EIA Drilling Productivity Report

For

Center on Global Energy Policy, Columbia University

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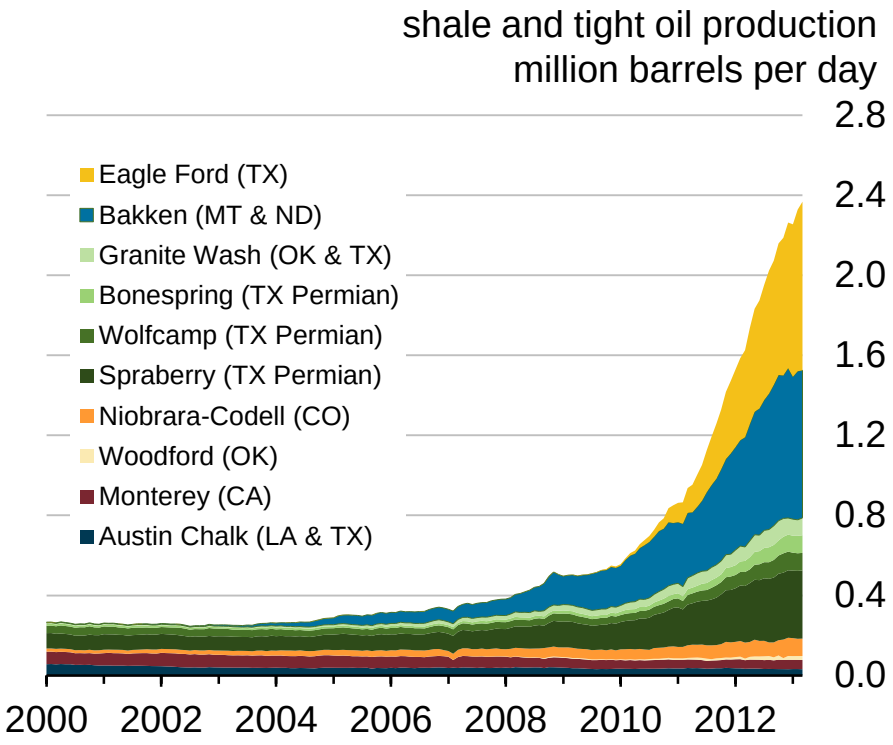
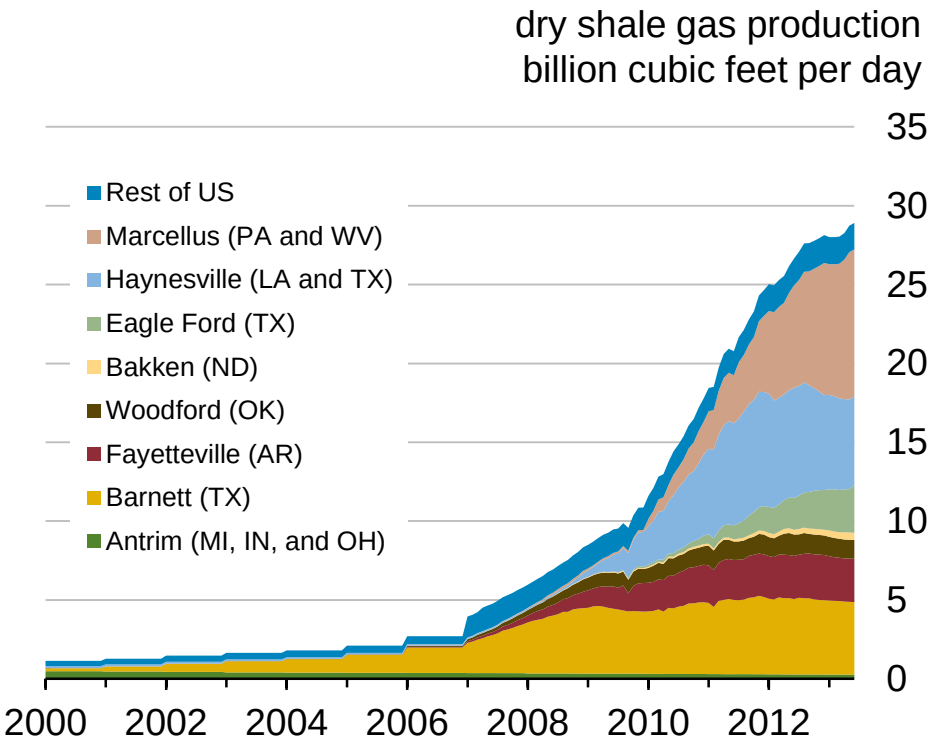
By

Adam Sieminski, Administrator

The U.S. has experienced a rapid increase in natural gas and oil production from shale and other tight resources





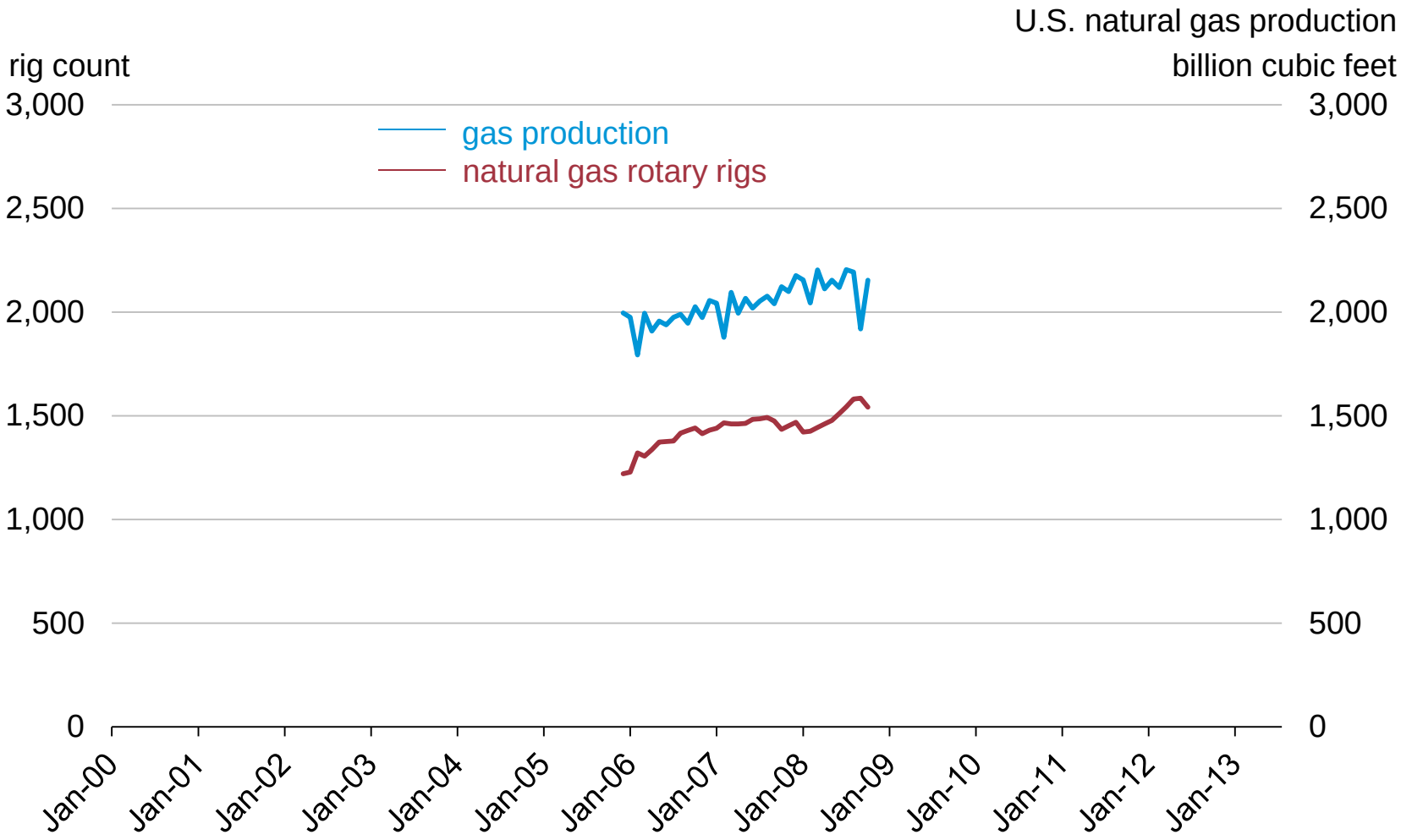
Note: Dry shale gas production data are based on LCI Energy Insight gross withdrawal estimates as of June 2013, converted to dry production estimates with EIA-calculated average gross-to-dry shrinkage factors by state and/or shale play.
Source: EIA based on DrillingInfo and LCI Energy Insight

Key insights on drilling productivity and production trends

- Higher drilling efficiency and new well productivity, rather than an increase in the rig count, have been the main drivers of recent production growth
- In the six plays considered, steep legacy production decline rates offset new well production by 69% for oil and 73% for natural gas
- Understanding the positive and negative forces that affect production volumes in a given region allows the estimation of the number of rigs required to make up for the natural loss of production from existing wells
- Considering new and existing wells separately helps to highlight plays where the growing number of relatively new wells leads to large monthly declines in legacy production, putting more pressure on increasing production from new wells in order to keep net output rising

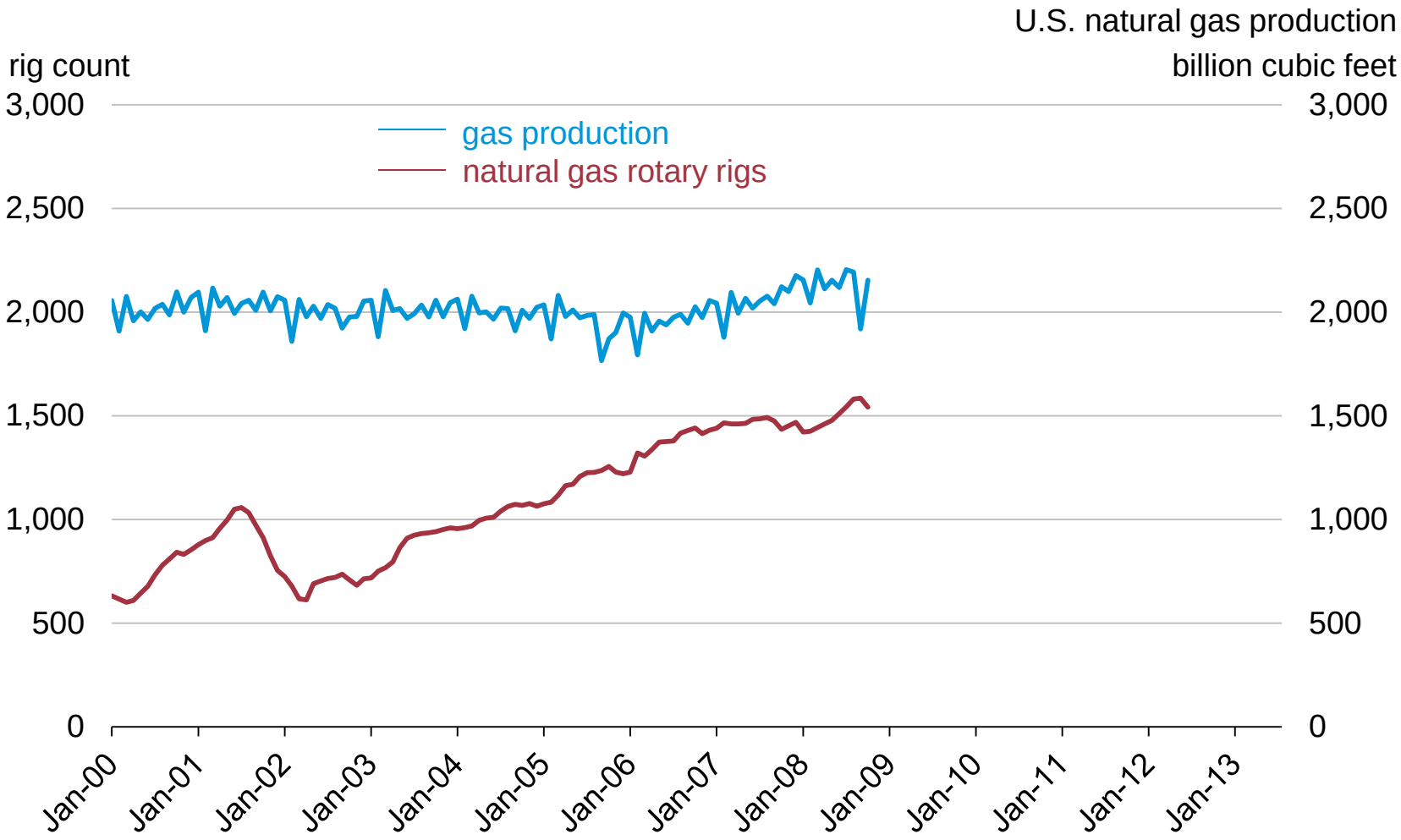
A little drilling history

Rig counts and natural gas production appeared to be coupled during 2006 and 2007



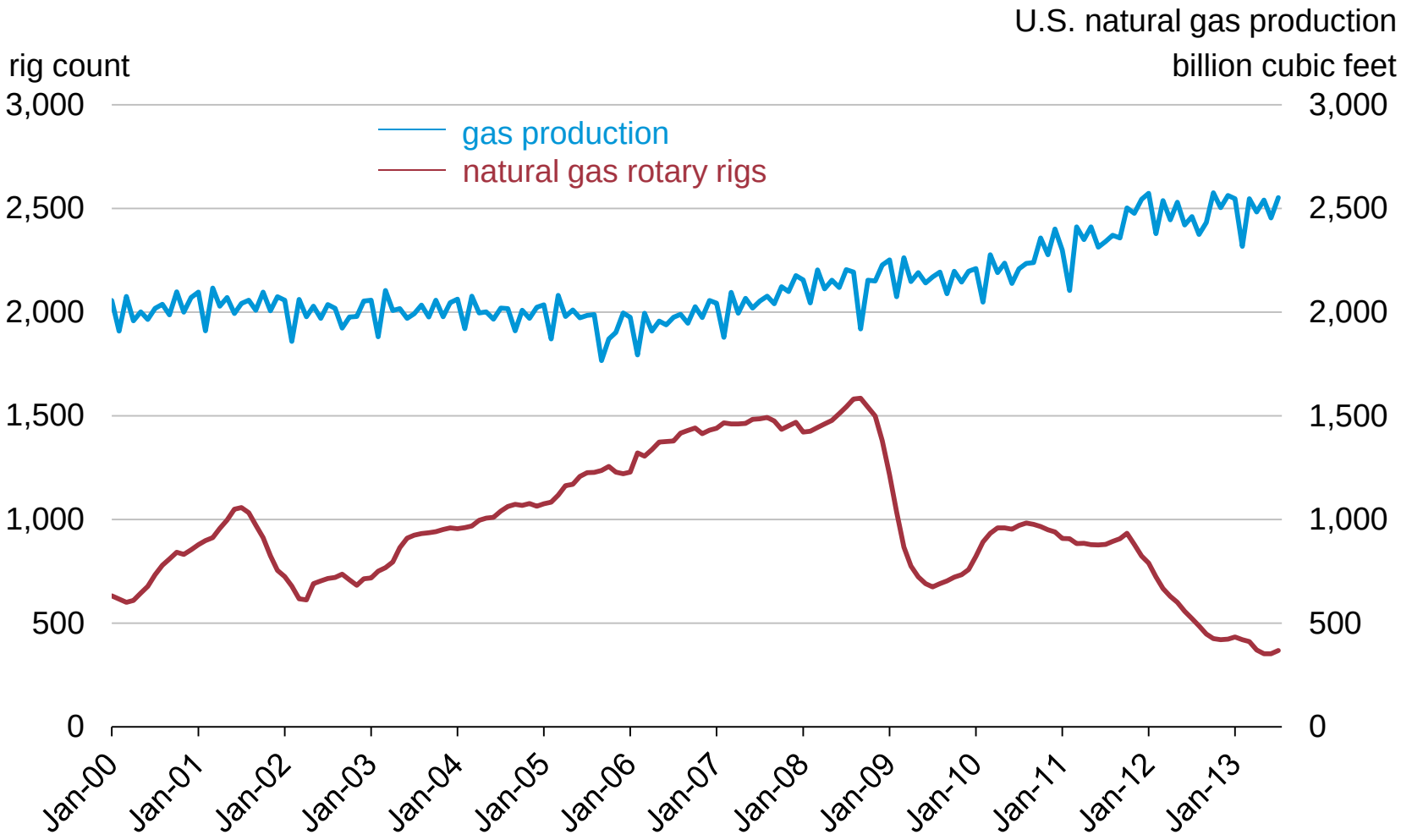
Source: Baker Hughes, Inc. rig count, EIA Short-Term Energy Outlook

Before 2006, changes in natural gas rig counts did not suggest subsequent changes in production



Source: Baker Hughes, Inc. rig count, EIA Short-Term Energy Outlook

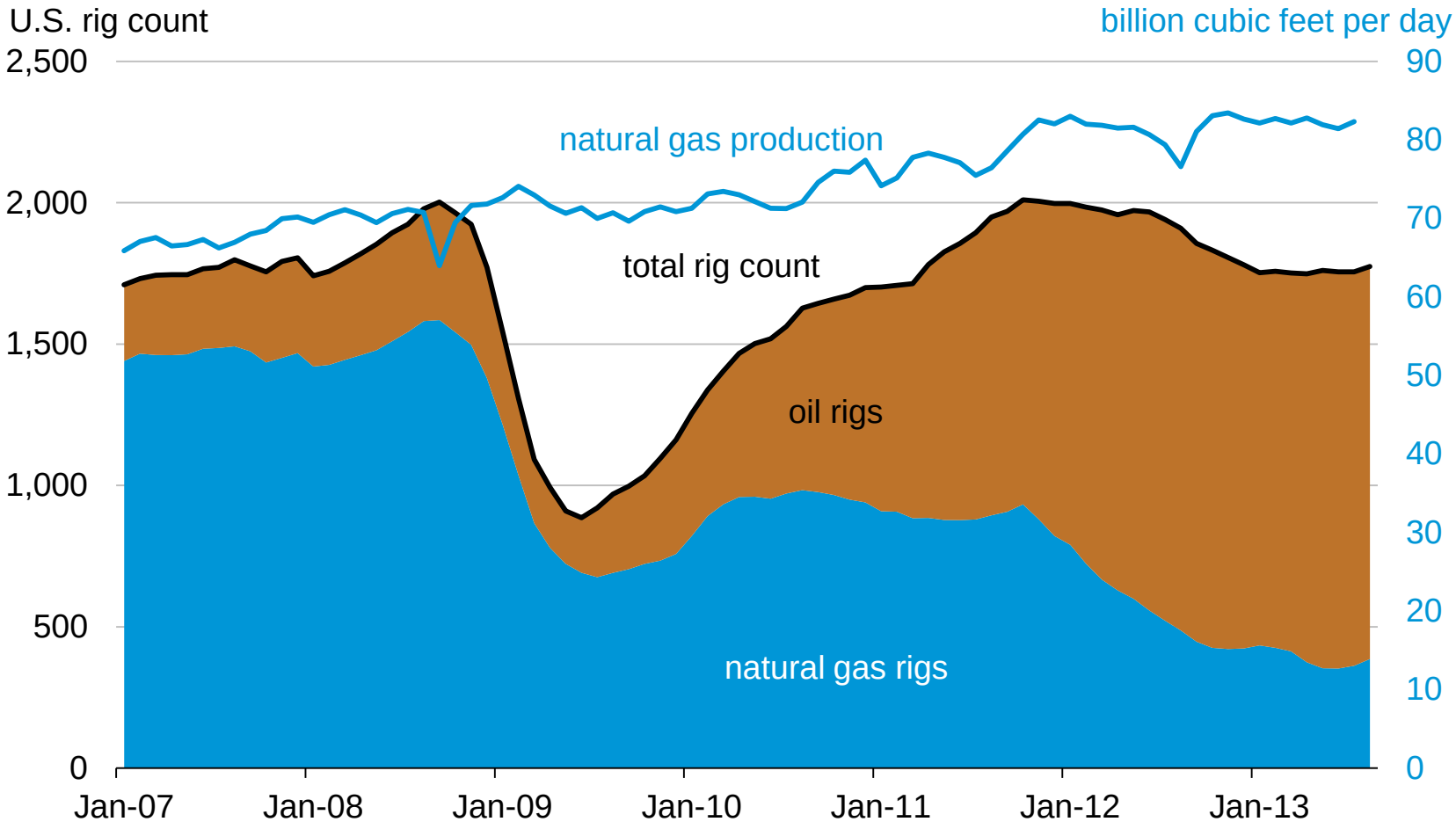
Gas-directed rig counts no longer serve as a useful metric for natural gas production levels



Source: Baker Hughes, Inc. rig count, EIA Short-Term Energy Outlook

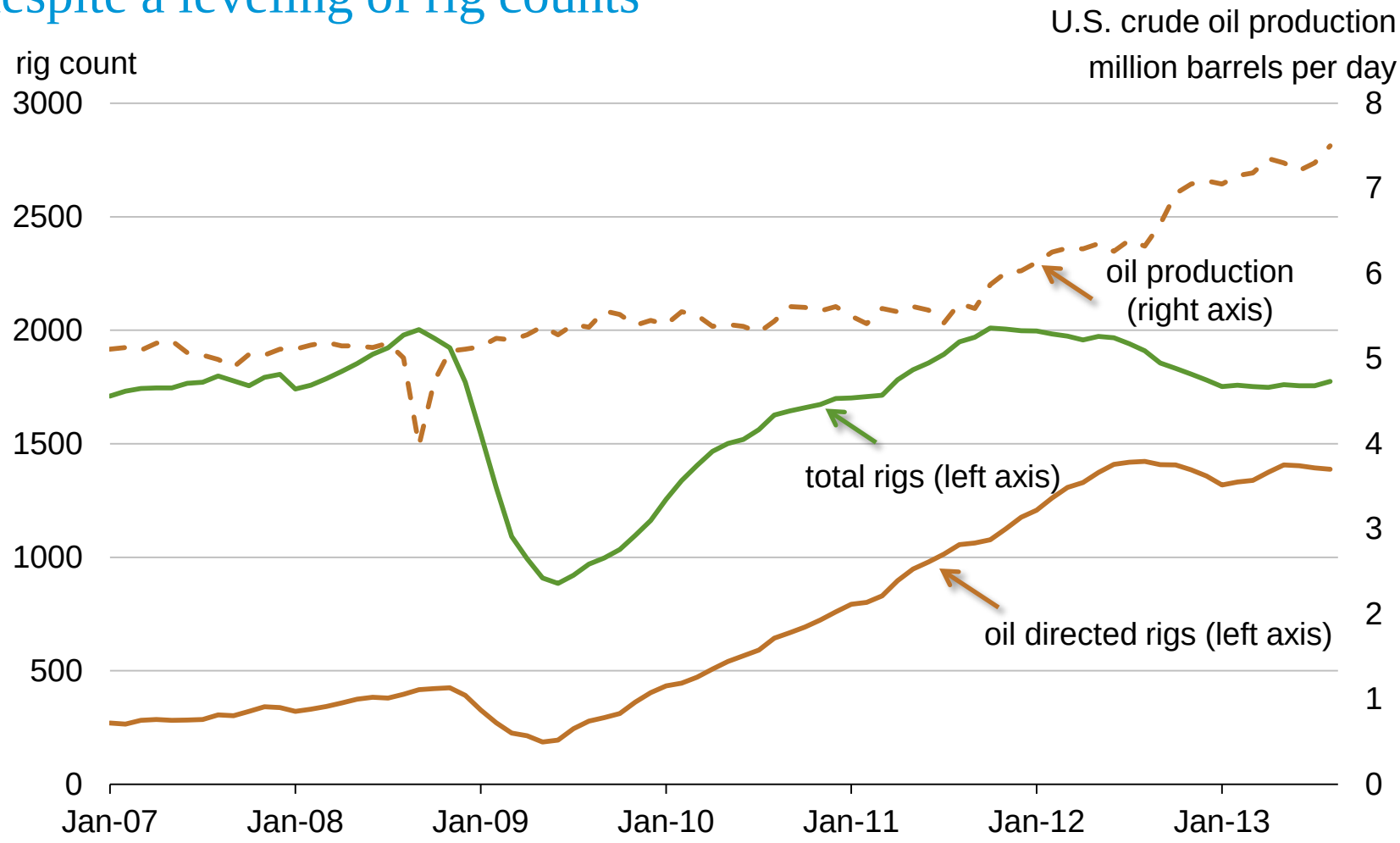
Rig counts, either gas-directed or total, no longer serve as a useful metric for natural gas production levels

oil and natural gas rig count and natural gas production



Source: Baker Hughes, Inc. rig count, EIA Short-Term Energy Outlook

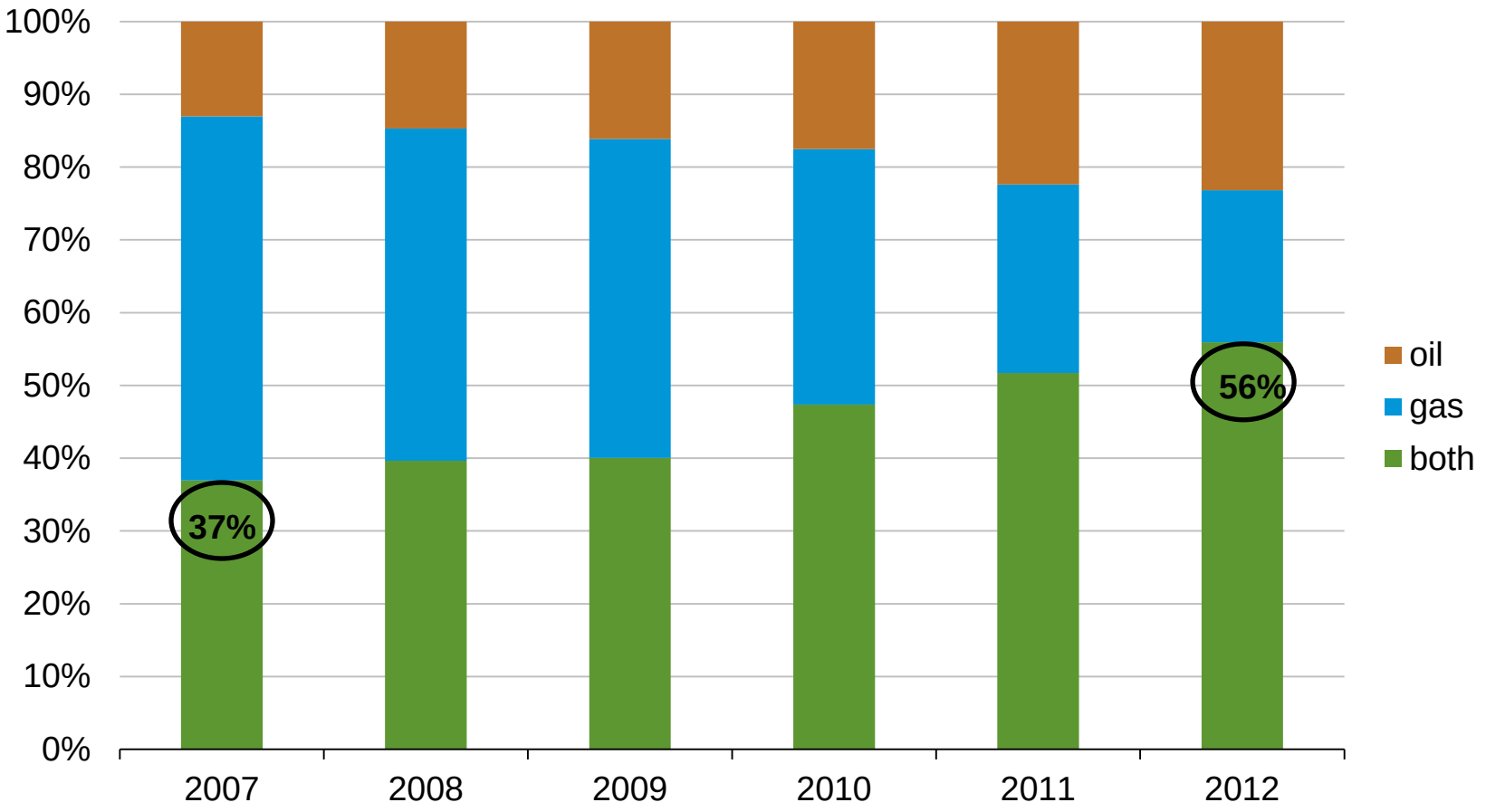
Rig counts, either oil-directed or total, are no longer an adequate indicator for oil production, which has continued to rise in 2013 despite a leveling of rig counts



Source: Baker Hughes, Inc. rig count, EIA Short-Term Energy Outlook

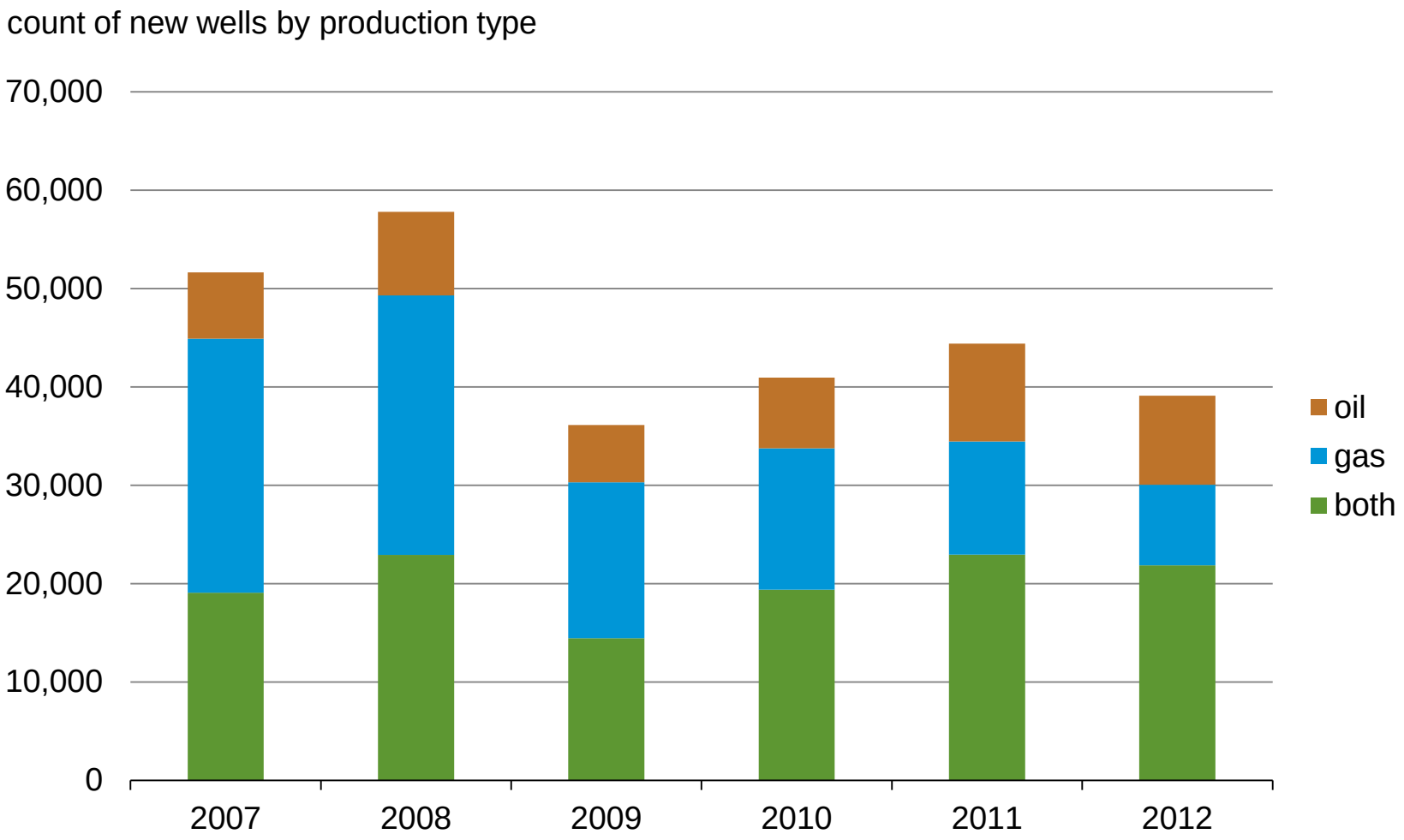
Oil and natural gas are increasingly developed from the same wells

share of new wells by type of hydrocarbons produced



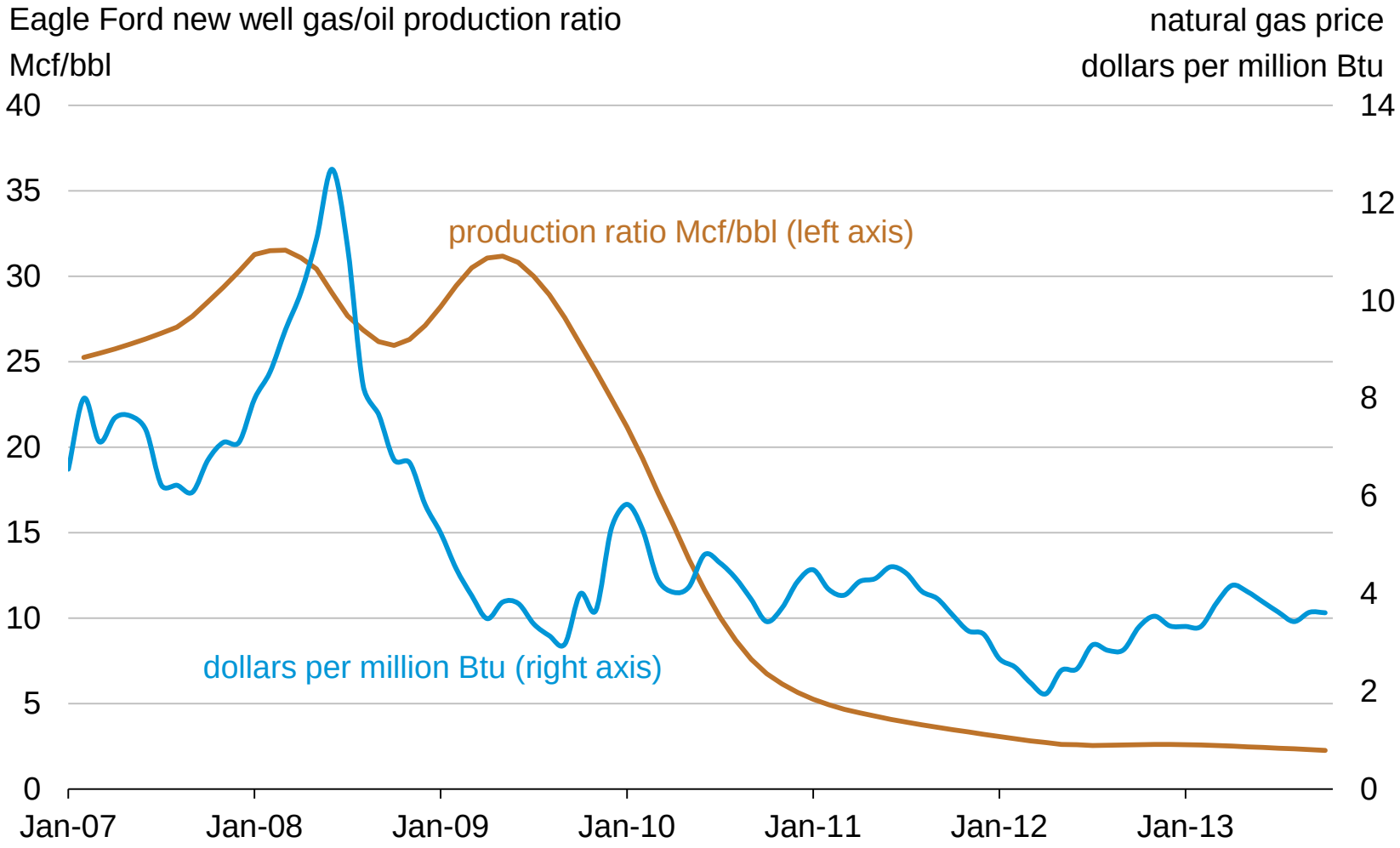
Source: EIA analysis of data from DrillingInfo, Inc.

In 2011 and 2012, more than half of all new wells produced both oil and natural gas



Source: EIA analysis of data from DrillingInfo, Inc.

Natural gas producers adapt their formation in line with market value



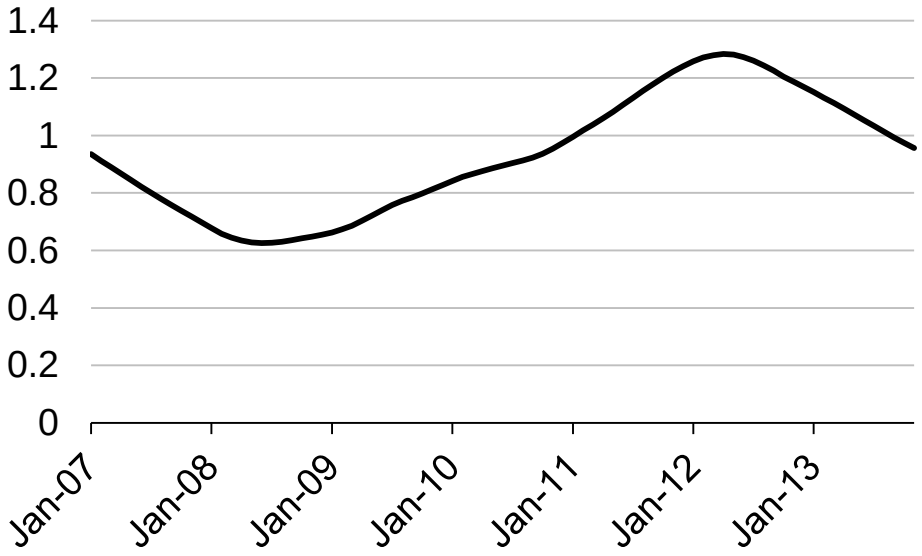
Source: EIA Drilling Productivity Report, EIA Short Term Energy Outlook

EIA's Drilling Productivity Report (DPR) uses a series of new metrics to assess the production and depletion trends of oil and natural gas wells

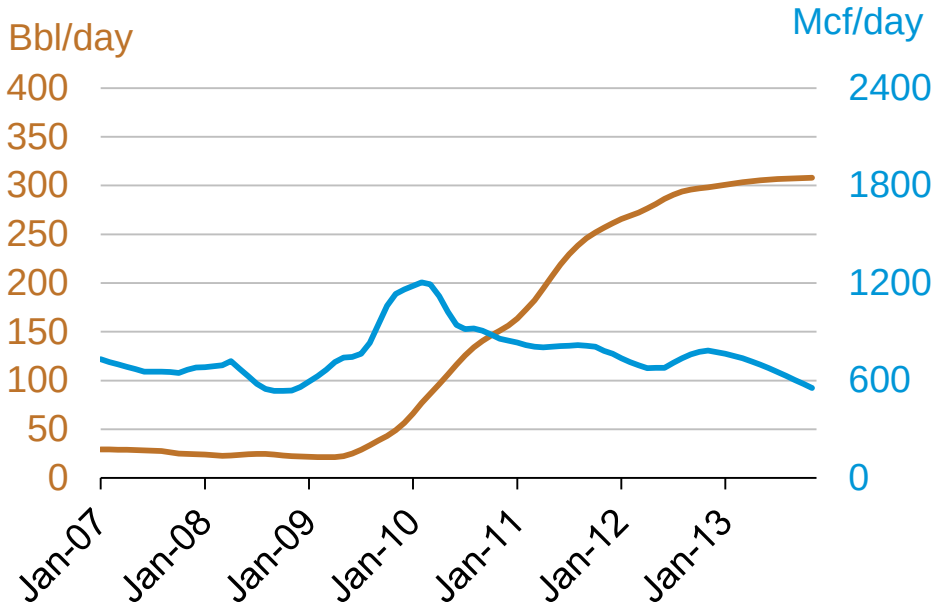
- Rig count
- Well classification
- Drilling efficiency
- Productivity of new wells
- Production and depletion trends

Drilling efficiency can be used to relate the number of rigs to production from new wells

Eagle Ford drilling efficiency
wells per rig per month

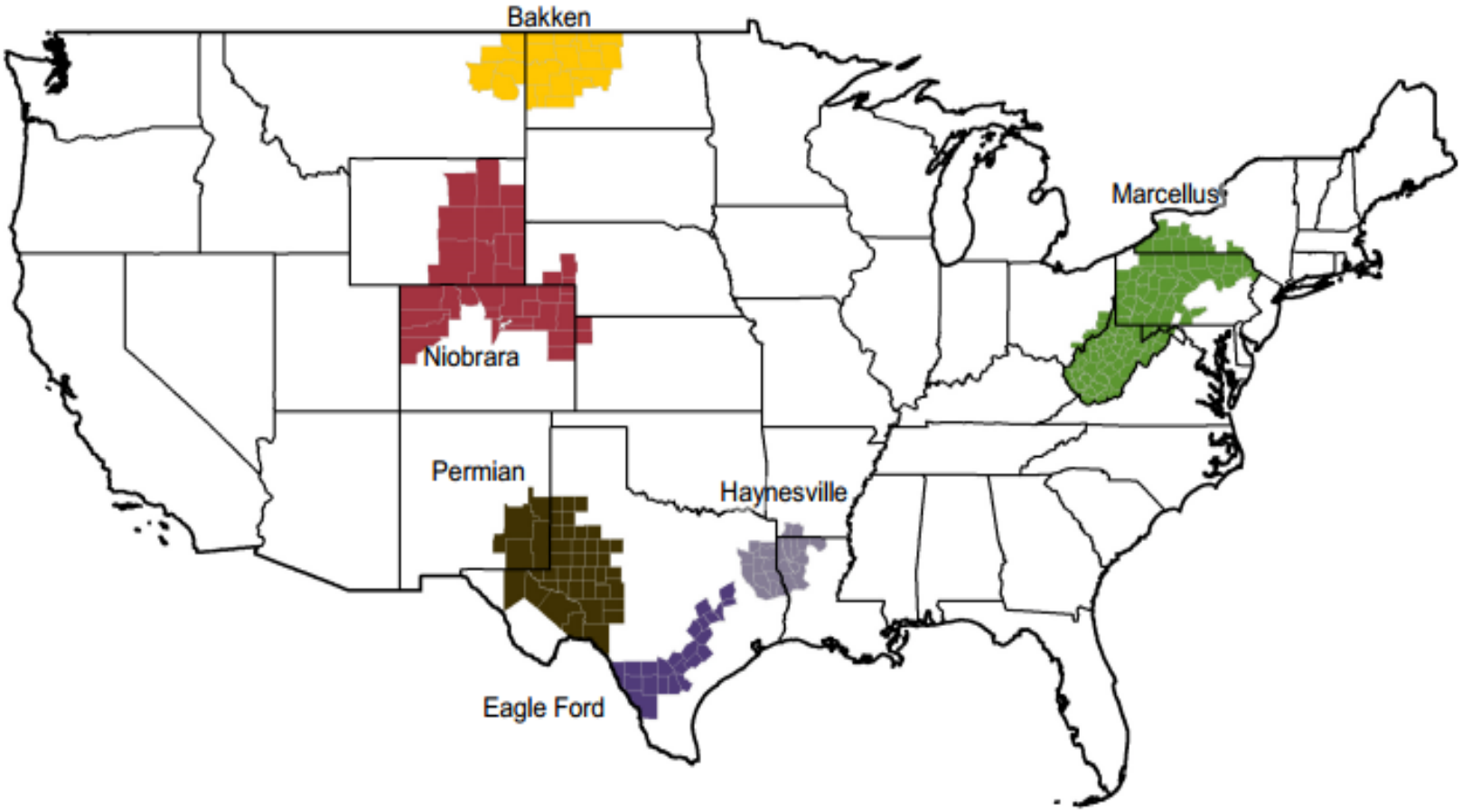


Eagle Ford
first full month's production per well



Source: EIA Drilling Productivity Report

Six key plays account for nearly all recent growth in production



Source: EIA Drilling Productivity Report

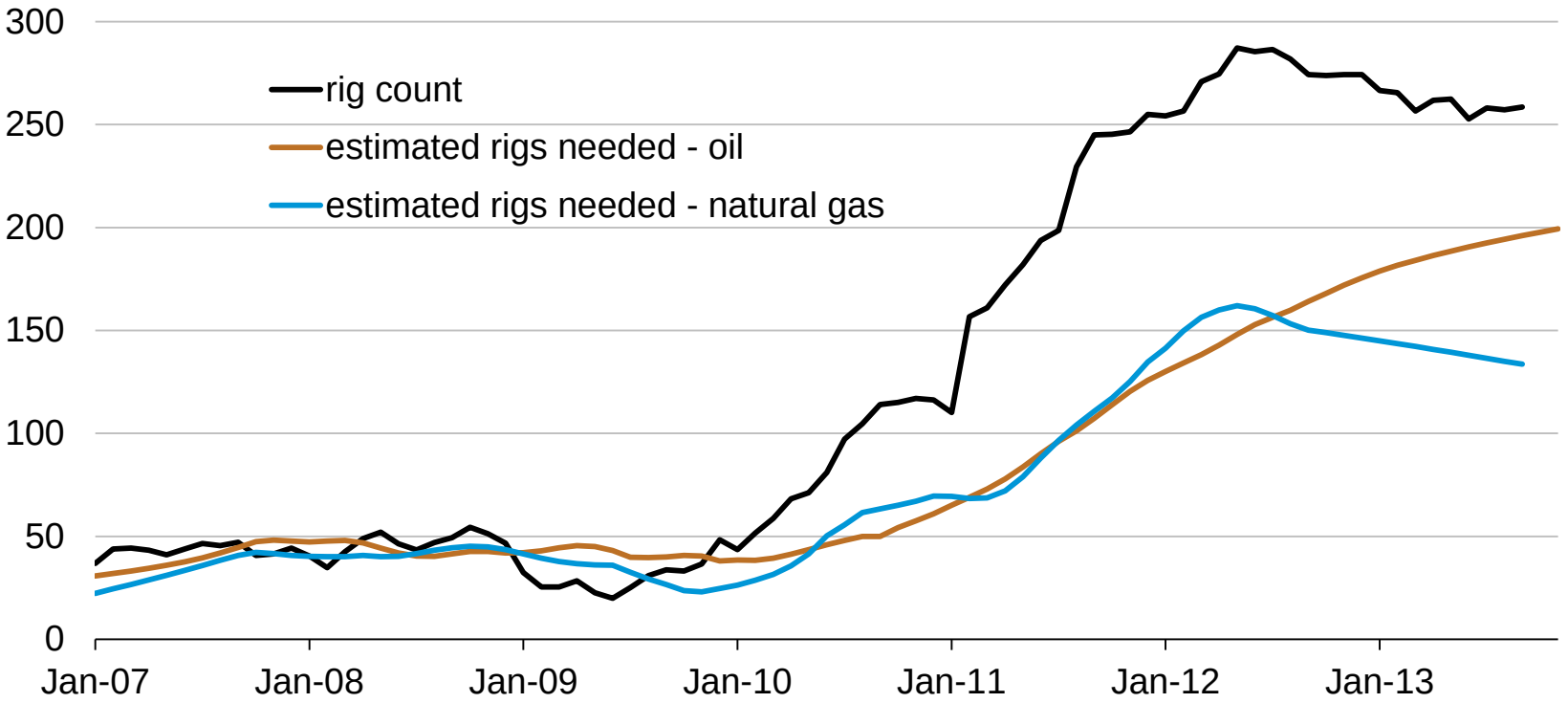
DPR methodology

- Monthly additions from one average rig
  - Represents EIA's estimate of an average rig's contribution to production of oil and natural gas from new wells
- New-well oil/gas production per rig
  - Represents historical estimated monthly additions from one average rig coupled with the number of total drilling rigs as reported by Baker Hughes
- Legacy oil and natural gas production change
  - Represents EIA's estimates of total oil and gas production changes from all the wells other than the new wells; the trend is dominated by the well depletion rates
- Projected change in monthly oil/gas production
  - Represents the combined effects of new-well production and changes to legacy production
- Oil/gas production
  - Represents oil and natural gas production from both new and legacy wells since 2007, based on all wells reported to state oil and gas agencies

Rigs needed to sustain production in the Eagle Ford play

Eagle Ford

rigs needed to sustain prior month's production

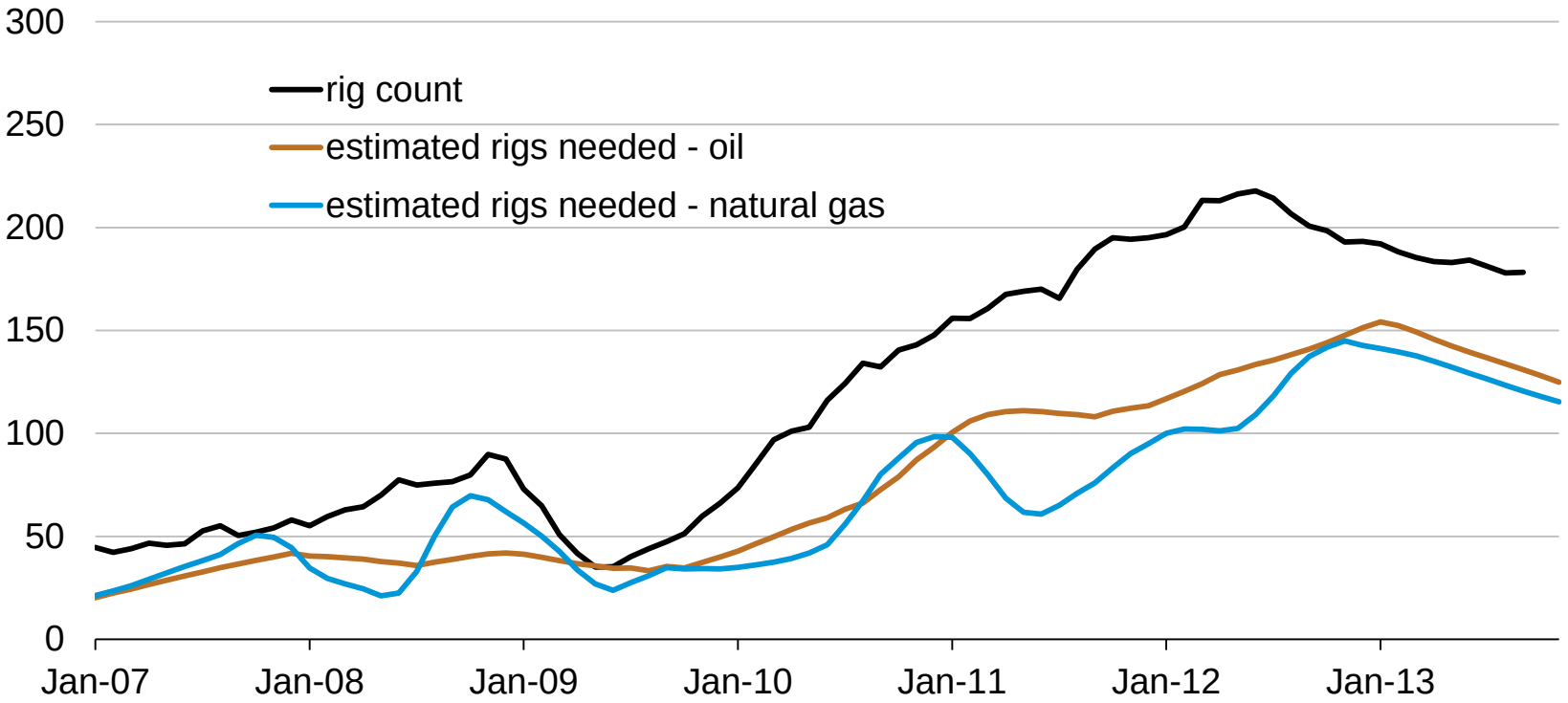


Source: EIA Drilling Productivity Report

Rigs needed to sustain production in the Bakken play

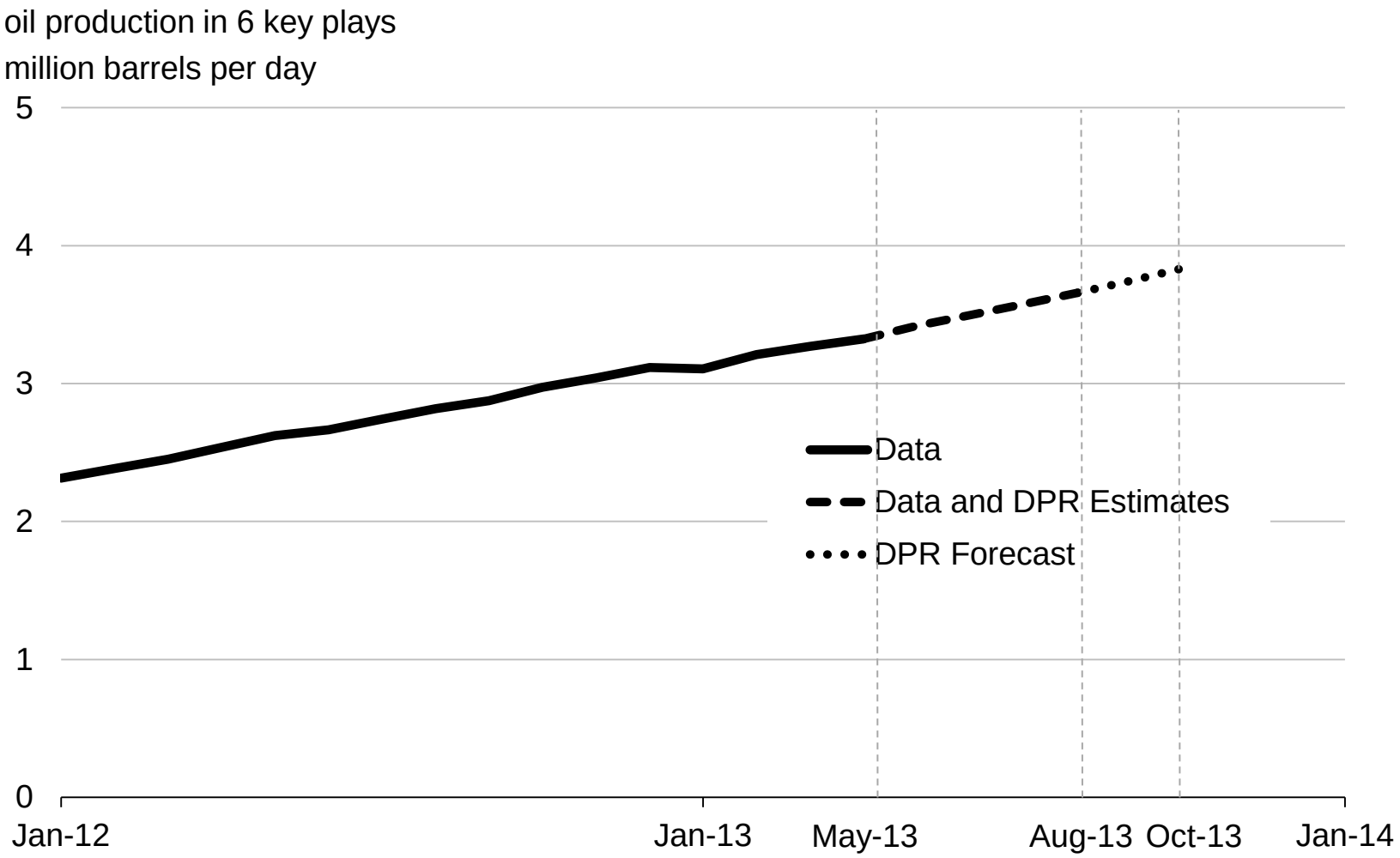
Bakken

rigs needed to sustain prior month's production



Source: EIA Drilling Productivity Report

DPR fills in missing data due to lags in state reporting

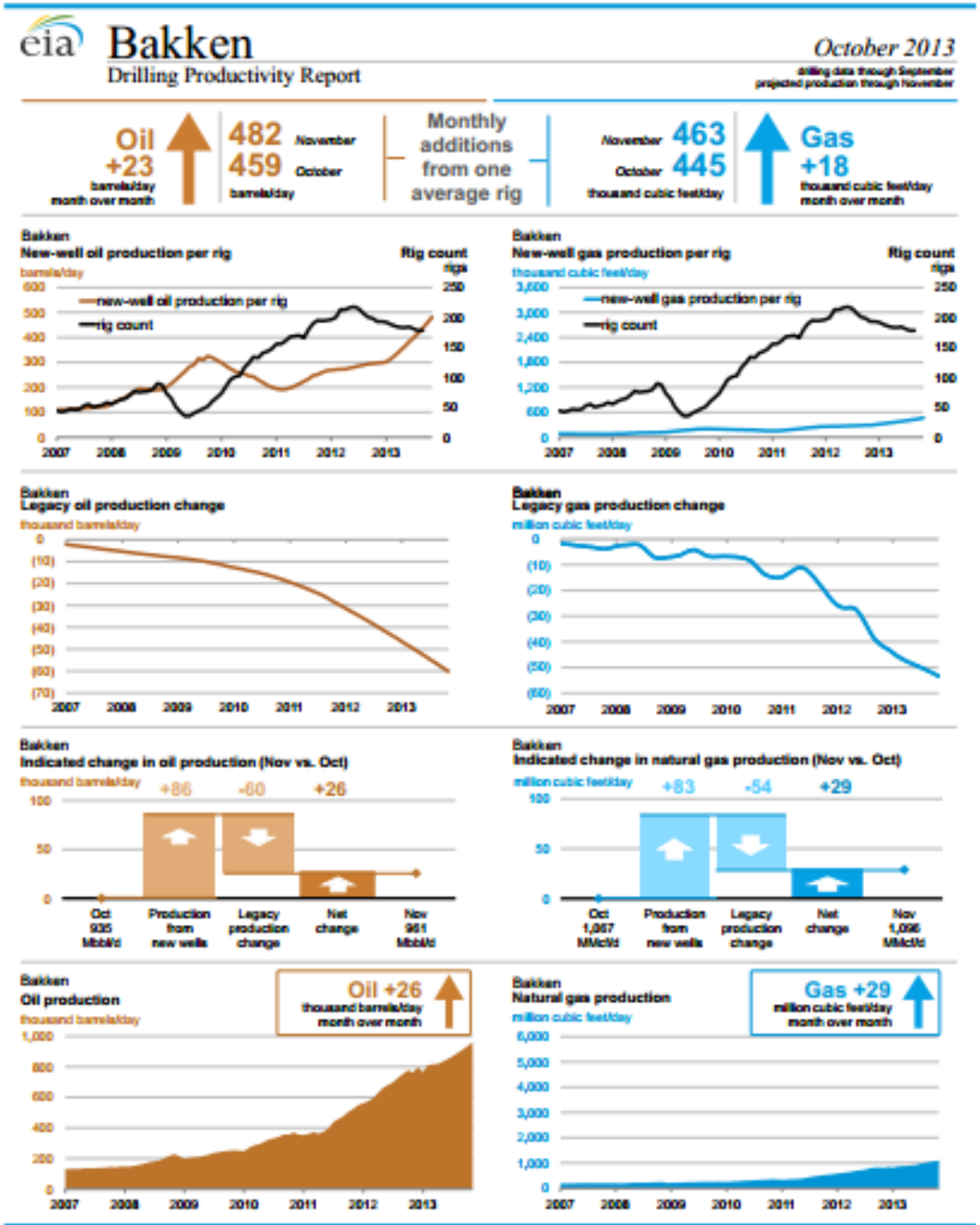


Source: EIA analysis of Drillinginfo data

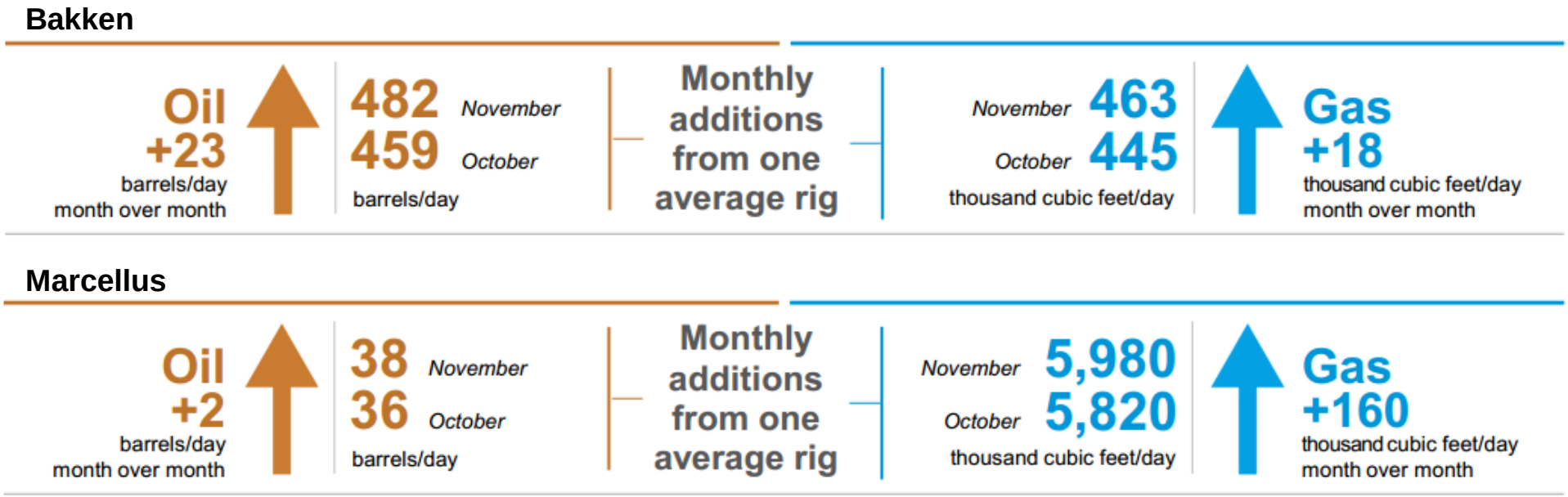
Backup slides

[DPR](#)

[Bakken page](#)



DPR methodology: step 1 – monthly additions from one rig



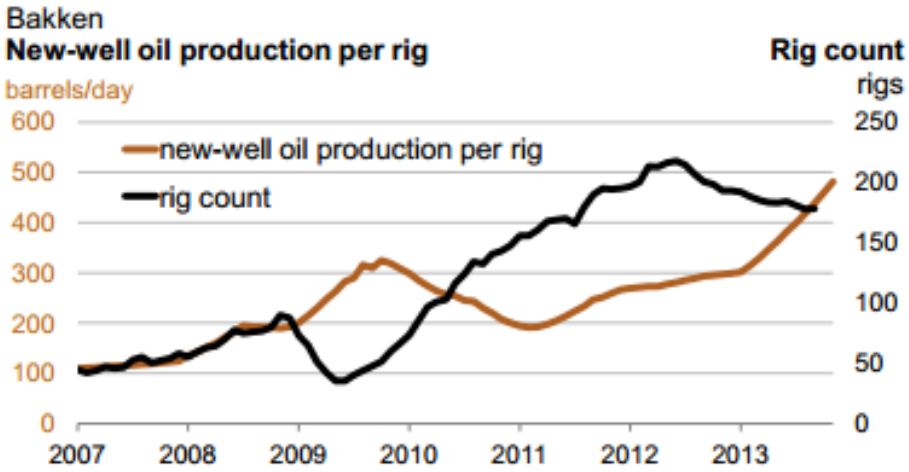
October 2013

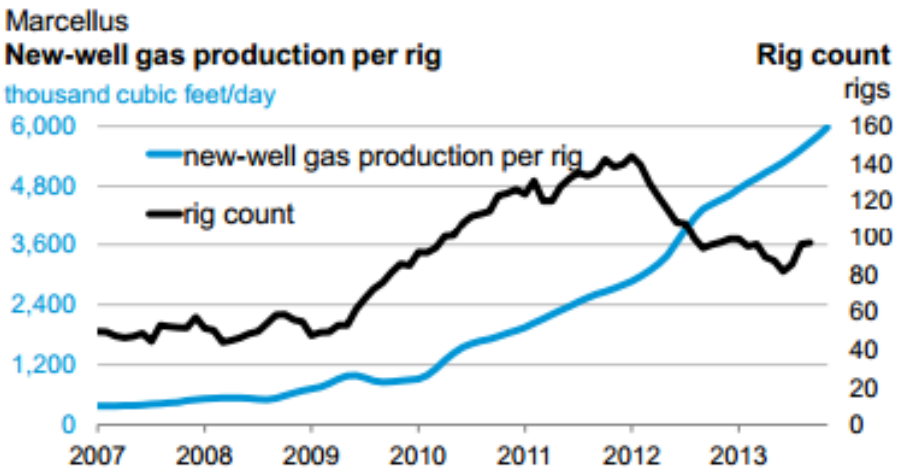
drilling data through September, projected production through November

Monthly additions from one average rig: Monthly additions from one average rig represent EIA's estimate of an average rig's contribution to production of oil and natural gas from new wells. The estimation of new-well production per rig uses several months of recent historical data on total production from new wells for each field divided by the region's monthly rig count, lagged by two months. Current- and next-month values are listed on the top header.

Source: EIA Drilling Productivity Report

DPR methodology: step 2 – rig counts and production per rig

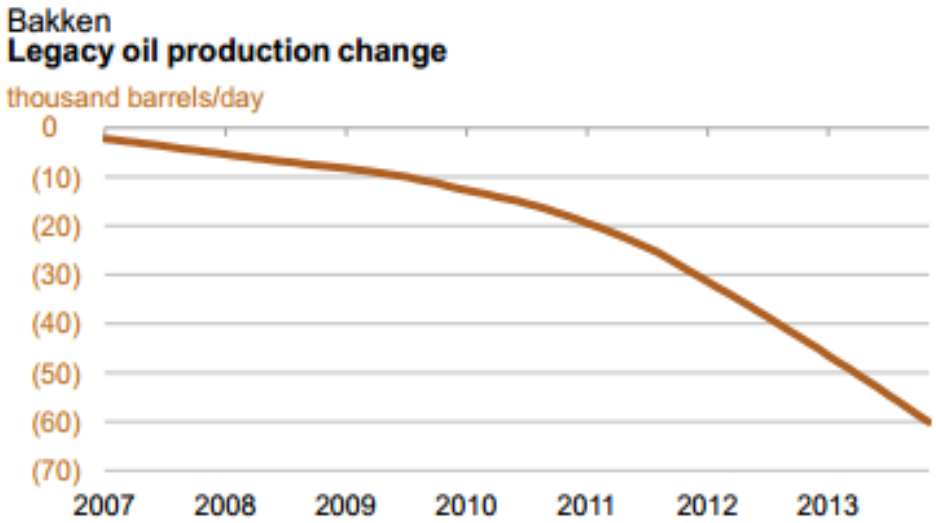


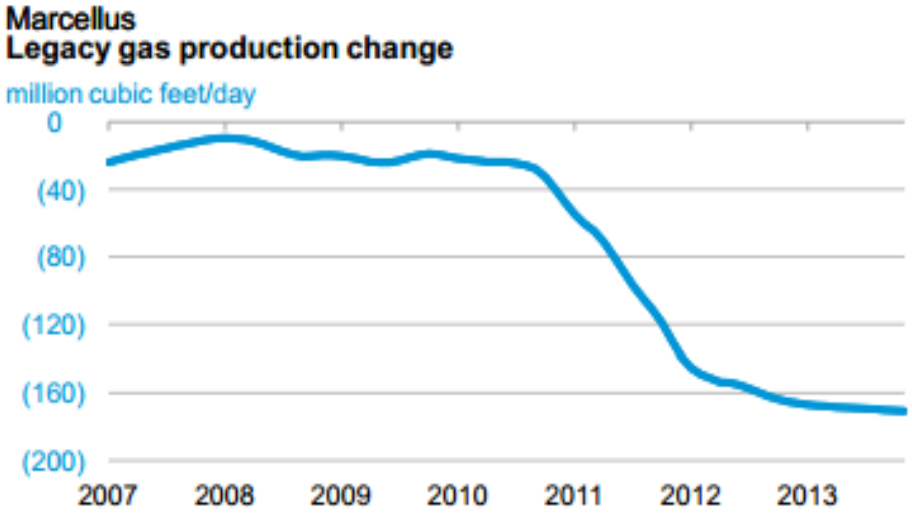


New-well oil/gas production per rig: The charts present historical estimated monthly additions from one average rig coupled with the number of total drilling rigs reported by Baker Hughes.

Source: EIA Drilling Productivity Report

DPR methodology: step 3 – legacy production decline

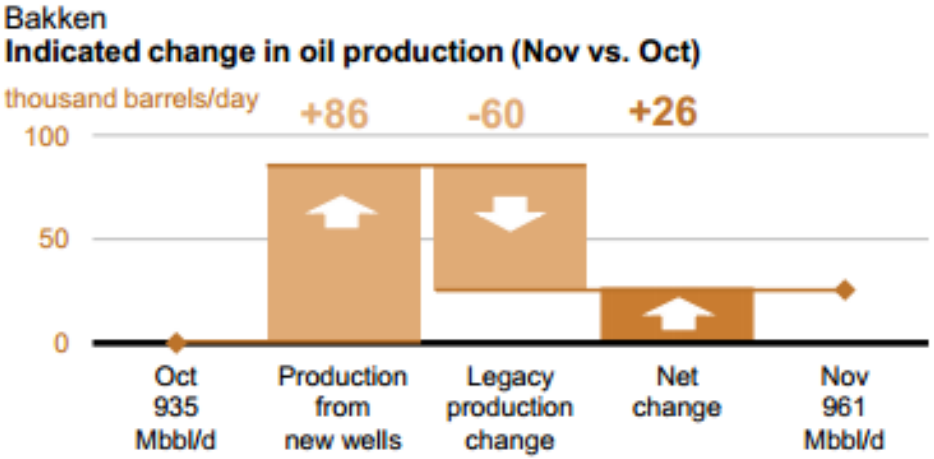


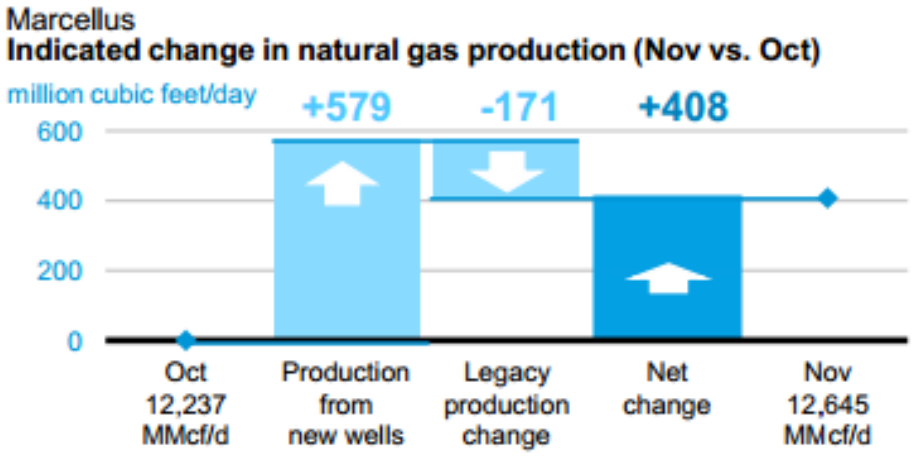


Monthly additions from one average rig: The charts present EIA's estimates of total oil and gas production changes from all the wells other than the new wells. The trend is dominated by the well depletion rates, but other circumstances can influence the direction of the change. For example, well freeze-offs or hurricanes can cause production to significantly decline in any given month, resulting in a production increase the next month when production simply returns to normal levels.

Source: EIA Drilling Productivity Report

DPR methodology: step 4 – production change

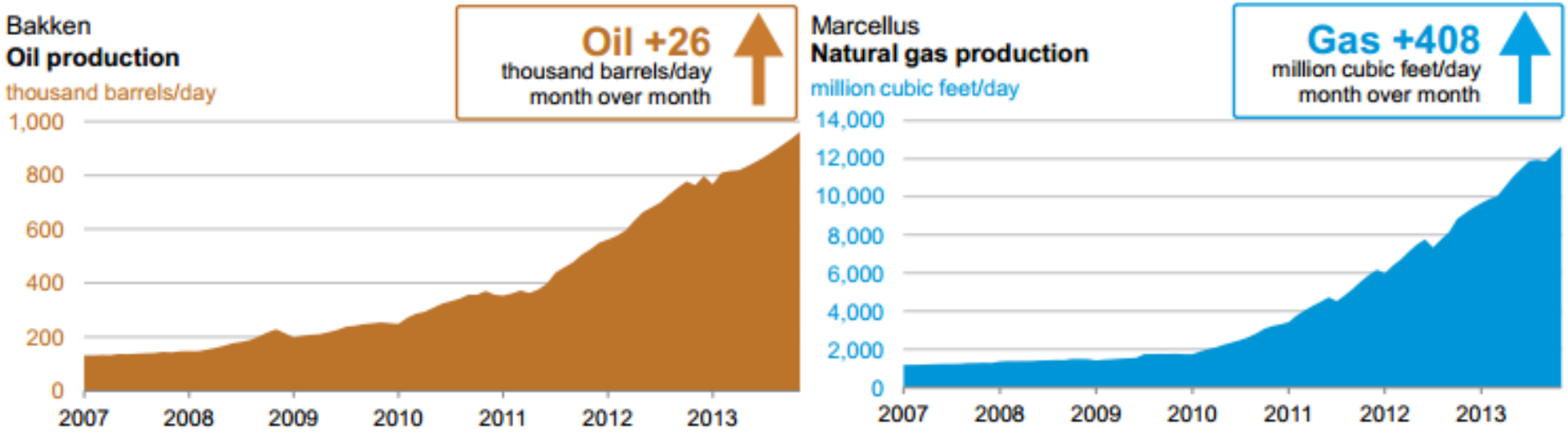




Monthly additions from one average rig: The charts present the combined effects of new-well production and changes to legacy production. Total new-well production is offset by the anticipated change in legacy production to derive the net change in production. The estimated change in production does not reflect external circumstances that can affect the actual rates, such as infrastructure constraints, bad weather, or shut-ins based on environmental or economic issues.

Source: EIA Drilling Productivity Report

DPR methodology: step 5 – total production



Oil/gas production: These charts present oil and natural gas production from both new and legacy wells since 2007. This production is based on all wells reported to the state oil and gas agencies. Where state data are not immediately available, EIA estimates the production based on estimated changes in new-well oil/gas production and the corresponding legacy change.

Source: EIA Drilling Productivity Report

For more information

U.S. Energy Information Administration home page | www.eia.gov

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

Annual Energy Outlook | www.eia.gov/aeo

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

International Energy Outlook | www.eia.gov/ieo

Monthly Energy Review | www.eia.gov/mer

Today in Energy | www.eia.gov/todayinenergy

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