Methodology for Monthly Crude Oil Production Estimates

Beginning with the December 31, 2015, release of October 2015 crude oil production estimates based on data collected on Form EIA-914, this methodology applies only to the following states: Alabama, Arizona, Federal Pacific Offshore, Florida, Illinois, Indiana, Kentucky, Maryland, Michigan, Mississippi, Missouri, Nebraska, Nevada, New York, Oregon, South Dakota, Tennessee, and Virginia.

Executive summary

The U.S. Energy Information Administration (EIA) relies on data from state and other federal agencies and does not currently collect survey data directly from crude oil producers.

Summarizing the estimation process in terms of percent of U.S. production:

- 20% is based on state agency data, including North Dakota and Alaska. Alaska, North Dakota, and a few small-volume states provide accurate data in time to meet EIA's publication schedule.
- 33% (Texas) is based on reported state data from third party sources. EIA uses data from a third-party data vendor that combines two data files from the Texas Railroad Commission.
- 17% (federal offshore Gulf of Mexico) is based on information from U.S. Department of the Interior's Bureau of Safety and Environmental Enforcement (BSEE). EIA uses three data series from the U.S. Department of the Interior for production from the federal Gulf of Mexico, and sometimes adjusts data to account for deficiencies.
- 30% of the production estimates are based on the Average Lagged-Ratio (ALR) methodology. EIA estimates monthly production for most states by modeling the relationship between official data from the state agency and volume data reported on the EIA-182 Domestic Crude Oil First Purchase Report, which collects both prices and volumes.

When hurricanes or other extreme events affect a state/area, EIA may use expert judgment or empirical methods based on industry knowledge, weather data, and information obtained from the companies, federal or state agencies, and trade press. EIA also uses expert judgment for states that only provide data annually or sporadically.

EIA plans to initiate a survey of crude oil producers in 2015, which will provide more accurate data. However, alternative data sources will still be examined where available, and there may still be a role for expert judgment/empirical estimation.

Background

Since 1981, EIA has estimated annual and monthly U.S. crude oil production by states and regions (i.e., U.S. Petroleum Administration for Defense Districts or PADDs) as part of its comprehensive information program.

EIA publishes its monthly and annual U.S. crude oil production estimates in several periodic reports, including the *Petroleum Supply Monthly*, *Petroleum Supply Annual*, *Annual Energy Review*, and *Monthly Energy Review*. These estimates are also included in EIA's webpage for petroleum data. [1]

EIA initially estimates and publishes crude oil production with a two-month lag. The most recent month for which estimates are reported is referred to as the "reporting month." For example, in April (the "calendar month"), EIA reports estimated production for February (the reporting month). At this time EIA also updates previously-estimated reporting months.

This paper documents EIA's use of data sources, estimation techniques, and revision policies for monthly crude oil production estimates. Throughout this report crude oil includes lease condensate.

Data sources

EIA's estimates of crude oil production are based on several sources, including administrative data reported by state and Federal regulatory agencies and data from the EIA-182 survey of crude oil purchase volumes, and some administrative data from state agencies that is organized for EIA by a commercial data vendor.

The production data EIA uses to make its estimates come from:

- State-government agencies that collect administrative data from oil and gas operators for tax, regulatory, or environmental purposes. EIA collects data directly from state agency's websites, by emails, and phone calls. For the majority of states it can take from a few months to a few years for their reported data to become complete, because of delays in producers' reporting to the states, reconciliation of data discrepancies between the operators and the state, and delays in state processing of the data.
- Drilling Info (DI) production data. In addition to state-reported data for Texas, EIA uses data that have been collected by the Texas Railroad Commission (TRR), but organized by a commercial data vendor, DI. DI assembles production data that state agencies have collected from production operators. For Texas, DI coverage includes pending data that have not yet been fully processed by the TRR. Texas accounts for approximately 33% of total national production.
- The U.S. Department of the Interior's Office of Natural Resources Revenue (ONRR). ONRR is responsible for management of all revenues associated with both federal offshore and onshore mineral leases and collects oil and gas production data from operators for Federal offshore areas on the Oil and Gas Operations Reports (OGOR-A). The Bureau of Safety and Environmental Enforcement (BSEE) provides these data on its website. BSEE also collects production data through its own Liquid Verification System (LVS) to gain more timely production data and as a check to what operators report on the OGOR-A. LVS data are published on the BSEE website at the end of each month, but preliminary data are provided to EIA about two weeks earlier. LVS

[1] EIA also estimates weekly U.S. crude oil production, published in the Weekly Petroleum Status Report (WPSR). The weekly estimates are based on daily production data for Alaska, and EIA projections, published monthly in the Short Term Energy Outlook.

data are usually complete in a month or two while the OGOR-A data are complete in six to eight months. EIA uses both the OGOR-A and the LVS data to estimate production in Federal offshore Gulf of Mexico, which accounts for approximately 17% of total national production.

- The EIA-182 Domestic Crude Oil First Purchase Report. The purpose of this survey of first purchasers is to estimate the wellhead price of crude oil, not wellhead production. This survey does not provide total production volumes. Nevertheless, these data tend to be among the timeliest data available to EIA and can be a reliable indicator of production trends for states that do not provide workable production data, a feature discussed again in connection with the estimation techniques below.

Estimation techniques

State and other federal agencies release oil production data according to widely varying schedules related to the underlying purposes and processes for the administrative data. In order to use these data in the regular development and publication of production estimates, EIA applies a standard cutoff date for gathering and estimating each month's oil production data, typically at mid-month. In addition, lags in these state and federal data collection processes mean that the data are generally incomplete and therefore not publishable at that time and so estimates are needed for those months with incomplete data. Consequently, EIA estimates crude oil production for many states and the federal offshore in each release of its monthly crude oil production data. A few states like Alaska, North Dakota, and Kentucky report complete production data (i.e., no further significant revision of the data for that month is made by the state) so no estimation is necessary. These states account for approximately 20% of total national production. Maryland and Oregon produce only natural gas so EIA reports no oil production for these two states. Estimates for all other producing states are based on one or more of the following estimation methods:

- Average lagged-ratio
- Alternative estimates

Summarizing the estimation process in terms of percent of U.S. production:

- 20% uses state agency data, including North Dakota and Alaska
- 30% based on Average Lagged-Ratio estimates
- 33% in Texas, with sources explained below
- 17% federal offshore water in Gulf of Mexico, with sources explained below

Alternative data and estimates

Federal Gulf of Mexico

EIA reports data from two sources from the Department of the Interior (DOI) for federal offshore crude oil production in the Gulf of Mexico, which accounts for approximately 17% of total national production.

Data from DOI's Liquid Verification System (LVS) is used for the current reporting month and five prior months, and data from DOI's OGOR-A system is used for prior months.[2]

EIA's primary data source for Gulf of Mexico production data is the Oil and Gas Operations Report (OGOR-A), published by the DOI's Bureau of Safety and Environmental Enforcement (BSEE). Oil and gas operators submit well-level OGOR-A forms to the DOI's Office of Natural Resources Revenue (ONRR) and data are processed there before being sent to the BSEE for publication. OGOR-A forms that fail initial edit checks are placed in a suspended file until the issues are resolved. EIA downloads and processes both the accepted and suspended data, eliminates duplicates, deletes "load oil" (injected into a well for artificial lift or paraffin removal) and production from state leases or the state portion of fields spanning the boundary between state and federal waters.

The OGOR-A data from BSEE (including the suspended data) have a lag of about six months. Consequently, EIA uses production data from the Liquid Verification System (LVS) for the current reporting period and five prior months.

LVS data are metered sales volumes gathered and measured by BSEE at numerous pipeline-metering points in the Gulf of Mexico region, not data that are reported by operators. LVS data for a particular report month are usually sufficiently complete in a month or two (although small revisions for any month typically occur for three or four months) that they are used with no adjustment as a proxy for Gulf of Mexico production until complete OGOR-A data are available.

Texas

EIA estimates Texas production (more than one-third of total national production) based on data published by the Texas Railroad Commission (RRC), but aggregated by a third-party data vendor, Drilling Info (DI). RRC data released on its website excludes the "pending data file," but RRC makes those data available to DI. Production estimates based on data that include the pending data file are better predictors of final data reported by the RRC. So EIA's production estimates for Texas are based on the DI data, which include the pending data file. The pending data file consists of RRC data that are not included in RRC published (accepted) data because oil and gas operators have not filed all of the required reports (for example, on well completions) with the RRC or the RRC has not processed the reports. The accepted file is also incomplete in recent months because of discrepancies in filed reports waiting on resolution. When reports in the pending data file are complete and processed, they are moved into the accepted data file. Final data from the RRC are usually available in two years after the first report.

RRC data assembled by DI (which includes the pending data file) have a lag of about five months while the RRC data posted on the RRC website have a lag of about two years. The lag for DI Texas data is determined using the same approach used in the ALR methodology (explained later). The short-term trend is computed for 11 months prior to the lag period; i.e. the average month-to-month change from lag L to L11 (12 months total).This short-term trend is then extrapolated throughout the lag period. For

[2]The ALR methodology, described later, is not used for the Gulf of Mexico production because of the low coverage of the Gulf of Mexico provided by the EIA-182 survey used in the ALR methodology.

example, if the reporting month is February 2014 and the lag is five months, the average month-to-month change in RRC data (compiled by DI) is the average month to month change (trend) between October 2012 and September 2013. If the average change is, for example, +50,000 barrels per day, then to estimate October 2013 production, 50,000 barrels per day are added to the September 2013 volume. The production for the next month is calculated by adding 50,000 barrels per day to the previous month estimate, and so on, until the estimate for the reporting month is calculated in this case, February 2014. In other words, each subsequent month's estimate during the lag period is based on adding 50,000 barrels a day to the previous month's estimate.

As long as Texas production continues to grow relatively uniformly, this estimation method will yield reasonable results. However, if other production indicators, such as the Drilling Productivity Report or the trend in the EIA-182 data are inconsistent with uniform growth, another method will be chosen. So, for the April 2015 estimate, the month-to-month changes in the EIA-182 survey volumes are used for the lag period. The EIA-182 data are more current than the DI data, so a change in the trend should be picked up several months before it would be using the trend described in the paragraph above.

Average lagged-ratio (ALR) estimation

EIA uses the averaged lagged ratio (ALR) method to estimate monthly oil production in most states. Of the 30 states (including federal offshore) for which monthly estimates are generated, the ALR method is used to estimate production for about 26 states accounting for approximately 30% of total national production.

The ALR method is a three-step process:

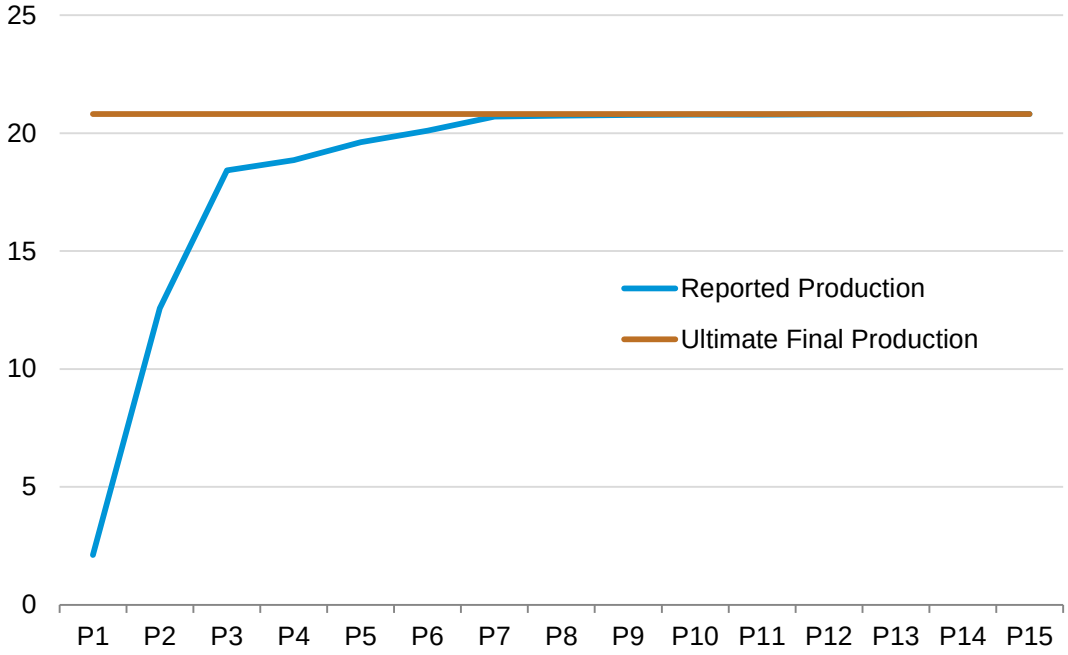
- Step 1. The lag time, measured in months, is determined for each state and federal offshore area. This is the number of months that it usually takes for data to be within 0.5% of the final value.
- Step 2. An average-lagged ratio (ALR) for each state is calculated where the ratio is the state reported data divided by the EIA-182 first purchase data.
- Step 3. State-level production is estimated. The state-level production estimate is calculated by multiplying the ALR by the EIA-182 first purchase production data. EIA uses this estimate for the publication month and also for the prior months in the lag period.

Average lagged-ratio (ALR) step one – determine the lag time

State and Federal offshore lag times vary considerably. Most states and Federal agencies require operators to report production in 30 to 75 days after the month of production. Additional delays are caused by incomplete and late reporting by operators, processing at the state agencies, discrepancy resolution between the state and the operators, and submission of revisions and corrections. States release incomplete monthly production data, which are then usually revised upward in following months, until the coverage of the data is complete. Figure 1 shows a typical revision pattern, with the volumes increasing rapidly in the first few months and then slowly plateauing near the final value.

Figure 1. Reported Michigan production for December 2012 over the period February 2013-April 2014

thousand barrels per day



Sources: Michigan Department of Environmental Quality, state-reported production data for December 2012, reported over the period February 2013 to April 2014.

The X-axis labels on the graph represent the number of times a production volume has been reported for December 2012 production. P_1 is the first reported production volume for December 2012, released in February 2013. P_2 is the second reported volume for December 2012 (or the first revision), released in March 2013. P_3 is the third reported volume for December 2012 (or the second revision), released in April 2013, and so on through P_{15} (or through 14 revisions).

Examining Figure 1, it appears that revisions become minor somewhere between P7 through P10. Where, exactly, isn't obvious from the graph, but can be determined by the underlying numbers. And, since the pattern varies somewhat month-to-month, EIA uses several cycles of data, instead of only one.

Each month, EIA receives both the current month's production and revised historical production data from the state agencies, and archives these data. In addition to storing the P values themselves, these monthly vintage production reports are used to calculate ratios of reported production changes. These are called P-to-P ratios and are denoted by

$$Incremental\ P\ to\ P\ Ratio_{n,state} = \frac{P_{n+1,state}}{P_{n,state}}$$

Where:

$P_{n,state}$ is the production volume for a given month and state at reporting period n, and n+1 through n+X are consecutive reporting periods of revised production. For example, the first four values plotted in

figure 1 are 2.11, 12.57, 18.42, and 19.62. So P_2/P_1 is 12.57/2.11 = 5.96; P_3/P_2 is 18.42/12.57 = 1.47; and P_4/P_3 is 19.62/18.42 = 1.07.

These P-to-P ratios are calculated for each state each month. So, for Michigan, besides having data for December 2012, we also have P-to-P ratios for January 2013, February 2013, etc. These are summarized by calculating the six-month median incremental P-to-P ratios[3] for each reporting period (beginning at n=1) using the six[4] previously reported months (i-1 through i-6). Medians for the Michigan example are listed in Table 1 column 3, for each month in column 1.The calculation of the median incremental P-to-P ratios is described by the following equation.

$$Median\ P-to-P\ Ratio_{n,state} = Median\left[\frac{P_{n+1,state}}{P_{n,state}}\right]_{i-n}^{i-(n+5)}$$

Where:

P_n = reported production for a given month and state, P_1 through P_X, from the first report of production through the final production report (X)
n = the production report number, 1<n<X
i = the time of the most recent state-reported production for state

For the Michigan December 2012 example, the series of six-month median ratios may look like column 3 in Table 1, "Median P-to-P Ratio" in which P_3/P_2 is 1.156, P_4/P_3 is 1.032, … P_{16}/P_{15} is 1.0000. In other words, P_3 is usually 15.6% higher than P_2, and P_4 3.2% higher than P_3, etc. These ratios approach one as the P values approach their final value. When .9999 < ratio < 1.0001, the data are considered final. However, instead of using the lag associated with this (lag 15 for the Michigan example) we are willing to accept the point where we are within 0.5% of this value. In order to do that, we need to compute the net or compound change.

The P-to-P ratios represent the expected change between sequential months, but we also need to know how close we are to the final value. This expected compound change is computed by taking the product of the median values, starting with the final value.

$$Product\ of\ Median\ P\ to\ P\ Ratios_{n,state} = \prod Median\left[\left(\frac{P_{n+1,state}}{P_{n,state}}\right)\right]_{n}^{n=x}$$

Where:

P_n = reported production for a given month and state, P_1 through P_X, from the first report of production through the final production report
n = the production report number, 1<n<X
i = the time of the latest reported production report for P_n

[3] The ratios can vary significantly, so median values are used instead of mean values to diminish the effect of outlying values.
[4] Confining the calculation to six periods developed over time and incorporates historic information without under-weighting the most recent past. Alternatives have been tried over the years and found less desirable: 12 periods tend to overwhelm recent changes with the long-term trend, while fewer than 6 periods tends to result in too much volatility.

For the Michigan example, the fourth column of Table 1 shows the product of all the ratios from the series of estimates for a single state and month, and is calculated from the bottom up. Each product of the median ratios represents the total net change in reported volume between a given estimate through the final reported volume. For Michigan, the product of the median ratios for the eighth estimate for is 1.0045, which is calculated as 1.0019 * 1.0013 * 1.0002 * 1.0004 * 1.0002 * 1.0003 * 1.0001 * 1.0000. This product indicates that the volume for the eighth production estimate historically is revised upward by a cumulative 0.45%. This satisfies the criteria that the reported values are expected to be within 0.5% of the final, and we use this lag plus one. Therefore, the six-month Average Lag Ratio (ALR) used to calculate the Michigan estimates would be calculated using EIA-182 data and state data from the ninth through fourteenth production estimates. The resulting lag period is nine months.

Table 1. Michigan Data Example: Determining Lag Months for Average Lagged Ratio Crude Oil Production Estimate

Monthly estimate(1=current)	P-to-P ratio	Median six-month P-to-P ratios	Product of the median P-to-P Ratios computed from bottom up	
1	P_2 / P_1	20.3131	25.0492	
2	P_3 / P_2	1.1561	1.2332	
3	P_4 / P_3	1.0317	1.0667	
4	P_5 / P_4	1.0257	1.0339	
5	P_6 / P_5	1.0012	1.0081	
6	P_7 / P_6	1.0011	1.0068	
7	P_8 / P_7	1.0012	1.0057	
8	P_9 / P_8	1.0019	1.0045	< Eight plus one is chosen as the lag time, because the product of the median P-to-P ratios of P_9/P_8 to P_{16}/P_{15} is less than or equal to 1.0050—that is, at a lag of eight months the data are within 0.5% of the complete data.
9	P_{10} / P_9	1.0013	1.0026	
10	P_{11} / P_{10}	1.0002	1.0013	
11	P_{12} / P_{11}	1.0004	1.0011	
12	P_{13} / P_{12}	1.0002	1.0007	
13	P_{14} / P_{13}	1.0003	1.0004	
14	P_{15} / P_{14}	1.0001	1.0002	
15	P_{16} / P_{15}	1.0000	1.0001	
16	P_{17}/P_{16}	1.0000	1.0000	

Note: Monthly Estimate 1 means first estimate for the example month; monthly estimate 2 means the second estimate for the example month, and so on. The P-to-P ratio is defined as the ratio of two sequential estimates for Michigan's production for the example month.
Source: U.S. Energy Information Administration.

Alternative procedures have been explored for determining the lag, including simply computing the ratio P_i/P_{final} for each P value, and use the value within 0.5% of the final. The median of these associated lags appears to be close to what is calculated using the above approach in many cases. However, this will not provide current information on revisions expected for the more recent estimates, such as the percent increases represented by the P-to-P ratios.

Average lagged-ratio (ALR) step two – Calculate the ratio

The lag time determined for a given state is used to select the months for which the ratio of state-reported data to EIA-182 First Purchase data will be calculated, the ALR. The ALR is calculated starting with the lag month and the next five earlier months for the six-month Average Lagged-Ratio or ALR.[5]

$$ALR_{i-L,state} = \frac{\sum_{i-L}^{i-L-5}\left(\frac{StateProd_{i,state}}{FP_{i,state}}\right)}{6}$$

Where:

$ALR_{i-L,\,state}$ = Average Lagged Ratio for a particular state and report month i

$StateProd_{i,state}$ = State-reported production for report month i

L= Lag time in months

i = The current or latest report month

$FP_{i=}$ EIA-182 First Purchase data for month i and state

Average lagged-ratio (ALR) step three – Calculate the monthly production estimate

The estimate for each state and federal offshore area in a given month is the product of the EIA-182 First Purchase data for that month, and the ALR. That is, for any state in month i:

$$\text{Estimated Production}_i = FP_i * ALR_{i-L}$$

Where:

FP_i = First Purchase data for month i

In the ALR method the lagged state-reported production chiefly influences the estimated level of production, while the EIA-182 First Purchase data chiefly influence the production trend.

This is the estimation method for most states. Discussion of the exceptions and estimation under other conditions follows.

[5] The average calculated is a simple, unweighted average.

The role of expert judgment

The ALR works reasonably well most of the time, but it is a simplistic model and can produce unreliable results. If the ALR production estimate deviates significantly from the production history because of outages, extreme weather such as hurricanes, or unusual market events, EIA's production estimate for that month and state is adjusted to incorporate additional market information, insight from federal agencies on production outages etc. In these cases, EIA's production estimate for that month and state is based on an analysis of other relevant information such as:

- Reports of new fields/wells
- Maintenance
- Weather/Storms/hurricanes
- Shut-ins, etc.

In addition, expert judgment may also be used in cases where unacceptable ALR estimates are sometimes related to a change in the EIA-182 First Purchase data such as a significant nonresponse, the addition or deletion of a respondent, or an unresolved incorrect response. An issue with either the state-reported data or the EIA-182 First Purchase data for the month when the ALR is calculated can also cause an unacceptable estimate. When this happens, the ALR can be calculated using a different lag time, to avoid the issue. If the issue is with the current month's EIA-182 First Purchase volume, the previous month's estimate may be repeated, or if there is an obvious trend in the production history, the trend may be applied to the previous month's estimate. Occasionally a value may be selected based solely on expert judgment. This may happen for only two or three states in addition to the states discussed below.

Expert judgment methods are routinely used for New York. New York reports production annually with very little change from year to year. So last year's production is used for the current year until the current year's production is available from the state.

Expert judgment is sometimes used for the Gulf of Mexico (GOM) and Pennsylvania.

As mentioned earlier, the LVS data are used for the most recent months in the GOM. Sometimes EIA analysts question the trend in the LVS data for the reporting month and the previous month. BSEE analysts are then consulted for an explanation. Based on discussions with BSEE analysts, the LVS volume may be increased or decreased up to 4% to account for production shut-ins, pipeline outages, or data processing delays.

Pennsylvania reports conventional production annually and nonconventional production semiannually. Because of this reporting schedule, instead of using the ALR estimate, previous state-reported production values are carried forward as current estimates. For example, the annual conventional production may be carried forward and added to the reported semiannual nonconventional production. The conventional production is relatively stable so this is considered a reasonable estimate. (Because a similar reporting schedule was recently put in place in Ohio, current estimates for Ohio use a method similar to Pennsylvania.)

Tabular summary of methods and lags times

EIA's monthly oil production estimates and production history along with the methodology used for each estimate are archived each month. Table 2 presents for reporting month February 2014 a summary of the lag times typically used for each state, and the methods used to estimate crude oil production over the lag period. Lag times can vary slightly from month to month. States that report only annual data will naturally have more variation in their lag times. Lag times can also change if a state's reporting

Table 2. State lags and methods used to estimate oil production, March 2015

		Number of months methodology was used				
State	Total lag time (months)	Average lagged ratio Estimate (months)	Alternative estimate* or expert judgment (months)	LVS data (months)	DI data (months)	March 2015 production (Mbopd)
AK	0					510.94
KY	0					3.82
MD	0					
ND	0					1190.58
OR	0					
AZ	1	1				0.12
FL	1	1				5.28
LA	1		1			176.60
NE	1	1				8.00
PA	1		1			19.65
SD	1	1				4.75
WY	1		1			238.69
AR	2	2				18.26
CO	2	2				303.96
IN	2	2				6.31
KS	2	2				137.70
MO	2	2				0.46
CA	3		3			552.00
FP	3	3				44.31
MI	3	3				17.87
NV	3	3				0.83
OH	3	2	1			70.07
UT	3	3				121.94
AL	4	4				28.42
GOM	4	1		3		1407.17
MS	4	4				66.09

Table 2. State lags and methods used to estimate oil production, March 2015 (cont.)

		Number of months methodology was used				
State	Total lag time (months)	Average lagged ratio Estimate (months)	Alternative estimate* or expert judgment (months)	LVS data (months)	DI data (months)	March 2015 production (Mbopd)
MT	4	4				90.81
VA	4	4				0.03
NM	5	5				412.62
NY	15		15			0.86
TN	15	13	2			0.98
WV	15	15				22.01
TX	24		3		21	3674.60
IL	27		27			24.25
OK	45	14	4		27	371.11

FP=Federal Pacific Offshore. LVS=Liquid Verification System by the Bureau of Safety and Environmental Enforcement (BSEE). DI=Drilling Info. GOM=Gulf of Mexico.

*Estimates by the crude oil production review team (expert judgment) can be made for any month, usually the most recent. Alternative estimates using other data sources can be used for any month and are usually volume data collected on Form EIA-182, or state data from an earlier month. For example, all estimates of Illinois production are aggregate EIA-182 data for the state.

Table 3. State Lags and Methods Used to Estimate Oil Production, March 2015 Sorted by Decreasing Volume

		Number of months methodology was used				
State	Total lag time (months)	Average lagged ratio estimate (months)	Alternative estimate* or expert judgment (months)	LVS data (months)	DI data (months)	March 2015 production (Mbopd)
TX	24		3		21	3674.60
GOM	4	1		3		1407.17
ND	0					1190.58
CA	3		3			552.00
AK	0					510.94
NM	5	5				412.62
OK	45	14	4		27	371.11
CO	2	2				303.96
WY	1		1			238.69
LA	1		1			176.60
KS	2	2				137.70
UT	3	3				121.94
MT	4	4				90.81
OH	3	2	1			70.07
MS	4	4				66.09
FP	3	3				44.31

Table 3. State Lags and Methods Used to Estimate Oil Production, March 2015 Sorted by Decreasing Volume (cont.)

State	Total lag time (months)	Number of months methodology was used: Average lagged ratio estimate (months)	Alternative estimate* or expert judgment (months)	LVS data (months)	DI data (months)	March 2015 production (Mbopd)
AL	4	4				28.42
IL	27		27			24.25
WV	15	15				22.01
PA	1		1			19.65
AR	2	2				18.26
MI	3	3				17.87
NE	1	1				8.00
IN	2	2				6.31
FL	1	1				5.28
SD	1	1				4.75
KY	0					3.82
TN	15	13	2			0.98
NY	15		15			0.86
NV	3	3				0.83
MO	2	2				0.46
AZ	1	1				0.12
VA	4	4				0.03
MD	0					
OR	0					

* Estimates by the crude oil production review team (expert judgment) can be made for any month, usually the most recent. Alternative estimates using other data sources can be used for any month and are usually volume data collected on Form EIA-182, or state data from an earlier month. For example, all estimates of Illinois production are aggregate EIA-182 data for the state.

Sources: State government agencies; the Bureau of Safety and Environmental Enforcement (and predecessor agencies); EIA-182, "Domestic Crude Oil First Purchase Report;" and Drilling Info.

practice changes substantially, for example, in a boom the state's processing may not be able to keep up and so the state's lag time becomes longer. Note that for any lag greater than one, more than one month of history is being estimated, and different methods can be used for some of the months. The particular methods applied can also vary somewhat from month to month.

Table 2 lists the lag time for each state, the time from the current report month to a month when the reported value is within 0.5% of the final reported volume. Table 2 lists four possible estimation methods available to estimate production over the lag time. Two of these make use of alternative data sources, the LVS data and the RRC data organized by DI data. Estimates for the current report month are listed in the table to provide a sense of relative size for each state. Table 3 presents the same information sorted by decreasing volume.

Revision of published estimates

EIA strives to maintain data quality and to ensure that its data are comparable to data released by others, such as state agencies. Different states have very different policies regarding revisions and the reporting of their crude oil production numbers, ranging from revising only once a year to revising as much as several years of past data every month. In order to report the most accurate data, EIA revises its estimated crude oil production every month.

EIA revises monthly oil production each month as far back as the previous two months. Further, once a year, when EIA's Petroleum Supply Annual (PSA) is published, as much as 2 years of monthly data may be replaced with complete state reported data. Most state-reported data become "complete" within this two-year window. Thus, EIA's policy of publishing data revisions for up to roughly two years makes it unlikely that EIA's published data will be out-of-date.