

Drillinginfo DPR

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FundamentalEdge
by drillinginfo

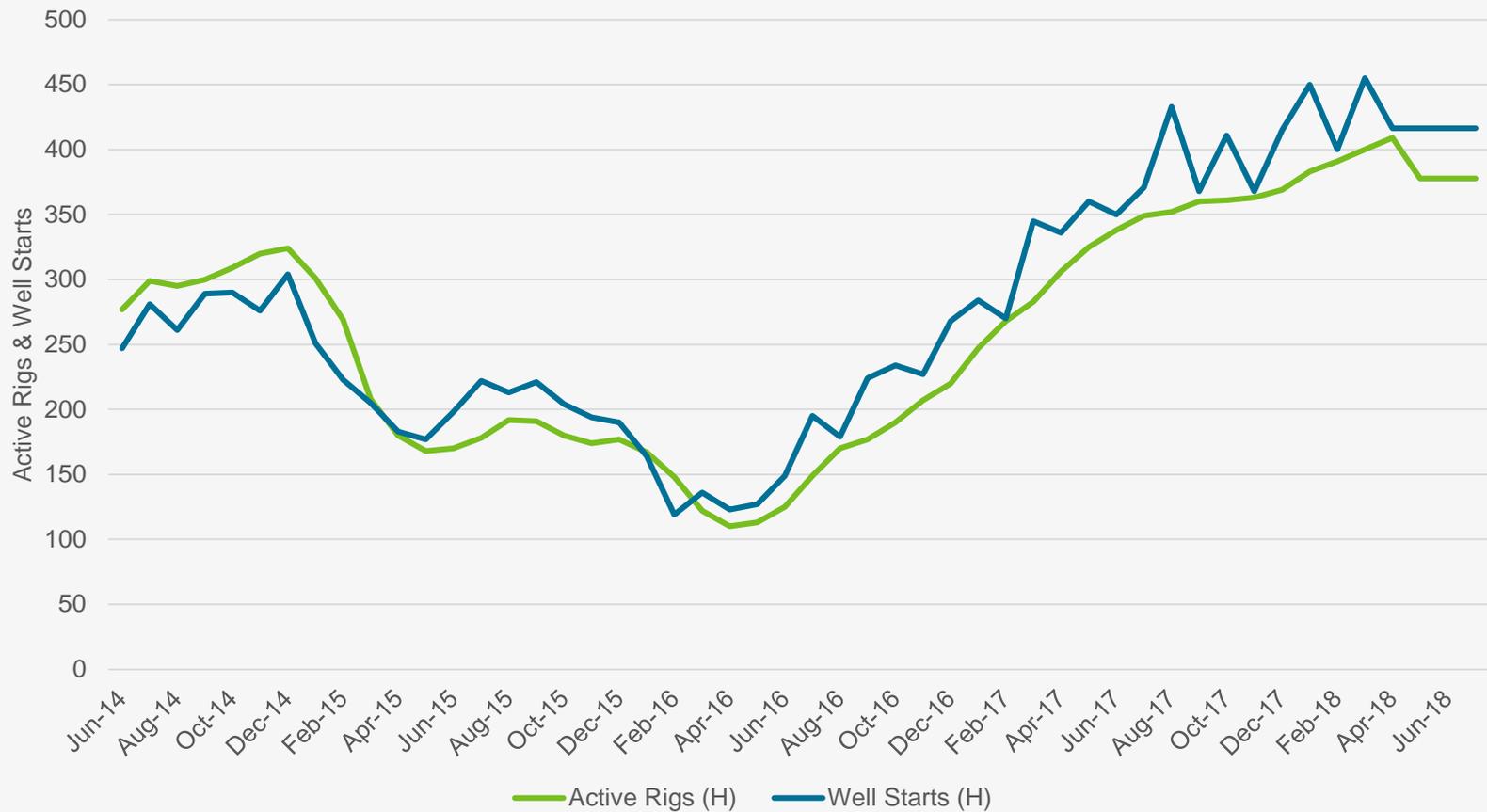
What is the *Drilling Productivity Report*?

- The purpose of the *Drilling Productivity Report* (DPR) is to give a short-term (three month) outlook for oil and gas production from the major shale basins in the country.
- The major shale basins are defined as Anadarko, Appalachia, Eagle Ford, Haynesville, Niobrara, Permian, and Williston. The counties included in the different basin definitions correspond to the same geographic extents as the EIA.
- The EIA's DPR was initiated to provide guidance on short-term production given the lack of up-to-date production information from the state reporting agencies using several different data sources including Drillinginfo (DI). The Drillinginfo *Drilling Productivity Report* (Drillinginfo DPR) uses DI's datasets and some key changes to methodology to provide an alternative short-term forecast for the market's consumption.
- Key differences between EIA and DI's DPR:
 - **Historical production:** both source DI's historical production. However, the determination of the completeness of the state data vs. when projections start varies between the two (e.g. the date that DrillingInfo uses to cut off historical observed data versus the forecast is generally more recent than the EIA DPR forecast starting date). Additionally, DI does not employ a natural gas flow data driven adjustment to historical volumes, instead taking the state reported volumes as the defacto production level. We do this because the state reported volumes are used for the purpose of calculating royalty and tax liabilities, and therefore should be the most accurate data available.
 - **Rig counts, wells drilled, and wells completed:** EIA uses Baker Hughes while DI incorporates proprietary data from GPS tracking units and publicly reported information to more accurately monitor oil and gas drilling rig movements.
 - **Incremental production:** DI's calculation uses a vintage type curve (from wells drilled in the last 12 months) from reported actual well results. EIA calculates incremental volumes per rig by dividing production from new wells by the rig count from the most recent month. The use of a vintage type curve allows for the use of a completion count instead of a rig count.

Permian – Active Rigs and Well Starts

CHART 31

Active Rigs and Well Starts



Source: DI Rig Analytics

Permian – Horizontal Vintage Type Curves

CHART 32

Crude Oil Vintage Curve

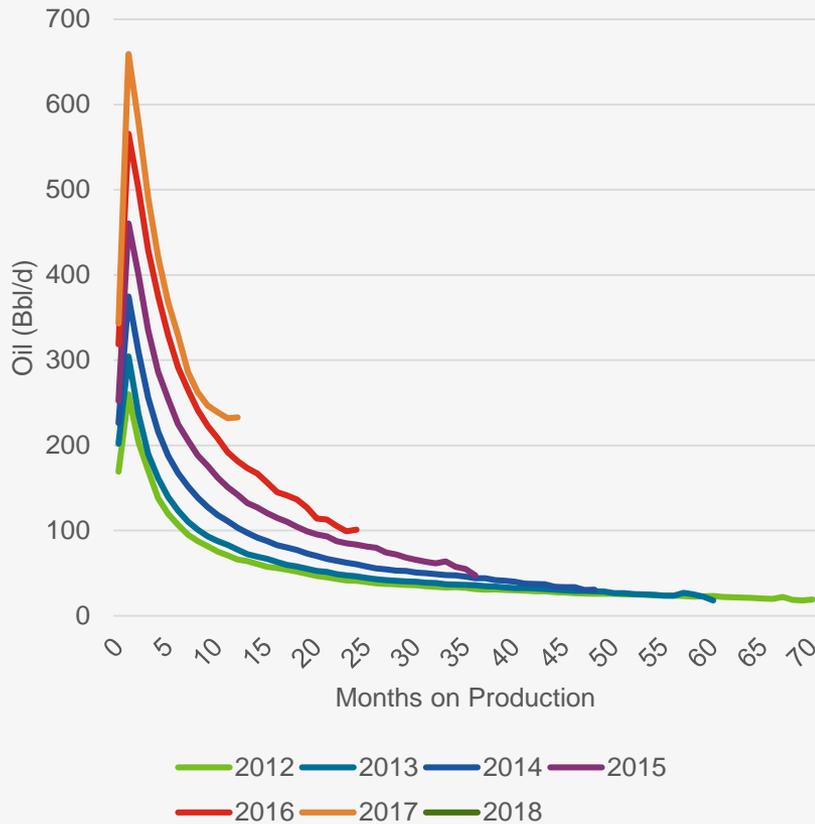
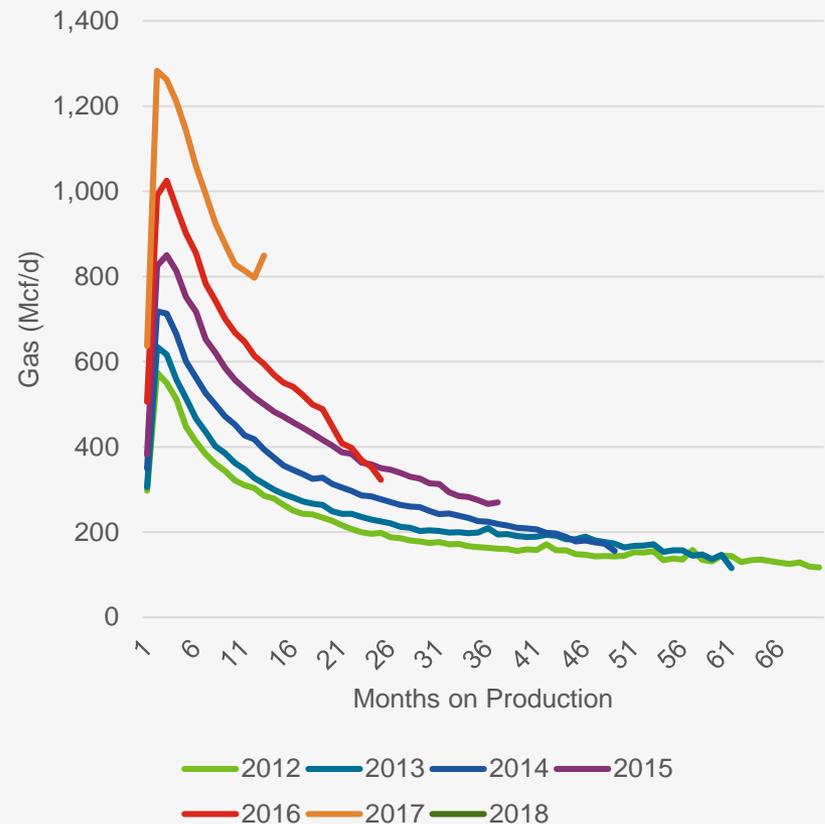


CHART 33

Gross Gas Vintage Curve



Source: DI Web App

Permian – Production Forecast

CHART 34

Crude Production

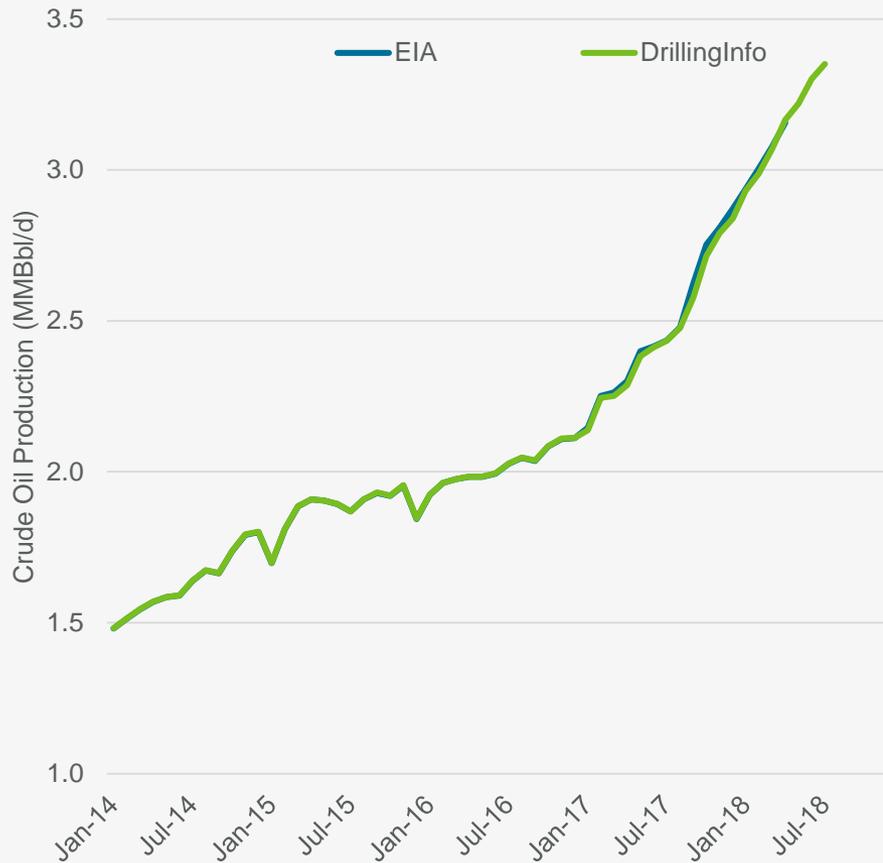
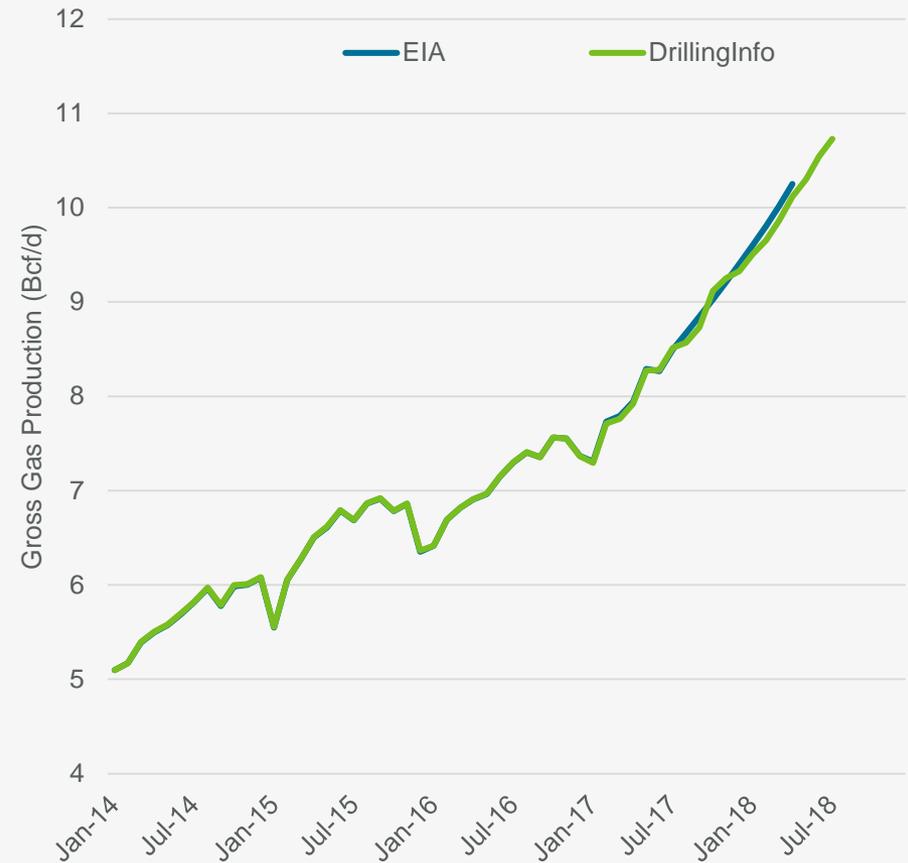


CHART 35

Gross Natural Gas Production



Source: DI ProCast

The purpose of the DPR is to give a short-term (three month) outlook for oil and gas production from the major shale basins in the country. The major shale basins are defined as Anadarko, Appalachia, Eagle Ford, Haynesville, Niobrara, Permian, and Williston. The counties included in the different basin definitions can be found in the data attachment to this report and correspond to the same geographic extents as the EIA. The EIA's DPR was initiated to provide guidance on short-term production given the lack of up-to-date production information from the state reporting agencies using several different data sources including DI. The DI DPR uses DI's datasets and some key changes to methodology to provide an alternative short-term forecast for the market's consumption.

The DI DPR uses DI Rig Analytics to obtain key inputs regarding rig counts and wells drilled. Using monthly active rig counts and well starts, a well starts/active rig/month is calculated for the shale basin for both horizontal wells and vertical/directional wells. The latest six month average for active rigs is used as the count going forward for the purposes of the forecast. The latest six month average for well starts/active rig/month is used as the rate going forward for the purposes of the forecast. Permit type Deepen Below, Deepen Within, Field Transfer, Plug Back, Reclass, Recompletion, & Reenter are not considered. Product description Carbon Dioxide, Disposal, Enhanced Recovery, Gas Storage, Injector, Monitoring Well, Permitted Carbon Dioxide, Permitted Disposal, Permitted Injection, Permitted Water Supply, Salt, Salt Water Disposal, Stratigraphic/Core Test, Water are not considered. If Drilling trajectory is listed as Unknown, the drilling trajectory is assumed to be Horizontal. A three month lag is assumed for the well start to completion lag for horizontal wells. A two month lag is assumed for the well start to completion lag for vertical wells. Active rigs data starts from June 2014 and well starts data starts from March 2014. Only data from months that have been completed are employed in the analysis. The key differences between the EIA and DI DPRs regarding the rig counts, wells drilled, and wells completed is the use of DI's rig count vs. Baker Hughes', a count of well starts from DI's more detailed rig activity data set vs. an approximation through modeling, and a three month lag in DI's DPR for horizontal wells between well start and completion vs. two months.

DI's state well-level data is used as the source for historical production for the shale basin from both horizontal and vertical/directional wells. The historical data starts in January 2007. If Drill type is listed as Unknown, the drill type is assumed to be Horizontal. DI makes a determination as to the completeness of state data using both the volumes and the count of wells reporting for the shale basin. The EIA also uses DI as the source for historical production data. The key difference between the EIA and DI DPRs regarding historical production will be the determination of the completeness of the state data vs. when projections start. Additionally, DI does not employ a natural gas flow data driven adjustment to historical volumes, instead taking the state reported volumes as the defacto production level.

Historical production from active wells is assumed to decline at a certain rate in the shale basin for both horizontal and vertical/directional wells, constituting the PDP volumes starting from the last month of complete state data. The declines are calculated by fitting a decline curve to every well within every vintage year by drilling trajectory. The calculated decline rates for both horizontal and vertical/directional wells is applied to the last month of complete historical production data to calculate PDP volumes for the shale basin. The decline rates are calculated using DI ProdCast. The key difference between the EIA and DI DPRs regarding the PDP volumes is that declines are calculated from a well-level up calculation of PDP volumes and the resulting decline rate over the duration of the forecast vs. a model that estimates monthly decline rate from the historical decline rate. Historical production data from Appalachia is lagged further than most other areas. Thus, natural gas flow data from Genscape is used to approximate gross gas production volumes using a ratio from the last year of complete historical production data from the state vs. the flow data from the same area. This allows for a more up to date starting point for natural gas production forecasts in Appalachia, ensuring a more accurate short-term outlook. This methodology, however, limits the availability of the data granularity for Appalachia.

Incremental volumes from wells completed after the state data ends are calculated using a vintage type curve for both horizontal and vertical/directional wells that have started production in the basin in the last 12 months. Should there be a sample size issue or a lack of state data, DI exercises discretion in terms of extending the time period or set of wells that are considered. The key differences between the EIA and DI DPRs from an incremental production calculation perspective is the use of a vintage type curve from wells actual well results vs. the use of an estimation of incremental volumes per rig given the most recent month of production. The use of a vintage type curve allows for the use of a completion count vs. a rig count and the aggregation of volumes given the combination of well completions through time and vintage type curve declines.

The DI DPR data deliverable provides the active rig count, well starts, well starts/active rig, historical production, PDP, and incremental production by month and trajectory where data is available for both commodities.

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