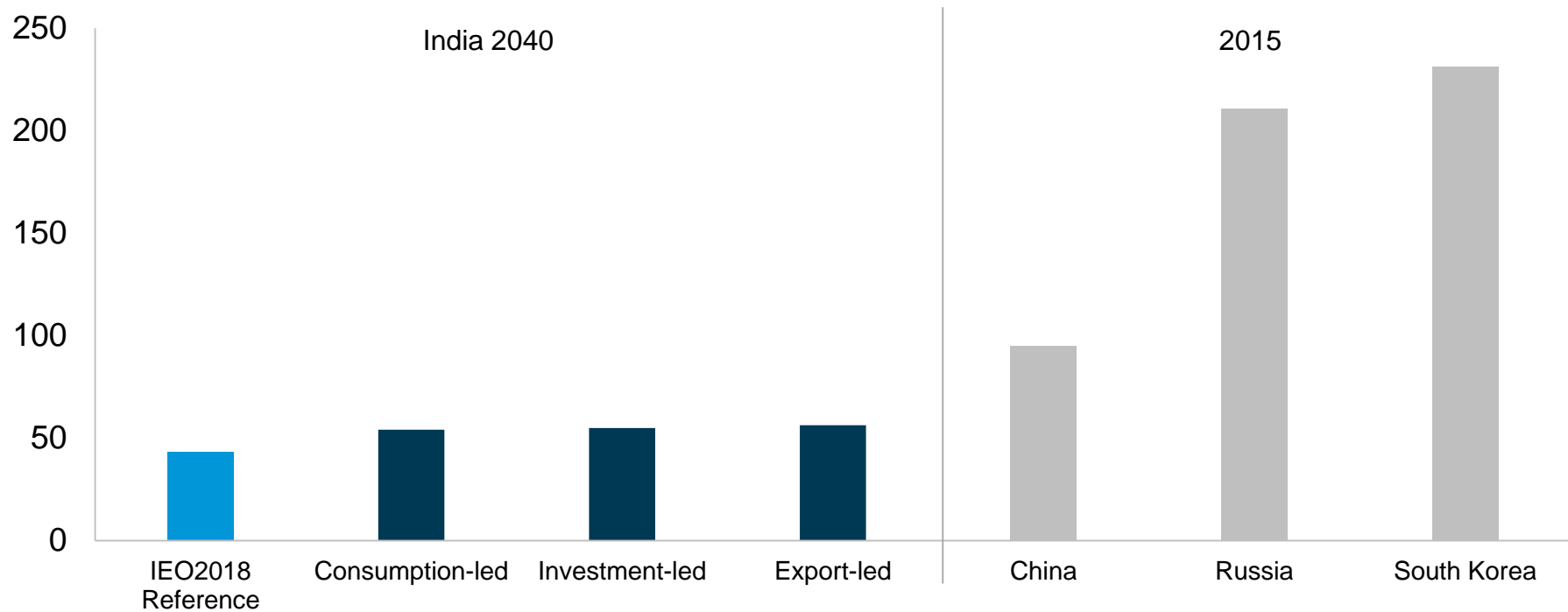
—but only reaches historical Chinese levels after 2035

- India's primarily service-oriented economy is less energy intensive than a large, goods-oriented economy such as China's.
- Services account for more than 50% of Indian output in all high economic growth cases by 2040.
- Much higher levels of energy use could occur in India with major changes to the country's industrial structure.



Historical levels of energy use per capita in other large economies are higher than projected for India in the IEO2018 Reference case—

energy consumption per capita
million Btu per person





—and India still does not reach these levels in the IEO2018 high economic growth cases by 2040

- Projected Indian energy use per person in 2040 remains low compared with other large economies in 2015, even under the high economic growth cases.
- India remains mostly a service-based economy, benefits from technological progress other countries have experienced, and adopts energy-efficient practices and equipment.



Contacts

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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

