Estimated domestic crude oil production in EIA’s Weekly Petroleum Status Report (WPSR)

January 29, 2018 | Washington, DC

By
Robert Merriam, Office Director, Petroleum and Biofuels Statistics
John Staub, Office Director, Petroleum, Natural Gas, and Biofuels Analysis
Key takeaways

• Estimating crude oil production is a necessary element to assess weekly U.S. crude oil supply/demand balances

• Collecting weekly crude oil production data from operators is not feasible

• Estimating weekly national-level production volumes is complicated

• Estimates are driven by EIA’s Short-Term Energy Outlook (STEO) model

• Track record compared to EIA’s monthly production (survey-based) data is quite good
Crude oil production estimates are necessary for assessing weekly U.S. crude oil balances

- EIA’s weekly (and monthly) petroleum reports balance the disposition and supply of crude oil
  - Refinery crude oil inputs (collected on EIA-800 survey)
  - Crude oil exports (estimated using U.S. Customs data)
  - Crude oil imports (collected on EIA-804 survey)
  - Crude oil inventories (collected on EIA-800 and EIA-803 surveys)
  - Domestic crude oil production (estimated)

- These supply and disposition elements are inter-related

- The degree to which all these elements fit is manifested in EIA’s crude oil adjustment
U.S. crude oil production has become an important component of the supply/disposition balance

- EIA's crude oil balance is represented as:

<table>
<thead>
<tr>
<th>U.S. production</th>
<th>Imports</th>
<th>Inventory change</th>
<th>Refinery crude runs</th>
<th>Exports</th>
<th>Adjustment</th>
</tr>
</thead>
</table>

- U.S. production has become a 9+ million barrel per day piece of this puzzle
- Massive volumes of data reportedmodeled. How well does it all fit?
  - U.S. Production: 9.7 million barrels per day (b/d)
  - Imports: 7.5 million b/d
  - Inventories: 400 million barrels
  - Refinery Runs: 17 million b/d
  - Exports: 1 million b/d

- The adjustment quantifies the cumulative uncertainty surrounding these elements and typically is less than 2% of disposition
Collecting weekly crude oil production data is not feasible

- WPSR respondents report their data on Monday for the preceding Friday’s weekly activity (i.e., two business days to turn around reports to EIA)

- Operators (roughly 12,000) and states are challenged to provide accurate reports for their monthly activity on the EIA-914 survey that is due 40 days after the month’s end

- It’s simply not feasible to get accurate data from these sources within the WPSR reporting window

- As a result, EIA uses the best available data we have to estimate current production
Estimating real-time U.S. production volumes is its own challenge

- Roughly 1.2 million current wells to account for across the country

- Production from these wells is driven by many factors
  - Multiple plays/regions with different characteristics
  - Changes in rig counts
  - New well initial production rates
  - Varying decline rates
  - Weather
  - Individual producers’ specific operating factors and economic drivers

- There is no comprehensive source of real-time data that takes all of these factors into account
WPSR’s estimate of U.S. production has three components

- **Alaska:** volumes reported daily by the state
  - Represents ~5% of total U.S. crude oil production
  - Estimated from deliveries to TAPS from the North Slope with lagged estimates for South Alaska production

- **Federal Gulf of Mexico:** STEO-driven estimates
  - Represents ~15-20% of total U.S. crude oil production
  - STEO forecast takes into account current and announced project start dates
  - Supplemented by updates from Bureau of Safety and Environmental Enforcement during times of disruptions (weather, operational issues, etc.)

- **Lower 48 States:** STEO-driven estimates
  - Represents ~75-80% of total U.S. crude oil production
  - STEO forecast takes into account WTI crude oil prices, rig counts, DrillingInfo intel, FracFocus completions, latest EIA-914, Drilling Productivity Report (DPR), industry financial filings/trade press, etc.
An explanation of the STEO crude oil production model

• Webinar was held on November 16, 2017

• Slides are available here:

  https://www.eia.gov/petroleum/workshop/crude_production
Brief overview of how STEO model forecast provides the WPSR weekly U.S. crude oil production estimate

- Most recent PSM month: October 9.64 mmbd
- STEO forecast for previous month(s):
  - November 9.87 mmbd
  - December 9.91 mmbd
- STEO forecast for current month: January 9.94 mmbd
- STEO forecast for next month: February 10.05 mmbd

Interpolate between January and February STEO values:
- January 3rd week 9.97 mmbd
- January 4th week 10.0 mmbd
- February 1st week 10.02 mmbd
- February 2nd week 10.05 mmbd

If the February STEO doesn’t change, these would be the weekly reported volumes:
- WPSR re-benched same week next STEO released (Feb. 6th) 10.?? mmbd

If the PSM value for November is substantially different than STEO forecast for November, then…
EIA forecasted 1.5 million b/d of new production in December 2017 from wells that started producing in Sept. through Dec. 2017

U.S. crude oil production million barrels per day

- Production from new wells Sept. through Dec.
- Production from legacy wells

Source: EIA Short-Term Energy Outlook, November 2017
WPSR crude production estimates are later evaluated compared with EIA’s monthly crude production survey data

• EIA-914 monthly survey is the most comprehensive and reliable estimate of U.S. crude oil production
  – Foundation for our monthly volumes reported in the Petroleum Supply Monthly (PSM)
  – Combination of operator-reported sample and state agency-provided data
  – Lagged two months (November operations to be published in January PSM)
  – Subject to small revisions for several months as additional data is provided to EIA

• Used to assess historic results of weekly estimates

• Used to re-benchmark weekly estimates going forward
Comparison of results from January 2016 to October 2017

- Since January 2016, EIA's weekly production estimates have typically ranged within 1 – 3% of Petroleum Supply Monthly data.
  - Average difference: 1.3% (absolute value)
  - Average difference -0.3% (simple average)
  - Largest difference: 3.7% (October 2017 – partially due to weather disruptions)
- WPSR estimates and PSM data showed same directional trend in 16 of 22 previous months.

Weekly U.S. Crude Oil Production Estimates
January 29, 2018

<table>
<thead>
<tr>
<th>Month</th>
<th>PSM</th>
<th>PSM month on month change</th>
<th>MFW</th>
<th>MFW month on month change</th>
<th>PSM and MFW trend the same?</th>
<th>% diff</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan-16</td>
<td>9,180</td>
<td></td>
<td>9,221</td>
<td></td>
<td></td>
<td>0%</td>
</tr>
<tr>
<td>Feb-16</td>
<td>9,100</td>
<td>-80</td>
<td>9,112</td>
<td>-109</td>
<td>yes</td>
<td>0%</td>
</tr>
<tr>
<td>Mar-16</td>
<td>9,128</td>
<td>28</td>
<td>9,038</td>
<td>-74</td>
<td>-1%</td>
<td></td>
</tr>
<tr>
<td>Apr-16</td>
<td>8,900</td>
<td>-228</td>
<td>8,915</td>
<td>-123</td>
<td>0%</td>
<td></td>
</tr>
<tr>
<td>May-16</td>
<td>8,853</td>
<td>-47</td>
<td>8,767</td>
<td>-148</td>
<td>-1%</td>
<td></td>
</tr>
<tr>
<td>Jun-16</td>
<td>8,696</td>
<td>-157</td>
<td>8,620</td>
<td>-147</td>
<td>yes</td>
<td>-1%</td>
</tr>
<tr>
<td>Jul-16</td>
<td>8,674</td>
<td>-22</td>
<td>8,464</td>
<td>-136</td>
<td>yes</td>
<td>-2%</td>
</tr>
<tr>
<td>Aug-16</td>
<td>8,709</td>
<td>35</td>
<td>8,515</td>
<td>31</td>
<td>yes</td>
<td>-2%</td>
</tr>
<tr>
<td>Sep-16</td>
<td>8,545</td>
<td>-164</td>
<td>8,490</td>
<td>-25</td>
<td>yes</td>
<td>-1%</td>
</tr>
<tr>
<td>Oct-16</td>
<td>8,784</td>
<td>239</td>
<td>8,513</td>
<td>23</td>
<td>yes</td>
<td>-3%</td>
</tr>
<tr>
<td>Nov-16</td>
<td>8,859</td>
<td>85</td>
<td>8,692</td>
<td>179</td>
<td>yes</td>
<td>-2%</td>
</tr>
<tr>
<td>Dec-16</td>
<td>8,768</td>
<td>-101</td>
<td>8,788</td>
<td>96</td>
<td>0%</td>
<td></td>
</tr>
<tr>
<td>Jan-17</td>
<td>8,851</td>
<td>83</td>
<td>8,947</td>
<td>159</td>
<td>yes</td>
<td>1%</td>
</tr>
<tr>
<td>Feb-17</td>
<td>9,070</td>
<td>219</td>
<td>9,017</td>
<td>70</td>
<td>yes</td>
<td>1%</td>
</tr>
<tr>
<td>Mar-17</td>
<td>9,131</td>
<td>61</td>
<td>9,145</td>
<td>128</td>
<td>yes</td>
<td>0%</td>
</tr>
<tr>
<td>Apr-17</td>
<td>9,110</td>
<td>-21</td>
<td>9,287</td>
<td>122</td>
<td>yes</td>
<td>2%</td>
</tr>
<tr>
<td>May-17</td>
<td>9,169</td>
<td>59</td>
<td>9,320</td>
<td>53</td>
<td>yes</td>
<td>2%</td>
</tr>
<tr>
<td>Jun-17</td>
<td>9,097</td>
<td>-72</td>
<td>9,320</td>
<td>0</td>
<td>2%</td>
<td></td>
</tr>
<tr>
<td>Jul-17</td>
<td>9,238</td>
<td>141</td>
<td>9,418</td>
<td>98</td>
<td>yes</td>
<td>2%</td>
</tr>
<tr>
<td>Aug-17</td>
<td>9,203</td>
<td>-35</td>
<td>9,344</td>
<td>-74</td>
<td>yes</td>
<td>2%</td>
</tr>
<tr>
<td>Sep-17</td>
<td>9,481</td>
<td>278</td>
<td>9,492</td>
<td>148</td>
<td>yes</td>
<td>0%</td>
</tr>
<tr>
<td>Oct-17</td>
<td>9,637</td>
<td>156</td>
<td>9,283</td>
<td>-209</td>
<td>-4%</td>
<td></td>
</tr>
</tbody>
</table>
Next steps

• EIA plans to show weekly U.S. production estimates rounded to nearest 100,000 barrels
  – for example: 9.741 million b/d estimate would be published as 9.700 million b/d
  – Still show Alaska production as currently reported
  – Round Lower 48 to nearest 100,000 barrels

• EIA will continue to benchmark weekly estimates against PSM volumes and make continuous improvements to the STEO model

• We are always interested in ideas and data sources that can help us sharpen our estimates
For more information

Short-Term Energy Outlook | www.eia.gov/steo

EIA-914 | www.eia.gov/petroleum/production

Drilling Productivity Report | www.eia.gov/petroleum/drilling

TWIP | www.eia.gov/petroleum/weekly

Today in Energy | www.eia.gov/todayinenergy