

Figure 2-19. Natural gas prices and oil and gas drilling activity, 2008–2012.

Source: [EIA \(2014e\)](#), [EIA \(2014g\)](#), and [EIA \(2013b\)](#).

- 1 Shale gas production varies by play (see Figure 2-20a). Until 2010, the Texas Barnett Shale was the
- 2 play with the most production. Although production from the Barnett Shale is still significant,
- 3 production has increased sharply in other plays. By 2012, production from the Haynesville play (on
- 4 the Louisiana/Texas border) surpassed that in the Barnett play, and by 2013 the Marcellus Shale
- 5 (in the Appalachian Basin underlying Pennsylvania, West Virginia, and other states) was the play
- 6 with the most production. Because technically recoverable resources are an order of magnitude
- 7 higher in the Marcellus than in any other U.S. shale gas play, it is likely that the Marcellus Shale will
- 8 be very active in shale gas production for the foreseeable future ([EIA, 2011a](#)).¹
- 9 In the 1970s, most tight gas production in the United States was in the San Juan Basin centered in
- 10 New Mexico. As modern hydraulic fracturing came into common usage in the mid-2000s, the lead in
- 11 tight gas production shifted to Texas (especially East Texas) and the Rocky Mountain states ([Vidas](#)
- 12 [and Hugman, 2008](#)).

¹ Technically recoverable resources represent the volumes of oil and natural gas that could be produced with current technology, regardless of oil and natural gas prices and production costs ([EIA, 2013c](#)).

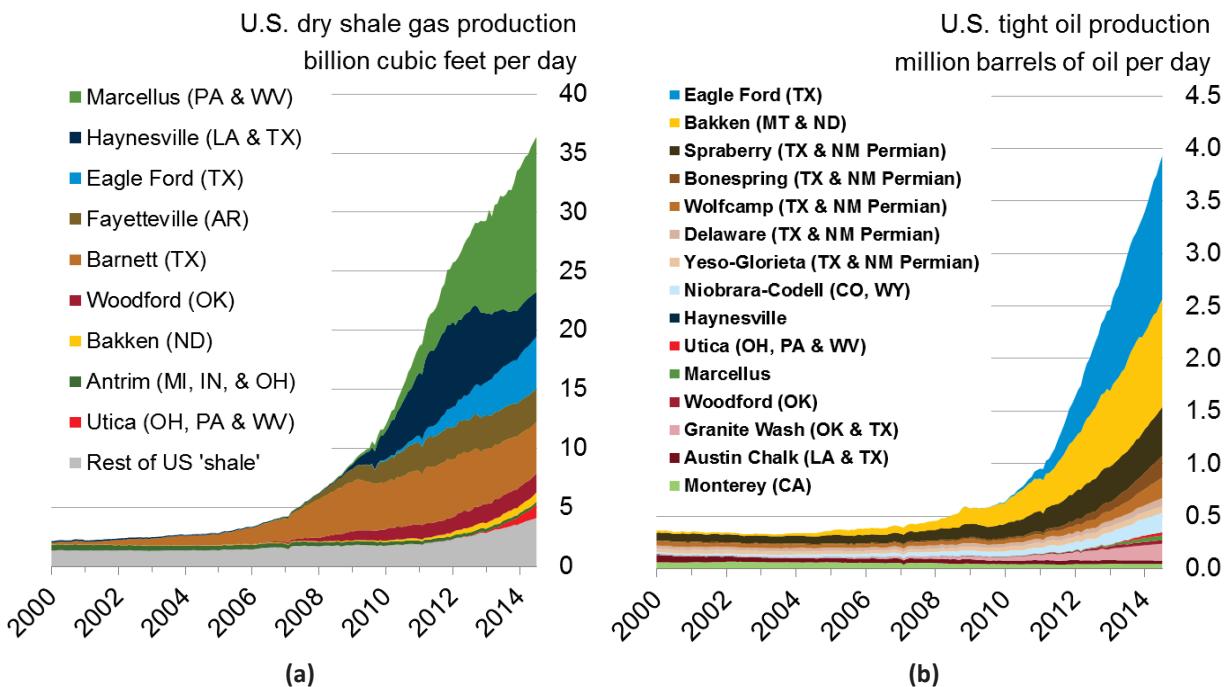


Figure 2-20. (a) Production from U.S. shale gas plays, 2000–2014, in billion cubic feet per day; (b) Production from U.S. tight oil plays, 2000-2014.

Tight oil includes oil from shale and other tight formations, plus lease condensate from natural gas production. Source: [EIA \(2012c\)](#).

1 Modern coalbed methane production techniques were pioneered in the Black Warrior Basin in
 2 Alabama and in the San Juan Basin ([Vidas and Hugman, 2008](#)). With the use of hydraulic fracturing,
 3 most coalbed methane production in the United States now comes from the San Juan Basin and
 4 from Rocky Mountain Basins (e.g., the Uinta-Piceance Basin in Colorado and Utah and the Powder
 5 River Basin centered in Wyoming) ([Vidas and Hugman, 2008](#)).

2.3.2. Oil

6 The EIA data indicate that as drilling activity for natural gas declined between 2008 and 2012,
 7 drilling for oil increased by a similar order of magnitude (see Figure 2-19). Figure 2-21 shows past
 8 and projected future trends in U.S. oil production and importation ([EIA, 2013a](#)). Note that this
 9 graph shows production and importation in millions of barrels (bbl) *per day*. The current surge in
 10 tight oil production is expected to continue until the latter part of the current decade and then
 11 taper, while conventional oil production is projected to remain fairly level. However, downward
 12 trends in the price of oil since mid-2014 are not reflected in these projections.

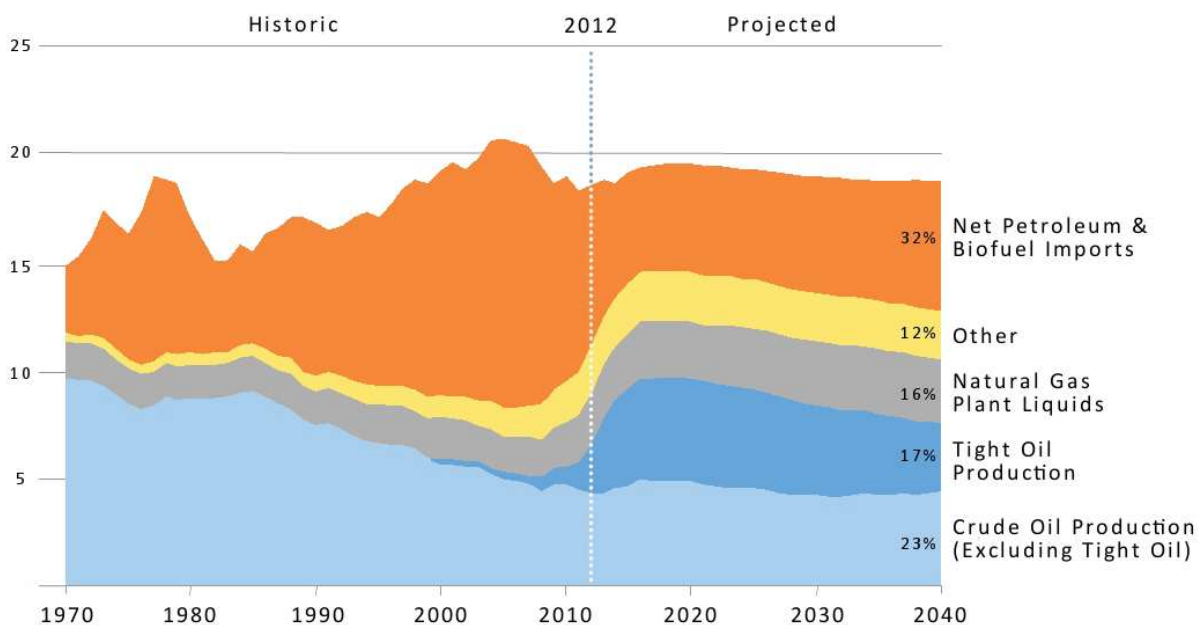


Figure 2-21. U.S. petroleum and other liquid fuels supply by source, past and projected future trends (million barrels per day).

Source: [EIA \(2013a\)](#).

1 Like shale gas production, tight oil production varies by play (Figure 2-20b). The Bakken Shale play,
 2 centered in western North Dakota, is important for shale oil production with production increasing
 3 from 123 million bbl (20 billion L) in 2011 to 213 million bbl (34 billion L) in 2012. Proved reserves
 4 in the Bakken have increased from almost 2 billion to over 3 billion bbl (316 billion L to 503 billion
 5 L). The Eagle Ford play in Texas is another major area of shale oil activity, with production
 6 increasing from 71 million bbl (11 billion L) in 2011 to 210 million bbl (33 billion L) in 2012, and
 7 proved reserves increasing from 1.25 billion to 3.4 billion bbl (199 billion to 536 billion L) ([EIA,](#)
 8 [2014b](#)). Oil production from the Eagle Ford surpassed that from the Bakken in 2013 ([EIA, 2014h](#)).
 9 Among other shale oil plays that might become important in future domestic U.S. oil production, the
 10 Niobrara (centered in Colorado) and Austin Chalk (in Texas, Louisiana, and Mississippi) are
 11 believed to have quantities of recoverable resources on the same order of magnitude as the Bakken
 12 and Eagle Ford plays ([EIA, 2012b](#)).

2.4. Conclusion

13 Since about 2005, the combination of hydraulic fracturing and horizontal drilling pioneered in the
 14 Barnett Shale have become widespread in the oil and gas industry. Hydraulic fracturing is now a
 15 standard industry practice and has significantly contributed to a surge in U.S. production of both oil
 16 and gas. Modern hydraulic fracturing has resulted in additional types of geological formations being
 17 tapped, and sometimes these formations are located in regions of the country new to intensive oil

1 and gas exploration and production. In other areas, the improved techniques have made possible a
2 resurgence of production.

3 An estimated 25,000 to 30,000 new wells drilled in the United States were hydraulically fractured
4 as a production-enhancing technique in each year from 2011 to 2014. Additional pre-existing wells
5 were also fractured. Since the early 2000s, the percentage of all hydraulically fractured wells that
6 are either horizontal or deviated has steadily grown. Reserves of oil and gas that are now accessible
7 with modern hydraulic fracturing are considerable, and if technical improvements outpace
8 depletion of oil and gas resources, the quantity of resources that are deemed economically and
9 technically recoverable may continue to grow. Given current trends, it appears likely that hydraulic
10 fracturing will continue to play an important role in the oil and gas industry, and the United States’
11 energy portfolio, in the decades ahead.

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