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Reducing Transportation Emissions in the Northeast and Mid-Atlantic: Fuel System Considerations

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GEORGETOWN CLIMATE CENTER
A Leading Resource for State and Federal Policy

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I. Introduction

The leaders of transportation, energy and environment agencies in 11 Northeast and Mid-Atlantic states and the District of Columbia formed the Transportation Climate Initiative (TCI) in 2010 to develop clean transportation solutions for the region. These jurisdictions recognize the challenge of maintaining a reliable and sustainable transportation system, which is essential to economic prosperity, while also reducing pollution from the transportation system, which now accounts for the largest share of regional carbon emissions. The Georgetown Climate Center supports TCI by facilitating dialogues and conducting analyses that help to inform the consideration of policy options.

The TCI jurisdictions understand the value of regional cooperation when developing common-sense strategies that will most efficiently reduce carbon emissions and other pollutants, improve transportation, advance public health, spur investments in clean transportation technologies and infrastructure, and inspire businesses to create jobs and drive innovation. In November 2015, several TCI jurisdictions committed to developing potential market-based policies to help achieve these goals.[1]

In support of states interested in learning more about market-based policy options, the Georgetown Climate Center developed this paper to explore technical aspects of a hypothetical regional cap-and-invest policy, as an illustrative example of a market-based approach to a multi-state transportation policy. The paper addresses two questions:

1) Which fuels might be covered under a policy? and
2) Which entities in the transportation fuel supply chain could be deemed responsible for reducing emissions?

TCI states have not yet decided upon any particular policy or policies to pursue, and the scope of this analysis does not examine all design questions that would be part of policy development. However, the issues explored in this paper are central to any discussion of market-based greenhouse-gas reduction policies that cover transportation fuels.

Section II provides a brief overview of the transportation fuel supply system in the Northeast and Mid-Atlantic and explains how a hypothetical cap-and-invest system covering gasoline and on-road diesel for transportation could operate. Section III provides an overview of transportation fuels that could be included in such a program, the magnitude of emissions from different fuels, and a summary of existing fuel data reporting requirements. Section IV describes three potential points of regulation, identifies whether data are already reported at each point, and describes how each approach might work in practice. Section V assesses each potential point of regulation against technical, administrative, and policy considerations. Section VI provides brief conclusions and recommendations for policymakers to consider.

The recommendations made in this paper are intended to aid in the development of robust market-based policies that provide flexibility and enable innovation while achieving region-wide reductions in carbon emissions. Complementary financing strategies, incentives and other policies could also promote public- and private-sector investments that advance clean transportation markets, reduce carbon pollution, and upgrade the region's transportation systems. Prior analysis detailed the possible net economic and environmental benefits of a hypothetical market-based transportation policy for the TCI region.[2]

This paper is a product of the Georgetown Climate Center. It has been peer reviewed for accuracy by external experts. It does not necessarily represent the views of any state officials or expert reviewers.

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[1] "Five Northeast States and DC Announce They Will Work Together to Develop Potential Market-Based Policies to Cut Greenhouse Gas Emissions from Transportation." November 2015. http://www.transportationandclimate.org/five-northeast-states-and-dc-announce-they-will-work-together-develop-potential-market-based

[2] "Reducing Greenhouse Gas Emissions from Transportation: Opportunities in the Northeast and Mid-Atlantic," November 2015. http://www.georgetownclimate.org/reports/reducing-greenhouse-gas-emissions-from-transportation-opportunities-in-the-northeast-and-mid-atlantic.html

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II. Background

A. Background on Fuel System

This section provides an overview of the production, transmission, and distribution of fossil transportation fuels in the Northeast and Mid-Atlantic. The region is defined to include the District of Columbia and the following 11 states: Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont. A more detailed description of the fuel system in the region is provided in Appendix II. Additionally, state agency staff provided very helpful data and information regarding the current fuel system, reporting requirements and related policies, much of which is summarized in Appendix III. A glossary of technical terms used in this paper can be found in Appendix I.

The production of fossil transportation fuels such as motor gasoline, diesel, kerosene jet fuel, and residual fuel oils for heavy engines begins with the extraction of petroleum. The Northeast and Mid-Atlantic region produces relatively little crude oil, and is largely dependent on imports of refined petroleum products into the region from other regions of the U.S., such as the Gulf Coast and upper Midwest and from international sources in Canada, the Middle East, and Central America. A small quantity of crude oil—less than one percent of total regional consumption—is extracted in Pennsylvania and New York.[3]

Crude oil moves by pipeline, ship, or barge to refineries, where it is turned into a finished product or refined fuel component that can be blended with other components (e.g., a blendstock such as reformulated blendstock for oxygenate blending (RBOB), which is the chief component of finished motor gasoline). The finished fuel or component moves from the refinery in bulk shipment, by pipeline, ship, or barge, to a bulk terminal. At the bulk terminal, gasoline blendstock is blended with an oxygenate component[4] when it is dispersed into tanker trucks in order to produce a finished fuel.[5] The title to the final product is held by suppliers at the bulk terminal, where it is purchased by regional wholesale distributors, sometimes called "jobbers," for eventual delivery to retail outlets, such as service stations, or directly to larger-scale end-users such as trucking companies. The "terminal rack" refers to the facility and equipment used to dispense fuel products from the bulk terminal into tanker trucks or rail cars.

The Energy Information Administration (EIA) tracks petroleum product movement by Petroleum Administration for Defense District or PADD. PADD 1 encompasses the East Coast, and is divided into three subdistricts. The Northeast and Mid-Atlantic states are contained within subdistricts 1A and 1B (See map in Appendix II).

- PADD 1A (New England): Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont.
- PADD 1B (Central Atlantic): Delaware, District of Columbia, Maryland, New Jersey, New York, and Pennsylvania.

New England (PADD 1A) is a net consumer of fuels with no refinery capacity in the region. New England relies on the delivery of petroleum products from outside the region, primarily delivered to coastal ports by tanker ship and barge but also by rail and truck from New York and Canada.

The Central Atlantic region (PADD 1B) has refinery capacity[6] for approximately 1.2 million barrels per calendar day, enough to meet more than half of demand within PADD 1B – but the refineries are not necessarily operating at full capacity. The remainder of the region's supply comes from pipeline movements, primarily from the Gulf Coast region via the Colonial Pipeline, and via tanker ship imports. Most supply in the Central Atlantic region passes through two major supply hubs, located in the Greater Philadelphia and New York Harbor areas, before being distributed to coastal markets primarily by barge, or piped to inland markets on the Buckeye and Sunoco

[3] Computed using Energy Information Administration State Energy Data System (EIA SEDS) 2016 data for crude oil production and end-user consumption of all petroleum products in the Northeast and Mid-Atlantic states.
[4] Usually ethanol derived from corn, most of which is produced in PADD 2.
[5] Diesel and Jet Fuel are not blended with oxygenate, but batches may be blended with other batches in order to meet quality standards.
[6] Refineries are located in Delaware, New Jersey, and Pennsylvania.

Logistics pipeline systems. Please refer to Appendix II for a more detailed breakdown of petroleum assets in the Northeast and Mid-Atlantic region.

B. Cap-and-Invest Program Background

This paper is intended to describe policy design options for a hypothetical multi-state cap-and-invest program that could be used to limit greenhouse gas (GHG) emissions from transportation fuels in the Northeast and Mid-Atlantic United States.

The term "cap and invest" describes a program that sets a mandatory, binding GHG emissions cap on one or more sectors of the economy and reinvests proceeds from the auction of emissions allowances into strategies that help drive emission reductions or otherwise benefit residents and the economy.

Under this kind of program, an implementing state would issue allowances equal to the emissions budget or "cap." Allowances are compliance instruments that regulated entities are required to hold for a given quantity of pollution that is emitted within the compliance period; for example, one allowance for one ton of carbon dioxide. If at the end of a compliance period a regulated entity does not have sufficient allowances to cover its emissions, it is out of compliance and subject to a penalty or other sanction. Emissions from the regulated sector are therefore "capped" at the quantity of allowances issued by the state. Generally, the cap declines over time, reflecting the policy objective to reduce emissions from covered sources.[7]

In a cap-and-invest program, most or all of the allowances are distributed through sale at periodic auctions. Regulated entities may purchase the allowances at auction and they can buy, sell, or otherwise transfer allowances directly with other market participants. The price of the allowances is not fixed—rather the quantity of allowable emissions is set by the program, and the market determines the price. Some allowances may also be freely distributed by the state to regulated entities or other parties.

Since the emission budget (i.e., the quantity of allowances) is typically set at a level of emissions below what would otherwise occur under "business as usual," a cap-and-invest program is expected to promote changes in behavior by regulated entities or consumers to reduce emissions. Some companies producing or supplying transportation fuels will find it cheaper to bring less carbon-intensive fuels to market than to purchase additional allowances. Investments of auction proceeds into emission reducing policies—for example electric vehicle incentives, additional transit service, multi-modal freight infrastructure, ridesharing, and pedestrian and biking infrastructure—will also reduce demand for fossil transportation fuels by promoting less carbon-intensive transportation options, thus mitigating costs for consumers and providing other benefits for residents. A price on emissions can also influence consumer behavior, reducing demand for fossil transportation fuels.

Cap-and-invest programs usually also include mechanisms to provide additional compliance flexibility to regulated entities, mitigate costs, and help ensure a stable and well-functioning allowance market. These can include:

- options to bank allowances for compliance in future years;
- cost-containment mechanisms that introduce additional allowances into the market when allowance prices reach a certain threshold;
- allowance price ceilings or price floors;
- offset credit mechanisms, which allow certified emission reducing projects in other, uncapped sectors to generate credits that can be used for compliance; and
- linking with similar programs in other regions or sectors, thereby allowing the most cost-effective emissions reducing actions to take place first across sectors or regions.

Cap-and-invest programs may also include provisions to address potential competitiveness and equity issues. This can include distributing allowances or investing auction proceeds in targeted ways, or choosing which sources of emissions are covered under the cap.

[7] For example of a long term policy objective, see "United States Mid-Century Strategy For Deep Decarbonization." November 2016. http://unfccc.int/files/focus/long-term_strategies/application/pdf/us_mid_century_strategy.pdf

A prominent example of a cap-and-invest program is the Regional Greenhouse Gas Initiative (RGGI), a program that covers power sector emissions in nine Northeast and Mid-Atlantic States. The RGGI program caps emissions from power plants, and the proceeds raised from auction are reinvested into strategies like energy efficiency, renewable energy, greenhouse gas abatement, and direct customer electric bill assistance.

The RGGI program was developed as a collaboration among participating states. The states jointly developed a Memorandum of Understanding (MOU) and a model rule, and each state then promulgated its own implementing regulations. Each state decides for itself how it will invest auction proceeds, though the states agreed that at least 25 percent of allowances would be used "for consumer benefit or strategic energy purpose."[8] The RGGI program also includes a "floor" for the price of emissions allowances sold at auction.

Because a large portion of proceeds from the RGGI program have been reinvested in energy efficiency programs that cut consumers' demand for electricity, the RGGI program has reduced overall electricity bills among consumers and provided net economic benefits to the region.[9]

California, Ontario and Quebec use a similar model for their economy-wide emissions programs with a mix of free and auctioned allowances. The California program launched in 2013, and began by covering the electric power sector and large industrial facilities. California's program and Quebec's became linked in January 2014. In January 2015, the program expanded to cover transportation fuels, natural gas, and other fuels. In California's program, refiners and importers of transportation fuels are required to hold allowances equal to the greenhouse gas emissions resulting from the combustion of the fossil fuels they supply (in this paper, we refer to this as the carbon content of the fuels).[10] Producers or importers of fossil transportation fuels that emit 25,000 tonnes of CO_2e[11] or greater qualify as regulated entities.[12] California and Quebec jointly auction a significant portion of their allowances and invest proceeds from the auction into emission-reducing projects.[13] These include investments into high-speed rail, electric vehicle incentives, transit, and sustainable communities.[14] In September 2017, Ontario signed an agreement with California and Quebec to officially link carbon markets.[15]

A transportation-sector cap-and-invest program established by multiple states could work as follows:

- *States establish a mandatory, binding limit or "cap" on the GHG emissions resulting from the direct combustion of fossil transportation fuels*, as calculated using volumetric fuel data and EPA transportation fuel emission factors. The emissions cap could decline over time. Because emission factors are known and standardized for each fuel type, total CO_2 emissions can be determined based on the type and quantity of each fuel consumed. The federal EPA publishes CO_2 emission factors for transportation fuels as part of its mandatory GHG reporting regulation.[16]

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[8] Regional Greenhouse Gas Initiative. Memorandum of Understanding, page 6. https://www.rggi.org/docs/mou_final_12_20_05.pdf

[9] Regional Greenhouse Gas Initiative. Fact Sheet: The Investment of RGGI Proceeds Through 2014. https://www.rggi.org/docs/ProceedsReport/RGGI_Proceeds_FactSheet_2014.pdf

[10] We chose not to use the term "carbon intensity" due to its association with inclusion of indirect emissions and full life cycle emissions accounting. For example, the California Air Resources Board uses the term "carbon intensity" to mean full life cycle GHG emissions of fuel: https://www.arb.ca.gov/fuels/lcfs/121409lcfs_lutables.pdf

[11] Carbon dioxide equivalent (CO_2e) is a commonly used term for describing the radiative forcing effect of different greenhouse gases, relative to carbon dioxide.

[12] 25,000 tonnes of CO_2e emissions is approximately equivalent to combusting 2,847,500 gallons of gasoline, or 317 full semi-tanker trucks of gasoline.

[13] Quebec, Auction Proceeds Allocated to the Green Fund. http://www.mddelcc.gouv.qc.ca/changements/carbone/revenus-en.htm

[14] California Air Resources Board. "California Climate Investments." https://www.arb.ca.gov/cc/capandtrade/auctionproceeds/auctionproceeds.htm

[15] Ontario's economy-wide cap-and-invest program will be linked with California and Quebec's beginning in January 2018. "Québec, Ontario and California Join Forces to Fight Climate Change." https://news.ontario.ca/opo/en/2017/09/quebec-ontario-and-california-join-forces-to-fight-climate-change.html.

[16] United States Environmental Protection Agency. "Emission Factors for Greenhouse Gas Inventories." 2014. https://www.epa.gov/sites/production/files/2015-07/documents/emission-factors_2014.pdf

- *States establish a point of regulation* that identifies the entities that would be subject to the program and the way in which the compliance obligation would be applied. This paper provides additional detail on three potential points of regulation: existing state points of taxation for transportation fuels, importers and refiners, and Prime Suppliers.
- *States auction allowances equal to the cap.* States could potentially establish a common auction platform and administrative entity, as RGGI states have done. In RGGI, the states established a non-profit, RGGI, Inc., that administers auctions. State agency leaders serve as the board of directors of RGGI, Inc.
- *Regulated entities comply by procuring allowances* by purchasing them at auction, receiving an allocation from the state, or obtaining them from other market participants. Each regulated entity must obtain allowances equal to the emissions that they are responsible for during the compliance period.
- *States would decide individually how to invest their share of the auction proceeds.* Proceeds could be used to increase low-carbon transportation options, mitigate potential cost impacts on businesses or vulnerable communities, and reduce demand for fossil fuels. In addition, states might agree that some portion would be invested to achieve a common purpose, e.g., on regional strategies to reduce GHG emissions from the transportation sector, which would make it easier to achieve the cap.

III. Fuel Coverage Options and Considerations

A key design choice for a cap-and-invest program is what fuels might be covered by the program. Fuels used for transportation include motor gasoline, diesel, aviation fuels, and marine fuels like residual fuel oil.

This paper only considers inclusion of fossil-based transportation fuels, and not biofuels, electricity, or hydrogen. For electricity, which is increasingly used as a transportation fuel, emissions are expected to decline over time as lower-carbon resources are brought online.[17] Many of the states in the Northeast and Mid-Atlantic region have existing policies in place to reduce GHG emissions from the power sector. California, Ontario, and Quebec also cover electricity in their economy-wide programs, but similarly exclude biofuels. In addition, California has a separate program—a Low Carbon Fuel Standard (LCFS)—that creates market incentives to reduce life cycle GHG emissions from transportation fuels.[18] [19] This paper does not address LCFS policies.

In considering which fuels to include in a hypothetical program, this paper examines two important factors[20] for each transportation fuel type: 1) its contribution to GHG emissions and 2) the potential ease of including it in the program. This section provides an overview of transportation fuels that could be included, identifies emissions resulting from the respective fuels in the region, and summarizes the extent to which data are currently collected for each fuel.

A. Overview of Fossil Transportation Fuels

The following fossil fuels are used in the transportation sector and could be included in a hypothetical emissions program for the transportation sector. At the end of this section, Table 1 provides EPA-derived carbon dioxide emission factors for each fuel.[21]

- *Motor gasoline:* Motor gasoline is used in most light-duty vehicles and accounts for 71 percent of regional transportation fuel use by volume. Motor gasoline typically contains 10 percent ethanol, which is used as an oxygenate and is blended with gasoline blendstock upon dispersal from a terminal rack.[22] [23]
- *No. 2 distillate diesel fuel, on-road and off-road:* No. 2 distillate diesel fuel is used in the majority of medium- and heavy-duty on-road vehicles; it is also used for rail, marine, and other off-road applications (e.g., agriculture, construction equipment). Federal and state laws typically tax this fuel when it is used for on-road use (i.e., in trucks) but not when it is used for off-road applications. Under federal law, fuel that is destined for off-road use is dyed red at the terminal rack and thereafter tracked separately from fuel destined for on-road use. Biomass-based diesel accounts for around 4 percent of diesel consumption in the United States.[24]
- *Kerosene-type jet fuel:* Kerosene-type jet fuel is used by jet-engine aircraft and is dispensed at airports for end-use.

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[17] Electric Power Research Institute (EPRI) and the Natural Resources Defense Council (NRDC). Environmental Assessment of a Full Electric Transportation Portfolio. 2015. https://www.epri.com/#/pages/product/3002006881/

[18] Life cycle emissions are the emissions attributable to a product from each stage of the product's creation and use. In the case of transportation fuels, life cycle emissions occur at each stage of the supply chain: extraction of feedstock, processing and transport of feedstock, refining of feedstock into fuel component, transport of fuel component, blending, transport to retailer, combustion by end user. Estimated through Life Cycle Assessment

[19] For example, for biofuels, there are various methods for reducing GHG emissions at each stage of the life cycle. National Research Council. Renewable Fuel Standard: Potential Economic and Environmental Effects of U.S. Biofuel Policy. Washington, DC: The National Academies Press. 2011. https://doi.org/10.17226/13105

[20] Policymakers may add additional factors that are not addressed in this paper.

[21] All emissions factors taken from EPA's "Emission Factors for Greenhouse Gas Inventories" or Table C-1 to Subpart C of Part 98—Default CO2 Emission Factors and High Heat Values for Various Types of Fuel. https://www.epa.gov/sites/production/files/2015-07/documents/emission-factors_2014.pdf

[22] US Department of Energy. "Ethanol Blends." http://www.afdc.energy.gov/fuels/ethanol_blends.html.

[23] US Energy Information Administration. "How much carbon dioxide is produced by burning gasoline and diesel fuel?" http://www.eia.gov/tools/faqs/faq.cfm?id=307&t=11

[24] US Energy Information Administration. "Biodiesels produced from certain feedstocks have distinct properties from petroleum diesel." https://www.eia.gov/todayinenergy/detail.php?id=36052&src=email

- *Natural gas, compressed or liquefied:* In the U.S., natural gas is most commonly used by transit buses and government fleet vehicles, and in some heavy-duty freight trucks, but more often used for non-transportation residential and commercial purposes (e.g., heating). In the longer term, it is possible that natural gas will increase its share of the transportation fuel market.
- *Aviation gasoline:* Aviation gasoline is used by piston-engine aircraft and is dispensed at airports for end-use.
- *Liquefied petroleum gas/propane:* Propane, or LPG, is not in widespread use for transportation though it is used by some vehicle fleets and buses. In the U.S., LPG is more often used for non-transportation residential or commercial purposes. Sometimes referred to as autogas when used for transportation.
- *E85:* A blend of 85 percent ethanol and 15 percent gasoline blendstock for use in flex fuel vehicles. This fuel type can also be used as a blending component in the creation of "mid-level" ethanol blends at retail station blender pumps.
- *No. 1 diesel fuel:* No. 1 diesel fuel is more volatile and flows more easily than No. 2 diesel fuel. This fuel is used by some city buses and is sometimes blended into No. 2 diesel fuel during extremely cold conditions to prevent gelling. No. 1 diesel is very chemically similar to kerosene.
- *Residual fuel oil:* Residual fuel oil is also known as No. 5 and No. 6 fuel oils. No. 6 fuel oil is used for ocean-going ships, and is often referred to as "bunker fuel." No. 5 fuel oil is used in steam powered vessels in government service.

Table 1: Carbon Dioxide Emission Factors for Transportation Fuels

Transportation fuel type	Kg of CO_2 per gallon or gallon equivalent
Motor gasoline	8.02
Motor gasoline without ethanol	8.78
No. 2 distillate diesel fuel	10.21[25]
Kerosene-type jet fuel	9.75
Natural gas	6.79
Aviation gasoline	8.31
LPG/propane	5.68
E85	2.28
No. 1 diesel fuel	10.18
Residual fuel oil	11.27

[25] The emissions factor for No. 2 distillate diesel fuel estimated by EPA does not account for the biomass-based diesel content of the finished fuel.

This paper assumes that all liquid fuels that are not used for transportation would not be covered in a hypothetical transportation sector emissions reduction program. This includes the following fuels, which are used for other purposes in this region:

- *No. 2 fuel oil:* Also known as heating oil, No. 2 fuel oil is used in atomizing-type burners for domestic heating or for moderate capacity commercial/industrial burner units. This fuel type is frequently chemically identical to, and manufactured to the same product specification as, No. 2 diesel fuel. No. 2 fuel oil represents a significant share of the region's total market for No. 2 distillates.
- *No. 1 fuel oil:* No. 1 fuel oil is used primarily as fuel for portable outdoor stoves and portable outdoor heaters.
- *No. 4 fuel oil*: No. 4 fuel oil is used in industrial plants and in commercial burner installations that are not equipped with preheating facilities.
- *No. 4 diesel fuel:* No. 4 diesel fuel is used for low- and medium-speed diesel stationary engines.
- *Kerosene:* Kerosene, also known as paraffin, is used in cook stoves and lamps for lighting and is very chemically similar to No. 1 diesel fuel.

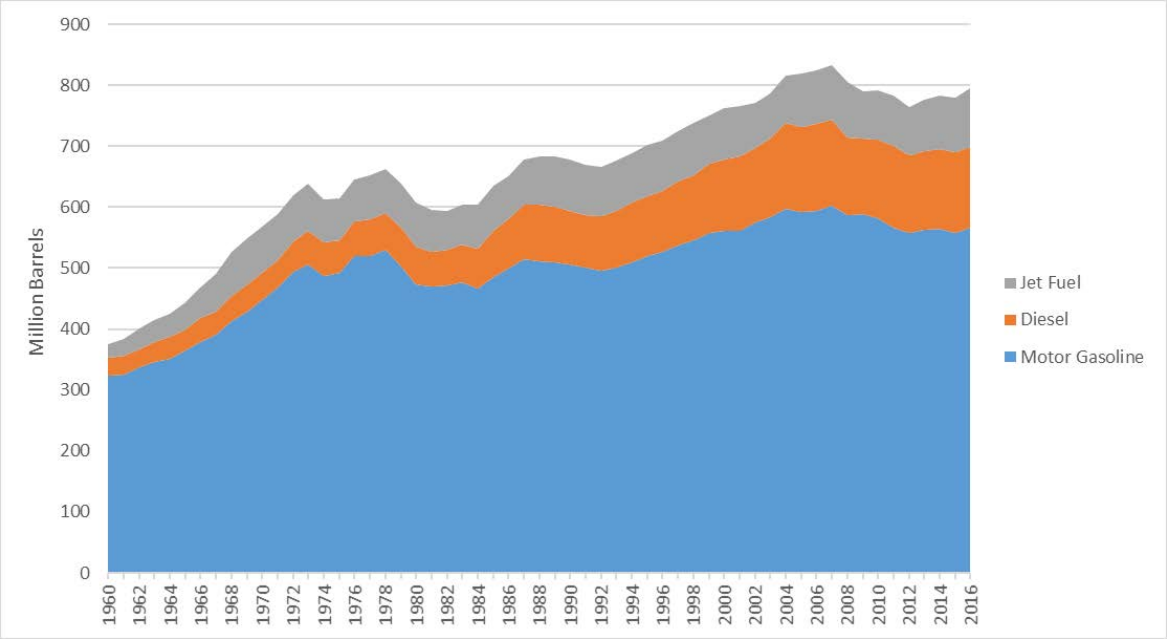
B. Transportation Fuel GHG Emissions

This subsection provides an overview of fuel consumption and resulting emissions in the Northeast and Mid-Atlantic region.[26]

Regional fuel consumption is dominated by motor gasoline, at 71 percent.[27] Diesel makes up 16 percent of fuel consumption, and jet fuel accounts for 12 percent. Within the diesel category, 89 percent of usage is federally taxed (undyed) on-road diesel. The remaining 11 percent is untaxed dyed diesel for various other purposes, such as off-road farm and industrial vehicles and engines. When comparing the proportions of emissions by fuel type versus proportion of fuel consumption by type, diesel and jet fuel make up greater shares of emissions than they do volumes of fuel use. This is due to the lower greenhouse gas emissions factor for motor gasoline when compared to diesel and jet fuel (but is slightly less stark when compared on an emissions-per-joule basis).

Regional fuel consumption peaked in 2007, declined slightly for several years after, and has recently plateaued. Fuel consumption has more than doubled since 1960, and has grown by approximately 20 percent since 1990 (Figure 1).

Figure 1: Northeast and Mid-Atlantic Region Transportation Fuel Consumption[28]



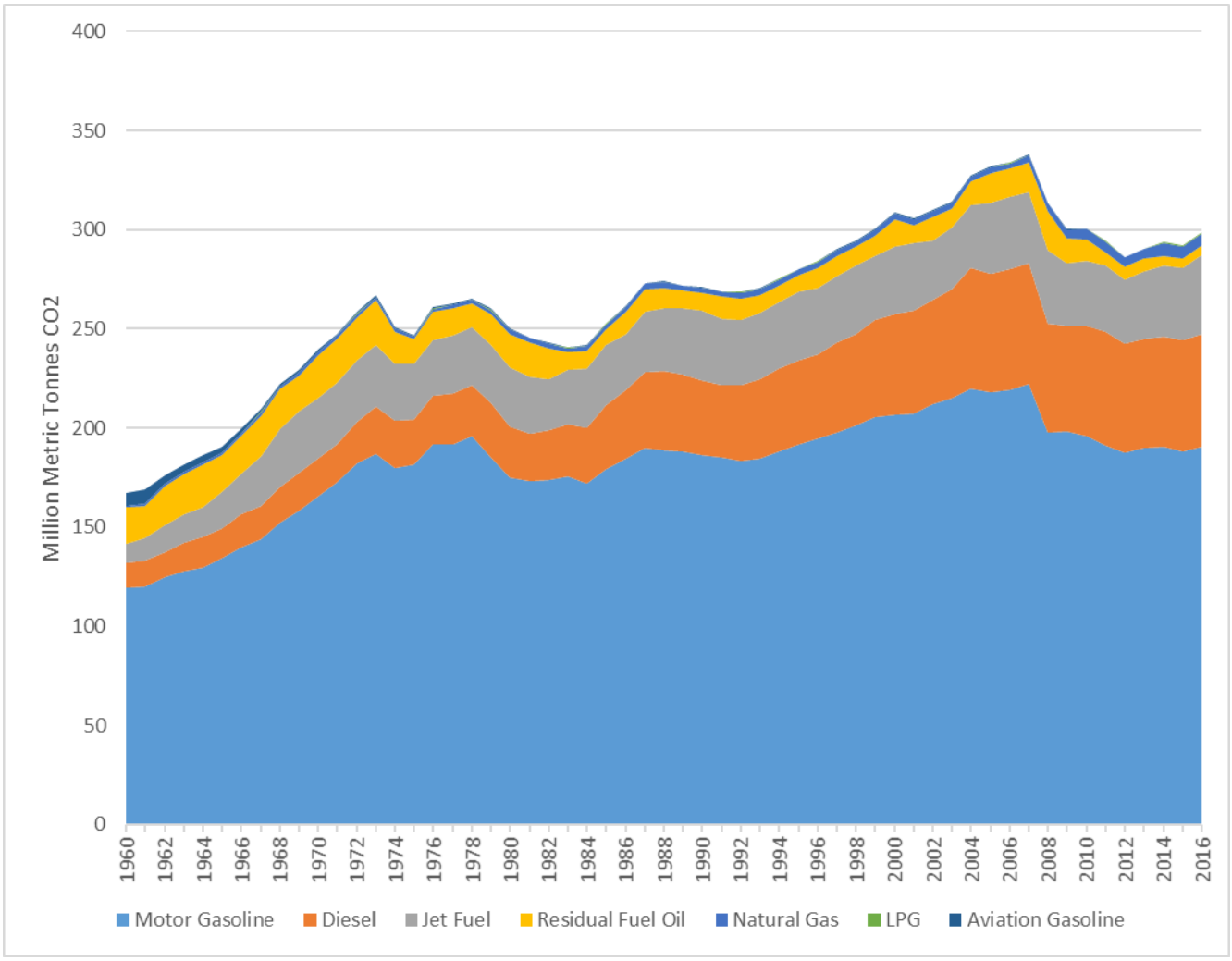
Graphs illustrating fuel emissions by fuel type look very similar to graphs of consumption by volume; minor differences can be explained by differences in the carbon content of each fuel.

Carbon dioxide emissions from transportation fossil fuels have grown since 1960, the earliest year for which data are available from the Energy Information Administration (EIA). Figure 2[29] illustrates that regional transportation-related emissions peaked in 2007, declined during the 2008-2010 recession, and have since plateaued. Motor gasoline dominates the emissions profile of the region, followed by diesel and jet fuel. Diesel fuel has been the fastest growing transportation fuel in the region. Residual fuel oil used to be a much bigger

[26] EIA State Energy Data System (SEDS) data as represented in Figures 1-3 refers to Finished Motor Gasoline, which is 10 percent ethanol by volume. Volumes include the ethanol component, but combustion emissions do not.
[27] Note that Figure 1 includes finished motor gasoline, which on average includes 10 percent ethanol as a blending component. Only the combustion emissions from fossil component of fuels is considered in this analysis. Combustion emissions or life cycle emissions of biofuels or biofuel components are not considered.
[28] Data source, EIA SEDS: http://www.eia.gov/state/seds/
[29] Figure 2 only includes CO_2 emissions. It does not include the combustion emissions of the ethanol component of motor gasoline, biodiesel blends, or non-CO_2 GHGs.

contributor to regional emissions, but its use for transportation has greatly decreased in the past decade. Aviation gasoline, liquid petroleum gas (LPG), and natural gas for transportation amount to a very small portion of emissions (less than 4 percent total) relative to the more common fuels, as shown in Figure 2.

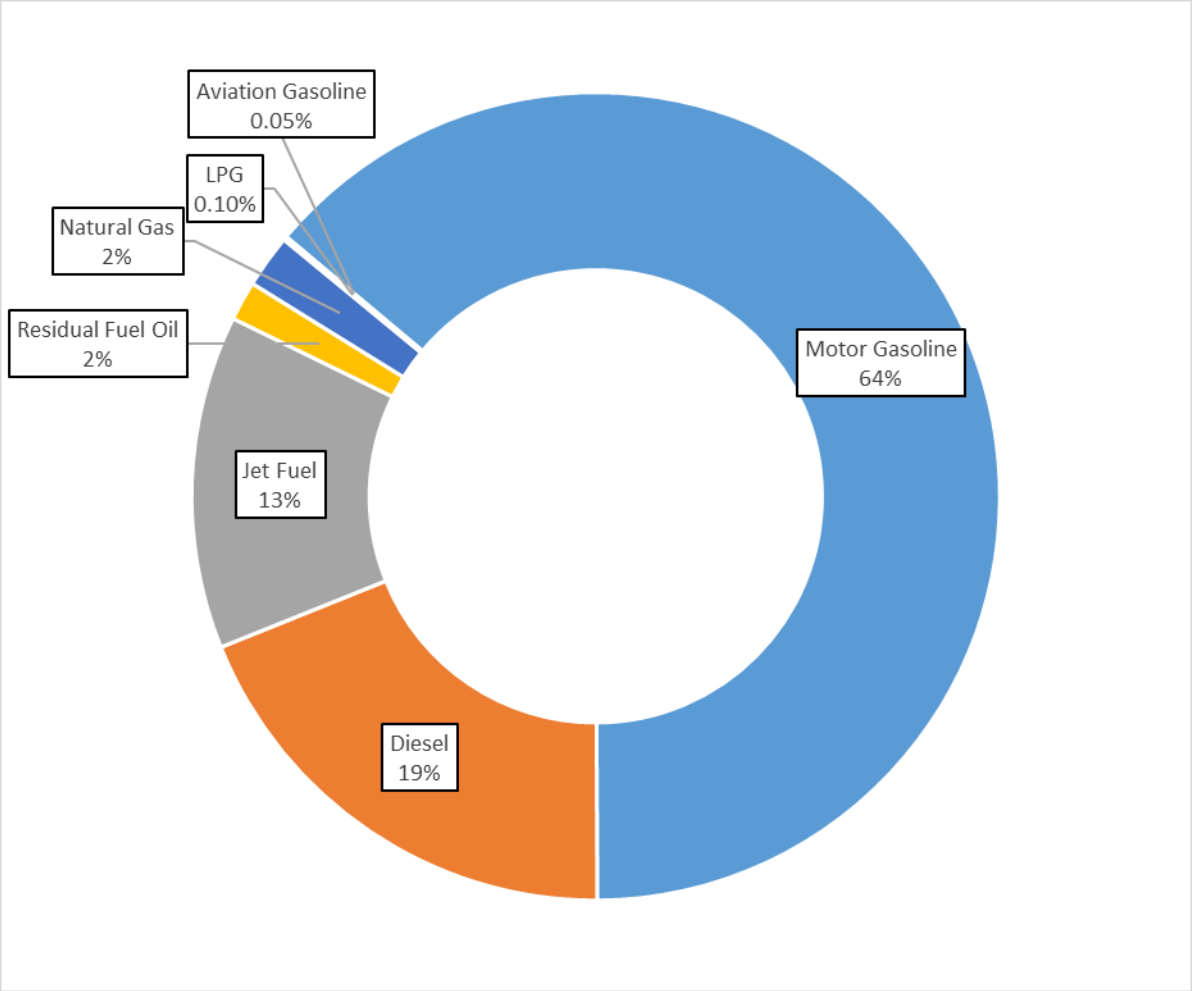
Figure 2: Northeast and Mid-Atlantic Transportation Emissions by Fossil Fuel Type[30]



[30] Data source, EIA SEDS: http://www.eia.gov/state/seds/

Regional transportation emissions data for the year 2016, as published by the EIA, are represented as a pie chart in Figure 3 below.

Figure 3: Northeast and Mid-Atlantic Transportation Emissions by Fuel Type, 2016[31]



When examining fuels from a life cycle perspective, the GHG emissions from the end-use combustion phase make up the greatest portion of total life cycle emissions.[32, 33, 34] California's Low Carbon Fuel Standard assesses fuels based upon their full life cycle emissions, which is particularly relevant when considering biofuels or fuels derived from unconventional sources of petroleum such as tar sands or deep water offshore fields. RIN credits under the federal Renewable Fuel Standard (RFS) also include life cycle aspects (see Appendix II. Fuels and Fuel System Background). Life cycle assessment introduce significant administrative complexity, including the need for chain-of-custody documentation related to the feedstock, production, refining and transport information for each unit of fuel covered by the program.

[31] Data source, EIA SEDS: http://www.eia.gov/state/seds/
[32] United States Environmental Protection Agency. "Lifecycle Greenhouse Gas Emissions for Select Pathways." July 2016. https://www.epa.gov/sites/production/files/2016-07/documents/select-ghg-results-table-v1.pdf
[33] Rahman et al. "Well-to-wheel life cycle assessment of transportation fuels derived from different North American conventional crudes." Applied Energy. October 2015. https://doi.org/10.1016/j.apenergy.2015.07.004
[34] Pont, Jennifer. "Full Fuel Cycle Assessment: Well-To-Wheels Energy Inputs, Emissions, and Water Impacts." California Energy Commissions. June 2007. http://www.energy.ca.gov/2007publications/CEC-600-2007-004/CEC-600-2007-004-F.PDF

Based on this discussion, it is most important that a hypothetical program cover motor gasoline and on-road diesel fuel, which are the two largest sources of carbon emissions from transportation in this region.

C. Current Fuel Data Availability

Assessing the carbon content of transportation fuels requires data on the transaction volumes for fuels being used in the state (or region), by fuel type, from each regulated entity. Depending on how the point of regulation is defined, it may also require information about the fuel's origin, destination, and transport pathway in order to avoid duplicative assessments and to exempt fuels that are destined for end use in other sectors (e.g., heating) or outside of the program region.

In determining which fuels could be covered by such a program, one consideration is whether existing federal or state requirements already require reporting of the necessary information for each type of transportation fuel, and whether fuel types are tracked separately or in combination with other fuels. This section includes a brief introduction to existing reporting requirements. Section IV of this paper includes a more detailed discussion about whether existing requirements produce enough data to calculate the carbon content of fuels at each potential point of regulation, and appendices III and IV provide a detailed description of state and federal reporting requirements.

Federal and state governments have significant data reporting requirements for transportation fuels. Many, but not all, of these reporting requirements are used to implement federal and state excise taxes on motor gasoline and diesel fuels.

Different states levy excise taxes at different points along the fuel supply chain (discussed in detail in Section IV.A.), but all states examined for this paper require reporting of motor gasoline and diesel fuel sales volume destined for in-state use at their respective points of taxation. Most states also require reporting of jet fuel sales volumes. A detailed summary of state reporting requirements is provided in Appendix III.

The federal government also requires substantial reporting of transportation fuel flows and transactions throughout the petroleum supply chain under federal energy laws. This includes reporting requirements for refiners, entities importing fuel into the country, entities producing finished fuel, and entities transporting fuel across state lines.[35] Federal laws require reporting for all transportation fuel types, including jet fuel, aviation gasoline, and maritime fuels. Biofuel volumes are tracked by regulated entities and are reported to the relevant federal agency, though according to most carbon accounting standards biofuels are counted as having zero combustion emissions.[36] A detailed summary of federal reporting requirements is provided in Appendix IV.

An important consideration is whether fuels are tracked and reported separately. As summarized in the table below, most fuels are tracked and reported separately under current reporting requirements, with a few exceptions. Motor gasoline is always tracked separately from diesel fuel. EIA does not track on-road and off-road diesel separately; however, states do tax these fuels differently. Heating oil (No. 2 fuel oil) is typically required to be reported separately from diesel fuel (No. 2 diesel), but there may be some misreporting prior to dying and disbursement from the terminal rack because the fuels are manufactured to the same product specifications.[37] Jet fuel and aviation gasoline are separately tracked at the federal level and in states where reporting is required. The private sector uses various methods for supply chain documentation, such as Bills of Lading and schedule information for tracking the movement of fuel products and to ensure that payments are received. Due to the technical and administrative challenges associated with disaggregating natural gas for transportation uses versus other uses, it is not included in the table below.

Table 2 summarizes the availability of state-level fuel data from three sources: 1) state taxation records, 2) mandatory reporting to EIA by refineries and importers and 3) mandatory reporting to EIA by Prime Suppliers.

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[35] All these entities would submit Prime Supplier reports to EIA, in addition to other EIA reporting. The EIA defines a Prime Supplier as any firm that produces, imports, or transports selected petroleum products across state boundaries and local marketing areas, and sells the product to local distributors, local retailers, or end users. Prime Supplier is further discussed as a potential point of regulation in Option 3: Prime Suppliers.

[36] For example, in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: "Carbon dioxide from the combustion or decay of short-lived biogenic material removed from where it was grown is reported as zero in the Energy, IPPU and Waste Sectors."

[37] Maureen Klein. Email Correspondence. EIA's Office of Energy Statistics. October 24, 2016.

Table 2: Availability of State-Level Fuel Data from Three Key Sources

Fuel type	State taxation records	EIA reporting requirements for refineries and importers	EIA reporting requirements for Prime Suppliers
Motor gasoline	Yes available	Yes available	Yes available
On-road diesel	Mostly yes. Two states combine reporting with off-road diesel.	Mostly yes. Can be reported together with off-road diesel and heating oil.	Not available, aggregated with off-road diesel
Off-road diesel	Mostly yes. Two states combine reporting with on-road diesel, another with heating oil.	Mostly yes. Can be reported together with on-road diesel and heating oil.	Not available, aggregated with on-road diesel
Aviation gasoline	Yes, in most states. Some states do not require reporting.	Yes available	Yes available
Jet fuel	Yes, in most states. Some states do not require reporting.	Yes available	Yes available
Heating oil	Mostly yes. Sometimes reported together with off-road diesel.	Mostly yes. Can be reported together with on-road or off-road diesel.	Mostly yes. Can potentially be misreported as diesel.

Based on this analysis, state-level data are available for all of the transportation fuels considered; however, depending on where in the supply chain the reporting happens, it may or may not be possible to disaggregate certain fuel types or separate fuels by sector of end use.

Section IV provides additional discussion about the potential to use each of these data sources to account for fuels in the context of a hypothetical multi-state emissions policy.

IV. Potential Points of Regulation

A second key design choice for a hypothetical cap-and-invest program is where to locate the point of regulation. In other words: how to define which entities within the fuel supply chain would be subject to a compliance obligation, requiring them to hold a number of carbon allowances equivalent to the quantity of emissions from the fossil fuel sold.[38] The entities at the point of regulation would most likely acquire emissions allowances through allowance auctions, but they could also acquire them through free allocation from state governments, brokers, or bilateral transactions with other parties.[39] As a general matter, there are advantages to applying the point of regulation further upstream in the fuel supply chain, because this would tend to cover a smaller number of relatively sophisticated large entities. The benefit of covering relatively large and sophisticated entities is that they are typically better able to manage any new regulatory requirements and efficiently navigate carbon markets while taking advantage of compliance flexibility options.

This section describes three potential points of regulation, determines whether data required for carbon assessment is already collected at these points, and describes how the point of regulation could function in the context of a hypothetical cap-and-invest program. The three potential points of regulation are: A) existing state points of taxation for transportation fuels, B) refiners in the region and importers into the region, and C) Prime Suppliers.

This analysis relies heavily on data provided by state agencies. For more information, please see Appendix III.

A. Option 1: Existing State Points of Taxation

Based on the information provided to us (Appendix III), states in the region tax motor gasoline and on-road diesel fuel, and many also tax jet fuel and non-road diesel fuels. States therefore have existing reporting, revenue collection, and enforcement mechanisms established for these points of taxation.

1. Current State Points of Taxation

The state points of taxation are not uniform throughout the Northeast and Mid-Atlantic region. Most states describe their motor gasoline or diesel tax obligation[40] as falling on the "distributor," however the way in which a "distributor" is defined differs between the states.[41] There are also differences in what actions trigger the state reporting requirement, and in a number of states, the point of taxation is different for different fuels.

In Maryland and New York, the point of taxation is the entity importing fuel into the state or making the first sale in the state. In these cases, the point of taxation is similar to what the EIA defines as a Prime Supplier (described below in Section IV.C), as it refers to the entity bringing fuel into the state for end use.

In Maine, New Hampshire, and Vermont, the point of taxation is defined as the last distributor, the entity that delivers fuels to the retailer (e.g., gas stations), which then sells the fuels for end use.

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[38] Allowances are denominated in emissions, not fuel volume.

[39] There is also the potential for a program to allow the compliance obligation to be contractually shifted up or down the supply chain, including the possibility for emissions allowances to be bundled with fuel products. The purpose of allowing these compliance options would be to provide more flexibility for regulated entities. Including these options as facets of the program does not depend on the choice of point of regulation.

[40] For simplicity, in this draft we are focusing on motor gasoline and on-road diesel points of taxation.

[41] See Appendix III. Corroborated with: Federation of Tax Administrators. "Summary of State Laws." *Tax Rates/Surveys - Tax Rates.* September 2015. http://www.taxadmin.org/assets/docs/MotorFuel/Unif_Docs/2015%20taxation%20diversion%20alternative%20fuels%20booklet.pdf

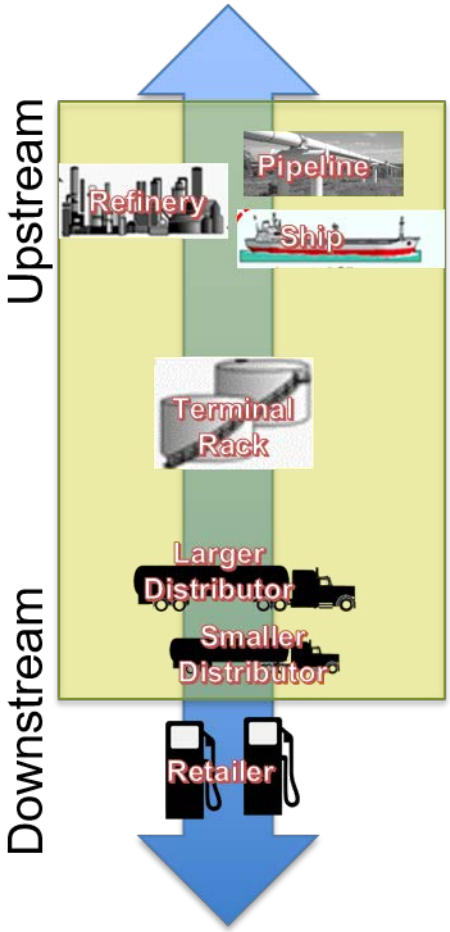
In New Jersey, the point of taxation is defined as the entity holding title to the fuel as it enters the terminal rack.[42] This point of taxation is higher upstream in the fuel supply chain than for most of the other states in the region (although some states that place the tax obligation on the "first importer" may cover the same entities).

Table 3: State Motor Gasoline and On-Road Diesel Points of Regulation[43]

	Motor gasoline	**On-road diesel**
CT	Distributor	Distributor
DE	Distributor	Distributor
DC	First import	First import
ME	Final distributor	Final distributor
MD	First import or sale	Distributor
MA	Distributor	Distributor
NH	Distributor (last licensee)	Distributor (last licensee)
NJ	Terminal rack	Terminal rack
NY	First import or production	Terminal rack
PA	Distributor	Distributor
RI	Distributor	Distributor
VT	Distributor (last distributor)	Distributor (last distributor)

[42] NJ Rev Stat § 54:39-104 (2013).
[43] Chart derived from Federation of Tax Administrators. "Summary of State Laws." *Tax Rates/Surveys - Tax Rates.* September 2015. http://www.taxadmin.org/assets/docs/MotorFuel/Unif_Docs/2015%20taxation%20diversion%20alternative%20fuels%20booklet.pdf

Figure 4: Entities Potentially Included in Option 1



Because state points of taxation vary in how they are defined, they can include many different types of entities in the supply chain. For example, New Jersey's definition includes major petroleum companies that are supplying fuel to the terminal rack. Other states that have a "first importer" or "first sale" type of definition would also include major petroleum companies.

Many of the state points of taxation apply lower in the supply chain, to distribution entities that purchase fuel from the terminal rack and distribute it to retail stations. This is especially the case in states where the point of taxation falls on the "last distributor" or "last licensee." There are many entities at this point in the supply chain—typically at least a hundred in each state, and in some cases, many more (Table 4).

Table 4: Number of Entities with Reporting Requirements, by State[44]

CT	717
DE	353
DC	78
MD	1673
MA	986
NH	430
NY	1733
RI	75
VT	245
TOTAL	6290

[44] See Appendix III for more on the data and information provided by state agencies for the purpose of this study.

2. Data Availability

As discussed above, states in the Mid-Atlantic and Northeast region levy tax, and therefore require reporting on, motor gasoline and on-road diesel fuels.[45] Based on information collected to date, it appears that most—but not all—states collect data through this mechanism for off-road diesel fuel, aviation gas, and kerosene jet fuel (See Table 5,[46] color-coded to highlight differences).

Table 5: Petroleum-Based Fuel Reporting by State[47]

	CT	DE	DC	MD	MA	NH	NY	RI	VT
Motor gasoline	yes	yes	yes	yes	yes	yes	yes	yes	yes
Diesel, on-road	yes	yes	yes	yes	yes	yes	yes	yes	yes
Diesel, off-road	no	yes	yes	yes	no	yes	yes	yes	yes
Heating oil	yes	no	yes	yes	no	yes	yes	no	yes
Aviation gasoline	no	yes	yes	yes	yes	yes	yes	yes	yes
Jet fuel	yes	no	yes	yes	no	yes	yes	yes	no

Table 6 (color-coded to highlight differences) shows that many states, but not all, require reporting of fuel component information. Some states only require reporting of finished fuel volumes.

Table 6: Component Reporting by State[48]

	CT	DE	DC	MD	MA	NH	NY	RI	VT
Both finished fuels & components	yes	yes	yes	yes	no	no	yes	no	no
Finished fuels only	no	no	no	no	yes	yes	no	yes	yes

State fuel taxes only apply to fuels sold for end use in the state. These states do not require reporting or tax fuels that are only transported through the state. Some states require reporting if fuel is de-racked or refined in the state and then exported.

Some states require reporting of full schedule information for taxation purposes—in part already tracked by the fuels industry with Bills of Lading—which provides details on the point of origin and point of destination of the fuel.

[45] Data is reported to the Federal Highway Administration (FHWA) for the purposes of allocating federal highway funding.
[46] Heating oil is included in this table because it shares most of its supply chain with diesel.
[47] See Appendix III for more details on the data and information provided by states for the purpose of this study.
[48] See Appendix III for more details on the data and information provided by states for the purpose of this study.

Most state tax offices will not provide transactions by fuel type by entity to sister agencies or outside groups due to taxpayer privacy requirements.

3. Implications for Carbon Content Assessment

A hypothetical cap-and-invest program could apply to the same entities that comply with existing state fuel taxes.

It would be most straightforward to include motor gasoline and on-road diesel fuels under such a program, since all states require reporting on such fuels. Including off-road diesel, aviation gas, or jet fuel under the program would require states that do not already require reporting of these fuels to establish new requirements.

States that require separate reporting of fuel components would be able to more accurately account for emissions from fuels. For example, it would be more precise to require separate reporting of gasoline blendstock (e.g., reformulated gasoline blendstock for oxygen blending, RBOB) and oxygenate (e.g., ethanol) rather than reporting finished motor gasoline. This is because assessing the carbon content of finished fuels requires using a default emissions factor, with simplifying assumptions about which blending components are used in each batch of fuel.

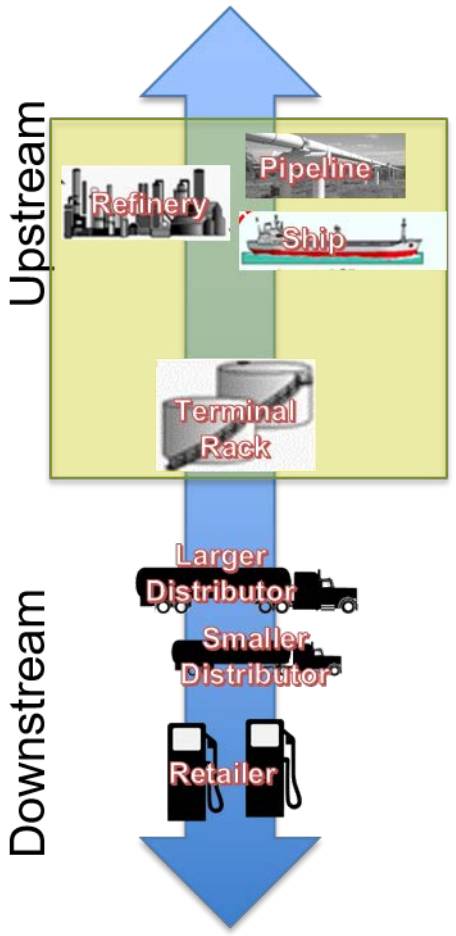
Since state fuel taxes only apply to fuels sold for end use in the state, associated reporting could be used in a multi-state climate policy to help avoid double counting.

B. Option 2: Refiners and Importers into the Region

A second option would be to use a point of regulation that is as far upstream as possible. This would include regional entities that refine fuels or blendstock for end use in the region, or regional entities that import finished fuels or blendstock by ship, pipeline, rail, or truck for end use in the region.

1. Description of Refiners and Importers

Figure 5: Entities Potentially Included in Option 2



The compliance obligation for this point of regulation would fall on refineries and, for fuels refined outside the region, on the first importer *into the multi-state region*. In contrast, the other two points of regulation considered in this paper are defined by individual state boundaries, rather than at the regional-level.

Under this option, the eight refineries in the region (located in Pennsylvania, New Jersey, and Delaware) would be subject to compliance for fuels that are shipped for end use within any state across the region.

Entities importing finished fuel or fuel components into the U.S. through states in the region would also be subject to compliance for fuels that are used in the region. International imports into the region include imports by ship into ports around Greater Philadelphia, New York/New Jersey Harbor, and Boston/Portsmouth/Portland areas, as well as imports from Canada by rail, truck, and barge into New York, Vermont, and Maine. Nationally, 396 entities that import crude oil or petroleum products into the U.S. qualify as "importers of record."[49] The EIA has extensive reporting requirements for importers into the U.S. by fuel type. However, EIA does not publicly disclose how many of those entities import finished fuel or fuel components into the region for use in the region.

Suppliers shipping finished fuels or components into the multi-state region from other U.S. states would also be subject to compliance under a hypothetical emissions program. This would include covering and accounting for emissions from large movements of fuel into the region, primarily via pipelines and barges. It would also include covering some number of smaller entities that transport fuel into the region by truck, for example from West Virginia into Pennsylvania, or from Virginia into Maryland. It is not clear exactly how many smaller distributors this point of regulation would include, due to the lack of publicly available state-level reporting information provided by EIA. Distributors, regardless of size, bringing fuel into the region for end use would likely report to EIA as Prime Suppliers.[50]

[49]US Energy Information Administration. "Form EIA 814 Monthly Imports Report." *Survey Forms.* http://www.eia.gov/survey/#eia-814

[50] More information would have to be available in order to perform a cross-check and avoid overestimating the number of covered entities or volume of fuel sold.

2. Data Availability

This option would likely require reporting of the point of destination for any fuel that enters or is produced in the region, in order to ensure that a fuel supplied for end use outside the region is not inadvertently covered.

EIA and the U.S. Environmental Protection Agency (EPA) generally require reporting on destination data—as well as fuel type and quantity—for Prime Suppliers, which includes refiners and importers into the U.S, as well as interstate suppliers. However, the agencies do not publicly disclose destination data, and therefore, it is not clear whether sufficient data are reported to enable this option to serve as the point of regulation for a hypothetical emissions policy. It is possible that data reported to EIA could be combined in a way that identifies a set of "importers into the region," but that dataset would have to be thoroughly and regularly cross-checked in order to avoid double-counting.

EIA requires refiners to report volume of fuel produced by finished fuel or fuel component type,[51] and also to report on a monthly basis the sales to retailers and wholesalers by state. EIA provides aggregate information by PADD district (but not PADD sub district, which is important because this region is only a portion of PADD 1) on fuel origin and delivery, based upon reports required of pipeline, tanker, and barge operators.

EIA similarly requires importers into the U.S. to report the volume of fuel or fuel component by type, country of origin, and the location of the domestic processing company (a refinery, blender, or storage facility) where the fuel or fuel component is being delivered. More information is required to understand whether the delivery data reported to EIA are consistent with the state of end use for the fuel.

[51] US Energy Information Administration. "Form EIA 810 Monthly Refinery Report." *Survey Forms.* http://www.eia.gov/survey/form/eia_810/form.pdf

3. Implications for Carbon Content Assessment

In option 2, entities that either refine fuel in the region for use in the multi-state region, or that import finished fuel products or components into the region for use in the multi-state region, would have a compliance obligation. "Importers" in this context would likely primarily be shippers or entities holding title to fuel being transported by pipeline, barge, or rail. Some fuel, however, would also be imported into the region by truck,[52] potentially by smaller entities lower in the supply chain.

This type of program would require the regulated entities to track and report the point of destination for fuel produced or imported, and possibly the refined product's point of origin. For example, a refiner in Delaware would track whether a particular batch of fuel was being shipped for end use in a participating state, or to another state outside of the policy region. An entity importing finished fuel, blendstock, or components into the region would also need to track whether the ultimate destination was within the multi-state policy region or outside the region. If it was outside of the region, the batch of fuel would be exempt from coverage. For example, entities transporting fuel from the west into New York by pipeline or trucking fuel into Maine from Canada would report where the fuel was destined for end use.

Similarly, states would likely require that all entities importing fuel into the state report point of origin of the fuel, in order to document whether the fuel was already covered in the multi-state program, or to develop some other mechanism for ensuring that fuel in the multi-state region was not counted twice. One alternative option would be to include all finished fuel imports and production in the region, regardless of final destination, and provide credits for exports; the additional reporting and administrative costs may be acceptable if it were more efficient overall.

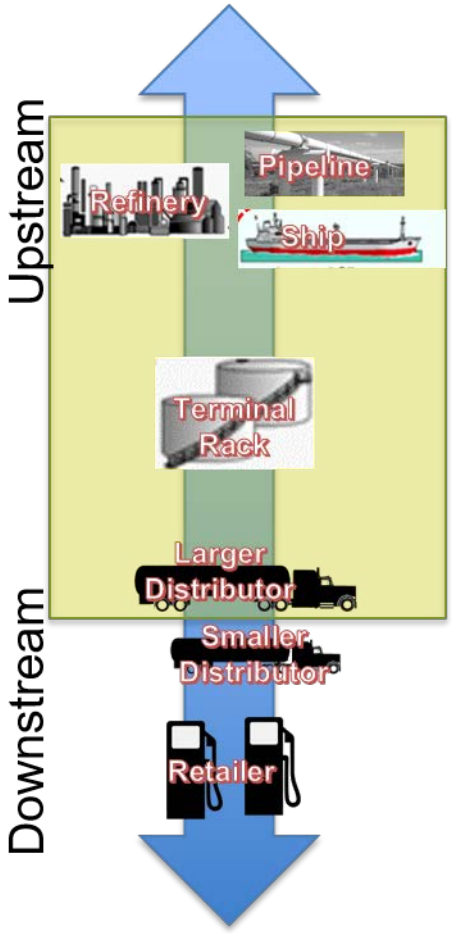
With option 2, some states participating in a multi-state regulatory program might have very few—or perhaps no—regulated entities. It is possible, for example, that Rhode Island, New Hampshire, or DC may have little or no fuel that is imported into the multi-state policy region across one of their borders and do not have refineries.

[52] Which, in the liquid fuel supply chain, is downstream from the terminal rack.

C. Option 3: Prime Suppliers

A third option would be to place the point of regulation on entities importing or producing fuel in an individual state for end use. The EIA has a definition of entities that generally fit this category— the "Prime Supplier."

Figure 6: Entities Potentially Included in Option 3



1. Description of Prime Suppliers

EIA defines Prime Suppliers as "suppliers who produce, import, or transport product across state boundaries and local marketing areas and sell to local distributors, local retailers, or end-users."[53] EIA requires entities matching this definition to report fuel sales by fuel type by state for end use on a monthly basis. According to EIA, the types of entities that match this description are refiners, other producers of finished fuel, interstate resellers and retailers, and importers.[54]

Entities that meet this description are required to submit reports detailing the amount of finished fuel sold or transferred for end use, by state. [55] EIA requires reporting for 18 different petroleum product types, including motor gasoline, diesel, and kerosene-type jet fuel.[56] The EIA requires reporting of finished fuels, but not fuel components such as gasoline blendstock or ethanol. EIA periodically re-determines which firms qualify as Prime Suppliers in order to avoid miscounting.[57]

The most recent list of prime suppliers published by EIA identified 85 entities supplying fuel to the Northeast and Mid-Atlantic states, with many entities supplying to multiple states. The number of Prime Suppliers averages around 30 per state and this number varies over time. There are only 195 Prime Suppliers in the entire U.S. and many submit reports for multiple states.

2. Data Availability

The EIA publishes monthly *aggregate* fuel sales/transactions by fuel type by Prime Suppliers by state.[58] For diesel fuels, EIA does not require reporting entities to disaggregate between on-road diesel and off-road diesel. EIA does require separate reporting for No. 2 diesel fuel and No. 2 fuel oil, which would enable states to exclude

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[53] Although alternative definitions of Prime Supplier exist and may not cover the same types of entities, for the purpose of this paper the EIA definition of Prime Supplier is used exclusively.

[54] EIA's definition of Prime Supplier closely aligns with the definition found in NY state law: Energy Law § 10-103 (2012). http://codes.findlaw.com/ny/energy-law/eng-sect-10-103.html

[55] EIA requires entities that produce finished fuel in a state and deliver that fuel for end use in that same state to report as Prime Suppliers, it is not necessary for the finished fuel to cross state lines to trigger reporting.

[56] US Energy Information Administration. "Form EIA 782C Monthly Report of Prime Supplier Sales of Petroleum Products Sold for Local Consumption." *Survey Forms.* http://www.eia.gov/survey/form/eia_782c/form.pdf

[57] Maureen Klein. Email Correspondence. EIA's Office of Energy Statistics. May 22, 2017.

[58] Similar data are also available from the Federal Highway Administration (FHWA). However, there are some differences in the fuel sales reported by Prime Suppliers by state and the fuel sales data published by FHWA. More information on the differences can be found in Appendix IV. Federal Reporting Requirements. We do not believe that it is necessary to fully resolve the differences between EIA and FHWA data in order to evaluate whether Prime Supplier is an appropriate point of regulation for a hypothetical cap-and-invest program.

fuel oil from coverage. To prevent double counting, EIA does not require a Prime Supplier to report fuel that is sold or transferred in a state to other Prime Suppliers.[59]

EIA does not publicly provide data by individual Prime Supplier because it would result in the release of competitive business information.[60] If there is a small number of Prime Suppliers for the fuel type in the state, EIA will also withhold aggregate sales volume information for that state and fuel type. Organizations may enter into data sharing agreements with EIA to obtain fuel sales by Prime Supplier, but EIA must be satisfied that the organization can meet the privacy requirements. For example, in order for a state agency to enter into a data sharing agreement with EIA, it must satisfy EIA that its Freedom of Information Act (FOIA) laws will not compel disclosure of competitive business information that would be protected by federal statute.

There is no *de minimis* amount for gallons of fuel sold or size of entity in EIA's Prime Supplier reporting methodology. The survey sample is updated routinely, and EIA experts regularly conduct interviews with petroleum supply chain entities in order to add or delete companies from the Prime Supplier survey.[61] The interviews EIA conducts are also used to avoid reporting errors and to ensure the survey forms are well understood by the respondents, which EIA refers to as "thorough cognitive outreach."

3. Implications for Carbon Content Assessment

Under this option, Prime Suppliers would be covered in a consistent manner across states, focusing on the most upstream entities producing fuel or bringing fuel into each state (making it a state-based definition).

If option 3 is used, most or all of the regulated entities would already be reporting fuel sales information by fuel type to EIA under the Prime Supplier reporting requirements. Many of these entities may also be registered with state tax departments and already report volumetric and schedule information.

States would likely want to consider some changes to EIA's reporting requirements for a hypothetical emissions policy. First, if the program is to focus on transportation fuels, states would likely want reporting for only on-road diesel - not off-road diesel (which may include fuel used for stationary industrial equipment or heaters) or heating oil. On-road diesel and off-road diesel are reported together on the EIA Prime Supplier form. Because heating oil and diesel are both No. 2 distillates, and because products manufactured to the diesel fuel specification are frequently used as heating oil, there is some risk of misreporting heating oil as diesel. There is presumably a greater risk of misreporting for entities above the terminal rack, before the fuels are dyed. There is not a great volume of fuel at risk of being misreported as diesel under these circumstances. It is not clear yet to what degree this would pose a new responsibility on Prime Suppliers.

The EIA requires Prime Suppliers only to report finished fuels. Therefore, states may want to consider requiring reporting of both finished fuels and fuel components because separate transactions made in gasoline blendstock or ethanol are not recorded in current EIA methodology.[62] Requiring reporting of both finished fuels and fuel components would also allow for more precision in estimating the carbon content of covered fuels. Since terminal racks are frequent sites of ethanol blending, terminal rack operators keep track of fuel component volumes in their inventories, even if they are only reporting finished fuel volumes to EIA.

[59] EIA publishes a list of Prime Suppliers so that Prime Suppliers know which sales or transactions are exempt from reporting.
[60] Maureen Klein. Telephone Conversation. US Energy Information Administration. September 26, 2016.
[61] Tammy Heppner and Maureen Klein. Interview. EIA's Office of Energy Statistics. April 4, 2018.
[62] Tammy Heppner and Maureen Klein. Interview. EIA's Office of Energy Statistics. April 4, 2018.

D. Other Possible Options

There are other potential points of regulation that are not considered in detail in this paper:

Distributors in each state. This would create a consistent downstream point of regulation among participating states. This option has not been considered in this paper because it neither aligns with existing state regulatory requirements (e.g., state points of taxation) nor is it an upstream point of regulation.

Transactions at Terminal Racks. This option was not considered in this paper because not all states in the Northeast and Mid-Atlantic region have terminal racks, and because this point of regulation would cover similar entities as the Prime Supplier option would.

V. Comparative Analysis of Options

The following section compares the three potential points of regulation identified above against key technical, administrative, and policy factors that would be valuable to consider in designing a hypothetical transportation cap-and-invest program.

A. Technical Considerations

When evaluated for technical considerations, the State Points of Taxation and Prime Supplier share similar strengths and weaknesses. Refiners and Importers is a less attractive option from a technical standpoint due to the lack of existing mechanisms for comprehensively tracking fuels and other data limitations. Prime Supplier enables a program to include a broader set of fuels, while the State Points of Taxation option makes it easier to avoid assessing heating oil.

The analysis presented in the matrix on the following page evaluates technical considerations regarding the fuel system and data availability, when exploring the most appropriate points of regulation. These include the following:

- **Are volumetric data by fuel type already collected at this point of regulation?** Volumetric data by fuel type are critical for assessing the carbon content of finished fuels. Default emissions factors can be applied to volumetric data to estimate carbon dioxide emissions that would result from fuel combustion.
- **Are the data collected for all transportation fuel types?** It is easier to identify a point of regulation for which all relevant data are already collected, thus avoiding any need for additional new reporting requirements. It is necessary to have data for all covered transportation fuels at the point of regulation.
- **Are the data disaggregated so that non-transportation fuels like heating oil may be excluded from the program?** Heating oil, which is identical to No. 2 diesel fuel—except for trace amounts of red dye added at the terminal rack—is a common fuel for space heating in the Northeast United States. Disaggregated data enables policy designers to exclude fuels destined for heating and other end uses, even if those fuels share large portions of their supply chain with transportation fuels. Having disaggregated data is very helpful for the purposes of accurate accounting.
- **Are data collected by fuel component, as opposed to finished fuel product, which would make for a more precise carbon content assessment?** Finished fuels—motor gasoline of particular interest—are made of components, such as a blendstock and an oxygenate. Since fuel components have slightly varying carbon contents (Table 1), it is more accurate to estimate associated emissions for each component of the fuel, rather than using default emissions factors to estimate emissions from finished fuel products. Component-level data are also more useful for estimating life cycle emissions.
- **Is there a mechanism for ensuring that fuel *passing through* a multi-state region would not be subject to coverage under the program?** A mechanism to exclude fuels that leave the region enables program designers to avoid inadvertently regulating emissions from fuels combusted outside the program boundaries. This is easier to achieve if a point of regulation already has an existing mechanism to exclude these batches of fuel.
- **Is there a mechanism for avoiding *double-counting* fuels, if they pass through more than one state participating in the multi-state program?** A mechanism to guard against double-counting helps ensure fair treatment of each regulated entity and the covered fuel types and

strengthens the integrity of the program. If a point of regulation lacked accounting mechanisms to avoid double-counting, then one would need to be devised. This is easier to achieve if a point of regulation already has an existing mechanism to address double counting.

	Existing State Points of Taxation	**Refiners and Importers**	**Prime Suppliers**
Data already collected for motor gasoline and diesel?	Yes, states have robust systems for reporting gasoline and on-road diesel fuel sales in a state for end use.	Most data collected, but with potential gaps. EIA requires extensive reporting of sales by refiners on the state-of-destination. Distributor destination information is collected for all entities importing fuel from abroad, but it is not clear if this is always the state of end use. Prime Suppliers report sales by state of end use. Pipelines, barges, and tankers moving fuel into the region from other U.S. locations do not report by state, only by PADD.	Yes, EIA requires reporting of fuel sales by state for all Prime Suppliers. Some state tax departments also collect these data from the same entities.
Data collected for non-road diesel, jet fuel?	Most, but not all states, separately require reporting of non-road diesel and jet fuel.	Yes.	Yes.

	Existing State Points of Taxation	Refiners and Importers	Prime Suppliers
Heating oil disaggregated?	Yes. There are no states in the region that report heating oil together with on-road diesel, since it is taxed separately.	Mostly yes.[63] Reporting form EIA 782A has entries for No. 2 fuel oil (heating oil) and No. 2. diesel fuel. The possibility exists for misreporting of No. 2 fuel oil as No. 2 diesel fuel in some rare contexts due to fact that these fuels are chemically identical.[64] Undyed fuels and dyed fuels are not reported separately.	Mostly yes. Reporting form EIA 782C has entries for No. 2 fuel oil (heating oil) and No. 2 diesel fuel. The possibility exists for misreporting of No. 2 fuel oil as No. 2 diesel fuel in some rare contexts due to fact that these fuels are chemically identical. [65] Undyed fuels and dyed fuels are not reported separately.
Reporting by component?	Many but not all states require reporting by fuel component. All states require reporting of finished fuels.	Yes.	No. EIA only requires reporting of finished fuels. It is not clear whether Prime Suppliers already track fuels by component; this likely varies by type of entity.
Mechanism for exempting fuel passing through, or being exported from region?	Yes. Since all of the state tax regimes tax fuel sold in the state for in-state use, fuel passing through has no reporting requirement. Fuel that is being exported may be reported,but is not subject to excise tax.	No complete mechanism exists. Refineries are required to report the sales of fuel to retailers or wholesalers by state. A mechanism would need to be developed to ensure that fuel entering the region from other modes (pipeline, rail, truck) that was passing through the region was not assessed.	Yes. Since this system is defined by sales into states for end use, it by definition exempts fuel passing through or being exported.

[63] Maureen Klein. Email Correspondence. US Energy Information Administration. October 24, 2016.
[64] From Form EIA-821 Annual Fuel Oil And Kerosene Sales Report Instructions: "*Report all volumes in accordance with what the product was sold as, regardless of the actual specifications of that product. If a No. 2 distillate was sold as diesel fuel, report that volume as No. 2 diesel fuel according to the parts per million (ppm) sulfur content; if it was sold as a heating or fuel oil, report that volume as No. 2 fuel oil, even if that product conformed to the higher specifications for diesel fuel. If sales of a No. 2 distillate were made for which no determination can be made as to whether the product was specifically sold as either a fuel oil or a diesel fuel, sales volumes should be classified in accordance with your best estimate of the intended use of the product regardless of the product specification.*"
https://www.eia.gov/petroleum/fueloilkerosene/pdf/instructions.pdf
[65] Ibid.

	Existing State Points of Taxation	Refiners and Importers	Prime Suppliers
Mechanism for avoiding double counting of fuel?	Yes. Since all of the state taxation regimes tax fuel sold in the state for in-state use, fuel passing through has no reporting requirement. Fuel that is being exported may be reported, but is not subject to excise tax.	No complete mechanism exists. Refineries are required to report the sales of fuel to retailers or wholesalers by state. Sales by refiner to wholesalers who then export out of region would need to be exempted or refunded. A mechanism would need to be developed to ensure that fuel entering the region in one state was not assessed again when it was transferred into another state in the policy region.	Yes. Since this system is defined by sales into states for end use, it by definition only counts fuel in the state where it is intended for end use.

B. Administrative Considerations

When evaluated for administrative considerations, Prime Supplier is the stronger option for point of regulation because it covers a reasonable number of entities, avoid regulating small entities, presents relatively few difficulties for reporting by covered entities, and is relatively simple for states to implement. Although the Refiners and Importers option is attractive because it places the compliance responsibility on a few very large entities, the few refineries in the region produce enough fuel to fulfill only 22 percent of regional consumption, and "importers into the region" would end up including some small entities trucking fuel over the regional boundaries.

The analysis presented in the matrix on the following page evaluates administrative implications of the different point of regulation options, including the following:

- **How many entities would have a compliance obligation at the point of regulation?** A program with a compliance obligation that applies to fewer entities would presumably be simpler to administer. Accurate estimates of the number of entities covered by a program are also important for determining a program's feasibility.
- **What types of entities would be covered?** Entities in the petroleum fuel supply chain vary in their size, complexity, relation to the end consumer, and regulatory jurisdiction. The types of entities covered would affect the relative difficulty of administering and complying with a program.
- **What would be the difficulty of reporting for covered entities at the point of regulation?** Minimizing the difficulty of reporting for covered entities minimizes the administrative costs of a hypothetical program. One way to accomplish this is to build on reporting requirements under existing programs.
- **What would be the level of difficulty for covered entities to meet compliance at this point of regulation?** Larger entities can typically manage new compliance obligations with greater ease because such organizations are more likely to have staff already accustomed to meeting compliance with similar programs. Smaller entities may not have sufficient staff to readily meet compliance and may need to hire new staff with specialized expertise.
- **What would be the additional administrative workload for state agencies?** State agencies will likely want to consider the degree to which any new programs would significantly increase staff workload on top of existing responsibilities.

	Existing State Points of Taxation	Refiners and Importers	Prime Suppliers
Number of entities	Hundreds or thousands per state.	Eight refineries in the region. At least dozens, most likely more than 100 importers from outside the United States. [66] Unclear how many interstate suppliers into the region.	Average of 30 per state; low of 16 and high of 53 for states in the region. Many entities are likely to qualify as Prime Suppliers in multiple states in the region; in total there are only 195 Prime Suppliers in the U.S.
Types of entities	Range from "majors" to small distributors.	Mostly majors.	Range from majors to large distributors. In states with refineries, ports, pipelines, more likely to be majors. In northern states without these assets and few terminals racks, more likely to be large distributors.
Difficulty of reporting requirements for covered entities	Low. All of these entities are already reporting this information, though not all states track fuel components in addition to finished fuels.	For refiners, minimal. Refiners already report information to EIA. For entities importing fuel from abroad into the region, minimal. Already report information to EIA. For entities moving fuel from elsewhere in the U.S. into the region, unclear. There is no existing complete dataset for "*importers into the region.*" Partial datasets held in federal and state databases are subject to privacy constraints. For larger entities that qualify as Prime Suppliers, they already report under Prime Supplier reporting requirements.	Low, unless requirement to accurately disaggregate diesel fuel and heating oil or report components is a significant new reporting complication, since Prime Suppliers are not required to report this information to EIA. Entities may already be tracking this information through Bills of Lading and scheduling.

[66] Nationally, 396 importers from outside the United States report to EIA on a monthly basis. US Energy Information Administration. "Form EIA 814 Monthly Imports Report." *Survey Forms.* http://www.eia.gov/survey/#eia-814

	Existing State Points of Taxation	Refiners and Importers	Prime Suppliers
Difficulty of compliance for covered entities	Low to potentially significant. Smaller distributors are not accustomed to dealing in tradable permits or futures markets, which require specialized expertise.	Low for refiners, since these are "majors" and therefore sophisticated companies. Not clear for importers. since the universe of entities that are "*importers into the region*" is unclear.	Mixed. Many Prime Suppliers are large, sophisticated entities, but some will be relatively smaller distributors.
Administrative difficulty for states	Mixed. States already require reporting at this level and levy taxes, however the number of entities regulated would be large.	Mixed to high. New reporting would be required. This could apply to the smallest number of entities, but it could require a complex interstate system to prevent double counting and capture all relevant transactions.	Low. New reporting would be required, but the number of entities would be much smaller than the existing state points of taxation.

C. Policy Considerations

Accounting for policy considerations, the Prime Supplier option offers advantages due to the low complexity, consistency among states, and the relative ease with which states could expand a hypothetical fuels program to cover more fuel types or additional jurisdictions. Uncertainties around a Refiners and Importers option outweigh its most positive aspect: straightforward inclusion of a program mechanism to assess life cycle emissions. The high complexity, lack of consistency of the regulated entities between the states, and the high difficulty of taking life cycle emissions into account make the State Points of Taxation option less appealing than the Prime Supplier option as a point of regulation.

The analysis presented in the matrix on the following page evaluates the policy implications associated with each of the different point of regulation options, including the following:

- **Would the point of regulation be consistent among states?** Consistency among states participating in a hypothetical regional program eases interoperability and permitting. Consistency provides clarity, simplicity, and fair treatment to entities that operate in multiple states.
- **How complex would the resulting system be in comparison to the other possible points of regulation?** The complexity of a hypothetical program can affect the extent to which a program is implemented consistently and effectively enforced. Simpler programs can be more readily implemented by regulators and more easily complied with by regulated entities.
- **Could coverage readily be extended to fuels in addition to motor gasoline and on-road diesel?** Motor gasoline and on-road diesel account for roughly 82% of transportation emissions in the Northeast and Mid-Atlantic region. Most of the remaining transportation-related emissions are from jet fuel, off-road diesel, and natural gas. While an initial hypothetical program may focus on the fuels with the largest shares of emissions, for the sake of completeness of coverage it may be desirable to extend coverage to other fuel types. Potential points of regulation vary in how readily they could cover a wide range of fuels, due to differences in the application of existing reporting requirements to different fuels.
- **What would be the implications for scaling this program to other states, or at the federal level?** Emission reduction programs can be applied at a range of scales and across multiple jurisdictions. This can be desirable in part because operating a common larger market for emissions trading can achieve emissions reductions with greater economic efficiency and at lower costs for energy consumers. Therefore, there is an advantage to program designs that enable additional states to readily join without unduly disrupting the program.
- **How possible would it be for states to de-link, or end their participation in the program?** Closely related to the issue of increasing the scale of a program to include new states, programs can be designed to allow states to exit an emissions program without disrupting or imposing additional costs on those states that chose to remain in the program.
- **How feasible would it be for entities to account for the life cycle emissions from finished fuels?** While a majority of life cycle emissions from finished fuels are generally associated with fuel combustion, a portion of a fuel's life cycle emissions result from upstream activities, such as crude oil extraction and refining. Accounting for life cycle emissions requires entities to have detailed information on the origins and processing of the fuel components that they handle and sell.
- **What would be the implications for linking with other programs?** Linking with similar existing programs would expand a hypothetical common market for emissions permits and result in greater economic efficiency.

	Existing State Points of Taxation	Refiners and Importers	Prime Suppliers
Consistency among states and implications	Significant differences in how states define the point of regulation. Unclear whether this would cause problems in a multi-state program.	This would be a consistent *regional* approach to defining the point of regulation. Some states may not have any entities captured under this definition.	States follow a consistent approach.
Complexity of the system	High. Many entities would be involved, and there would be significant differences among states in the point of regulation.	Unclear. This may involve the fewest number of entities, and may cover the most sophisticated entities, but it would require an additional system to address the fuels sold to wholesalers in the region then exported out of the region in order to prevent double counting.	Potentially low. This would balance trying to focus on larger, more upstream entities with a consistent approach taken by each state.
Difficulty of covering fuels in addition to motor gasoline and on-road diesel	High. Not all states in the region tax fuels other than motor gasoline or on-road diesel.	Depends on which fuel. Low for jet fuel, higher for natural gas.	Low for fuels reported on EIA-782C, including jet fuel. Very high for natural gas without an added reporting requirement.
Implications for scaling	If this model could be made to work despite inconsistent state points of regulation, then it should scale well since all states have a state gas and diesel tax reporting system. That said, it would capture thousands of entities nationwide.	This model might be easiest to scale if it was applied nationwide, since it could apply only to refiners and importers into the nation, capturing the fewest, most sophisticated entities.	This model might be the easiest to scale with regards to adding other states to the program, as it would be a consistent approach for each state.
Implications for de-linking	Potentially easy to de-link, once inconsistencies between types of reporting entities are overcome.	Potentially difficult to de-link, because it changes the regional boundaries.	Potentially easy to de-link because the definition of Prime Supplier is state-based.
Difficulty of tracking life cycle emissions	High. Because this point of regulation includes a greater number of distributors that are	Low. Because they are by definition at the upper ends of the supply chain, refiners and	Intermediate. Some of entities regulated under this approach would be majors with the ability to track the sourcing of

	Existing State Points of Taxation	Refiners and Importers	Prime Suppliers
	lower in the supply chain, many of these distributors have relatively little ability to track the sourcing of fuel components for finished fuel products.	importers are most able to track the sourcing of fuel components (including biofuel type and crude oil source).	fuel components; others will be large distributors with relatively little control or knowledge of sourcing higher up the supply chain.
Implications for linking with other programs	More work would need to be done to understand what the implications might be of having different points of regulation for linking with other programs. Quebec and California have slightly different points of regulation, but in this program, fuels do not pass from one jurisdiction to the next. Quebec's point of regulation is similar to a Prime Supplier model, in that the regulated entity can be a refiner or importer of fuel to be used in Quebec.		

VI. Conclusions

This paper is intended to inform discussion about policy designs for a hypothetical multi-state cap-and-invest program that could be used to limit GHG emissions from transportation fuels in the Northeast and Mid-Atlantic United States. The paper identifies policy considerations for two fundamental program design choices: which fuels might be covered under a policy, and which entities in the transportation fuel supply chain might be subject to a compliance obligation. Based on our analysis, we offer the following six findings and recommendations for consideration:

1) **Including motor gasoline and on-road diesel would cover the most emissions.** Among fossil transportation fuels, motor gasoline and diesel are responsible for the largest quantities of GHG emissions in the region and have the most robust existing reporting requirements. An effective program to address transportation emissions would cover, at minimum, finished motor gasoline and on-road diesel. Therefore, it is important to identify which types of entities in the petroleum supply chain track on-road and off-road diesel separately. Although these diesel fuels are taxed differently, some states and the EIA aggregate them for purposes of reporting.

2) **Covering other fuels is desirable, but may reach a point of diminishing returns.** States could also consider covering additional fuels, such as jet fuel. Fuels other than gasoline, diesel, or jet fuel make up a very small portion of total emissions, suggesting that there would be little to gain by covering other transportation fuels (e.g., natural gas), given the additional technical and regulatory effort needed to cover them. External review comments on a draft version of this paper favored the broadest coverage of fuels feasible.

3) **Simplify reporting and tracking by addressing life cycle emissions separately.** A market-based program that assesses combustion emissions of the fossil portion of transportation fuel without accounting for life cycle emissions would minimize administrative complexity, avoid duplication with other policies like the federal RFS, and conform to most carbon accounting standards. For states interested in addressing life cycle emissions, it may be possible within that framework to develop a protocol through which regulated entities could receive credit for demonstrating that upstream emissions (e.g., at production sites) are lower than a default emissions value.

4) **All three options for points of regulation have advantages and drawbacks.** With regard to potential points of regulation, the three options have different possible benefits and drawbacks. Using existing state points of taxation would make use of existing state regulatory mechanisms, but would require regulating over a thousand entities, many of them smaller distributors. State points of taxation are also not consistent among states. In contrast, applying the point of regulation to refiners and importers into the region would presumably cover many fewer entities, and most of them would be large, sophisticated petroleum companies. This point of regulation would likely be complex to develop, however, because it would likely require new reporting requirements that include points of origin and destination to prevent double-assessment and to identify fuels that could be exempt from coverage. Under this point of regulation, it is also possible that not all states would have covered entities in their state. Finally, the Prime Supplier point of regulation might include a larger number of entities than the importers and refiners option, but would provide a consistent state-based definition of a point of regulation that would be higher in the supply chain than the existing state points of taxation.

5) **For the Northeast and Mid-Atlantic, a system with refiners and importers as the point of regulation would be especially difficult to implement.** Refiners and importers would not be a readily viable option as the point of regulation for a sub-national multi-state cap-and-invest program. Since only three states have refineries, and importers are not systematically tracked at the state level, it would be very complicated to account for fuels that are transported through states, in order to avoid double counting. This complexity would also likely add to the challenge of managing and maintaining the program, if and when states enter or leave the program.

6) **Of the three possible points of regulation, Prime Suppliers provide the best balance of administrative ease and consistency across multiple states.** On the other hand, both Prime Supplier and the state points of taxation are potentially viable options. State points of taxation is viable because these are already established for all states. However, Prime Supplier is preferable for several reasons. EIA's Prime Supplier is a lower complexity option because it provides a consistent definition that is already understood by the potentially regulated entities – since they currently report to EIA as Prime Suppliers. Prime Supplier would apply further upstream than most points of taxation, so fewer small entities would have a compliance obligation. Also, Prime Supplier reports apply to finished fuel products, not fuel components, and it allows for relatively easy addition or subtraction of states from the multi-state program.

Appendices

Appendix I. Glossary

Bill of Lading: A document issued by a carrier which details a shipment of merchandise and gives title of that shipment to a specified party. Used in trade to help guarantee that exporters receive payment and importers receive merchandise. Often digital to ease databasing.

Bulk terminal: A facility used primarily for the storage and/or marketing of petroleum products, which has a total bulk storage capacity of 50,000 barrels or more and/or receives petroleum products by tanker, barge, or pipeline. See "terminal rack."

CBOB: Conventional blendstock for oxygenate blending. A fuel component created from crude oil in an oil refinery. When blended with an oxygenate component it creates finished conventional motor gasoline.

De-rack: The act of dispensing a petroleum product from the United States' petroleum bulk transfer system through a terminal rack.

Distillates: General classification for one of the petroleum fractions produced in conventional distillation operations at an oil refinery. Examples of distillates include diesel fuels and fuel oils.

Fuel component: The chemical or mixture of chemicals which when physically blended with other components make up a finished fuel. Gasoline blendstocks, like CBOB or RBOB, and oxygenates are components of finished motor gasoline. Some diesel fuels have a petroleum component and a biomass-based component which are blended together before consumption, such as B20.

Gelling: When the paraffin molecules in a distillate fuel transition from a liquid phase to a solid phase. Can occur at 10 degrees Fahrenheit in No. 2 diesel fuel.

Heavy-duty vehicles: On-road vehicles with a gross vehicle weight rating of more than 26,000 pounds.

Jobber: A fuel dealer. Wholesale distributors of finished petroleum products who purchase fuel from a refiner or terminal operator and distribute the fuel to a retailer or large end-user.

Joule, emissions per: The joule is the unit of measurement for energy in the metric system (International System of Units, or SI). Measuring emissions per unit of energy is a way of comparing fuels that may have differing applications or very different physical properties, such as mass, volume, or density.

Light-duty vehicles: On-road vehicles with gross vehicle weight rating of less than 14,000 pounds. Includes passenger cars and light truck.

Life cycle emissions: The emissions attributable to a product from each stage of the product's creation and use. Estimated with relevant data using Life Cycle Assessment. In the case of transportation fuels, life cycle emissions occur at each stage of the supply chain: extraction of feedstock, processing and transport of feedstock, refining of feedstock into fuel component, transport of fuel component, blending, transport to retailer, combustion by end user.

Majors: Large oil companies, typically vertically integrated with divisions in exploration, production, marketing, refining, transmission and distribution.

Medium-duty vehicles: On-road vehicles with gross vehicle weight rating of between 14,000 and 26,000 pounds.

Oxygenate: Substances which, when added to gasoline, increase the amount of oxygen in that gasoline blend. Fuel ethanol is by far the most common oxygenate in the United States. Butanol, Methyl Tertiary Butyl Ether, Ethyl Tertiary Butyl Ether, and methanol are also fuel oxygenates.

PADD, PADD 1A, PADD 1B: Petroleum Administration for Defense District. The aggregation of the 50 states and DC into five districts. PADD 1 is all of the states of the east coast. PADD 1A is the sub-district of

Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont. PADD 1B is the sub-district of Delaware, District of Columbia, Maryland, New Jersey, New York, and Pennsylvania.

Prime Supplier: A firm that produces, imports, or transports selected petroleum products across State boundaries and local marketing areas, and sells the product to local distributors, local retailers, or end users. Defined by the EIA and associated with entities required to report information to EIA on Form EIA-782C.

RBOB: Reformulated blendstock for oxygenate blending. A fuel component created from crude oil in an oil refinery. When blended with an oxygenate component it creates finished reformulated motor gasoline.

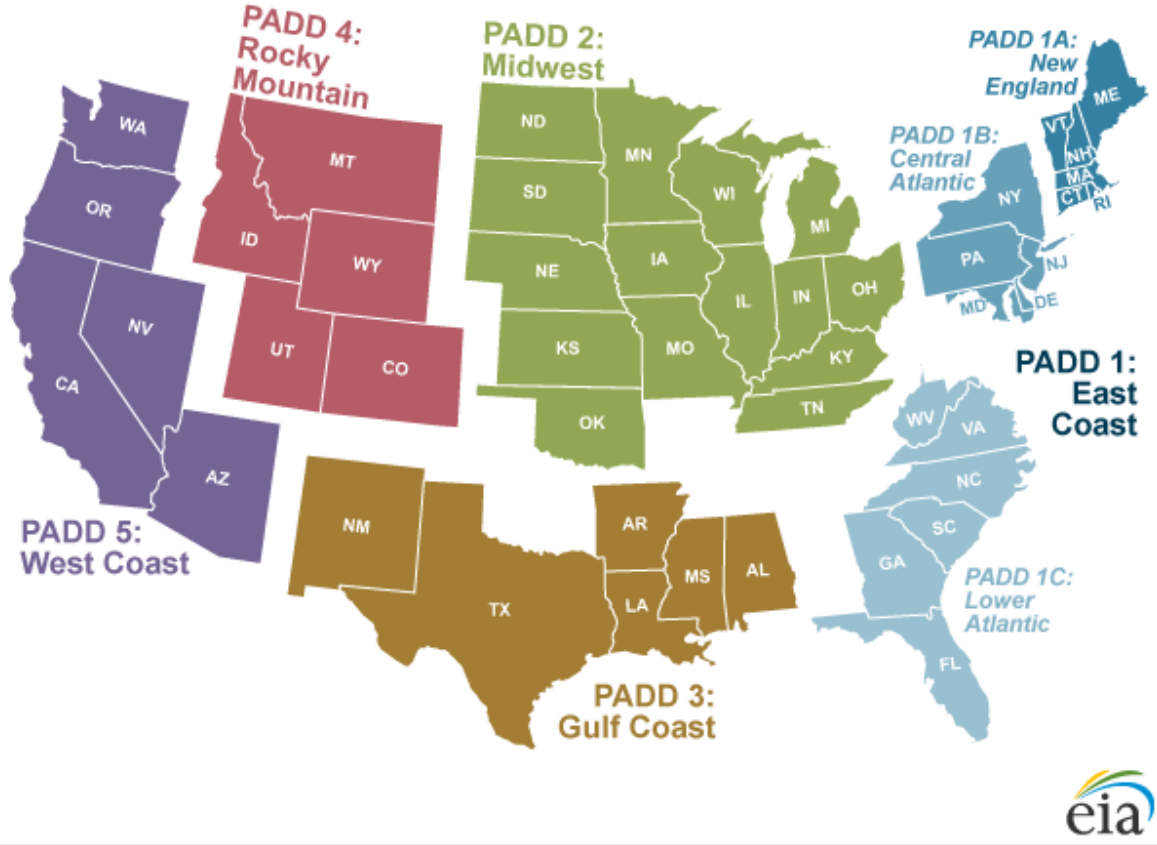
Schedule: A listing of shipments with dates, times, amount, type of product, and other transaction information. Kept by deliverers, carriers, and receivers of goods.

Terminal rack: Facility and equipment that dispenses wholesale volumes of liquid fuels from the bulk transfer system into distribution trucks. See “Bulk terminal.”

Appendix II. Fuels and Fuel System Background

1. Introduction to the PADD

The Energy Information Administration makes data available by Petroleum Administration for Defense District or PADD. The PADD was first developed during the Second World War, during which the United States rationed fuel supplies for use in the war efforts.[67] Today, the PADDs are used for aggregating data about how fuel moves around the country through both the wholesale and retail markets.



PADD - Petroleum Administration for Defense Districts
U.S. Energy Information Administration Form EIA-888

PADD 1 encompasses the East Coast. PADD 1 can be further divided into three subdistricts. The region considered in this paper comprises subdistricts 1A and 1B.

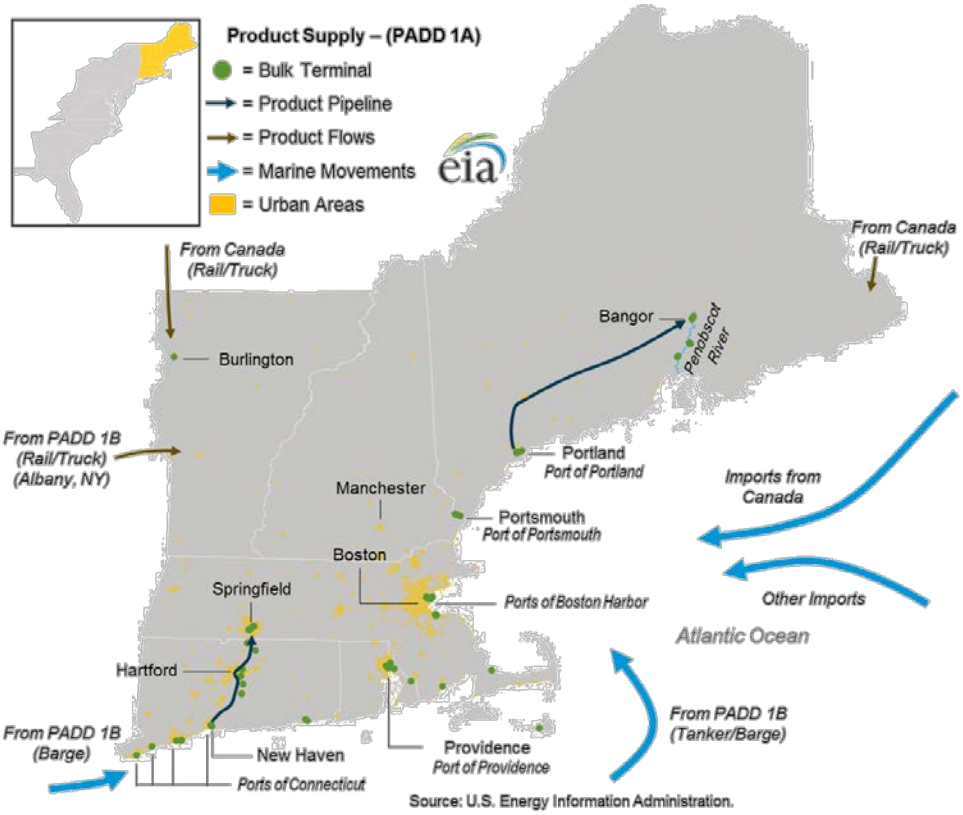
- PADD 1A (New England): Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont.
- PADD 1B (Central Atlantic): Delaware, District of Columbia, Maryland, New Jersey, New York, and Pennsylvania.

[67] United States Energy Information Administration. "PADD regions enable regional analysis of petroleum product supply and movements." February 27, 2012. http://www.eia.gov/todayinenergy/detail.cfm?id=4890

2. PADD 1 Subdistrict Detail

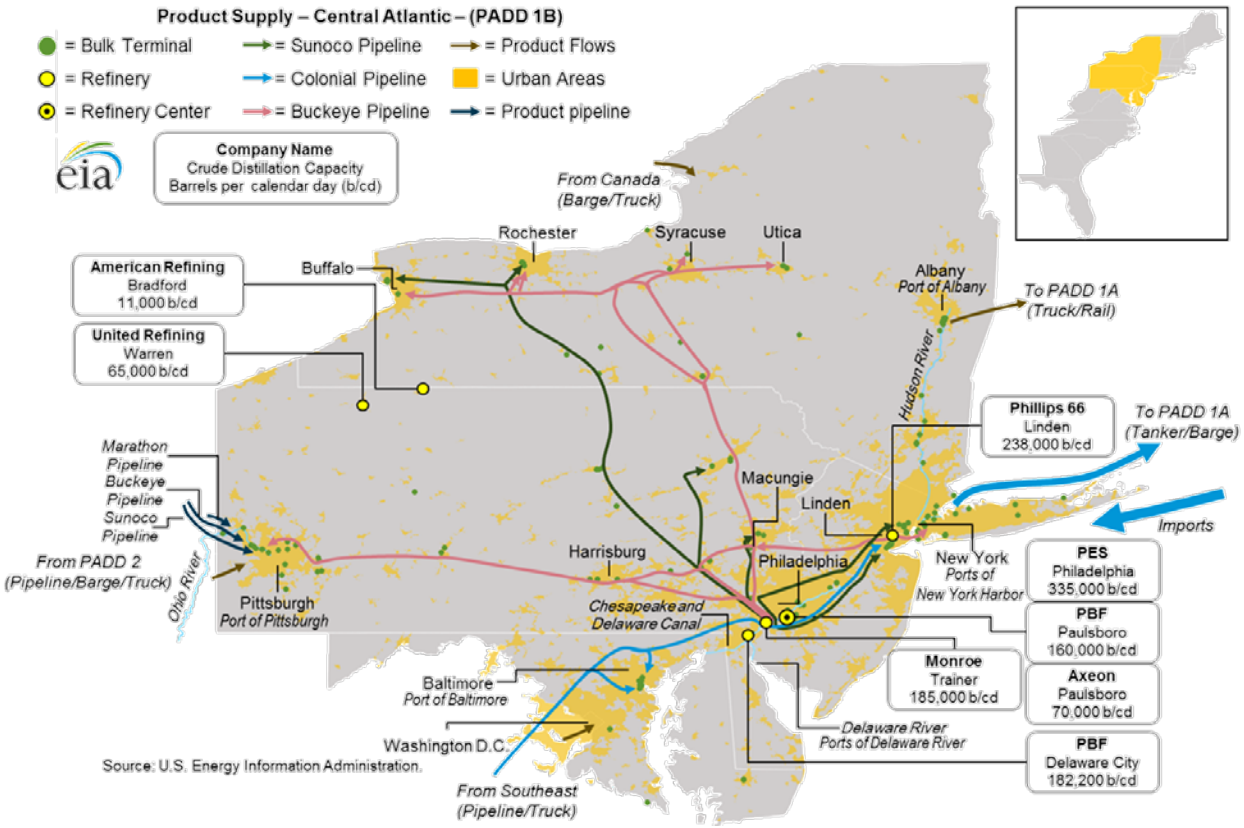
New England (PADD 1A)

New England is a net consumer of fuels with no refinery capacity in the region. New England relies on the delivery of petroleum products from outside the region, primarily delivered to coastal ports by tanker ship and barge but also by rail and truck from New York and Canada.



Central Atlantic (PADD 1B)

The Central Atlantic region has refinery capacity for approximately 1.2 million barrels per calendar day, enough to meet more than half of in-region consumption. The remainder of the region's supply comes from pipeline movements, primarily from the Gulf Coast region via the Colonial Pipeline, and from imports via tanker ship. Most supply in the Central Atlantic region passes through two major supply hubs, located in the Greater Philadelphia and New York Harbor areas, before being distributed to coastal markets primarily by barge, or piped to inland markets on the Buckeye and Sunoco Logistics pipeline systems.



3. Regional Petroleum Infrastructure

Regional petroleum infrastructure includes: production, bulk transport, and storage. Crude oil is converted to petroleum products such as gasoline blendstock and diesel at the refinery. Liquid petroleum products are then sent via pipeline, tanker, or barge to bulk storage at a bulk terminal (>50,000 barrels) or bulk station (<50,000 barrels) depending on the volume being stored. Petroleum assets by state are listed below.

	PADD	Refineries[68]	Bulk terminals[69]	Active bulk terminals[70]	Bulk stations and bulk terminals[71]
CT	1A	0	23	21	39
DE	1B	1	3	3	5
DC	1B	0	0	0	-
ME	1A	0	11	10	23
MD	1B	0	15	13	35
MA	1A	0	23	23	43
NH	1A	0	4	2	17
NJ	1B	3	37	30	79
NY	1B	0	66	59	148
PA	1B	4	62	61	139
RI	1A	0	8	6	7
VT	1A	0	1	0	11
TOTAL	1	8	250	228	546

4. Inter-PADD Dependencies

PADD 1 is highly dependent on refinery capacity and fuel delivery from outside the region. PADD 1A has no refineries and is entirely dependent on deliveries via rail, truck or marine vessel. While PADD 1B does have some refinery capacity, it is not enough to meet the region's fuel needs. In 2015, PADD 1 consumed 5,702,000 barrels per day but had refinery capacity of only 1,268,500 barrels per day (22 percent of consumption).[72] In particular, PADD 1 relies heavily on refinery capacity and production from PADD 3 (Gulf Coast). Gulf Coast refineries and associated infrastructure are concentrated in coastal areas. Consequently, these facilities are vulnerable to disruption from tropical storms and hurricanes.[73] In recent years, several major hurricanes interrupted fuel supply from the Gulf Coast, including hurricanes Katrina and Rita in 2005, and Ike and Gustav in 2008, and Harvey in 2017. Most domestic ethanol used as an oxygenate blending component in finished motor gasoline is produced in PADD 2 and transported by rail car.

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[68] United States Energy Information Administration. "Number and Capacity of Petroleum Refineries." June 21, 2017. https://www.eia.gov/dnav/pet/pet_pnp_cap1_a_(na)_8O0_Count_a.htm

[69] Ibid.

[70] United States Internal Revenue Service. "Active Fuel Terminals." April 30, 2018. https://www.irs.gov/pub/irs-utl/tcn_db.pdf

[71] Information extracted from U.S. Census Bureau 2014 County Business Patters available at: http://censtats.census.gov/cbpnaic/cbpnaic.shtml (NAICS Code 424710 - Petroleum Bulk Stations and Terminals; NAICS Code 424720 - Petroleum and petroleum products merchant wholesalers (except bulk stations and terminals)

[72] United States Energy Information Administration. Supply and Disposition of Petroleum and Other Liquids. April 30, 2018. https://www.eia.gov/dnav/pet/pet_sum_snd_a_ep00_mbblpd_a_cur.htm

[73] U.S. Department of Energy. Quadrennial Energy Review: Energy Transmission, Storage, and Distribution Infrastructure. 2015. https://energy.gov/epsa/downloads/quadrennial-energy-review-first-installment

5. Transportation Supply Chain Entities

Fuel changes hands as it moves through the supply chain. First, fuel moves from the refinery in bulk shipment, by pipeline, ship, or barge, to a bulk terminal. The ownership title to the final product is held by Prime Suppliers at the bulk terminal. At the bulk terminal, fuel is purchased by regional wholesale distributors, sometimes called "jobbers," for eventual delivery to retail outlets, such as service stations, or directly to larger-scale end-users such as trucking companies. The terminal rack refers to the facility and equipment that is used to dispense fuel products from the terminal into tanker trucks or rail cars. In some uncommon circumstances, gasoline blendstock and ethanol are procured from different terminal racks and then blended into finished motor gasoline within the tanker truck.

6. Renewable Fuel Standard and Federal Fuel Tax

Due in large part to abundance of available ethanol supply – resulting from the RFS established by the Energy Independence and Security Act of 2007 – approximately 97 percent[74] of finished motor gasoline sold in the United States is a 90/10 blend of petroleum gasoline blendstock and ethanol (this blend is referred to as E10). The ethanol component of finished motor gasoline acts as an oxygenating agent. Ethanol production facilities and blending facilities are now an important part of the US fuel supply chain. Most domestic ethanol is produced in PADD 2. In the Northeast and Mid-Atlantic, most ethanol is blended with gasoline blendstock at the terminal rack to create finished motor gasoline. Currently, there is disagreement between ethanol producers, oil refiners, vehicle manufacturers, and the EPA about technical limitations of common internal combustion engine vehicles in terms of their ability to safely and reliably operate using higher blends of ethanol in finished motor gasoline. This "blend wall" limits the ratio of ethanol to petroleum components in finished motor gasoline and is for the time being acting as a limit to the aggregate amount of ethanol being used as fuel in the United States. In 2011, the EPA approved usage of finished motor gasoline with a 15 percent by volume ethanol component (E15) in vehicles model year 2001 and newer.[75] A small proportion of ethanol is consumed by flex fuel vehicles as part of an E85 blend.

The RFS includes a yearly Renewable Volume Obligation which must be met by the program's regulated entities. Regulated entities demonstrate compliance through retiring compliance instruments called Renewable Identification Numbers (RINs). RINs are paired with biofuel volumes and are generated by biofuel producers. RINs fall into categories based on various statutory criteria, including the life cycle emissions of their fuel in comparison to an equivalent fossil fuel benchmark.

The RFS has also encouraged the use of biodiesel/petrodiesel blends. Unlike ethanol in gasoline, a "blend wall" of technical impediments is not currently limiting increased use of biodiesel blends such as B5 or B20.[76] Rather, the major impediment to greater production of biodiesel in the US is the availability of affordable feedstock (due to competition from other uses).[77]

Federal fuel tax is collected at the point of disbursement from the terminal rack.[78] The tax is paid by the inventory position holder in the terminal, which is usually the same party that is receiving the dispensed fuel.[79] Heating oil and off-road diesel is exempted from federal highway excise tax. In many cases it is at the terminal rack that red

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[74] US Department of Energy. "Ethanol Blends." http://www.afdc.energy.gov/fuels/ethanol_blends.html
[75] US Department of Energy. "E15." https://www.afdc.energy.gov/fuels/ethanol_e15.html
[76] Wade Brorsen. "Projections of U.S. Production of Biodiesel Feedstock." July 2015. *Union of Concerned Scientists.* http://www.ucsusa.org/sites/default/files/attach/2015/07/Brorsen-RFS-Biodiesel-Feedstock-Analysis.pdf
[77] Ibid.
[78] US Department of Transportation Federal Highway Administration. "Motor Fuel Tax Compliance Outreach FAQs." http://www.fhwa.dot.gov/motorfuel/faqs.htm
[79] Internal Revenue Service.
"Fuel Taxes." *Publication 510, Excise Taxes.* January 2016.
https://www.irs.gov/publications/p510/ch01.html#en_US_201601_publink1000116840

dye is added to heating oil and off-road diesel.[80] Because adding red dye to No. 2 distillate exempts it from the federal fuel excise tax, the IRS regulates how and where in the supply chain that dye is added. Dye is mechanically added to a batch of fuel while the fuel is being dispensed from the terminal rack.[81]

7. Jet Fuel

Jet fuel is subject to federal taxes, the proceeds of which are primarily used to fund airport and air traffic operations. In the Northeast and Mid-Atlantic region, emissions from domestic jet fuel constitute 13 percent of total transportation emissions (compared with 19 percent for diesel and 64 percent for motor gasoline, all other fuels taken together make account for less than 2 percent). Domestic GHG emissions from the combustion of jet fuel are not capped or offset by any current U.S. law or program. Emissions from jet fuel are not included in California's otherwise economy-wide GHG reduction program, but CARB has proposed allowing alternative jet fuel to generate credits within California's Low Carbon Fuel Standard.[82] Since aviation travelers tend to be wealthier than travelers using cars or buses for long distance travel, an emissions program that covers motor gasoline and diesel fuel but not jet fuel would have distributional equity effects.

In the recent UN International Civil Aviation Organization (ICAO) agreement on aviation emissions, the Carbon Offsetting and Reduction Scheme for International Aviation, the emissions from domestic aviation are not covered. Beginning in 2021, offsetting is required for any emissions from international flights that exceed the 2020 baseline. In the United States, jet fuel used for domestic flights and jet fuel used for international flights is kept separate for bookkeeping purposes - international fuel is "bonded fuel." This is because the Chicago Convention of 1947 setting up the ICAO exempts commercial air fuels from tax.[83] Because fuel for international flights is already untaxed, kept separated from taxed domestic fuel, not tracked by the EIA 782C Prime Supplier form, and is not accounted for in US state emissions inventories, there would be little to no risk that a hypothetical program that covers jet fuels used for domestic flights would pose a conflict with the ICAO offsetting regime.

The European Union Emissions Trading System (EU ETS)—the world's largest market-based program for GHG emissions—expanded in 2012 to include emissions from aviation. Only flights within the European Economic Area (EEA) are included; flights to and from the EEA will be covered under the ICAO's Carbon Offsetting and Reduction Scheme for International Aviation program, beginning in 2021. Within the EU ETS there are separate allowances for stationary sources and for aviation. The aviation emissions budget is fixed at 210 million metric tonnes per year for the 2013-2020 compliance period, equal to 95 percent of historic aviation emissions based on a benchmarking analysis using fuel consumption data. The aviation sector can use stationary source emissions for compliance, but stationary sources are prohibited from using aviation allowances. Most aviation allowances—82 percent—are distributed freely to airlines based on miles flown, 15 percent are auctioned, and three percent are held in a special reserve for fast growing airlines or new companies.

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[80] This product specification sheet from the Colonial Pipeline Company sheds some light on the abilities of upstream entities to distinguish between the No. 2 distillates that they transport: Colonial Pipeline Company. "Section 3 Product Codes and Specifications." March 6, 2013. http://www.colpipe.com/docs/default-source/product-specs/product-specifications.pdf

[81] Internal Revenue Service. "Diesel Fuel and Kerosene Excise Tax; Dye Injection." *Internal Revenue Bulletin: 2005-19.* https://www.irs.gov/irb/2005-19_IRB/ar12.html

"(2) Mechanical injection system; requirements. The Commissioner will approve a mechanical injection system only if—(i) The system has features that automatically inject an amount of dye that satisfies the concentration requirements of §48.4082-1(b) into diesel fuel or kerosene as the diesel fuel or kerosene is delivered from the bulk transfer/terminal system into the transport compartment of a truck, trailer, railroad car, or other means of nonbulk transfer;"

[82] California Air Resources Board. "Notice of Public Hearing to Consider Proposed Amendments to the Low Carbon Fuel Standard Regulation and the Regulation on the Commercialization of Alternative Diesel Fuels." April 27, 2018. https://www.arb.ca.gov/regact/2018/lcfs18/notice.pdf

[83] Citing the Chicago Convention (the UN treaty establishing ICAO), the US federal government has called the EU ETS inclusion of international aviation under their cap as an "illegal tax."

Appendix III: State Fuel Tax Reporting Requirements

This appendix summarizes data collected from states on state reporting requirements for transportation fuels. Connecticut, Delaware, Maryland, Massachusetts, New Hampshire, New York, Rhode Island, Vermont, and the District of Columbia provided data.

1.1. What are the relevant state motor fuel excise tax levies or other tax/reporting requirements that could provide information on petroleum fuel transactions by fuel type?

CT	(CGS § 12-458). (CGS § 12-455a)
DC	Code of the District of Columbia, § 47–2303 and § 47-2501
DE	Delaware Law Title 30, Chapter 51
MD	COMAR 03.03.01.19
MA	M.G.L C. 64A governs gasoline, 64E, special fuels (diesel and gaseous fuels), and 64J, jet fuel.
NH	NH State Statutes: RSA 146-A:11-b: RSA 260:32
NY	Petroleum business tax and motor fuel excise tax
RI	Rhode Island General Laws § 31-36-7
VT	Vermont Transportation Fund

1.1.1. Under what legal authority, policy, or program are the data collected? Are the data collected for a regulatory or revenue purpose?

All responding states collect data from entities in the petroleum fuel supply chain for revenue purposes. Three out of nine of the responding states also collect data for other regulatory purposes.

	CT	DE	DC	MD	MA	NH	NY	RI	VT
Revenue	yes	yes	yes	yes	yes	yes	yes	yes[84]	yes
Regulatory	yes	yes	no	no	no	yes	no	no[85]	no

[84] Based on GCC's interpretation of Rhode Island General Laws § 31-36-1 et seq.
[85] Ibid.

1.2. What fuels are subject to the reporting requirement(s), and to what degree is reporting disaggregated?

1.2.1. In particular, does it provide for separate reporting?

All states separately report motor gasoline and on-road diesel (both fuels are subject to separate federal cent-per-gallon taxes, and generally to separate state taxes, as well). The following table addresses which fuels are subject to reporting requirements.

	CT	DE	DC	MD	MA	NH	NY	RI	VT
Motor gasoline	yes	yes	yes	yes	yes	yes	yes[86]	yes	yes
Diesel, on-road	yes[87]	yes	yes	yes	yes	yes	yes	yes	yes
Diesel, off-road	no	yes[88]	yes	yes	no	yes[89]	yes	yes[90]	yes[91]
Heating oil	yes	no	yes	yes	no	yes[92]	yes[93]	no[94]	yes[95]
Aviation gasoline	no	yes	yes	yes	yes	yes	yes	yes	yes
Jet fuel	yes	no	yes	yes	no[96]	yes	yes	yes	no[97]

No states report on-road diesel and heating oil together, and almost all states do not report on-road and off-road diesel together[98] (i.e., without disaggregation). (Both off-road diesel and heating oil are exempted from federal taxes and dyed different shades of red at the terminal rack to prevent use of these tax-exempt fuels in a taxable, on-road use).

States may also require reporting of other types of fuels. For example, DC's law is written to include "all motor vehicle fuels", and New Hampshire has separate reporting of propane, compressed natural gas, liquefied natural gas, special fuel, and lubricating oil.

[86] With some disaggregation.
[87] Connecticut does not differentiate between on-road and off-road diesel; they are reported together.
[88] "Limited to low sulfur dyed diesel or low sulfur dyed bio diesel sold to school bus contractors."
[89] "Tracked for environmental fees."
[90] In RI, off-road diesel and heating oil reported together as non-taxable.
[91] "Off-road diesel is called out in the report for gallons by diesel distributor as being in the "SOLD OR DLVD. TAX FREE" column."
[92] "Tracked for environmental fees."
[93] Reported as off-road diesel, in the same category.
[94] In RI, off-road diesel and heating oil reported together as non-taxable.
[95] In separate section, "Title 33: Human Services, Chapter 025: Home Weatherization Assistance Program, § 2503. Fuel gross receipts tax."
[96] Only if a local option tax is in place, no statewide data.
[97] Sales tax only. Except in the rare instance that jet fuel is used to propel a motor vehicle.
[98] DC reports on-road and off-road diesel in the same category due to the small amount of usage of off-road diesel.

1.3. What entities are subject to the reporting requirement?

CT	No data provided
DC	Importers/Wholesalers. Any importer engaged in the sale or other disposition or use of motor vehicle fuel.
DE	Any company which acts as a Motor Fuel Distributor, Special Fuel Suppliers Dealer, Common Carrier, and/or User in the State of Delaware. Please note that exempt entities and retail dealer stations are subject to licensing but not required to report on a monthly basis. Some entities, like federal and state government, are exempt from reporting and excise tax.
MD	Any entity with a Maryland motor fuel license class A,B,C,D,F,G,S,U,W or petroleum transporter if over 1749 gallons of motor fuel is loaded or discharged from a conveyance in Maryland.
MA	All licensees in the chain of intra-state motor fuel commerce.
NH	Motor Fuel Distributors and Oil Discharge and Pollution Control licensees (collectively covers heating oil, lubricating fluids, gasoline, diesel distributors)
NY	Every petroleum business in NY, plus transporters. One batch of fuel might be reported by different entities, but only one would be responsible for the tax. Subsequent entities would report the batch as previously tax paid fuel.
RI	Distributors, exporters, special category exemptions
VT	Distributors

The above chart shows that entities subject to reporting requirements vary widely by state. Entities that are not liable to pay fuel taxes may be required to report. (Note: question 1.3 is asking for all reporters, not just those paying taxes).

1.3.1. Are entities defined differently for different fuels?

CT	DE	DC	MD	MA	NH	NY	RI	VT
yes	yes	no	yes	yes	yes	no	no	no

For states that define entities differently for different fuels, there is usually a distinction between entities dealing in motor gasoline versus entities dealing in diesel fuel or entities dealing in alternative fuels.

1.3.2. Are there entities exempted from requirements, for example those below a minimum threshold of sales?

CT	DE	DC	MD	MA	NH	NY	RI	VT
yes[99]	yes[100]	no	no	no	no[101]	no[102]	no[103]	no[104]

Due to the relationship between regulated petroleum fuel entities' reporting requirements and the collection of state fuel taxes, entities exempted from paying fuel taxes are in some cases also exempted from reporting data to state authorities. Exempted entities may be using dyed fuels, which are dyed prior to dispensation from the terminal rack in order to designate those fuels as exempt from the federal excise tax on fuels.

[99] "Those companies selling #2 heating oil, kerosene or propane exclusively for heating purposes submit an annual Heating Fuels Distributor License Renewal Form."

[100] "For purposes of exemption from the state excise taxation, as defined in the Delaware Law Title 30, Chapter 51. For example, these include government (federal, state and local), volunteer fire companies in any of their official vehicles, and veteran or civic organizations in their ambulances when such vehicles are used on a voluntary, nonprofit basis. In addition, sales by a distributor to another licensed distributor in the State, sales by a Special Fuel Supplier to another licensed Special Fuel Supplier, Special Fuel Dealer, and/or Special Fuel User in the State, or motor fuel sold or delivered under the protection of the interstate commerce clause of the Constitution of the United States. There are no entities exempted based on a threshold of sales."

[101] "there are no exemptions from reporting requirements for importing, refining, distilling or distributing in the state. Some may be exempt from the road toll tax (e.g. distributor to distributor in-state – point of taxation is when it is dropped into retail station or sold to unlicensed end users and nonroad fuels)"

[102] "However, government (federal state and local) and not-for profit entities (as defined in section 1116 (a) of the tax law) are exempt from registration and fuel reporting requirements if the fuel they import is used exclusively for the entities purposes. Some registered entities may be responsible for quarterly versus monthly reporting. Certain types of fuel might be exempt from tax, but entities have to report quantities handled."

[103] "However, there are other exemptions under the statute. For example, the term "fuels" for purposes of Rhode Island's motor fuel tax includes gasoline, benzol, naphtha, and other volatile and inflammable liquids (other than lubricating oils, diesel fuel for the propulsion of marine craft, fuels used for the propulsion of airplanes, oils used for heating purposes, manufactured biodiesel fuel), used or suitable for use for operating or propelling motor vehicles with internal combustion engines. This does not include benzol and naphtha sold or used for a purpose other than for the operation or propulsion of motor vehicles."

[104] "But there are users that are exempt from the diesel tax (non-road Ag, State, municipal, school district, fire district, or other governmentally owned vehicles for official purposes, non-road vehicles, registered farm trucks). Also no tax on sales between distributors."

1.4. How many entities are currently subject to the reporting requirement(s)?

The number of entities varies widely by state, dependent upon the state's size and the variety of entities required to report. Of the states listed below, we estimate that 6290 entities are subject to a reporting requirement—although some entities hold more than one license, qualify as more than one type of entity, or operate in more than one state within the region and therefore may be double-counted. Entities have a natural incentive to avoid being double-counted and seek to clarify their status to avoid over-taxation. Some of these entities are only required to register or hold a license—they may not have any reporting or tax requirements.

	# of entities	Notes
CT	717	Motor vehicle fuel distributors, special fuel distributors
DC	78	Importers of motor fuel, and each person who delivers heating oil to an end-user in the District
DE	353	Active special fuel dealers, active special fuel users, active motor fuel distributors, active special fuel suppliers, active transporters
MD	1673	Gasoline dealer licenses, distributors, special fuel seller licenses, special fuel user licenses, aviation gasoline licenses, petroleum transporter registrations
MA	986	Gasoline licensees, special fuels licensees, jet licensees
NH	430	Motor fuel distributors, oil discharge and pollution permittees
NY	1733	Registered distributors: Motor fuel, diesel fuel, importing transporter, natural gas, terminal operator, retailer non highway diesel, utilities, liquid propane, aviation gas retail, commercial aviation fuel, kero-jet distributor, dyed diesel, residual products
RI	75	Distributors, special entities
VT	245	Motor fuel distributors, diesel distributors[105]
TOTAL	6290	(note: not all entities required to report have a tax liability)

[105] May not include all distributors of dyed diesel.

1.5. What action triggers the reporting requirement? (e.g., Delivery into the state, removal from the rack, first sale in the state?)

	CT	DE	DC	MD	MA	NH	NY	RI	VT
Imports into state	yes	yes	yes	yes	yes	yes	yes	yes	no
Refines / produces	no	yes	yes	no	no	yes[106]	yes	no	no
Sells	yes	yes[107]	no	yes	no	no	yes[108]	yes	yes
Export out of state	yes	yes	no	yes	yes	no	no	yes	no
Load / discharge	yes	no	no	yes[109]	no	no	no	no	no
Removal from rack	yes	no	no	no	yes	no	no	no	no

All states have reporting requirements on a quantity of fuel when it is imported into the state or sold in the state. Some states' reporting requirements are generally less extensive than others, which relates to the number of entities reporting (see question 1.4) and the depth of reporting requirements (see question 1.7). For example, in New York State, all movement of fuel is supposed to be recorded in the reporting system and so many entities without a tax obligation are subject to reporting.

[106] However, the only fuel currently being produced in NH is biodiesel.
[107] Only if the entity wishes to buy and sell fuel excise tax free in the State of Delaware.
[108] Selling diesel motor fuel other than at a retail station. This does not apply to sale of motor gasoline.
[109] Loading or discharge reporting applies to Maryland's Petroleum Transporter (PT) registrants that do not also have a motor fuel license in Maryland (PTs that do not hold title to the product).

1.6. Does the reporting requirement apply to finished fuels (e.g., reformulated gasoline), or component elements?

	CT	DE	DC	MD	MA	NH	NY	RI	VT
Both finished fuels & components	yes[110]	yes[111]	yes[112]	yes[113]	no	no	yes[114]	no	no
Finished fuels only	no	no	no	no	yes	yes	no	yes	yes

Some states require reporting for finished fuels and fuel components, while other states only require reporting for finished fuels. The states that do require some reporting of fuel components are not consistent with each other. For example, New York requires the reporting of RBOB, CBOB, and fuel grade ethanol while Connecticut only requires the reporting of any biodiesel components in addition to finished fuels. Relatedly, all bulk terminal operators and blenders are required to complete monthly reporting form EIA 815 for the federal Energy Information Administration which does include component data.

[110] Components: fuel grade ethanol, RBOB, CBOB, biodiesel.
[111] Applies to the finished fuels and fuel component elements (e.g. RBOB, CBOB, ethanol, etc.). However, some fuel components not blended with a base motor fuel are exempt from monthly reporting.
[112] "…gasoline, diesel fuel, and other volatile and flammable liquid fuels produced or compounded for the purposes of operating or propelling internal combustion engines… (see 47-2302 definition for "motor vehicle fuels)."
[113] Component: Ethanol only.
[114] The product categories are not distinguishable on the reporting form whether the amount reported is finished fuel or petroleum blendstock or fuel grade ethanol. Applies to finished and component elements (e.g. RBOB, CBOB, fuel grade ethanol) fuels, but some fuels and components are exempt from taxes and would be reported separately.

1.7. For each fuel, what data are required to be reported?

Many states require reporting of the "schedule information," but some do not. Lack of schedule information and inventory information could hamper efforts at developing a pass-through mechanism to avoid double-counting.

	CT	DE	DC	MD	MA	NH	NY	RI	VT
Total inputted / bought / received volume by fuel type	yes	yes	yes	yes	yes	yes	yes	yes	yes
Total outputted / sold / distributed volume by fuel type	yes	yes	yes	yes	yes	yes	yes	yes	yes
Total volume of fuel type by point of destination	no	yes	yes	yes	yes	yes	no	yes	no
Total volume of fuel type by point of origin	no	yes	yes	yes	yes	yes	no	yes	no
Total volume of fuel type imported into state	yes	yes	yes	yes	yes	yes	yes	yes	yes
Total volume of fuel type exported out of state	yes	yes	yes	yes	yes	yes	yes	yes	yes
Beginning inventory fuel volume by type	yes	yes[115]	yes	yes	yes	yes	yes	no	yes
Ending inventory fuel volume by type	yes	yes[116]	yes	yes	yes	yes	yes	no	yes

[115] Limited to motor fuel distributors, special fuel users, and special fuel dealers. Not all reporters.
[116] Ibid.

1.8. How does the reporting requirement treat fuel that enters or is produced in the state but is not used in the state, i.e., it passes through the state?

	CT	DE	DC	MD	MA	NH	NY	RI	VT
Lacks reporting requirement if only passing through a state	yes	yes	yes	yes	yes	yes	yes	yes	yes
Reporting requirement if produced in state and exported	yes	yes	yes	yes	no	yes	yes	no	no
Reporting requirement if de-racked in state but exported	yes	yes	no	yes	yes	yes[117]	yes	yes	no

No state requires reporting or taxation of fuels not coming to rest or not being bought, sold, or exchanged within state boundaries. Some states require reporting if a fuel is produced or de-racked in the state and then exported. Generally, the definition of "come to rest" is important in these laws. A batch or quantity of fuel which does not come to rest in the state is not required to be registered, reported, or filed. The concept of "no exchange" is also important.

1.9. How are the data collected?

1.9.1. What is the frequency and timing of data collection? (e.g., monthly, quarterly)

	CT	DE	DC	MD	MA	NH	NY	RI	VT
Monthly	yes	yes	yes	yes	yes	yes	yes[118]	yes	yes
Quarterly	no	no	no	no	no	no	no	no	no[119]

All states require regulated entities to report monthly.

[117] The reporting requirement for de-racking in New Hampshire then exporting out of state is in administrative rules, not state statute.
[118] Rare exceptions may report quarterly in New York.
[119] Yes, but only for heating oil.

1.9.2. What is the reporting tool/methodology (e.g., form)?

	CT	DE	DC	MD	MA	NH	NY	RI	VT
Paper only	yes	yes	no	yes	no	no	yes	yes	no
Either submission method	no	no	yes	no	no	yes[120]	no	no	yes
Electronic only	no	no	no	no	yes	no	no	no	no

A plurality of states requires regulated entities to report by paper form. It has been discussed on conference calls that the states currently relying on paper submissions may in the future upgrade their reporting systems to allow for electronic submissions. The state of California's program is built upon an electronic reporting platform, and CARB staff strongly recommended that an electronic reporting platform serve as the basis for any cap-and-invest program in the Northeast and Mid-Atlantic region.

1.10. Is reporting required? Who enforces the requirement and what is the penalty?

Reporting is required by states. Penalties vary by state and are usually a small fine at first offense. Fines may increase in severity with repeated offenses and if other tax violations are also committed. Responsibility for enforcing the requirement also varies by state.

[120] "If an entity has <100 transactions/mo they can do paper reports, if > than 100/mo must do electronic."

1.11. Are the data currently available to state environmental or transportation agencies, or could it be made available without legislation? What issues or considerations may accompany accessing data?

	CT	DE	DC	MD	MA	NH	NY	RI	VT
Fully available[121]	no	no	yes	no	no	no	no	no	yes
Partially available[122]	yes	yes	yes	yes	yes	yes	no	no	yes
Fully withheld	no	no	no	no	no	no	yes[123]	yes[124]	no

The availability of data varies by state. Question remains about which data may be available to the public or state agencies, and whether those data are available in raw form or only in aggregate. Some state transportation department and/or environment departments do not have access to the data because the state department in charge of taxation has restrictions on the disclosure of personally identifiable taxpayer information. In some states, aggregated data which does not include personal identifiable information is available to transportation and environment departments. States are already required to report fuel data to the Federal Highway Administration, including motor gasoline and diesel use.

1.12. Are there any considerations related to data quality/completeness?

No states have serious concerns about the quality or completeness of their data.

[121] Volumes transacted by entity.
[122] Only in aggregate, not by entity.
[123] Not currently, but that is subject to change.
[124] Tax return information is confidential by statute.

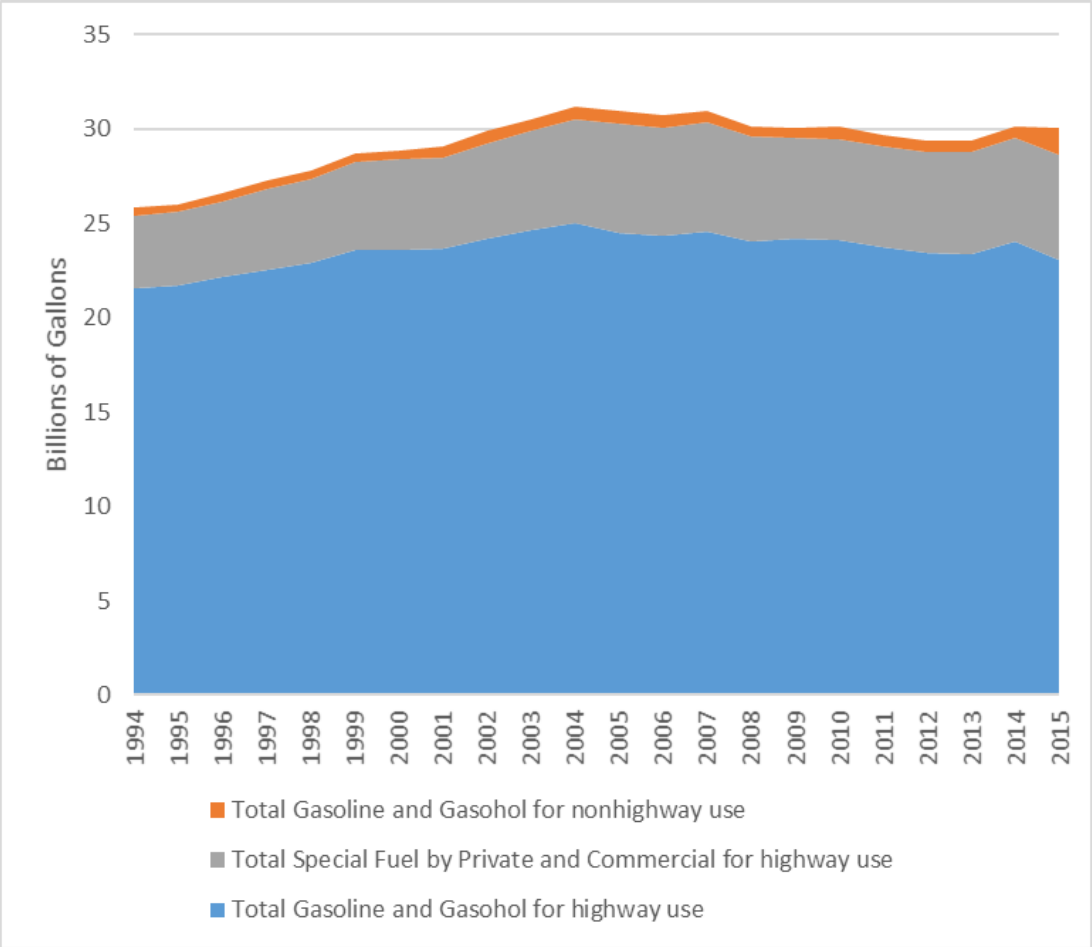
Appendix IV. Federal Reporting Requirements

1. Federal Highway Administration (FHWA)

The US Department of Transportation Federal Highway Administration annually publishes a report on highway statistics. Currently available data on motor fuel information are available from 1992 to present. In addition, data are available on other highway related topics such as bridges, road length, vehicle miles traveled, travelers, vehicles, revenue, debt, conditions, safety, and performance indicators.[125] State departments of transportation are required by law to report these data to the FHWA in order to evaluate the health of the highway system. Also, part of the process of distributing monies from the federal Highway Trust Fund depends on the motor fuels usage data reported by the states. Of particular relevance to this paper are Form FHWA 551M Monthly Motor-Fuel Consumption, and Form FHWA-556 State Motor-Fuel Tax Receipts and Initial Distribution by Collection Agencies.[126]

The highway statistics are published by state and includes highway and non-highway use of gasoline (including E10), special fuel (diesel and all non-gasoline, non-ethanol transportation fuels), and total fuels.

Figure 7: Motor Fuel Use Northeast and Mid-Atlantic[127]

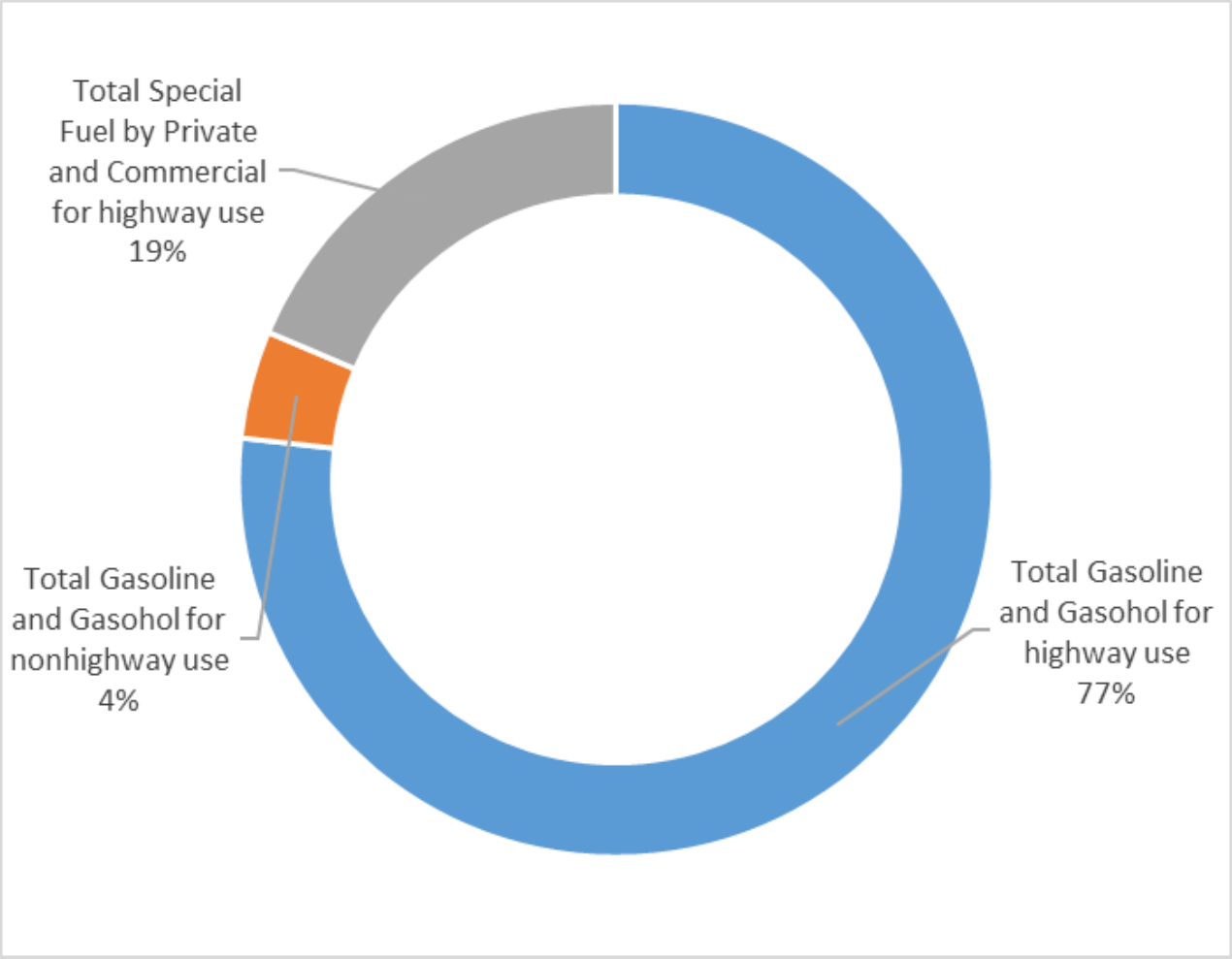


[125] US Department of Transportation Federal Highway Administration. "Highway Statistics 2014." 2014. http://www.fhwa.dot.gov/policyinformation/statistics/2014/

[126] US Department of Transportation Federal Highway Administration. "Reports Identifying Motor-Fuel Use and Taxation." *Highway Finance Data Collection.* http://www.fhwa.dot.gov/policyinformation/hss/guide/ch2.cfm

[127] Data source: FHWA, https://www.fhwa.dot.gov/policyinformation/statistics.cfm

Figure 8: Motor Fuel Use in the Northeast and Mid-Atlantic, 2015[128]



Special fuel includes diesel and all non-gasoline or gasohol fuels for highway use. The FHWA does not publish special fuels data for non-highway use. Gasoline dominates over special fuels, and non-highway gasoline use is miniscule. The FHWA categorizes fuels differently than the EIA.

[128] Data source, FHWA: https://www.fhwa.dot.gov/policyinformation/statistics/2015/mf21.cfm

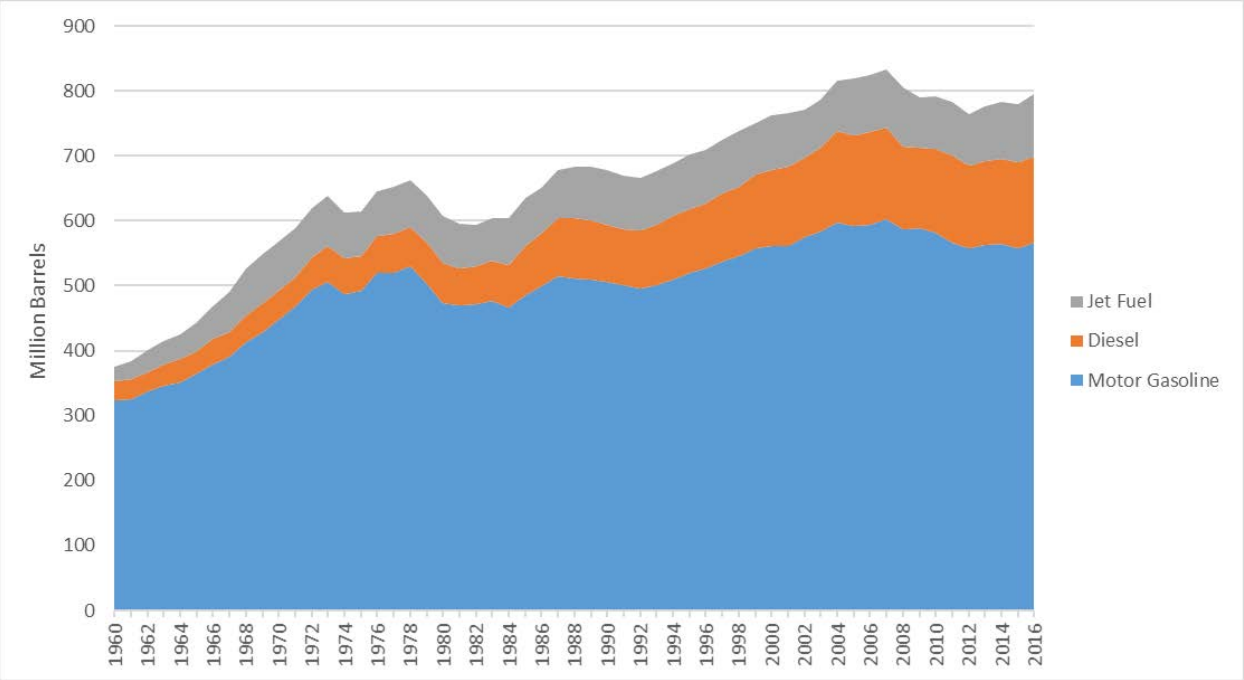
2. The Energy Information Administration (EIA)

The EIA surveys refiners, importers, Prime Suppliers, pipeline owners, terminal rack owners, and blending facility owners. EIA surveys do not consistently request point of origin/destination information from reporting entities. Refer to Table 8 for a listing of EIA reporting forms of relevance to this paper.

State Energy Data System (SEDS)

The State Energy Data System managed by the EIA is constructed from information gathered in many EIA surveys and from Federal Highway Statistics. The data from the survey forms are then used to build reports on specific topics, such as "Fuel Oil and Kerosene Sales 2014," which can take approximately a year to publish. Within SEDS, fuels are broken down by the sector that uses them, and the survey forms capture this information directly. The SEDS data most relevant to this paper, motor gasoline for highway use and on-road diesel, are an EIA modification of FHWA data.[129] Estimates of motor gasoline usage are based almost entirely on the FHWA data.[130] The SEDS data for Distillate Fuel Oil (Diesel) comes from the EIA's Fuel Oil and Kerosene Sales Report.[131] The SEDS data for Jet Fuel consumption by state comes from Prime Supplier reports.[132] In SEDS, all distillate fuel oils for transportation are lumped together.

Figure 9: EIA SEDS Northeast and Mid-Atlantic Region Transportation Fuel Consumption[133]



[129] US Energy Information Administration. "State Energy Data System 2014 Consumption Technical Notes." Page 61-64. June 29, 2016. *State Profiles and Energy Estimates.* http://www.eia.gov/state/seds/sep_use/notes/use_technotes.pdf

[130] "The data reported on form FHWA 551M are widely considered to provide the most up-to-date, complete and accurate information on gasoline usage, and as such, are invaluable for a variety of analyses within the Department of Transportation and by other agencies." U.S. Department of Transportation Federal Highway Administration. "Chapter 2: Reports Identifying Motor-Fuel Use and Taxation." http://www.fhwa.dot.gov/policyinformation/hss/guide/ch2.cfm

[131] US Energy Information Administration. "State Energy Data System 2014 Consumption Technical Notes." *State Profiles and Energy Estimates.* Page 36. June 29, 2016. http://www.eia.gov/state/seds/sep_use/notes/use_technotes.pdf

[132] Ibid. page 45.

[133] Data source, EIA SEDS: http://www.eia.gov/state/seds/

Refiners and Importers

Refiners and importers report extensively on quantities produced or imported by fuel type. Reporting is mandatory for all refiners and importers.

Refiners report on EIA forms 820, 810, 800, & 782A. Refiners are not required to specify the precise country of origin for refinery inputs, and are only required to specify destination of finished fuels on EIA Form 782A Refiners'/Gas Plant Operators' Monthly Petroleum Product Sales Report. EIA Form 782A is an important source of data for EIA's Petroleum Marketing Monthly, which includes categorization of refiners' fuel sales by state.[134]

Importers report on EIA forms 804 & 814. In the reports, imported volumes are divided by PADD, and by one of 22 product codes. Volumes are also divided by country of origin, port of entry, and processing company (e.g., a refinery, blender, or storage facility).

Some EIA public databases distinguish between total distillate and No. 2 diesel. On Forms EIA-821, EIA-782A, and EIA 782C, the No. 1 diesel is reported separately - those forms cover Prime Supplier and refiner/importer. Therefore, EIA tracks each type of distillate separately, but does not publicly release those data.

Terminals, pipelines, tanker and barge movements

Bulk terminals and blenders are required to report monthly on form EIA-815. They must report finished fuels and fuel components by inventory stocks, receipts, inputs, production, shipments, and uses & losses. Bulk terminals and blenders are also required to complete a weekly version of the report on EIA-805, which is less granular and specific. Bulk terminals and blenders are the furthest downstream entities required by EIA to report data on fuel components, rather than only finished fuels.

Pipeline operators report monthly on Form EIA-812 and weekly on Form EIA-802. The weekly EIA-802 requires reporting of pipeline stocks by finished fuel or fuel component for each PAD district. The monthly EIA-812 requires reporting of the same data as EIA-802, in addition to reporting pipeline movements of product between PAD districts.

Tankers and barges report monthly on Form EIA-817. They report finished fuel, fuel components, and other petroleum product specific data on movements between PAD districts.

Fuel Oil and Kerosene supply chain entities

Form EIA-821 Annual Fuel Oil and Kerosene Sales Report is required to be completed by "all refiners; companies doing business in five or more States; companies accounting for five percent or more of the distillate fuel oil volume for any target variable or particular energy use category sold in a State; companies that sold residual fuel oil; companies accounting for five percent or more of the kerosene volume sold in a State in an earlier EIA-821 survey; and augmented frame units for which no attribute data were available."[135] The data reported includes volumes for all kerosene and distillate fuels by state of destination and type of usage (on-road, farm, military, residential, etc.).

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[134] US Energy Information Administration. "Petroleum Marketing Monthly." October 2016. http://www.eia.gov/petroleum/marketing/monthly/pdf/pmmall.pdf

[135] US Energy Information Administration. "Form EIA 821 Annual Fuel Oil and Kerosene Sales Report Instructions." *Survey Forms.* http://www.eia.gov/survey/form/eia_821/instructions.pdf, "Augmented frame unit" refers to large specific end-use sellers such as vessel bunkering services, military and electric utilities, and residual fuel sellers.

EIA Prime Supplier

For every Prime Supplier,[136] completion and submission of Form EIA-782C Monthly Report of Prime Supplier Sales of Petroleum Products Sold for Local Consumption is mandatory. A Prime Supplier is required to complete a separate 782C form for each state it operates in. Prime Suppliers are requested to exclude sales to other Prime Suppliers in order to avoid double counting of fuel volumes. Prime Suppliers are listed on the EIA-782C Exclusionary List.[137] Form 782C is for monthly sales by volume of 18 possible finished fuels, not fuel component (sales of gasoline blendstock and oxygenate are not recorded in Prime Supplier reporting). The data reported on Form 782C does not include point of origin or fuel products, only the state into which the finished fuel is sold for local consumption.

Table 7: Prime Suppliers by State[138]

	2015 Prime Suppliers of finished motor gasoline and diesel
CT	26
DE	29
DC	18
ME	17
MD	41
MA	32
NH	25
NJ	41
NY	45
PA	53
RI	16
VT	25

The most recent list of prime suppliers published by EIA identified 85 entities supplying fuel to the Northeast and Mid-Atlantic states, with many entities supplying to multiple states. Entities that import finished fuel into a state from abroad for local consumption are considered Prime Suppliers and must complete form 782C. All refiners are to report all of their end use sales to non-refiners on form 782C. According to the FAQs for EIA form 782c, dyed off-road fuel is included in the Prime Supplier reported numbers and it is not tracked separately from undyed diesel, while there is a separate reporting line for No. 2 fuel oil (heating oil).[139] Even though it is not a transportation fuel, No. 2 fuel oil is included in Figure 10, for comparison.

Prime Suppliers who sell fuel oil and/or kerosene are also required to complete form EIA-821 Annual Fuel Oil and Kerosene Sales Report.

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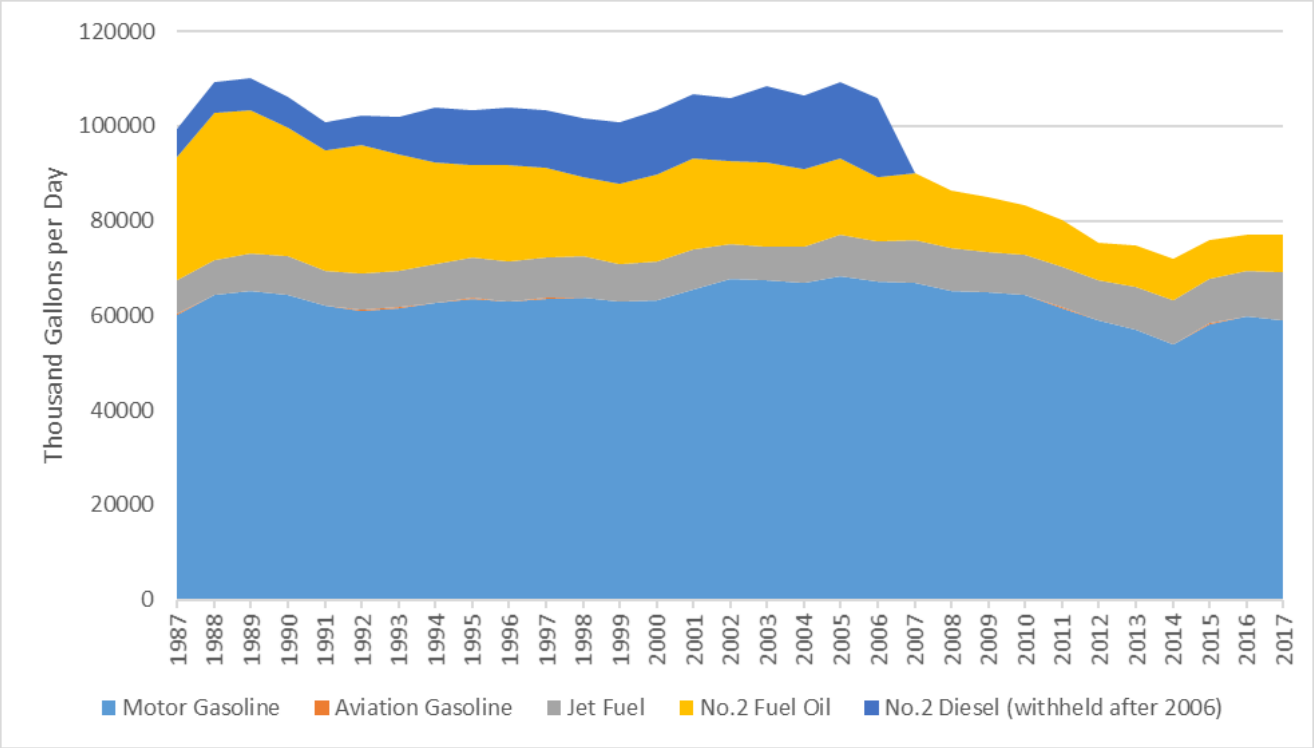
[136] "A firm that produces, imports, or transports selected petroleum products across State boundaries and local marketing areas, and sells the product to local distributors, local retailers, or end users." US Energy Information Administration. "Glossary." http://www.eia.gov/tools/glossary/index.cfm?id=P

[137] US Energy Information Administration. "EIA-782C Exclusionary List Instructions." April 2018. *Survey Forms.* http://www.eia.gov/survey/form/eia_782c/exclusion_list.pdf

[138] Data extracted from EIA's Form 782C database by EIA and provided to Georgetown Climate Center, August 2016.

[139] US Energy Information Administration. "FAQs for Survey Form EIA-782C." *Survey Forms.* http://www.eia.gov/survey/form/eia_782c/faqs.cfm#q30

Figure 10: Prime Supplier Fuel Sales in Northeast and Mid-Atlantic[140]



[140] Data Source, EIA Prime Supplier: http://www.eia.gov/petroleum/marketing/prime/archive/. The No.2 Diesel total column was eliminated in 2007 from Petroleum Marketing Monthly tables to ensure that sensitive data reported to EIA by individual survey respondents may not be closely estimated using the aggregates published by EIA.

Table 8: Energy Information Administration Transportation Fuel Reporting Forms

Form #	Form Name	# of Respondents	Description
EIA-821	Annual Fuel Oil and Kerosene Sales Report	3055	Sales of distillate and residual fuel oils and kerosene by end use and state of destination are reported by a sample of fuel oil dealers in the 50 States and the District of Columbia.
EIA-820	Annual Refinery Report	151	Collects data on: fuel, electricity, and steam purchased for consumption at the refinery; refinery receipts of crude oil by method of transportation; current and projected capacities for atmospheric crude oil distillation, downstream charge, and production capacities.
EIA-810	Monthly Refinery Report	142	Collects information regarding the balance between the supply (beginning stocks, receipts, and production) and disposition (inputs, shipments, fuel use and losses, and ending stocks) of crude oil and refined products located at refineries.
EIA-782A	Refiners'/Gas Plant Operators' Monthly Petroleum Product Sales Report	100	Price and volume data at the State level for 14 petroleum products for various retail and wholesale marketing categories are reported by the universe of refiners and gas plant operators.
EIA-800	Weekly Refinery and Fractionator Report	129	Input and stocks of refinery feedstocks as well as inputs, production, and stocks of selected finished petroleum products are collected from a sample of operators of petroleum refineries and fractionators.
EIA-817	Monthly Tanker and Barge Movement Report	35	Shipments of crude oil and petroleum products between PAD Districts are reported by all companies that have custody of crude oil or petroleum products transported by tanker or barge.
EIA-815	Monthly Bulk Terminal and Blender Report	1473	Collects information on the balance between the supply (beginning stocks, receipts, and production), and disposition (inputs, shipments, fuel use and losses, and ending stocks) of refined products and renewable fuels from bulk terminals. In addition, storage capacity is collected for working, shell in operation, and shell idle for several major product groupings.
EIA-814	Monthly Imports Report	396	Collects data on imports of crude oil and/or petroleum products. The resulting statistics are used by public and private analysts.
EIA-804	Weekly Imports Report	107	Imports of crude oil, (including imports for delivery to the SPR), NGPLs and LRGs (including propane/propylene), fuel ethanol, finished motor gasoline, motor gasoline blending components, kerosene-type jet fuel, kerosene, distillated fuel oil by sulphur content, residual fuel oil, and other petroleum products are provided by a sample of importers on a PAD and sub-PAD district.
EIA-812	Monthly Product Pipeline Report	86	End-of-month stock levels and movements of petroleum products transported by pipeline are reported on a custody basis by all product pipeline companies.
EIA-802	Weekly Product Pipeline Report	46	End-of-week stock levels of selected petroleum products which include stocks of NGPLs and LRGs (including propane/propylene), fuel ethanol, finished motor gasoline, motor gasoline blending components, kerosene-type jet fuel, kerosene, and distillate fuel oil by sulphur content are collected from a sample of petroleum product pipeline companies on a PAD and sub-PAD District basis.
EIA-805	Weekly Bulk Terminal and Blender Report	737	Input and production of oxygenates, renewable fuels (including fuel ethanol), NGPLs and LRGs, finished motor gasoline, motor gasoline blending components, kerosene-type jet fuel, kerosene, and distillate fuel oil by sulfur content, are collected from a sample of terminal blenders.
EIA-782C	Monthly Report of Prime Supplier Sales of Petroleum Products Sold for Local Consumption	195	Prime supplier sales of selected petroleum products into the local markets of ultimate consumption are reported by refiners, gas plant operators, importers, petroleum product resellers, and petroleum product retailers that produce, import, or transport product across State boundaries and local marketing areas and sell the product to local distributors, local retailers, or end users.

3. Environmental Protection Agency (EPA)

Transportation fuels and fuel additives must be registered with the EPA under the Clean Air Act, 40 CFR Part 79. Reports must be submitted by producers on a quarterly and annual basis. Reports include company information, fuel or fuel additive production volumes, and chemical properties of the fuels.[141]

Under Title 40 CFR Part 80, companies that produce transportation fuel, export fuel, import fuel, or wish to own Renewable Identification Numbers under the RFS must register with the EPA. Title 40 CFR Part 80 covers the EPA's gasoline fuel programs, diesel fuel programs, and the RFS program. Reporting requirements for these programs are quite extensive, but they do not require complete "schedule information" from companies.[142, 143]

[141] US Environmental Protection Agency. "List of all fuel and fuel additive reports." *Fuels Registration, Reporting, and Compliance Help.* https://www.epa.gov/fuels-registration-reporting-and-compliance-help/list-all-fuel-and-fuel-additive-reports

[142] Ibid.

[143] US Environmental Protection Agency. "List of all quarterly and annual reports for Renewable Fuel Standard (RFS)." *Fuels Registration, Reporting, and Compliance Help.* https://www.epa.gov/fuels-registration-reporting-and-compliance-help/list-all-quarterly-and-annual-reports-renewable

4. Small Differences Between EIA SEDS and EIA Prime Supplier Data

For most years, EIA's state-level estimates of finished motor gasoline consumption reported in SEDS[144] match closely with EIA's state-level estimates for volume of finished motor gasoline sold by Prime Suppliers. However, beginning in 2007 and continuing through 2016, the EIA's Prime Supplier numbers have been markedly lower than those reported in SEDS. As described below, several factors help explain the difference, although the biggest factor is likely related to changes in downstream operations and business practices as a result of the federal Renewable Fuel Standard.[145]

A small amount of the difference between SEDS and Prime Supplier data can be explained by differing methodologies in the creation of the datasets. Estimates reported in SEDS are a top-down approximation of finished motor gasoline consumption in each state based in part on reports to FHWA by state tax departments, and EIA's refinery production data. According to EIA, SEDS data are "product supplied," which is a measure of "apparent consumption" that estimates consumption by measuring production at the refinery.[146] The methodology of Prime Supplier reporting is different because it attempts to measure "actual consumption." To estimate "actual consumption," Prime Supplier data is collected further downstream in the supply chain. Estimates of actual consumption include stock changes, while estimates of apparent consumption would not.

Border effects result from residents of one jurisdiction buying finished motor gasoline in another jurisdiction due to a price difference between jurisdictions. This common practice likely explains a small amount of the difference between regional totals of finished motor gasoline consumption estimated by SEDS versus those reported by Prime Suppliers. Border effects are most noticeable when comparing SEDS to Prime Supplier data in the densely-populated DC-Virginia-Maryland and New York-New Jersey-Connecticut border areas.

The greatest factor contributing to the divergence between EIA estimates of finished motor gasoline consumption published in SEDS versus Prime Suppliers for the years 2007 to 2016 is likely related to changes in downstream operations and business practices that have resulted from implementation of the federal Renewable Fuel Standard.[147]

The Prime Supplier form (EIA FORM-782c) only collects data on transactions of finished fuels – not *production* of finished fuels. The act of creating finished fuel does not trigger a reporting requirement in the Prime Supplier program, it is the transfer of title of a batch of finished fuel that does. In the late 20th century, finished motor gasoline was created at a refinery. Contrary to practice prior to 2007, it is now standard industry practice to create finished motor gasoline further downstream by blending ethanol with gasoline blendstock[148] upon dispersal from a terminal rack and prior to delivery to a retail station.[149] In most cases, transactions between entities at the terminal rack are recorded in gallons of finished motor gasoline and are reported on the Prime Supplier form. Conceptually, a fuel distributer could purchase gasoline blendstock from one source, purchase ethanol from another source, and then produce finished motor gasoline through the blending of those components in the tanker truck. Because each of those transactions would not have been for finished motor gasoline—the gasoline blendstock and ethanol were sold separately—they would not be reported on the Prime Supplier form because the Prime Supplier form is only for reporting finished fuels. If a fuel distributor only distributes fuel to its own retail stations then the title to the finished motor gasoline is never transferred. Some large retailers operate in this fashion – purchasing blendstock from one source and ethanol from another while never transporting the finished

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[144] EIA SEDS' figures are primarily based on FHWA data, with some minor changes based upon EIA survey data.
[145] Tammy Heppner and Maureen Klein. Interview. EIA's Office of Energy Statistics. April 4, 2018.
[146] Yvonne Taylor. Email Correspondence. EIA's Office of Energy Statistics. October 20, 2016.
[147] The Renewable Fuel Standard, or RFS, is described in detail in Appendix II, section 8.
[148] RBOB or CBOB, both of which are manufactured with an octane number too low to be consumed in typical internal combustion engines without "knocking."
[149] Because on-site retail storage of ethanol and gasoline blendstock is not permitted, industry practice does not include creation of finished motor gasoline at retail stations using blender pumps. Source: Kristi Moriarty. Email Correspondence. National Renewable Energy Laboratory. April 23, 2018.

fuel across state boundaries and thus not triggering a Prime Supplier reporting requirement for some fuel batches.[150]

Regardless of differences between EIA SEDS and EIA Prime Supplier data, EIA's definition of Prime Supplier remains useful for defining a possible point of regulation under a hypothetical cap and invest program. In the event that such a program were developed, knowing the causes of these differences between public data sources could help regulators develop and implement accounting systems to ensure that any such program is transparent and complete, in terms of coverage.

[150] Tammy Heppner and Maureen Klein. Interview. EIA's Office of Energy Statistics. April 4, 2018.

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