AEO2019 cases examine a range of conditions through 2050

- **Reference case**
  - Assumes current laws and regulations remain unchanged, including sunset dates
  - Assumes 1.9% compound annual growth rates for real U.S. gross domestic product (GDP)
  - Reflects current views in economic and demographic trends, and improvements in known technology
  - Assumes Brent $108 per barrel (b) crude price in 2018 dollars by 2050

- **High and Low Economic Growth cases**
  - 2.4% GDP in high case and 1.4% GDP in low case assumes

- **High and Low Oil Price cases** (Brent crude prices by 2050 in 2018 dollars)
  - $211/b in the High Oil Price case and $50/b in the Low Oil Price case

- **High and Low Oil and Gas Resource and Technology cases**
  - High - more accessible resources and lower extraction technology costs than the Reference case
  - Low - fewer accessible resources and higher extraction technology costs than the Reference case
AEO2019 Highlights

• The United States becomes a net energy exporter in 2020 and remains so through 2050 as production increases in crude oil, natural gas, and natural gas plant liquids (NGPL) coupled with slow growth in U.S. energy consumption.

• Natural gas and NGPLs have the highest production growth of the fossil fuels, and account for almost one-third of cumulative U.S. liquids production through 2050.

• Natural gas prices remain comparatively low to 2050, leading to additional use of this fuel across end-use sectors as well as increasing liquefied natural gas exports (LNG).

• The power sector shows a notable shift in fuel-mix. Significant growth in natural gas-fired electricity generation and intermittent renewables is accompanied by additional retirements of less economic coal and nuclear plants.

• Increasing energy efficiency across end-use sectors keeps U.S. energy consumption relatively flat, even as the U.S. economy continues to expand.
Energy production is more sensitive to assumptions than consumption

**Total energy production**
quadrillion British thermal units

- **2018**
  - history
  - projections

- High Oil and Gas Resource and Technology
- High Oil Price
- High Economic Growth
- Reference
- Low Economic Growth
- Low Oil Price
- Low Oil and Gas Resource and Technology

**Total energy consumption**
quadrillion British thermal units

- **2018**
  - history
  - projections
The United States becomes a net energy exporter after 2020 and remains a net exporter in most cases

Net energy trade
quadrillion British thermal units

<table>
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<th>2010</th>
<th>2020</th>
<th>2030</th>
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- Low Oil and Gas Resource and Technology
- Low Oil Price
- High Economic Growth
- Reference
- Low Economic Growth
- High Oil Price
- High Oil and Gas Resource and Technology

2018

history | projections

net imports

net exports
Net energy exports are driven by liquid fuels and natural gas trade flow.
U.S. crude oil and natural gas plant liquids production exceeds its peak 1970 level; consumption declines in most cases

Dr. Linda Capuano | AEO2019 Press release
January 24, 2019
The United States becomes a net exporter of petroleum on a volume basis after 2020 in the Reference case.

U.S. petroleum and other liquids net imports
AEO2019 Reference Case
million barrels per day

2000 2010 2020 2030 2040 2050

-15 -10 -5 0 5 10 15

2018

history projections

net imports

Low Oil Price
Low Oil and Gas Resource and Technology Reference

High Oil Price
High Oil and Gas Resource and Technology
Transportation energy consumption declines through the mid-2030’s as fuel economy increases offset growth in vehicle miles traveled.

*Transportation sector consumption (by fuel)*
quadillion British thermal units

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Dr. Linda Capuano | AEO2019 Press release
January 24, 2019
U.S. natural gas production growth outpaces natural gas consumption in all cases

**Dry natural gas production**
- trillion cubic feet
- billion cubic feet per day

**Natural gas consumption**
- trillion cubic feet
- billion cubic feet per day

- **2018**
- **History**
- **Projections**

**Scenarios:**
- High Oil and Gas Resource and Technology
- High Oil Price
- High Economic Growth
- Reference
- Low Economic Growth
- Low Oil Price
- Low Oil and Gas Resource and Technology
Net exports of natural gas from the United States continue to grow in the Reference case, led by waterborne trade.
Natural gas prices are influenced more by resource and technology assumptions than global market conditions.
Natural gas prices drive growth in electricity generation fuel mix

**Electricity generation from selected fuels**

- **natural gas**
- **renewables**
- **coal**
- **nuclear**

**High Oil and Gas Resource and Technology**

**Low Oil and Gas Resource and Technology**

- **2018 projections**
- **2019 projections**
- **2020**
- **2030**
- **2040**
- **2050**
Renewables and natural gas are projected to meet new generating capacity.
Nuclear capacity retirements continue with lower natural gas prices

Nuclear electricity generating capacity
gigawatts

- Low Oil and Gas Resource and Technology Reference
- High Oil and Gas Resource and Technology

![Graph showing nuclear electricity generating capacity from 2010 to 2050 with projections for 2018, history, and projections.](Image)
Coal production decreases through 2035 because of retirements of coal-fired electric generating capacity.

Coal production by region
million short tons

2018
history
projections

2000 2010 2020 2030 2040 2050

Coal production

2018
history
projections

2000 2010 2020 2030 2040 2050

Total

West

Interior

Appalachia
Electricity prices decline slightly as falling generation costs offset increasing transmission and distribution costs

Dr. Linda Capuano | AEO2019 Press release
January 24, 2019
U.S. energy production and consumption change significantly under current laws and regulations

Energy production (Reference case)
quadrillion British thermal units

Energy consumption by sector (Reference case)
quadrillion British thermal units
AEO2019 Highlights

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AEO 2019 Panel Discussion

• Market, policy, and technological forces driving AEO projections of U.S. fuel consumption and generation.
  – Development of tight and shale resources
  – Impact of sustained low natural gas prices and falling renewable energy costs.

• Uncertainties that could impact projections.
  – Electricity sector trends
  – consumption trends of oil and petroleum product consumption trends
  – Impact of emerging technologies across sectors.