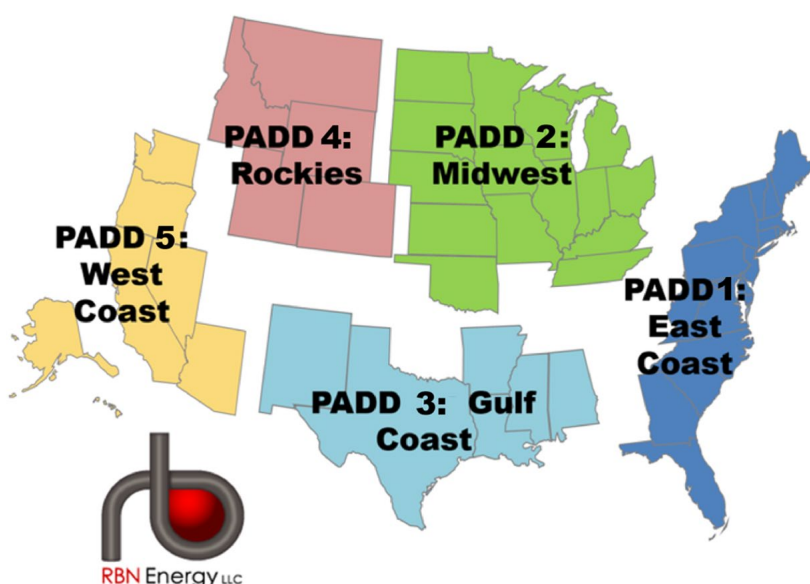


Pictures of You – Regional Balances Tell the Tale of the U.S. Crude Oil Market

PADD-Level Data Details Trends Around Imports, Exports and Production



- East Coast refining capacity allows it to rely almost exclusively on crude imports
- Midwest serves as the crossroads for Canadian barrels headed south
- Gulf Coast's influence boosted by production growth, export capacity
- The Rockies have limited refining capacity but provide key links to other regions
- West Coast undergoing transformation as product demand slides, output falls

1. Introduction

Over the past 15 years, the Shale Revolution has transformed the U.S.'s crude oil supply/demand balance. Increasing production unlocked through horizontal drilling and hydraulic fracturing and technologies pushed up the nation's overall supply without an equal change in refining capacity, resulting in significant changes in regional balances.

The supply/demand balance of crude oil is a simple equation: Total Supply equals Total Demand. Despite all the factors that can go into it, there are ultimately six variables, with Total Supply made up of production, imports and stock withdrawals (green section in Figure 1 below), and Total Demand made up of refinery input, exports and stock additions (red section).

<u>Total Supply</u>				<u>Total Demand</u>						
Production	+	Imports	+	Stock Withdrawals	=	Refinery Input	+	Exports	+	Stock Additions

Figure 1. Crude Oil Supply and Demand Equation. Source: RBN

Since stock additions and withdrawals should theoretically even out in the long term, changes in production would need to be balanced out by changes in refinery input, exports and/or imports — highlighting the connections among the different variables.

What the equation in Figure 1 doesn't show, however, is the significant impact that geography can have in measuring production, refinery inputs, stocks and flows into and out of a region. As any good travel brochure or political ad might say, the U.S. is a large and diverse country — that's equally applicable to its crude oil market. Luckily for us, the U.S. was divided into five Petroleum Administration for Defense Districts (PADDs) during World War II to manage the country's refined product demand. These districts now serve to regionalize supply-and-demand data and provide information on the flow of crude oil between regions.

The changes brought about by the Shale Revolution serve as a good example of the equation noted above. The supply-side variables are shown as the stacked layers in Figure 2 below, whereas the stacked lines represent the Total Demand variables. As crude oil production (blue layer) ramped up from 2010-14, domestic demand for crude oil could only rise as fast as spare refinery capacity allowed or as total refinery capacity increased. That meant the most significant impact from rising production was felt by imports (orange layer), which dropped from 9.2 MMb/d in 2010 to 7.3 MMb/d in 2014 for a total decline of 1.9 MMb/d, compared to the 1.5-MMb/d increase in Total Demand over the same five-year period.

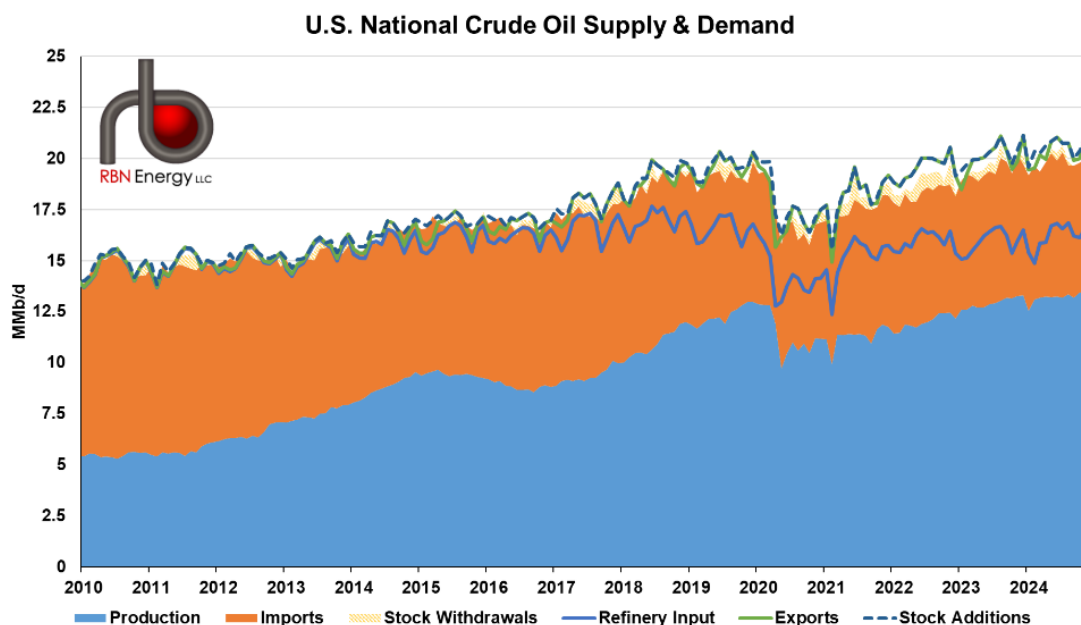


Figure 2. U.S. Crude Oil Supply and Demand Balance History. Source: EIA

By 2016, however, the demand side of the equation started to increase, led by exports (green layered line), which expanded after the 40-year ban on most crude exports was lifted in December 2015. The additional export capacity allowed domestic production to grow by 3.8 MMb/d from 2015-24 without having the same effect on imports, which averaged 6.5 MMb/d in 2024, down just 800 Mb/d from 2014.

This report examines the factors contributing to both sides of the crude oil balance, including the role of weakening downstream markets in PADD 1; imported Canadian crude oil's contribution to PADD 2's refinery inputs; the pipeline constructions and reversals which have allowed for PADD 3's increased inflows; PADD 4 production's critical egress routes; and how PADD 5's reliance on imports have increased despite refinery conversions limiting its demand for crude oil.

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