AEO2018 Highlights

• U.S. net energy exports occur over the projection period to 2050 in most cases
  – U.S. becomes a net energy exporter by 2022 in Reference Case
  – Strong domestic production and relatively flat demand

• Increased energy efficiency offsets growth in energy demand
  – Energy consumption grows about 0.4%/year on average in the Reference case
  – Gross Domestic Product is expected to average 2.0% annual growth to 2050 in the Reference case

• U.S. liquids and natural gas production continues to grow through 2042 and 2050, respectively
  – Result of further tight and shale resources development, despite relatively low prices

• Most new electricity generation capacity will be natural gas/renewables after 2022 (Reference case)
  – Result of low natural gas prices, declining renewables technology costs and supportive policies
AEO2018 cases examine a range of conditions through 2050

• **Reference case:**
  – Considers improvements in known technologies
  – Current views in economic and demographic trend
  – Current laws and regulations remain unchanged

• **High and Low Economic Growth cases:**
  – High case assumes compound annual growth rates for U.S. gross domestic product of 2.6%
  – Reference case 2.0%
  – Low case assumes 1.5%

• **High and Low Oil and Gas Resource and Technology cases:**
  – High case - more accessible resources and lower extraction technology costs than in the Reference case
  – Low case - fewer accessible resources and higher extraction technology costs than the Reference case

• **High and Low Oil Price cases:** Brent crude prices by 2050 in 2017 dollars
  – $229 per barrel in the High Oil Price case
  – $114/b in the Reference case
  – $52/b in the Low Oil Price case
Crude oil price projections are sensitive to global conditions, while U.S. natural gas prices depend more on domestic resources.
U.S. crude oil and natural gas production are more sensitive to resource availability and technological improvements.

**Crude oil production**

- Million barrels per day
- History and projections from 2010 to 2050

**Dry natural gas production**

- Trillion cubic feet
- History and projections from 2010 to 2050

Dr. Linda Capuano | AEO2018 Press Release
February 6, 2018
Growth in U.S. energy production surpasses domestic consumption in most cases

**Total U.S. energy consumption**
- quadrillion British thermal units

**Total U.S. energy production**
- quadrillion British thermal units

- **2017**
  - History
  - Projections

- **High Economic Growth**
- **Reference case**
- **Low Economic Growth**

- **2017**
  - History
  - Projections

- **High Oil and Gas Resource/Technology**
- **High Oil Price**
- **Reference case**
- **Low Oil Price**
- **Low Oil and Gas Resource/Technology**
The United States becomes a net energy exporter in most cases

Net energy trade
quadrillion British thermal units

2017
history projections

1990 2000 2010 2020 2030 2040 2050

net imports
net exports

Low Oil and Gas Resource/Technology
Low Oil Price
Reference case
High Oil Price
High Oil and Gas Resource/Technology

Dr. Linda Capuano I AEO2018 Press Release
February 6, 2018
The United States becomes a net petroleum exporter in most cases

Petroleum net imports as a percentage of product supplied

2000 2010 2020 2030 2040 2050

2017

history projections

low oil price

low oil and gas resource/technology

high oil price

high oil and gas resource/technology

net imports

net exports

percent

The United States becomes a net petroleum exporter in most cases

Petroleum net imports as a percentage of product supplied

2000 2010 2020 2030 2040 2050

2017

history projections

low oil price

low oil and gas resource/technology

high oil price

high oil and gas resource/technology

net imports

net exports

percent
The United States becomes a net energy exporter in the Reference case largely because of growing exports.

**U.S. energy trade (Reference case)**
quadrillion British thermal units

**Net U.S. energy trade (Reference case)**
quadrillion British thermal units

- **Exports**
- **Imports**
- **Net imports**
- **Net exports**
- **Petroleum and other liquids**
- **Electricity**
- **Coal and coke**
- **Natural gas**
The fuel sector mix of energy consumption changes over the projected period in the Reference case.

**Energy Consumption by source (Reference case)**
- Quadrillion British thermal units

**Consumption by sector (Reference case)**
- Quadrillion British thermal units

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Transportation demonstrates the impact of energy efficiency on consumption.

Energy consumption by travel mode – Reference case
quadrillion British thermal units

Transportation sector energy consumption by fuel type
quadrillion British thermal units
Light-duty vehicle fuel economy improves with increasing sales of more fuel-efficient cars, while electrified powertrains gain market share in the Reference case.
U.S. crude oil production growth led by tight oil

Crude oil production
million barrels per day

2017

2000 2010 2020 2030 2040 2050

2017

2000 2010 2020 2030 2040 2050

2017

2000 2010 2020 2030 2040 2050

Reference case

High Oil and Gas Resource and Technology

Low Oil and Gas Resource and Technology

history projections

projections

projections

tight oil

other
U.S. natural gas production and consumption continue to increase in most cases

U.S. natural gas production
trillion cubic feet per year    billion cubic feet per day

U.S. natural gas consumption
trillion cubic feet per year    billion cubic feet per day

2017

history    projections

High Oil and Gas Resource/Technology
High Oil Price
Reference
Low Oil Price
Low Oil and Gas Resource/Technology

Dr. Linda Capuano I AEO2018 Press Release
February 6, 2018
The United States becomes a net exporter of natural gas before 2020, although the level of LNG exports is uncertain.

**Natural gas trade**

<table>
<thead>
<tr>
<th>Year</th>
<th>History</th>
<th>Projections</th>
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<tbody>
<tr>
<td>2020</td>
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<td>20</td>
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<tr>
<td>2050</td>
<td>15</td>
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**Liquefied natural gas exports**

<table>
<thead>
<tr>
<th>Year</th>
<th>History</th>
<th>Projections</th>
</tr>
</thead>
<tbody>
<tr>
<td>2020</td>
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<tr>
<td>2050</td>
<td>7</td>
<td>25</td>
</tr>
</tbody>
</table>

Dr. Linda Capuano | AEO2018 Press Release | February 6, 2018
Natural gas prices remain relatively low compared to historic values

**Natural gas spot price at Henry Hub**
2017 dollars per million British thermal units

![Graph showing natural gas prices](image-url)

- **2017**
  - History
  - Projections

- **Low Oil and Gas Resource and Technology**
- **AEO 2017 Reference**
- **AEO 2018 Reference**
- **High Oil and Gas Resource and Technology**
Electricity consumption is expected to grow steadily through 2050.

**Electricity use growth rate**

Percent growth (three-year rolling average)

- **2017**
  - History
  - Projections

**Electricity use by end-use demand sector**

Billion kilowatthours

- Residential
- Commercial
- Industrial
- Transportation

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The projected mix of electricity generation varies widely across cases as differences in fuel prices result in significant substitution.
Change in electricity generation fuel mix is reflected in shifting capacity additions and retirements

Annual electricity generating capacity additions and retirements (Reference case)
gigawatts

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February 6, 2018
The electric power sector demand for coal remains flat through 2050

U.S. Coal production by region – Reference Case with and without Clean Power Plan

million short tons

Coal production decreases through 2022 because of retirements of coal-fired electric generating capacity.
Residential and commercial energy consumption grows slowly through 2050

Residential sector delivered energy consumption
quadrillion British thermal units

Commercial sector delivered energy consumption
quadrillion British thermal units

- Electricity
- Natural gas
- Petroleum and other liquids
- Other

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Increased efficiency contributes to slowing the growth of electricity use in buildings sector

Use of purchased electricity per household
thousand kilowatthours per household

- cooking
- clothes & dishwashing
- TVs and PCs
- heating
- fridges & freezers
- lighting
- water heating
- cooling
- other uses

Use of purchased electricity per square foot of commercial floorspace
thousand kilowatthours per thousand square feet

- water heating
- cooking
- heating
- lighting
- cooling
- ventilation
- refrigeration
- comp. & office equip.
- other uses

Dr. Linda Capuano I AEO2018 Press Release
February 6, 2018
Industrial energy consumption grows in all cases, driven by economic growth and relatively low energy prices.
U.S. energy consumption and production sees significant changes through 2050 under current laws and policies

Energy Consumption (Reference case)
quadrillion British thermal units

Energy Production (Reference case)
quadrillion British thermal units

Dr. Linda Capuano | AEO2018 Press Release
February 6, 2018
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