Freight Rail & Energy: Crude Oil, Ethanol & Coal

Key Takeaway: Railroads are critical in powering the nation and fueling its energy needs. They facilitate the reliable and safe movement of essential energy resources, such as coal, oil, and natural gas, enabling power generation, fuel production, and economic growth. With their extensive network and capacity, they continue to effectively meet customer needs as energy sources and consumption patterns have changed.

Railroads have helped power America since its earliest days. In fact, the first big haul for America's first major railroad was transporting coal from western Maryland and Virginia to Baltimore. In the years since, the role of railroads in the energy industry has continued to grow. And as energy sources and consumption patterns have changed, the freight rail industry has adjusted to customer needs to continue safely and efficiently moving energy products.

Freight railroads safely transport crude oil.

Crude oil is a fundamental component in countless products, ranging from transportation fuels and plastics to everyday items like polar fleece jackets, toiletries and medicines. Given its pivotal role, railroads are critical to the nation's crude oil logistics, leveraging their expansive network and adaptability.

As crude oil is classified as a hazardous material, the freight rail industry continuously updates its hazmat operations to ensure its safe transportation. Rigorous employee training on hazmat handling and annual instruction for tens of thousands of first responders underscore their commitment to safety. Additionally, the industry embraces innovative technologies, such as route analysis software and wayside sensors, to enhance track inspections and security measures. Because of this unwavering dedication to safety standards, over 99.99% of hazmat, including crude oil, reaches its destination without incident.

To further enhance safety, railroads advocate for robust tank car standards, supporting federal regulations that mandate higher-grade steel, enhanced thermal protection, improved valves and fittings, and thicker tanks. These efforts have significantly reduced hazmat accident rate by 75% between 2000 and 2023 to its lowest-ever rate.

Crude Oil Production & Rail Shipments

The "shale revolution" initially led to a decline in U.S. crude oil production from 9.6 million barrels per day in 1970 to five million barrels per day in 2008. Yet, with the rise of shale oil, production surged to 12.3 million barrels per day in 2019, settling at 11.3 million in 2020. Notably, Texas, North Dakota, New Mexico, Oklahoma, and Colorado played key roles in this increase.

Historically, pipelines dominated crude oil transportation, but increased production surpassed pipeline capacity growth, notably in North Dakota. Railroads bridged this gap, with originated crude oil carloads on U.S. Class I railroads skyrocketing from 9,500 in 2008 to 493,146 in 2014. Although new pipelines led to a decline, carloads rebounded in 2018 and 2019. In 2014, crude oil comprised 1.6% of originated and 1.7% of terminated carloads. By 2021, these shares dropped to 0.3% and 0.6%, respectively, reflecting changes in transportation dynamics. In 2014, railroads handled around 11% of U.S. crude oil production at its peak.

[1] "Originated" carloads are loaded carloads beginning a rail journey; "terminated" carloads are loaded carloads completing a rail journey. U.S. Class I originations do not equal U.S. Class I terminations because some crude oil that originates on U.S. Class I railroads is terminated by U.S. short line railroads or railroads in Canada. Likewise, some crude oil that terminates on U.S. Class I railroads originates on railroads in Canada or on U.S. short line railroads.

Ethanol

Key Data Point: Railroads account for 60 to 70% of ethanol movement.

Ethanol — a renewable fuel made from corn and other plant materials — is an important commodity for U.S. railroads. The U.S. ethanol industry — and railroad carloads of ethanol — has grown tremendously since methyl tertiary butyl ether (MTBE), a gasoline additive, was banned from use in 2006. Coupled with high oil and low corn prices, the ban gave rise to ethanol's replacement of MTBE as a fuel additive. Since then, Government policies requiring renewable and biofuels have only strengthened the demand for this energy resource.

Because of its alcohol content, ethanol cannot move in oil pipelines, making railroads the chief mode of transport for this commodity. Each U.S. Class I railroad transports ethanol, with some serving several dozen plants. An estimated 15 to 20% of ethanol rail movements originate on short line and regional railroads — not surprising, given the rural nature of many short lines and much of America's ethanol production.

Ethanol production is concentrated in the Midwest, where most of the corn used in ethanol production is grown, but many of the major markets for ethanol are on the East Coast, California and Texas.

Coal

Key Data Point: In 2022 alone, U.S. railroads moved 3.4 million carloads of coal, with each rail car carrying enough coal to power 20 homes for an entire year.

Despite recent declines in rail coal shipments, coal remains crucial to the nation's industrial economy and a significant rail market. Over 90% of U.S. coal consumption is for electricity generation, industrial purposes, and is an export for steelmaking and power generation worldwide. While five states contribute nearly 70% of U.S. coal production, freight railroads enable nationwide distribution, offering efficient and cost-effective transportation solutions through innovation and investments.

In recent years, technological advancements in natural gas extraction and the growing reliance on renewables have led to a substantial drop in coal's share in U.S. electricity generation. This shift, coupled with environmental concerns, has impacted the coal industry. The electricity market, a key determinant for coal's fate, has seen coal's share decline despite flat total U.S. electricity generation over the past 15 years. The rise of natural gas production, driven by technologies like hydraulic fracturing, has made it a more abundant and cost-effective alternative for electricity producers.