## Crude Oil Prices

<table>
<thead>
<tr>
<th>Description</th>
<th>Last</th>
<th>Net Change</th>
<th>Open</th>
<th>High</th>
<th>Low</th>
<th>Close</th>
<th>Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oct 17 NYMEX Light Sweet Crude Oil (WTI) Futures</td>
<td>47.31</td>
<td>-0.17</td>
<td>47.58</td>
<td>47.94</td>
<td>47.26</td>
<td>47.48</td>
<td>220802</td>
</tr>
<tr>
<td>Nov 17 NYMEX Light Sweet Crude Oil (WTI) Futures</td>
<td>47.88</td>
<td>-0.18</td>
<td>48.15</td>
<td>48.50</td>
<td>47.84</td>
<td>48.06</td>
<td>63772</td>
</tr>
<tr>
<td>Dec 17 NYMEX Light Sweet Crude Oil (WTI) Futures</td>
<td>48.36</td>
<td>-0.20</td>
<td>48.65</td>
<td>49.00</td>
<td>48.32</td>
<td>48.56</td>
<td>35732</td>
</tr>
<tr>
<td>Jan 18 NYMEX Light Sweet Crude Oil (WTI) Futures</td>
<td>48.75</td>
<td>-0.20</td>
<td>49.00</td>
<td>49.37</td>
<td>48.72</td>
<td>48.95</td>
<td>17989</td>
</tr>
<tr>
<td>Feb 18 NYMEX Light Sweet Crude Oil (WTI) Futures</td>
<td>49.13</td>
<td>-0.12</td>
<td>49.46</td>
<td>49.64</td>
<td>49.07</td>
<td>49.25</td>
<td>8848</td>
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<td>Mar 18 NYMEX Light Sweet Crude Oil (WTI) Futures</td>
<td>49.24</td>
<td>-0.22</td>
<td>49.49</td>
<td>49.84</td>
<td>49.24</td>
<td>49.46</td>
<td>8122</td>
</tr>
<tr>
<td>Apr 18 NYMEX Light Sweet Crude Oil (WTI) Futures</td>
<td>49.47</td>
<td>-0.13</td>
<td>49.75</td>
<td>49.94</td>
<td>49.42</td>
<td>49.60</td>
<td>3636</td>
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<td>May 18 NYMEX Light Sweet Crude Oil (WTI) Futures</td>
<td>49.47</td>
<td>-0.23</td>
<td>49.78</td>
<td>49.99</td>
<td>49.47</td>
<td>49.70</td>
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<td>Jun 18 NYMEX Light Sweet Crude Oil (WTI) Futures</td>
<td>49.55</td>
<td>-0.22</td>
<td>49.91</td>
<td>50.13</td>
<td>49.54</td>
<td>49.77</td>
<td>9196</td>
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<tr>
<td>Jul 18 NYMEX Light Sweet Crude Oil (WTI) Futures</td>
<td>49.69</td>
<td>-0.12</td>
<td>50.13</td>
<td>50.13</td>
<td>49.69</td>
<td>49.81</td>
<td>1732</td>
</tr>
<tr>
<td>Aug 18 NYMEX Light Sweet Crude Oil (WTI) Futures</td>
<td>49.90</td>
<td>0.05</td>
<td>50.14</td>
<td>50.14</td>
<td>49.90</td>
<td>49.85</td>
<td>1118</td>
</tr>
<tr>
<td>Sep 18 NYMEX Light Sweet Crude Oil (WTI) Futures</td>
<td>49.90</td>
<td>0.01</td>
<td>50.09</td>
<td>50.17</td>
<td>49.90</td>
<td>49.89</td>
<td>2538</td>
</tr>
</tbody>
</table>
Oil Prices Over the Past Year

[Graph showing the fluctuation of oil prices over the past year, with a downward trend indicated by a red line.]
# Natural Gas Prices

<table>
<thead>
<tr>
<th>Description</th>
<th>Last</th>
<th>Net Change</th>
<th>Open</th>
<th>High</th>
<th>Low</th>
<th>Close</th>
<th>Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oct 17 NYMEX Henry Hub Natural Gas Futures Electronic</td>
<td>2.944</td>
<td>0.054</td>
<td>2.910</td>
<td>2.947</td>
<td>2.899</td>
<td>2.890</td>
<td>45853</td>
</tr>
<tr>
<td>Nov 17 NYMEX Henry Hub Natural Gas Futures Electronic</td>
<td>3.013</td>
<td>0.048</td>
<td>2.984</td>
<td>3.015</td>
<td>2.972</td>
<td>2.965</td>
<td>18690</td>
</tr>
<tr>
<td>Dec 17 NYMEX Henry Hub Natural Gas Futures Electronic</td>
<td>3.169</td>
<td>0.046</td>
<td>3.140</td>
<td>3.171</td>
<td>3.128</td>
<td>3.123</td>
<td>8261</td>
</tr>
<tr>
<td>Jan 18 NYMEX Henry Hub Natural Gas Futures Electronic</td>
<td>3.278</td>
<td>0.048</td>
<td>3.249</td>
<td>3.279</td>
<td>3.238</td>
<td>3.230</td>
<td>10961</td>
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<tr>
<td>Feb 18 NYMEX Henry Hub Natural Gas Futures Electronic</td>
<td>3.281</td>
<td>0.047</td>
<td>3.253</td>
<td>3.282</td>
<td>3.241</td>
<td>3.234</td>
<td>4117</td>
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<tr>
<td>Mar 18 NYMEX Henry Hub Natural Gas Futures Electronic</td>
<td>3.238</td>
<td>0.044</td>
<td>3.218</td>
<td>3.240</td>
<td>3.200</td>
<td>3.194</td>
<td>6648</td>
</tr>
<tr>
<td>Apr 18 NYMEX Henry Hub Natural Gas Futures Electronic</td>
<td>2.935</td>
<td>0.034</td>
<td>2.915</td>
<td>2.937</td>
<td>2.914</td>
<td>2.901</td>
<td>6138</td>
</tr>
<tr>
<td>May 18 NYMEX Henry Hub Natural Gas Futures Electronic</td>
<td>2.907</td>
<td>0.034</td>
<td>2.880</td>
<td>2.907</td>
<td>2.880</td>
<td>2.873</td>
<td>4212</td>
</tr>
<tr>
<td>Jun 18 NYMEX Henry Hub Natural Gas Futures Electronic</td>
<td>2.933</td>
<td>0.033</td>
<td>2.915</td>
<td>2.933</td>
<td>2.915</td>
<td>2.900</td>
<td>485</td>
</tr>
<tr>
<td>Jul 18 NYMEX Henry Hub Natural Gas Futures Electronic</td>
<td>2.958</td>
<td>0.032</td>
<td>2.941</td>
<td>2.958</td>
<td>2.941</td>
<td>2.926</td>
<td>242</td>
</tr>
<tr>
<td>Aug 18 NYMEX Henry Hub Natural Gas Futures Electronic</td>
<td>2.961</td>
<td>0.031</td>
<td>2.948</td>
<td>2.961</td>
<td>2.946</td>
<td>2.930</td>
<td>193</td>
</tr>
<tr>
<td>Sep 18 NYMEX Henry Hub Natural Gas Futures Electronic</td>
<td>2.939</td>
<td>0.032</td>
<td>2.925</td>
<td>2.939</td>
<td>2.922</td>
<td>2.907</td>
<td>235</td>
</tr>
</tbody>
</table>
Natural Gas Prices Over the Past Year
U.S. energy consumption by energy source, 2014

Total = 98.3 quadrillion Btu

Petroleum 35%
Natural gas 28%
Coal 18%
Nuclear electric power 8%
Renewable energy 10%

Total = 9.6 quadrillion Btu

Solar 4%
Geothermal 2%
Wind 18%
Biomass waste 5%
Biofuels 22%
Wood 23%
Hydroelectric 26%

Note: Sum of components may not equal 100% as a result of independent rounding.

Source: U.S. Energy Information Administration, Monthly Energy Review, Table 1.3 and 10.1 (March 2015), preliminary data
U.S. primary energy consumption by source and sector, 2016

Total = 97.4 quadrillion British thermal units (Btu)

percent of sources

percent of sectors

transportation
27.8 (29%)

industrial
21.3 (22%)

residential and commercial
10.5 (11%)

electric power
37.8 (39%)

source

sector

petroleum
35.9 (37%)

natural gas
28.4 (29%)

coal
14.2 (15%)

renewable energy
10.2 (10%)

nuclear electric power
8.4 (9%)

United States total energy consumption (2000-2016)
quadrillion British thermal units

U.S. energy consumption rose slightly in 2016 despite a significant decline in coal use

United States total energy consumption (2000-2016)
quadrillion British thermal units

Change from 2015
quadrillion British thermal units

Source: U.S. Energy Information Administration, Monthly Energy Review
The U.S. has experienced a rapid increase in natural gas and oil production from shale and other tight resources.

U.S. tight oil production

- Million barrels of oil per day

- Eagle Ford (TX)
- Bakken (MT & ND)
- Spraberry (TX & NM Permian)
- Bonespring (TX & NM Permian)
- Wolfcamp (TX & NM Permian)
- Delaware (TX & NM Permian)
- Yeso-Glorieta (TX & NM Permian)
- Niobrara-Codell (CO, WY)
- Haynesville
- Utica (OH, PA & WV)
- Marcellus (PA, WV, OH & NY)
- Woodford (OK)
- Granite Wash (OK & TX)
- Austin Chalk (LA & TX)
- Monterey (CA)

U.S. dry shale gas production

- Billion cubic feet per day

- Marcellus (PA, WV, OH & NY)
- Haynesville (LA & TX)
- Eagle Ford (TX)
- Fayetteville (AR)
- Barnett (TX)
- Woodford (OK)
- Bakken (ND)
- Antrim (MI, IN, & OH)
- Utica (OH, PA & WV)
- Rest of US 'shale'

Sources: EIA derived from state administrative data collected by DrillingInfo Inc. Data are through August 2016 and represent EIA’s official tight oil & shale gas estimates, but are not survey data. State abbreviations indicate primary state(s). Note: Scales are presented at approximate barrel of oil equivalent.
Electric Generation by Fuel

Figure IF3-6. Electricity generation by fuel in the Reference and Extended Policies cases, 2000–2040 (billion kilowatthours)

- **History**
- **2015**
- **Projections: Reference case**
- **Projections: Extended Policies case**

- **Coal**
- **Nuclear**
- **Natural gas/oil**
- **Renewables**
US Crude Oil Production

Crude oil production and imports (million barrels per day)

Source: U.S. Energy Information Administration

CRUDE OIL PRODUCTION (million barrels per day)

<table>
<thead>
<tr>
<th></th>
<th>Year ago</th>
<th>Four-week averages</th>
<th>Year ago</th>
<th>Week ending</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>09/02/16</td>
<td>09/01/17 08/25/17 08/18/17</td>
<td>09/02/16</td>
<td>09/01/17 08/25/17 08/18/17</td>
</tr>
</tbody>
</table>
US Crude Oil Imports

Crude oil production and imports (million barrels per day)

CRUDE OIL IMPORTS (million barrels per day)

<table>
<thead>
<tr>
<th></th>
<th>Year ago</th>
<th>Four-week averages</th>
<th>Year ago</th>
<th>Week ending</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>09/02/16</td>
<td>09/01/17 08/25/17 08/18/17</td>
<td>09/02/16</td>
<td>09/01/17 08/25/17 08/18/17</td>
</tr>
<tr>
<td>Crude oil, excluding SPR</td>
<td>8.205</td>
<td>7.976 8.146 8.233</td>
<td>7.069</td>
<td>7.083 7.905 8.790</td>
</tr>
</tbody>
</table>

Source: U.S. Energy Information Administration
Canada provides record-high share and amount of U.S. crude oil imports in 2015

Gross imports of crude oil to the United States by country, 1985-2015
million barrels per day

Although total U.S. crude oil imports in 2015 continued to be lower than levels reached during the mid-2000s, imports from the United States' top foreign oil supplier—Canada—were the highest on record, according to annual trade data from EIA's Petroleum Supply Monthly. Canada provided 4 out of every 10 barrels of oil imported into the United States in 2015.
## Drilled-but-uncompleted Wells “DUCs”

<table>
<thead>
<tr>
<th>Region</th>
<th>June 2017</th>
<th>July 2017</th>
<th>change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anadarko</td>
<td>906</td>
<td>948</td>
<td>42</td>
</tr>
<tr>
<td>Appalachia</td>
<td>724</td>
<td>711</td>
<td>(13)</td>
</tr>
<tr>
<td>Bakken</td>
<td>784</td>
<td>782</td>
<td>(2)</td>
</tr>
<tr>
<td>Eagle Ford</td>
<td>1,385</td>
<td>1,420</td>
<td>35</td>
</tr>
<tr>
<td>Haynesville</td>
<td>189</td>
<td>194</td>
<td>5</td>
</tr>
<tr>
<td>Niobrara</td>
<td>668</td>
<td>674</td>
<td>6</td>
</tr>
<tr>
<td>Permian</td>
<td>2,195</td>
<td>2,330</td>
<td>135</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>6,851</strong></td>
<td><strong>7,059</strong></td>
<td><strong>208</strong></td>
</tr>
</tbody>
</table>

Source: https://www.eia.gov/petroleum/drilling/#tabs-summary-3
US Crude Refinery Inputs

Crude oil refinery inputs (*million barrels per day*)

<table>
<thead>
<tr>
<th>U.S. crude oil refinery inputs</th>
<th>million barrels per day</th>
</tr>
</thead>
<tbody>
<tr>
<td>18.0</td>
<td></td>
</tr>
<tr>
<td>17.0</td>
<td></td>
</tr>
<tr>
<td>16.0</td>
<td></td>
</tr>
<tr>
<td>15.0</td>
<td></td>
</tr>
<tr>
<td>14.0</td>
<td></td>
</tr>
<tr>
<td>13.0</td>
<td></td>
</tr>
</tbody>
</table>

Source: U.S. Energy Information Administration

**CRUDE OIL REFINERY INPUTS (million barrels per day)**

<table>
<thead>
<tr>
<th></th>
<th>Year ago 09/02/16</th>
<th>Four-week averages 09/01/17 08/25/17 08/18/17</th>
<th>Year ago 09/02/16</th>
<th>Week ending 09/01/17 08/25/17 08/18/17</th>
</tr>
</thead>
</table>
US Crude Oil Inventory – Days of Supply

Crude oil stocks *(million barrels)* and days of supply

<table>
<thead>
<tr>
<th>CRUDE OIL STOCKS (million barrels)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year ago</td>
</tr>
<tr>
<td>09/02/16</td>
</tr>
<tr>
<td>U.S.</td>
</tr>
</tbody>
</table>

Source: U.S. Energy Information Administration
Harvey Impacts

- Petroleum Administration for Defense District 3

Figure 1. U.S. East Coast (PADD 1) and Gulf Coast (PADD 3) Sub-PADD regional breakouts

Source: U.S. Energy Information Administration
Harvey Impacts

- **PADD-3**
  - 62% of US onshore oil production/18% offshore
  - >50% of US refining capacity (40% in TX alone)
  - ~50% of US crude oil storage capacity
  - 40% of working storage for gasoline & diesel
  - World’s largest petroleum refining & petrochemical manufacturing corridor
    - More infrastructure additions in the past (5) years
    - Cheaper chemical feedstocks, e.g. – ethylene/propylene
Harvey Impacts

- Curtailments/Outages
  - 34% of refining capacity = 63% utilization
  - Colonial Pipeline (ETX to Northeast US)
  - Imports/Exports: Corpus Christi & Houston port closures – “stranded” vessels
  - Inventories: Crude increased/Distillates decreased
  - Petrochemical plants outages(exports halted”)
Hurricane Harvey caused substantial disruptions to crude oil and petroleum product supply chains and increased petroleum product prices. For the week ending September 1, 2017, gross inputs to refineries in the U.S. Gulf Coast fell by 3.2 million b/d, or 34%, from the previous week, the largest drop since Hurricanes Gustav and Ike in 2008. Weekly refinery utilization in the region fell from 96% to 63%, while other areas of the country remained virtually unchanged.

Just over half of all U.S. refinery capacity is located in the U.S. Gulf Coast (defined as Petroleum Administration for Defense District 3). Texas, where Harvey made landfall, represents 31% of all U.S. refinery capacity, based on data from January 2017. These refineries supply petroleum products to domestic markets on the Gulf Coast, East Coast, and Midwest, as well as to international markets.
Crude oil refinery inputs *(million barrels per day)*

Regional crude oil refinery inputs 4-wk Avg.

<table>
<thead>
<tr>
<th></th>
<th>East Coast</th>
<th>Midwest</th>
<th>Gulf Coast</th>
<th>Rocky Mountain</th>
<th>West Coast</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oct-15</td>
<td>2.4</td>
<td>3.0</td>
<td>9.2</td>
<td>0.6</td>
<td>2.4</td>
</tr>
<tr>
<td>Apr-16</td>
<td>2.5</td>
<td>3.0</td>
<td>9.2</td>
<td>0.6</td>
<td>2.4</td>
</tr>
<tr>
<td>Oct-16</td>
<td>2.4</td>
<td>3.0</td>
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<td>2.4</td>
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<td>0.6</td>
<td>2.4</td>
</tr>
<tr>
<td>Oct-17</td>
<td>2.5</td>
<td>3.0</td>
<td>9.2</td>
<td>0.6</td>
<td>2.4</td>
</tr>
</tbody>
</table>

Source: U.S. Energy Information Administration

**CRUDE OIL REFINERY INPUTS (million barrels per day)**

<table>
<thead>
<tr>
<th></th>
<th>Year ago 09/02/16</th>
<th>Four-week averages</th>
<th>Year ago 09/02/16</th>
<th>Week ending</th>
</tr>
</thead>
<tbody>
<tr>
<td>East Coast (PADD 1)</td>
<td>1.101</td>
<td>1.131 1.125 1.119</td>
<td>1.155</td>
<td>1.138 1.117 1.136</td>
</tr>
<tr>
<td>Midwest (PADD 2)</td>
<td>3.784</td>
<td>3.994 3.971 3.901</td>
<td>3.867</td>
<td>4.068 4.070 3.945</td>
</tr>
<tr>
<td>Rocky Mountain (PADD 4)</td>
<td>0.595</td>
<td>0.658 0.657 0.653</td>
<td>0.618</td>
<td>0.680 0.682 0.635</td>
</tr>
</tbody>
</table>
PADD-3 Fuel Movements

Product Supply Overview – U.S. East Coast (PADD 1) and Gulf Coast (PADD 3)

- = Refinery
○ = Refinery Center
= Colonial Pipeline
= Marine Movements
= Plantation Pipeline
= Urban Areas
= Product Pipeline

Source: U.S. Energy Information Administration
Harvey Impacts

**Prices**

### Retail prices (dollars per gallon)

<table>
<thead>
<tr>
<th>U.S. regular gasoline prices</th>
<th>U.S. on-highway diesel fuel prices</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Retail prices</strong></td>
<td><strong>change from last</strong></td>
</tr>
<tr>
<td><strong>09/04/17</strong></td>
<td><strong>Week</strong></td>
</tr>
<tr>
<td>Gasoline</td>
<td>2.679</td>
</tr>
<tr>
<td>Diesel</td>
<td>2.758</td>
</tr>
<tr>
<td><strong>Year</strong></td>
<td>0.280†</td>
</tr>
<tr>
<td></td>
<td>0.153†</td>
</tr>
<tr>
<td></td>
<td>0.456†</td>
</tr>
<tr>
<td></td>
<td>0.351†</td>
</tr>
</tbody>
</table>

Source: U.S. Energy Information Administration
Harvey Impacts

- Prices

**Futures prices (dollars per gallon*)**

<table>
<thead>
<tr>
<th>Futures contracts</th>
<th>Change from last</th>
<th>09/01/17</th>
<th>Week</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crude oil</td>
<td></td>
<td>47.29</td>
<td>-0.58</td>
<td>2.85</td>
</tr>
<tr>
<td>Gasoline</td>
<td></td>
<td>1.748</td>
<td>0.081</td>
<td>0.446</td>
</tr>
<tr>
<td>Heating oil</td>
<td></td>
<td>1.747</td>
<td>0.125</td>
<td>0.337</td>
</tr>
</tbody>
</table>

*Note: Crude oil price in dollars per barrel.*

Source: U.S. Energy Information Administration, New York Mercantile Exchange (NYMEX)
The United States remained the world's top producer of petroleum and natural gas hydrocarbons in 2015, according to U.S. Energy Information Administration estimates. U.S. petroleum and natural gas production first surpassed Russia in 2012, and the United States has been the world's top producer of natural gas since 2011 and the world's top producer of petroleum hydrocarbons since 2013.
EIA projects 48% increase in world energy consumption by 2040

World energy consumption by source, 1990-2040
quadtrillion Btu

Global Crude Oil

- **Supply growth:** +4.1 mb/d 2016 – 2021 (vs. +11.0 2009 – 2015)
- **Lower capex:** -24% 2016; -17% 2017
- **Demand growth:** 1.2 mb/d per annum through 2021
  - Est total = 100 million Bbld by 2020
  - India/China/Asia
**Crude Exportation**

  - No exact definition of “crude”
  - Implies anything after the “still” is not crude
  - Loophole which qualified *processed* condensate
  - 07/14: Enterprise & Pioneer export condensate

- **12/18/15: Ban lifted – exporting starts**
  - 12/31/15: *Theo T* leaves Corpus Christi (NuStar)
    - 01/20/16 - Arrives in Marseille, France
  - 01/01/16: *Seaqueen* leaves Port of Houston (EPP)
    - 01/21/16 – Arrives in Rotterdam, The Netherlands
  - 01/09/16: *Angelica Schulte* leaves Port of Houston
    - 01/31/16 - Arrives in Marseille, France
12/31/15: Bahamian Vessel, *Theo T*, leaves The Port of Corpus Christi with a load of Conoco-Phillips crude oil bound for Italy. Corpus Christi has 1.0 million Bbld of offloading capability.
Exxon-Mobil

- 02/2016 – 1st US major oil company to export crude
  - *Maran Sagitta* leaves Beaumont, TX
  - 03/2016: arrives in Italy
Pricing Implications

Brent vs. WTI

[Graph showing the price movements of Brent and WTI crude oil futures from June 2016 to July 2017.]
US Oil Export Issues

- Transport costs
  - WTI needs to be ($2.50 - $3.00) less than Brent to make exportation economical, esp., to Asia
  - Shipments going to Latin America, Europe primarily

- Infrastructure
  - “re-purposing” terminal facilities (unloading vs. loading)
    - Magellan Midstream & Enterprise Products Partners
  - Expansion projects – storage, pipelines, loading terminals
    - Corpus Christi/East Houston/Brownsville
  - Can’t load “VLCCs” at this time.
    - Can’t dock them.
    - 600 million Bbl/d max loading rates except for Corpus Christi
  - Major pipeline re-configurations & new projects
    - Move more domestic crude to export terminals.
Figure 3. U.S. Crude oil exports January through May 2016 (excludes Canada)

<table>
<thead>
<tr>
<th>Country</th>
<th>Quantity (thousand barrels per day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Curacao</td>
<td>54</td>
</tr>
<tr>
<td>Netherlands</td>
<td>39</td>
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<tr>
<td>Japan</td>
<td>17</td>
</tr>
<tr>
<td>Italy</td>
<td>15</td>
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<tr>
<td>Marshall Islands</td>
<td>14</td>
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<tr>
<td>France</td>
<td>11</td>
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<tr>
<td>United Kingdom</td>
<td>1*</td>
</tr>
<tr>
<td>Bahama Islands</td>
<td>10</td>
</tr>
<tr>
<td>China</td>
<td>10</td>
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<tr>
<td>Panama</td>
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<td>Israel</td>
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<td>Colombia</td>
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</tr>
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<td>Switzerland</td>
<td>3</td>
</tr>
<tr>
<td>Peru</td>
<td>2</td>
</tr>
</tbody>
</table>

Source: U.S. Energy Information Administration
US Exports of Crude Oil

Weekly Imports & Exports

Mmbbl/d

1,500

1,250

1,000

750

500

250

0

Jul '14
Jan '15
Jul '15
Jan '16
Jul '16
Jan '17
Jul '17

U.S. Exports of Crude Oil

Source: U.S. Energy Information Administration
Global crude oil balances expected to tighten through 2018

**World liquid fuels production and consumption balance**

million barrels per day

production

consumption

million barrels per day

forecast

stock builds

stock draws

forecast


EIA estimates that crude oil and other liquids inventories grew by 2.0 million barrels per day (b/d) in the fourth quarter of 2016, driven by an increase in production and a significant, but seasonal, drop in consumption. Global production and consumption are both projected to increase through 2018, but consumption is expected to increase at a faster rate than production. As a result, global balances are expected to tighten.
Exports of Refined Products

Weekly Imports & Exports

Mbbl/d

Source: U.S. Energy Information Administration
Exportation of Natural Gas Liquids

Source: U.S. Energy Information Administration
The first ethane shipment out of Enterprise Products Partners’ (EPP) new export terminal in Morgan’s Point, Texas, is preparing to set sail for Norway.

The terminal, located on the Houston Ship Channel, is the second to open in the United States, and has an export capacity of up to 200,000 barrels of liquefied ethane per day, of which about 90% is contracted.

The United States’ first export terminal, at Marcus Hook, Pennsylvania, has been shipping ethane cargoes since March of last year.

Ethane cargoes from the United States are used as feedstock in European ethylene crackers.
First shipment of ethane from U.S. Gulf Coast arrives in Europe

U.S. exports of ethane (January 2014 - June 2016) thousand barrels per day

Increased production of ethane in the United States has led to increased ethane exports, first by pipeline to Canada and more recently by tanker to overseas destinations. Ethane is used domestically and internationally as a key feedstock for plastics production and other industrial uses.

Production of ethane and other natural gas plant liquids (2010-16) million barrels per day

Source: U.S. Energy Information Administration, Natural Gas Monthly
Natural Gas Supply

- Gross Production ~ 90 MMcfd

Source: U.S. Energy Information Administration
Natural Gas Supply

- Shale gas continues to increase:

![Monthly dry shale gas production chart]

*Sources: EIA derived from state administrative data collected by DrillingInfo Inc. Data are through July 2017 and represent EIA's official shale gas estimates, but are not survey data. State abbreviations indicate primary state(s).*
Natural Gas Consumption

Natural Gas Consumption by End Use

Source: U.S. Energy Information Administration
Natural Gas Consumption by Type

Natural Gas Consumption by End Use

Source: U.S. Energy Information Administration
Natural Gas Inventory

Working natural gas in underground storage

billion cubic feet

Source: Form EIA-912, "Weekly Underground Natural Gas Storage Report"
Ample natural gas supply is adequate to meet growth in both export and domestic markets.

Figure MT-43. Natural gas production, consumption, and net imports and exports in the Reference case, 1990–2040 (trillion cubic feet)

History | 2015 | Projections
---|---|---

- **Net exports, 2040 (21%)**
- **Total production**
- **Net imports, 2014 (4%)**
- **Total consumption**

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Natural Gas Exports

U.S. natural gas production will soon exceed consumption, making the United States a net exporter

U.S. energy production and consumption (quadrillion Btu)

- LNG ≈ 2.0 Bcf/day (Cheniere – Sabine River Pass, LA)
- Mexico ≈ 4.0 Bcf/day (2018 Projection ≈ 8.0 Bcf/day)

Source: EIA, Annual Energy Outlook 2016
Projected U.S. natural gas exports reflect the spread between domestic natural gas prices and world energy prices

U.S. natural gas imports and exports

<table>
<thead>
<tr>
<th></th>
<th>2015</th>
<th>Reference</th>
<th>High Oil and Gas Resource and Technology</th>
<th>2015</th>
<th>Low Oil Price</th>
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<td>trillion cubic feet</td>
<td></td>
<td>History</td>
<td>Reference</td>
<td>Projections</td>
<td>Projections</td>
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</tr>
<tr>
<td>2010</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>-20</td>
</tr>
<tr>
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<td>0</td>
<td>4</td>
<td>4</td>
<td>0</td>
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<td>2040</td>
<td>0</td>
<td>0</td>
<td>16</td>
<td>16</td>
<td>20</td>
</tr>
</tbody>
</table>

- **Alaska LNG exports**
- **Pipeline exports to Canada**
- **Pipeline imports from Canada**
- **Lower 48 states LNG exports**
- **Pipeline exports to Mexico**

Source: EIA, Annual Energy Outlook 2016
LNG Exports

- Liquefied Natural Gas
  - Liquefaction - natural gas cooled to -260 Degrees Fahrenheit
    - This reduces the volume by over 600 times making transportation & storage easier.
    - 1 ton of LNG = 47 MMBtu
    - One ocean-going tanker = ~ 3.0 Bcf natural gas
  - Re-gasification
  - Heat-up gas for pipeline transportation
LNG Exports

- Kenai, AK
  - Conoco-Phillips Liquefaction/Export terminal
  - 200K MMBtu/day capacity
- “Virtual” exports *aka*, “re-exports”
  - US to Mexico: LNG delivered by truck
  - Re-sale of tanker loads bound for US
  - Re-sale of stored LNG
North American LNG Import/Export Terminals

Approved

Import Terminals

U.S.

APPROVED - UNDER CONSTRUCTION - FERC
1. Corpus Christi, TX: 0.4 Bcf/d (Cheniere - Corpus Christi LNG) (CP12-507)
2. Salina, PR: 0.6 Bcf/d (Aguirre Offshore GasPort, LLC) (CP13-193)

APPROVED - NOT UNDER CONSTRUCTION - FERC
3. Gulf of Mexico: 1.0 Bcf/d (Main Pass McMoRan Exp.)
4. Gulf of Mexico: 1.4 Bcf/d (TORP Technology-Bienville LNG)

Export Terminals

U.S.

APPROVED - UNDER CONSTRUCTION - FERC
5. Sabine, LA: 0.7 Bcf/d (Cheniere/Sabine Pass LNG) (CP11-72 & CP14-12)
6. Hackberry, LA: 2.1 Bcf/d (Sempra-Cameron LNG) (CP13-25)
7. Freeport, TX: 2.14 Bcf/d (Freeport LNG Dev/Freeport LNG Expansion/FLNG Liquefaction) (CP12-509) (CP15-518)
8. Cove Point, MD: 0.82 Bcf/d (Dominion-Cove Point LNG) (CP13-113)
9. Corpus Christi, TX: 2.14 Bcf/d (Cheniere - Corpus Christi LNG) (CP12-507)
10. Sabine Pass, LA: 1.40 Bcf/d (Sabine Pass Liquefaction) (CP13-552)
11. Elba Island, GA: 0.35 Bcf/d (Southern LNG Company) (CP14-103)

APPROVED - NOT UNDER CONSTRUCTION - FERC
12. Lake Charles, LA: 2.2 Bcf/d (Southern Union - Lake Charles LNG) (CP14-120)
13. Lake Charles, LA: 1.08 Bcf/d (Magnolia LNG) (CP14-347)
14. Hackberry, LA: 1.41 Bcf/d (Sempra-Cameron LNG) (CP15-560)
15. Sabine Pass, TX: 2.1 Bcf/d (ExxonMobil - Golden Pass) (CP14-517)

Canada

APPROVED - NOT UNDER CONSTRUCTION
16. Port Hawkesbury, NS: 0.5 Bcf/d (Bear Head LNG)
17. Kitimat, BC: 3.23 Bcf/d (LNG Canada)
18. Squamish, BC: 0.29 Bcf/d (Woodfibre LNG Ltd)
19. Prince Rupert Island, BC: 2.74 Bcf/d (Pacific Northwest LNG)

★ Train 5 & 6 with Train 5 under construction
Cheniere Energy, Inc.
Sabine Pass
Liquefaction Facility
Cheniere – Sabine Pass LNG facility

- (2) initial liquefaction trains
- (4) additional by 2017
- Initial capacity = 1.5 Bcfd
- Design capacity = 4.0 Bcfd
- 02/24/16: First LNG shipment heads for Brazil
  - *Asia Vision* ≈ 3.0 Bcf
  - US “net” exporter for a day (LNG/Canada/Mexico)
Loading of the first cargo at the Sabine Pass LNG Terminal - February 2016
Questions?