



Oil Infrastructure

During New England winters, the region relies on oil-fired generators to replace the loss of “fuel-deprived” natural gas-fired capacity/energy. During summers, these same oil-fired generators supplement all online generation to meet peak summer demands and operating reserve requirements. Below are some maps and information regarding the regional oil infrastructure that fuels New England’s oil-fired generation fleet.

There are two interstate oil pipelines that serve the New England generator fleet. They bring refined (liquid) products from outside of the region and deliver it to end use customers within New England’s borders. These interstate oil pipelines are regulated by FERC. A good portion of southern New England’s oil-fired generating capacity is fueled either directly or indirectly from these pipelines.

There are two intrastate natural gas pipelines in New England. They deliver gas to customers within a state’s boundaries. These intrastate pipelines are regulated by their state PUCs. However, these pipelines only supply fuel to a minimum amount of oil-fired generation capacity, if any.

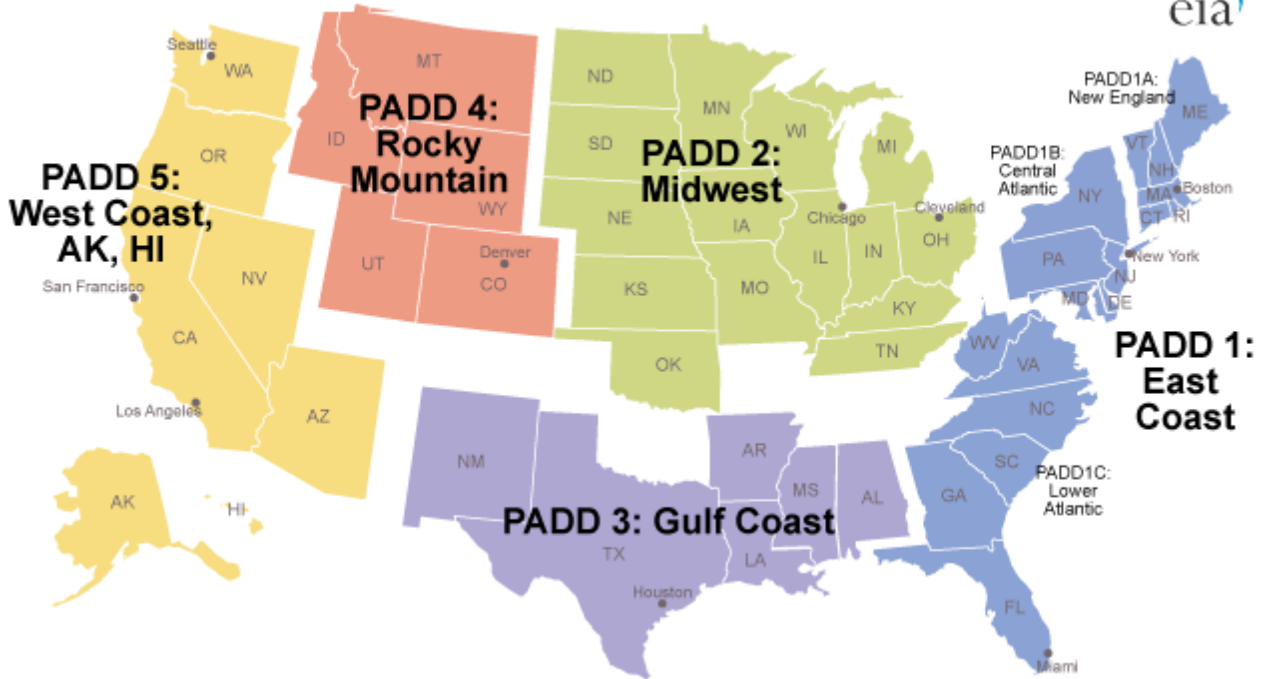
Petroleum Administration for Defense Districts (PADD)

The Petroleum Administration for Defense Districts (PADDs) are geographic aggregations of the 50 states and the District of Columbia into five districts: PADD 1 is the East Coast, PADD 2 the Midwest, PADD 3 the Gulf Coast, PADD 4 the Rocky Mountain Region, and PADD 5 the West Coast. Due to its large population, PADD 1 is further divided into sub-PADDs, with PADD 1A as New England, PADD 1B the Central Atlantic States, and PADD 1C comprising the Lower Atlantic States.

During World War II, the Petroleum Administration for War was established by an Executive order in 1942, and used these five districts to ration gasoline. Although the Administration was abolished after the war in 1946, Congress passed the Defense Production Act of 1950, which created the Petroleum Administration for Defense and used the same five districts, only now called the Petroleum Administration for Defense Districts. Figure 1 shows the five major PADDs in the continental U.S.

Figure 1 – Five Petroleum Administration for Defense Districts (PADDs)

Petroleum Administration for Defense Districts

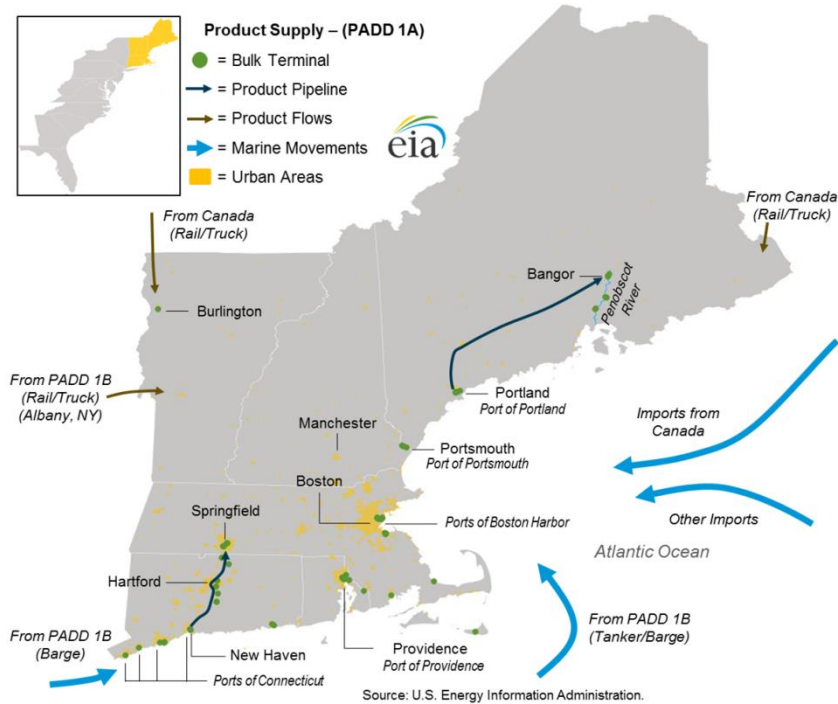


New England (PADD 1A)

PADD 1 – Liquid Fuel Supply Infrastructure

Figure 2 shows the primary transportation routes of liquid fuel supply to New England (PADD 1A). New England obtains its liquid fuels via pipelines, ocean tankers from foreign ports, barges (from the New York harbor), and rail and trucking deliveries from the Midwest and Canada. The following discussions will focus on liquid fuel supplies by state.

Figure 2 – Liquid Fuel Supply to PADD 1A (New England)



Connecticut

Connecticut does not have any petroleum reserves and does not produce or refine petroleum. The state receives refined petroleum products at the coastal ports of New Haven, New London, and Bridgeport. The Connecticut River is an important inland water route for sending petroleum products by barge into central Connecticut. River barges carry motor gasoline, diesel fuel, fuel oil, jet fuel, and asphalt up to the middle of the state. The Buckeye pipeline originates in New Haven and runs north to supply the Hartford area and then western Massachusetts. The pipeline terminates north of Springfield, Massachusetts. Three Northeast Home Heating Oil Reserve sites were created by the U.S. Department of Energy in 2000, to hold over one million gallon of liquid fuels as a buffer against future fuel disruptions. One site is located in Groton, Connecticut. In 2019, approximately 39% of Connecticut households used fuel oil as their primary energy source for home heating.¹

¹ Source: U.S. Census Bureau, "Profile of Selected Housing Characteristics." Data is 2019, 1-year estimates.

Maine

Maine does not produce or refine petroleum. In 2019, approximately 60% of Maine households used fuel oil as their primary energy source for home heating, the highest percentage in all New England. Maine receives more than half its petroleum products through the Port of Portland on Casco Bay, where storage terminals are operated by major product suppliers. Portland is a natural deep-water harbor and is mostly ice-free year round. Most of the rest of Maine's refined products are received farther north, at Searsport and Belfast, or at several border crossings from Canada. Canada is the dominant supplier of petroleum product imports to all of Maine's ports.

Massachusetts

Massachusetts has no petroleum reserves, production, or refineries. In 2019, approximately 24% of Massachusetts households used fuel oil as their primary energy source for home heating. The Port of Boston, the oldest continuously active port in the nation, has petroleum product terminals that supply most of the oil demand in Massachusetts. Refined products are transported to Boston Harbor by tanker or barge, from both refineries in Canada and Europe, as well as from U.S. refineries. Two small-capacity petroleum product pipelines run from ports in Connecticut and Rhode Island into central Massachusetts. As noted earlier, the U.S. DOE created the Northeast Home Heating Oil Reserve to avert shortages; one of the three terminals is in Revere, Massachusetts.

New Hampshire

New Hampshire has no petroleum reserves and does not produce or refine petroleum. In 2019, approximately 42% of New Hampshire households used fuel oil as their primary energy source for home heating. However, petroleum products dominate New Hampshire's energy consumption. The state's residential petroleum consumption per capita is among the highest in the nation, in part because of heavy dependence on heating oil and propane during the frigid winters. Portsmouth, the state's only seaport, has terminal and storage facilities for heating oil, propane, and other refined products. Marine terminals connect with railroad lines and highways (trucking) to take products inland. Distributors also bring in supplies by rail and by truck from neighboring states. Refined products are shipped by sea to Portsmouth from Middle Atlantic and Gulf Coast refineries or are imported, mainly from Canada.

Rhode Island

Rhode Island has no petroleum reserves and does not produce or refine petroleum, but the Port of Providence is a key petroleum products hub for southern New England. Almost all of the liquid fuels consumed in Rhode Island, eastern Connecticut, and parts of Massachusetts are supplied via marine shipments through the Port of Providence. The port area has petroleum storage tanks and a small-capacity petroleum product pipeline runs from the port to central Massachusetts. In 2019, approximately 29% of Rhode Island households used fuel oil as their primary energy source for home heating, the lowest percentage in all New England.

Vermont

Vermont has no petroleum proved reserves, production, or refining. However, nearly three-fifths of the energy consumed in the state is petroleum-based. Petroleum products are brought in by railroad and truck from neighboring states and Canada. In 2019, approximately 41% of Vermont households used fuel oil as their primary energy source for home heating.

New England

The table below shows the number of households in New England categorized by primary space heating (fuel) source:

Heating Source	Winter 2020/2021 (in 1,000s)	Percentage² (%)
Natural Gas	12,516	57.4
Fuel Oil	4,306	19.76
Electricity	3,713	17.04
Propane	1,042	4.78
Wood	218	1.00
Totals	21,795	100

Source: U.S. EIA, October 2020

Assessing only the top three residential heating fuels in New England, by categories, we find that natural gas is the highest at 39.9%, heating (fuel) oil is second at 34%, and electricity is lowest at 14.6%. (Sum total = 100%)

PADD 1 (East Coast)

PADD 1A (New England): Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont

With no refineries operating in the region, New England is a net consumer of liquid fuels. Markets in the New England region rely entirely on the delivery of petroleum products from outside the region, primarily delivered to coastal ports by marine tanker and barge, but also to a lesser degree, by rail and truck from New York and Canada. Distillate fuel oil consumption in New England is primarily driven by heating oil consumption during the winter months and electric power sector use throughout the year. Swing supply to meet the coincidental demand from peak heating and power sector oil consumptions is satisfied by increased domestic deliveries from the Central Atlantic region and increased imports, primarily from Canada.

Buckeye Pipeline

Buckeye currently serves Connecticut and Massachusetts through an approximately 100-mile pipeline that carries refined petroleum products from New Haven through central Connecticut and into Massachusetts. Running north from New Haven, the pipeline has Connecticut delivery locations in Middletown, Rocky Hill, East Hartford, Hartford, Bradley International Airport, Melrose, and Enfield. It continues into Massachusetts with locations in Springfield, Ludlow, and the Westover Air Force Base.

² Totals may not sum exactly due to rounding

Buckeye operates a pipeline terminal with a 345,000 barrel capacity in Wethersfield. It handles ultra-low sulfur diesel, gasoline, ethanol, and heating oil. Its pipeline terminals receive products from pipelines and distribute them to third parties, who in turn deliver them to end-users and retail outlets. The facilities consist of multiple storage tanks and are equipped with automated truck loading equipment that is available 24 hours a day. They derive most of their revenues from various fees paid by customers.

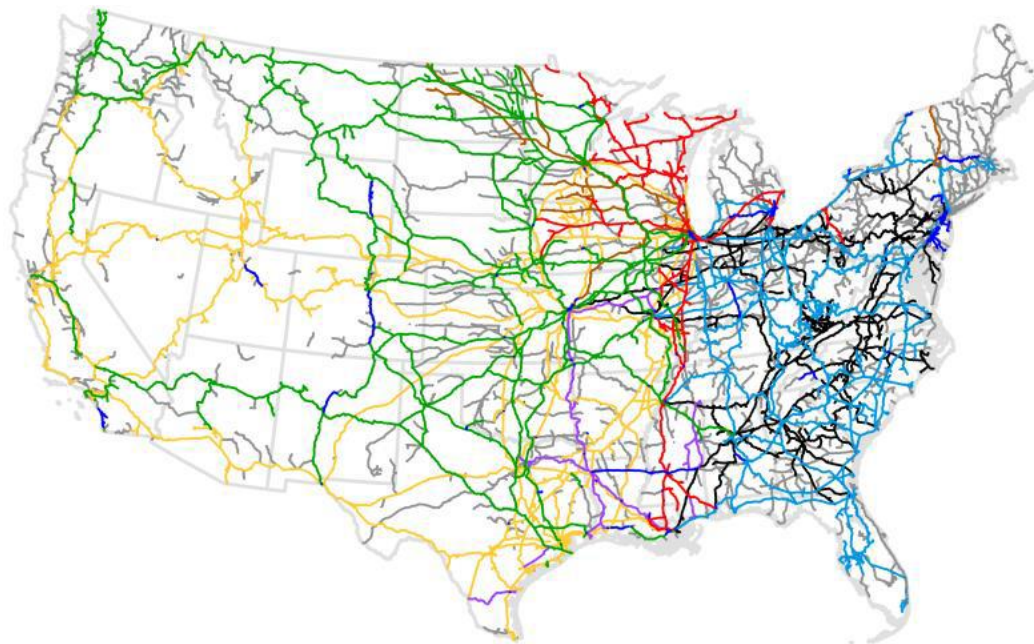
Terminals - Working and Net Available Shell Storage Capacity

Net Available Shell Storage Capacity³ (Table 6) and Working Storage Capacity⁴ (Table 7) are the EIA reports containing storage capacity data for crude oil, petroleum products, and selected biofuels. These reports includes tables detailing working storage capacity by type of facility, product, and PADD. Net available shell storage capacity is broken down further to show the percent for exclusive use by facility operators and the percent leased to others.

Rail Delivers to PADD 1

Figure 3 shows the U.S. rail freight network as of 2014. Figure 4 show the U.S. rail crude oil loading and unloading terminals. Although there is a rail terminal in Boston, be reminded that there are no petroleum refineries in PADD 1A (New England), so that terminal is primarily used for export crude oil to foreign, Atlantic basin refineries. In addition, the rail terminals in New York and New England are also used to bring in refined and distillate products from other regions in the U.S. (PADD 2) and Canada.

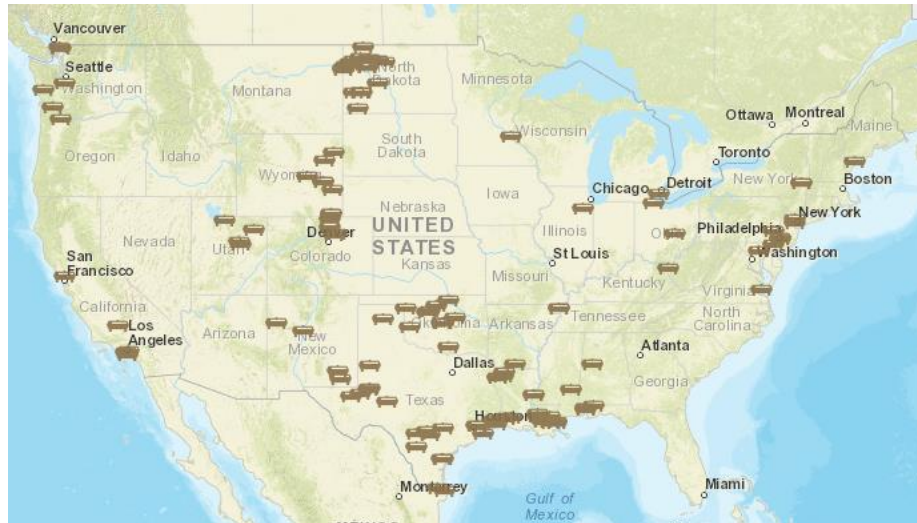
Figure 3 – America’s Rail Freight Network – U.S. DOT - 2014



³ The design capacity of a petroleum storage tank which is always greater than or equal to working storage capacity.

⁴ The difference in volume between the maximum safe fill capacity and the quantity below which pump suction is ineffective (bottoms).

Figure 19 – Rail Crude Oil Loading and Unloading Terminals in the U.S. - EIA



Trucking Deliveries to PADD 1A (New England)

Once liquid fuels are brought into the region in bulk, they are typically distributed to the end use customer by truck. A tank truck or tanker truck or tanker is a motor vehicle designed to carry liquefied loads, dry bulk cargo or gases on roads. The largest such vehicles are similar to railroad tank cars which are also designed to carry liquefied loads. Tank trucks tend to be large; they may be insulated or non-insulated; pressurized or non-pressurized; and designed for single (one tank) or multiple loads (internal divisions between tanks).

Size and Volume

Tank trucks are described by their size or volume capacity. Large trucks typically have capacities ranging from 5,500 to 11,600 US gallons. A tank truck is distinguished by its shape, usually a cylindrical tank upon the vehicle lying horizontally. The tanks themselves will almost always contain multiple compartments or baffles to prevent load movement destabilizing the vehicle.

Common Large Tank Trucks

Large tank trucks are used for example to transport gasoline to filling stations or various fuels to dual fuel or oil-fired power plants. Tank trucks are constructed of various materials depending on what products they are hauling. These materials include aluminum, carbon steel, stainless steel, and fiberglass reinforced plastic (FRP).

Some tank trucks are able to carry multiple products at once due to compartmentalization of the tank into multiple tank compartments. This allows for an increased number of delivery options. These trucks are commonly used to carry different grades of gasoline to service stations to carry all products needed in one trip. Smaller tank trucks, with a capacity of less than 3,000 US gallons are typically used to deal with light liquid cargo (heating oil) within a local community.

Rack Rates

Refineries sell liquid fuels (gasoline, home heating oil, etc.) to wholesalers and directly to some fuel retailers. When the driver pulls the truck up to load the tanker at the fuel depot/terminal, he or she parks in a loading rack. The truck driver gets an invoice for the fuel to be delivered to a particular client. That invoice indicates the “rack” rate the client will need to pay for the delivery, which is usually set once a day. The rack price includes the cost of the fuel itself, as well as transportation, overhead, and profit costs. The price can vary from terminal to terminal and depends on the cost of crude oil and related refining costs. The rack price also depends upon the distance between the fuel retailer and wholesale terminal.