Report to the Environment and Natural Resources Committee
127th Legislature, First Session

Low Sulfur Fuel Oil Availability Study

January 2015

Contact: Marc Cone
Director of Bureau of Air Quality
Maine Department of Environmental Protection
Marc.A.Cone@maine.gov
Phone: (207) 287-1932

MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION
17 State House Station | Augusta, Maine 04333-0017
www.maine.gov/dep

Executive Summary:

The United States Environmental Protection Agency (EPA), under the Clean Air Act, issued its Regional Haze Rule directing the states impacting the visibility in Class I Areas to revise their State Implementation Plans to address contributions to visibility degradation in these areas, and to coordinate with other States and Indian Tribes in reducing regional haze. To advance and coordinate the regional planning effort, EPA created five Regional Planning Organizations (RPOs) across the country. Maine is included in the Mid-Atlantic/Northeast Visibility Union (MANE-VU), one of the five RPOs. In 2007, as part of their regional haze planning efforts, MANE-VU participants resolved to reduce sulfur emissions, which form sulfates and impair visibility in the Northeast and Mid-Atlantic states. These sulfates account for one-half to two-thirds of the total fine particle mass and visibility impairment on the haziest days at Class I Areas. Public Law, Chapter 604 of the 124th Legislature (2009 PL 604) implements these requirements by establishing limits on the sulfur content of residual and distillate fuel oil to reduce emissions of sulfur dioxide from the fuel combustion, which are codified at 38 M.R.S.A. § 603-A. This law required the Department to submit a fuel oil supply study by January of 2015.

Maine law does not currently impose a sulfur content limit on distillate fuels consumed within the State, but does impose a sulfur content limit of 1.5 percent for residual fuel oil in the Portland Air Peninsula and 2.0 percent in the rest of the State. In order to meet its Clean Air Act (CAA) obligations regarding regional haze and Class I Areas, Maine will transition to a limit of 50 PPM (0.005 percent) sulfur content in distillate fuels in 2016 and 15 PPM (0.0015 percent) in 2018; Maine will also reduce its sulfur content limit for residual fuel oil to 5,000 PPM (0.5 percent) statewide in 2018. Because the petroleum industry will have had 6 years to prepare for these transitions, and Maine consumes a relatively small amount of distillate fuel compared to the United States production, there should be sufficient distillate to supply Maine after both the 2016 and 2018 sulfur limit reductions.

The Department incorporated these requirements into Department Chapter 106: *Low Sulfur Fuel Regulation*. This major substantive rulemaking was submitted to the Legislature for final approval in March 2014. During the rulemaking process no concerns were expressed regarding either the price or the availability of lower sulfur fuels.

Later in 2014, the Department undertook an extensive research and fact finding process to determine any supply issues or roadblocks that may impact the transition to lower sulfur fuels, which include diesel; heating oil; Number 1; and Number 2, and residual fuel oils, which include Number 4; Number 5 or Navy Special; and Number 6 or Bunker C fuel oil.

Based on current energy markets and projections, the Department expects there should be sufficient product, both distillate and residual fuel oil, available primarily from the refineries in the United States and Canada to supply the needs of Maine. Further, the Department finds that the logistics involved with transporting, storing and distributing the low sulfur products should be no more difficult than current practices.

History of Sulfur Content in Distillate and Residual Fuel Oil:

The sulfur content of fossil fuels in Maine is currently regulated by the Maine Department of Environmental Protection's (Department's) Chapter 106 Low Sulfur Fuel Rule. Currently, Maine does not limit sulfur content in distillate fuels, excluding federal on road diesel requirements. Chapter 106 of the Department's rules currently requires any residual fuel oil used in Maine to have a sulfur content of 2.0 or less percent, except in the Portland Peninsula Air Quality Control Region, where the maximum allowable sulfur is 1.5 percent (there are instances where sulfur content is further controlled by additional measures). With the distillate and residual fuel sulfur content requirements set to change in 2016 and again in 2018, the purpose of this report is to investigate the availability of the required products.

In 2010, Maine adopted its Regional Haze State Implementation Plan (SIP) to implement the United States Environmental Protection Agency's (EPA's) regional haze rule which for Maine covers the following Class I Areas: Acadia National Park, Moosehorn National Wildlife Refuge, and Roosevelt Campobello International Park. EPA directed states impacting the visibility in Class I Areas to revise their Clean Air Act (CAA) SIPs to address the contributions and to coordinate with other States and Indian Tribes in this work. EPA created Regional Planning Organizations (RPO) to facilitate this coordination. Maine addresses its coordination requirement by participating in the Mid-Atlantic/Northeast Visibility Union (MANE-VU)[i] RPO.

As part of their regional haze planning efforts, in June 2007 MANE-VU participants resolved to reduce sulfur emissions, which react in the atmosphere to form sulfates, and are the predominant cause of visibility impairment in the Northeast and Mid-Atlantic states. Because of the dominant role played by sulfates, the regional haze planning efforts and control efforts are focused on reducing sulfur emissions, which are primarily emitted in the form of sulfur dioxide (SO_2). These sulfates account for one-half to two-thirds of the total fine particle mass and visibility impairment on the haziest days at Class I Areas in Maine and throughout the United States.

In 2010, the 124th Legislature adopted LD 1662 "An Act to Improve Maine's Air Quality and Reduce Regional Haze at Acadia National Park and other Federally Designated Class I Areas" implementing the MANE-VU ask for a low sulfur fuel strategy.[ii] These requirements are codified in 38 M.R.S.A. § 603-A. In 2016, Maine will require distillates to have a sulfur content no greater than 0.005 percent (50 PPM), and in 2018 the limit will be reduced to .0015 percent (15 PPM); this is the same level of sulfur required in on-road diesel. Also, in 2018 the sulfur requirement in residual fuel oil will be reduced from the present levels of 2.0 and 1.5 percent to 0.5 percent (5,000 PPM) statewide.[iii] In addition LD 1662 required the Department to assemble an advisory committee consisting of 9 members representing government, industry, and environmental interest to "assess the barriers and impediments to air emissions sources' reducing their reliance on fuel oils." The committee was to report its findings and initial recommendation in January 2011 and a final report with recommendations by January 2012 (see Appendix D).

In 2013, the Department undertook major substantive rulemaking incorporating the low sulfur fuel requirements of LD 1662 into its Chapter 106: *Low Sulfur Fuel Regulation.* The Department held a public hearing in December of 2013, and concluded the Department's rulemaking process in 2014. There were two commenters, EPA Region 1 and Central Maine Power (CMP). EPA suggested clarification of the rule, while CMP was concerned with converting their

supply of fuel to low sulfur by the effective date without risking disruptions to their operation. The amended regulation was submitted and approved by the Legislature in March through LD 1773. The Department and the Legislature did not receive any comments concerning either the price or the availability of these lower sulfur fuels.

Distillate Fuels in Maine:

Distillate fuels, often referred to as diesel or heating oil, are lighter weight fuel oils that are classified as either Number 1 or Number 2 according to their viscosity. [1] While the sulfur content of these fuels is not regulated by Maine, in 2007 EPA required on-road diesel to meet the Ultra Low Sulfur Diesel (USLD) standard which is a sulfur content of 15 PPM or less (.0015 percent). And in 2010, EPA required that non-road diesel also conform to the ULSD standard. Given the prior change over from high sulfur diesel to ULSD specification, the industry has significant experience at adapting to provide low sulfur products. Figure 1 demonstrates that the replacement of higher sulfur distillate fuels with lower sulfur distillate fuels is already happening in the marketplace.

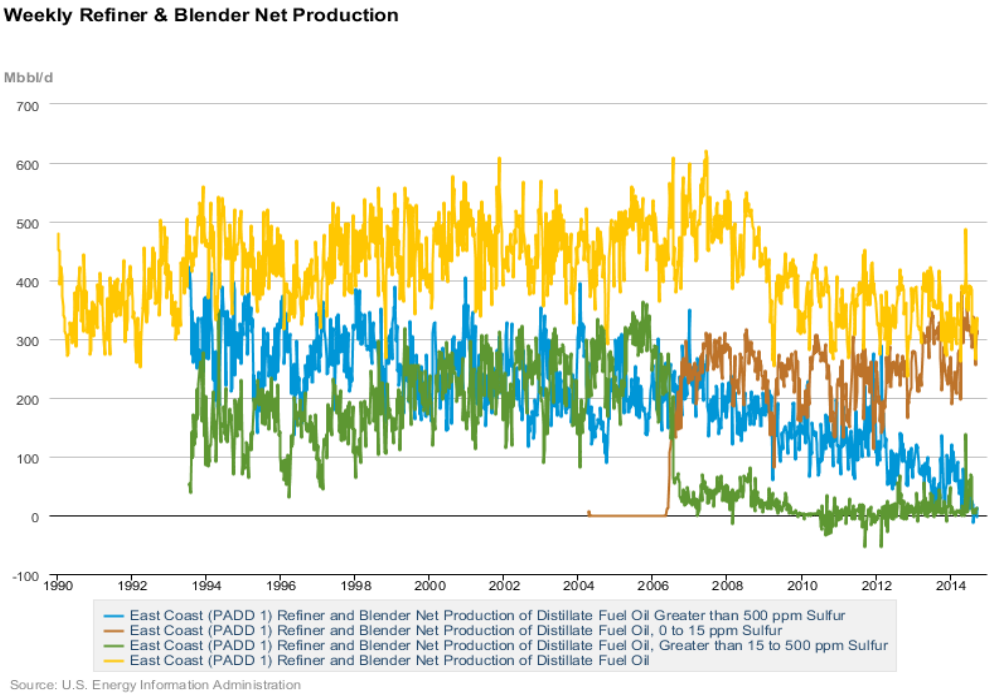


Figure 1: Production of 15 to 500 PPM distillate decreased significantly from 2004 to 2008 and production of 0 to 15 PPM distillate took its place in PADD 1 (Petroleum Administration Defense District) as the on road USLD requirement took effect.

Present Distillate Consumption:

Although approximately 70 percent of Maine households rely on distillates for their heating needs,[iv] distillate consumption in Maine has been declining. Total distillate deliveries and sales in the State of Maine have declined from 2004 to 2012. (The last year data was available.)[v] Residential

[1] Chapter 106 of the Department's rules defines distillate as Number 1 low sulfur, Number 2 low sulfur and Number 2 fuel oils.

heating oil leads this reduction in distillate use, beginning in 2003. In 2004 residential demand for distillate was 413,995 million gallons (Mgals), and in 2012 the residential demand for distillate declined to 174,854 Mgals. This represented a decrease of 42 percent in 2012, mirroring the national residential demand, which fell to 54 percent of its 2012 level. Over the same time period, Maine's total distillate and retail deliveries of distillate excluding on road diesel, which remained relatively constant, declined from 639,404 Mgal in 2004 to 308,081 Mgal in 2012.[vi] This decline is depicted in figure 2.

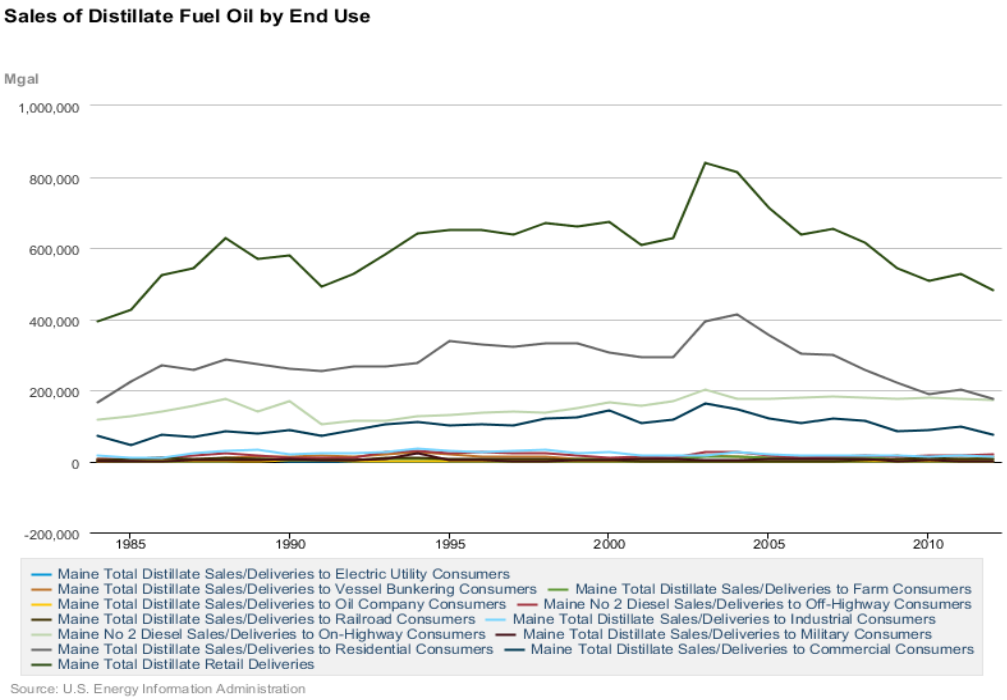


Figure 2: Total sales and deliveries of distillates in Maine has been consistently declining for 10 years, predating the economic downturn of 2008. This decrease in distillate utilization has been led by a reduction in residential demand for distillate predominantly in the form of home heating oil.

According to the *Oil Dependence Reduction Assessment* forecast prepared by the 2013 Maine Governor's Energy Office, the consumption of oil products, such as distillate, is forecast to continue declining (see figure 3 below) as alternative energy sources satisfy an increasing amount of Maine's energy demands and efficiency continues to improve.

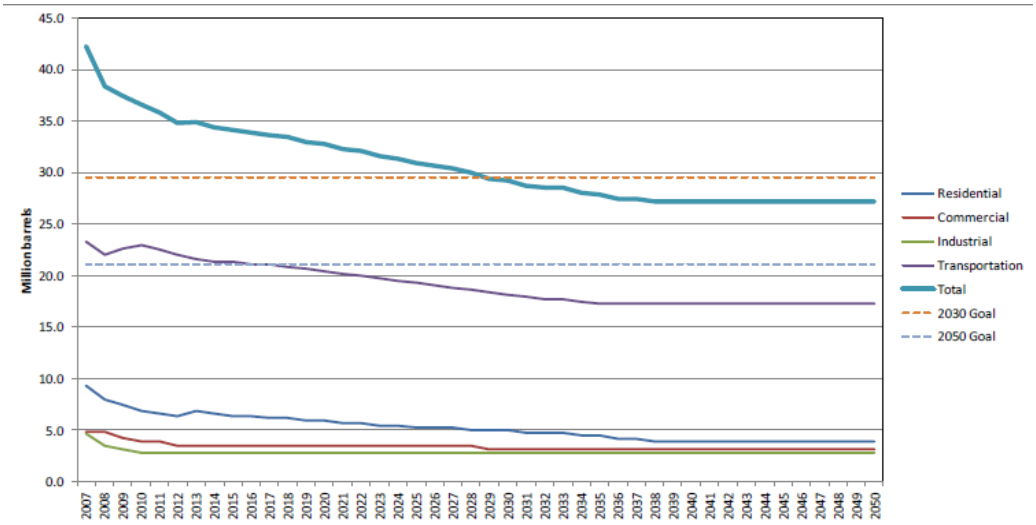


Figure 3: Maine's Baseline Oil Consumption Forecast for 2007-2050 with Governor's Energy Office 2030 and 2050 goals. *Oil Dependence Reduction Assessment,* Pg. 17.

The falling state and national demands means that a smaller volume of distillate will be needed to satisfy Maine's needs while existing refinery capacity remains constant. This trend will make it easier for industry to meet Maine's demand for lower sulfur distillate.

Distillate Fuel Availability:

The transition from higher sulfur heating oil to ULSD specification heating oil has already begun in the MANE-VU region as Vermont, New York, Connecticut, Massachusetts, and Rhode Island have transitioned to lower sulfur distillates; the entire region is scheduled to transition to 15 PPM within the next several years. In preparation for this transition, the New York Mercantile Exchange (Nymex), a commodities future trading exchange handling billions of dollars' worth of commodities, "converted the standard heating oil futures contract to 15 ppm in May, 2013".[vii] Higher sulfur products may become difficult to obtain "[b]ecause NYH [New York Harbor] is the delivery point for Nymex futures contract and because most terminals are expected to store only one comingled product (ULSD), rather than segregating two distillate products (home heating oil and ULSD)."[viii] In addition, The Northeast Home Heating Oil Reserve (NEHHOR), a component of the Strategic Petroleum Reserve meant to compensate for interruptions in supply of home heating oil, "was converted from high sulfur heating oil to ultra-low sulfur distillate (15 parts per million)". By February 2012, the transition was complete and 1 million barrels of ULSD is now stored in New England.[ix] Given these commercial and infrastructure transitions, the industry should be well prepared for Maine's transition to ULSD.

With respect to supply, 61 percent of the Northeast's ULSD is currently provided by refineries in the region, a further 28 percent is supplied by other regions of the United States, and approximately 10 percent is imported.[x] It is anticipated that as the entire Northeast shifts to ULSD specification for all distillates, it will add 20 percent to the regional demand for ULSD.[xi] As ULSD replaces traditional heating oil, the origin of Maine's heating oil may change to include new sources, such as the U.S. Gulf Coast, which would be able to supply the necessary products.

In 2010, the National Oilheat Research Alliance (NORA), an entity created by federal statute, whose Board contains members of the heating oil industry, issued a report on ULSD heating oil. The report found the US refining industry did not have the capacity to convert all heating oil consumed in the Northeast to ULSD because the industry's output is closely matched to the demand for product.[xii] The NORA report concluded that if given the proper regulatory or market signals, refineries would invest in additional desulfurization capacity.[xiii] The report further found that the industry would need sufficient lead time, approximately 5 years, to meet the increased demand for ULSD for the entire Northeast. But states could begin switching to ULSD heating oil immediately and others could transition as additional capacity became available.[xiv] Additionally in 2009, prior to cloture deadline, members of the oil industry, including the Maine Oil Dealers Association (currently known as Maine Energy Marketers Association), submitted a letter to the Northeast States for Coordinated Air Use Management (NESCAUM) recommending and committing to encourage governments to mandate "[t]hat by July 2011, the petroleum base stock we now call heating oil will be transitioned to ultra low sulfur diesel fuel." With the Legislature's 2010 adoption of low sulfur standards, the industry will have had 9 years since the MANE-VU membership first proposed the use of low sulfur fuels and 6 years since Maine adopted these standards to prepare for the 2016 transition. Also the industry will have had 5 years beyond the date set in its 2009 letter. In the intervening time the industry has had sufficient regulatory signals and time to develop the necessary capacity. As noted earlier, demand continues to decline due to the availability alternative of fuels such as natural gas, cordwood, and wood pellets and energy efficiency projects, which will ease the transitions.

In 2010 Pennsylvania commissioned a study on transitioning to low sulfur heating oil. While the results of the report indicated sufficient ULSD for Pennsylvania to transition at that time, Pennsylvania delayed implementation until 2016. Their report came to conclusions similar to the NORA report, finding that Pennsylvania could transition to ULSD specification heating oil, but if all of the region were to switch to ULSD the industry would need additional time to build capacity.[xv] The report also emphasized that "in all cases, the refining industry has met the regulations" when a new environmental requirement has steered the market.[xvi] The Pennsylvania report further found that sufficient supplies of ULSD exist in other parts of the Country, such as the Gulf Coast.

As depicted in Figure 4 below, Petroleum Administration Defense District (PADD) 3 (the Gulf Coast) exports significantly more ULSD than consumed by the state of Maine, excluding the existing on highway diesel which is already supplied with 15 PPM, in fact the PADD exports more ULSD than all distillate consumed by New England. There is limited data of sub-15 PPM distillate exports since it has only been required in the United States since 2007. However, the short-term trend is toward increasing exports, which are significantly more than the State of Maine consumes. Transporting ULSD from PADD 3 into New England may pose a logistical challenge as the Colonial pipeline, which runs from Houston Texas to New York City, is operating near capacity and "moving the needed product to the Northeast [may] require Jones Act vessels, which may be in short supply."[xvii] However, the Energy Information Administration (EIA) concluded that it will probably be more economical to overcome these logistical challenges than to turn to imports to satisfy the demand.[xviii]

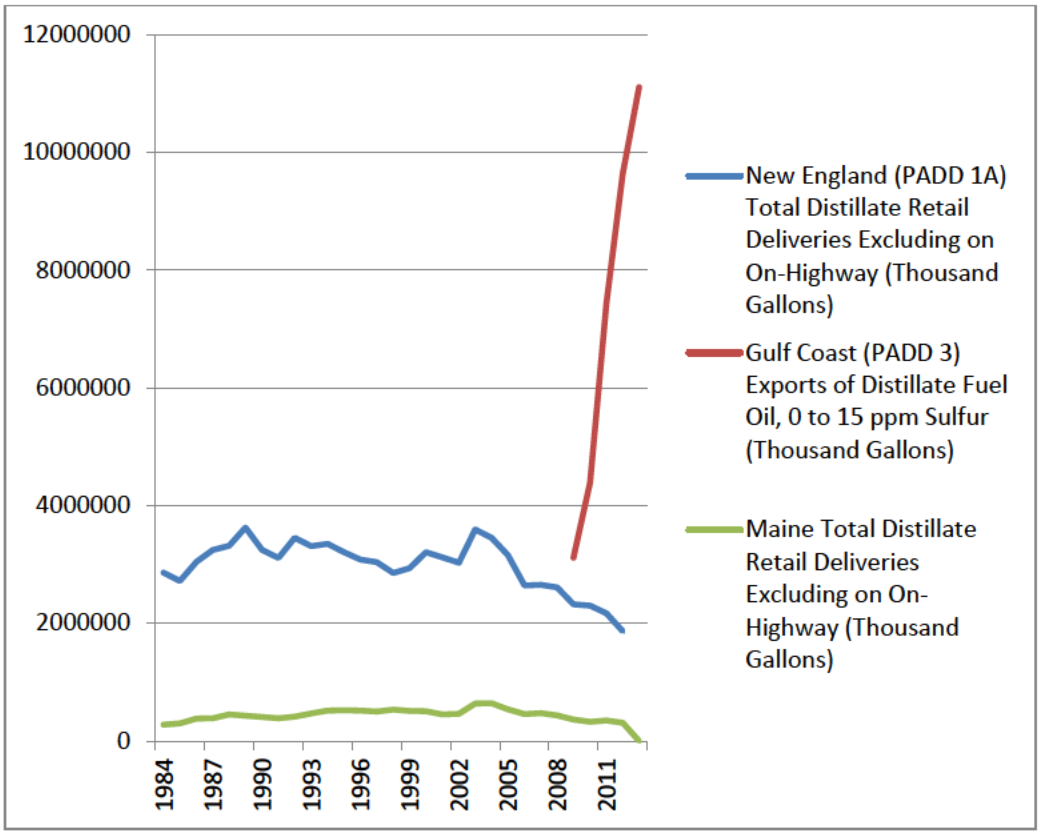


Figure 4: Maine and all of PADD 1A (New England) heating oil consumption could be met by shifting Gulf Coast ULSD exports.
Sources:
http://tonto.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=KD0VTESME1&f=A,
http://tonto.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=K2DVHNSME1&f=A,
http://tonto.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=KD0VTER0X1&f=A,
http://tonto.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=K2DVHNR0X1&f=A, and
http://tonto.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=M_EPDXL0_EEX_R30-Z00_MBBL&f=A.
1 oil barrel is equivalent to 42 US gallons.

Terminals' and Major Consumers' Comments on Distillate:

In addition to the public hearing and comment period held in December and throughout the summer and fall of 2014, the Department contacted members of the regulated community to get input on the change in sulfur limits. According to members of the regulated community, Maine's 2016 requirement of 50 PMM sulfur distillate will be met by supplying this ULSD product. Some members of the industry indicated that they believe there will be challenges in the transition, such as converting distillate storage from the current standards to the 50 PPM standard without distribution interruptions or exceedances and the timing of the transition; a sentiment echoed by an electrical generator using distillate in it operations. But they believe that as the entire region is transitioning to ULSD they will be able to meet the demand for product. Multiple terminal operators have indicated that having on road diesel and heating oil (distillate) conform to the same specification will allow for easier terminal operation.

Summary of Distillate Fuels:

Given Maine's declining demand for distillate and 6 year lead time, the industry should be able to supply sufficient amounts of distillate in 2016 when the 50 PPM requirement goes into force and the industry will meet it with 15 PPM fuel. When the 2018 15 PPM requirement goes into force the product will already be in place. The industry has successfully responded to a market shift created by environmental regulations in 2007 and 2010 when diesel was converted to the same 15 PPM sulfur standard. The trend towards low sulfur diesel has spread around the world and the United States now exports more ULSD from PADD 3 than would be necessary to supply all of Maine's residential distillate needs. While there may be challenges in transporting ULSD into the Northeast, the industry possesses sufficient capacity to supply Maine with sufficient distillate for its needs.

Given the State's declining demand for distillates, led by a decline in residential heating oil and a lead time in excess of 6 years; there should be a sufficient supply of ULSD to supply the needs of Maine. Presently, the United States' Gulf Coast exports exceed the distillate demand of the Northeast. The industry may face challenges moving distillate into the Northeast, however the industry has several options to move product and it is likely that it will be more economical to address the transportation logistics than to import ULSD.

Residual Fuel Oil in Maine:

The EIA defines residual fuel oil as "heavier oils known as No. 5 and No. 6 fuel oils, that remain after the distillate fuel oils and lighter hydrocarbons are distilled away in refinery operations . . . No. 5 [is a] residual fuel oil of medium viscosity, [which] is also known as Navy Special . . . It is used in steam-powered vessels in government service and inshore power plants. No. 6 fuel oil includes Bunker C fuel oil and is used for the production of electric power, space heating, vessel bunkering, and various industrial purposes."[xix] In addition, Maine includes No.4 light and No. 4 fuel oil in its definition of residual fuel oil.[xx]

The Department noted in a January 2012 report to the Legislature (see Appendix D) that "demand for residual oil in Maine has already decreased significantly due to fuel switching at many of Maine's paper mills. There is some de minimis level of demand for residual oil below which it will no longer be economical for terminals to continue storing and supplying the fuel. Sufficient information is not available to identify that threshold for each of Maine's terminals."[xxi] Between January 1, 2011 and August 12, 2014, 55 air emission sources licensed by the Department either entirely converted to, or added natural gas to their operations and another 5 licenses, comprising 14 pieces of equipment, have been surrendered. These conversions and closures either reduce demand for residual oil or avoid future demand. (See figure 5) The Department has learned from discussions with the terminals that at least one terminal does not handle residual oil, and that significant quantities of product are delivered to ships and consumed outside of Maine's waters and are therefore not subject to the requirements of 38 M.R.S.A. §603-A. These conditions significantly reduce the amount of residual fuel oil necessary to satisfy the requirements. Even if the terminals determine that stocking residual fuel oil is not economical, end users will still be able to purchase residual fuel oil, but they will have to carefully manage their contracts to prevent interruptions. As

demand for residual fuel oil has declined, refineries have converted refining capacity to other products, but sufficient production of residual fuel oil remains available.

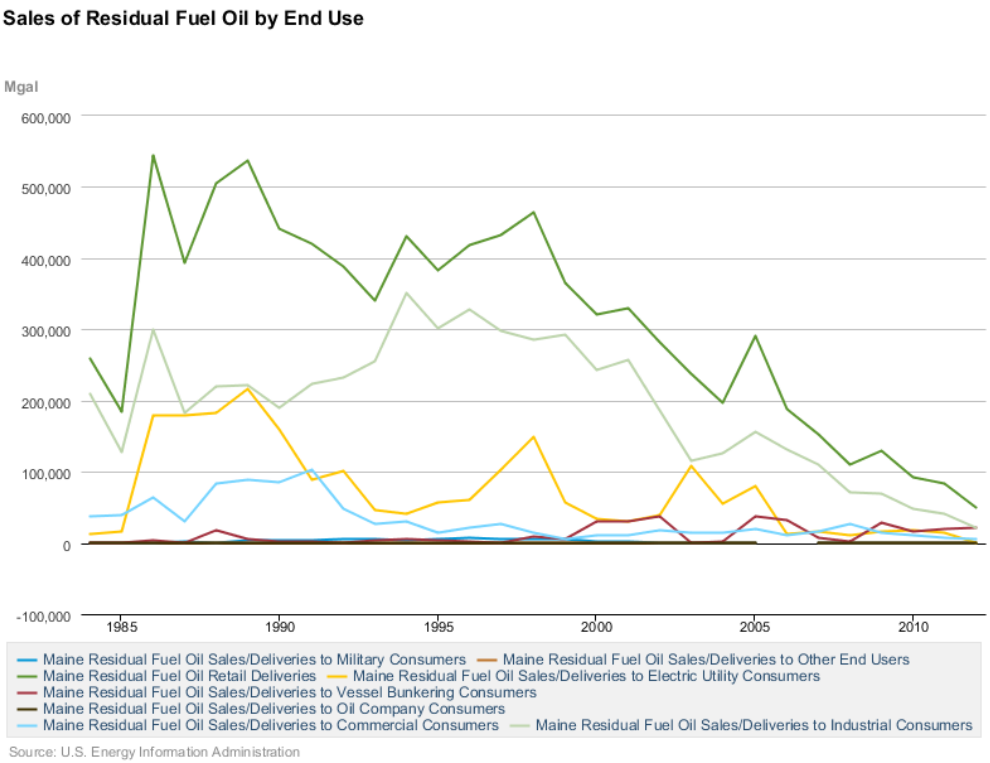


Figure 5: The consumption of residual fuel oil in the State of Maine has declined significantly over the past 29 years, led primarily by a declining demand from industrial consumers. The Department has no reason to believe that this trend will reverse in the future.

Many industrial users of residual fuel oil in Maine are using oil below the present requirements of 1.5 and 2.0 percent in order to comply with Best Available Retrofit Technology (BART), Best Available Control Technology (BACT), or other new source review requirements. In order to meet these requirements many air emission licenses already require the use of 0.5 percent sulfur content residual fuel oil. The declining demand for residual fuel oil coupled with the requirements for lower sulfur fuel has created a situation where the majority of residual oil consumed in Maine is below the current statutory requirements (see figure 6), ensuring that the future reductions in Maine's sulfur content limits will have a limited impact on supply dynamics.

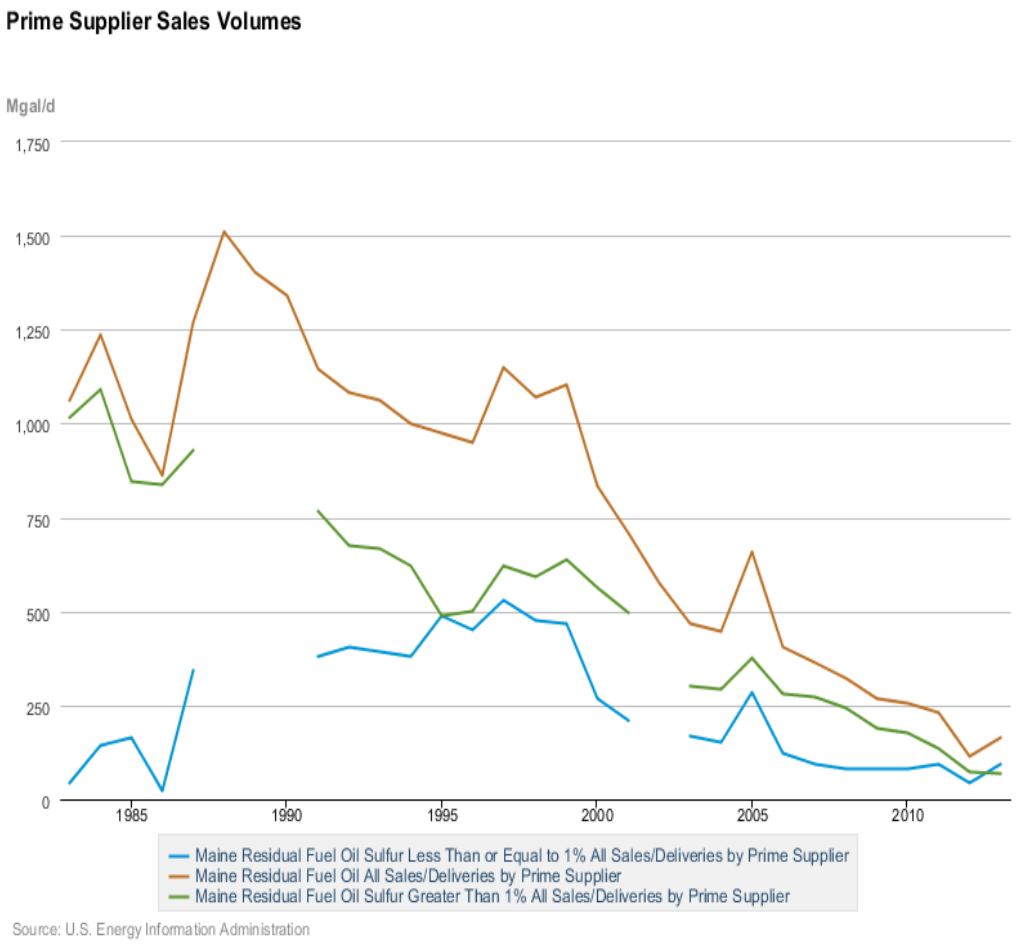


Figure 6: To comply with regulatory requirements some consumers choose to use residual fuel oil with a lower sulfur content than required by state statute. As a result of these decisions delivery of residual oil less than 1.0 percent sulfur into the final local market of Maine (Prime Supply) exceeded that of residual oil with a sulfur content greater than 1.0 percent for the first time in 2013.

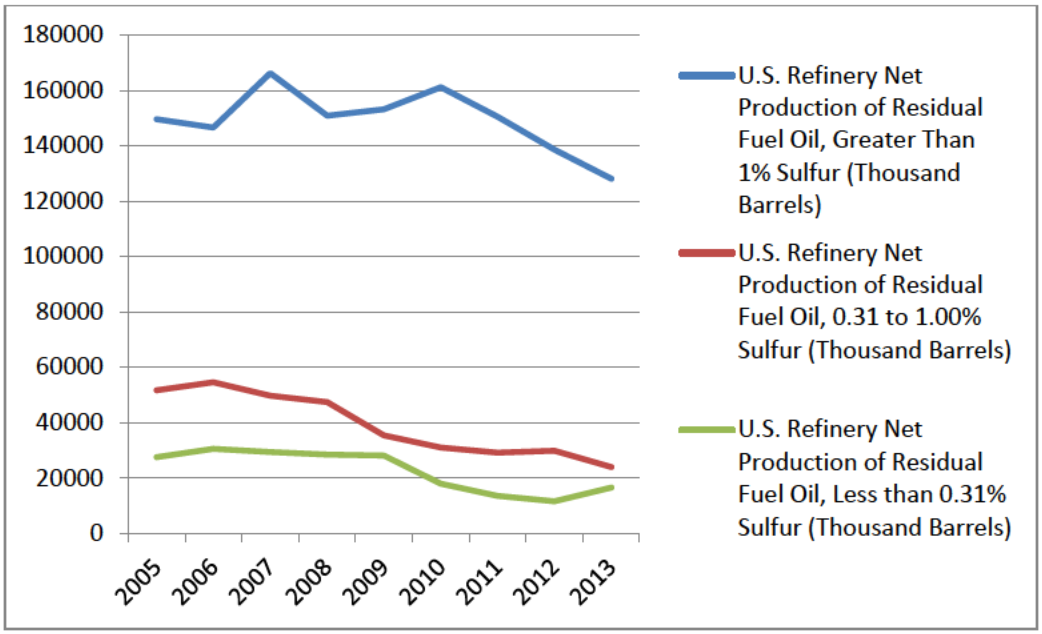


Figure 7: U.S. residual fuel oil production has been falling in line with decreasing demand for product; recent trends have shown stabilization in production of residual oils below 1.0 percent while residual oil with a sulfur content in excess of 1.0 percent continues to decline.
Sources http://www.eia.gov/dnav/pet/pet_pnp_refp2_a_epprh_ypy_mbbl_a.htm, http://www.eia.gov/dnav/pet/pet_pnp_refp2_a_epprx_ypy_mbbl_a.htm, and http://www.eia.gov/dnav/pet/pet_pnp_refp2_a_eppry_ypy_mbbl_a.htm

Together the declining demand for residual fuel oil nationally and in Maine, the residual oil distributed in Maine for consumption outside of the State, and numerous licensed sources already utilizing fuel meeting the new limit means that a relatively small amount of residual oil will be needed to meet the new standard. Industry is expected to provide sufficient low sulfur residual fuel oil to satisfy the needs of Maine.

Terminals' and Consumers' Comments on Residual Fuel Oil:

Prior to the public hearing held on December 23, 2014 and the close of the written comment period on December 31, 2014, the Department contacted members of the regulated community to solicit industry input on the change in sulfur limits. After contacting members of the regulated community it was determined that this regulation will affect the terminals to different extents; some do not distribute residual oil and instead focus on other fuels, while some distribute residual oil in part for use outside of the state of Maine. In the circumstances were residual oils will be used outside of Maine it will not need to comply with Maine sulfur standards, reducing the amount of low sulfur residual fuel oil necessary to comply with the standard. Ultimately, because the entire region and many industries (such as marine shipping) are transitioning to the low sulfur standards, the terminals indicated that they will meet the demand for residual fuel oil.

The Department also contacted significant consumers of residual fuel oil to ascertain how the transition would impact their operations. The majority of consumers contacted believed that either Maine's terminals or their alternative supply arrangements would continue to provide their residual needs without any major impact to their operations. But, other consumers expressed a

concern regarding the availability of low sulfur residual. One consumer has been utilizing natural gas exclusively since April of 2014, but maintains fuel oil as a back-up. This operator does not maintain a supply of residual oil nor does it have contracts in place to supply residual fuel oil, instead they are relying on the spot market to obtain residual oil when needed. As noted elsewhere in this report, the continuing trend of less residual oil consumed in Maine means consumers may have to proactively manage their supply in order to avoid interruptions; a transition to low sulfur residual oil may increase the necessity for consumers to be proactive. Another operator, an electrical generator, expressed concerns regarding the availability of sufficient low sulfur fuel for their needs. They operate under an agreement with the Federal Energy Regulation Commission (FERC) to provide reliable electrical power in the event other fuel sources are disrupted; they worry that any difficulty obtaining fuel could place them in violation of their agreement with FERC. Unlike the terminals the Department spoke with, consumers are divided on the availability of low sulfur residual oil and extent of its impact on their business.

Public Hearing and Comment:

The Department held a public hearing for the content of this report on December 23, 2014 and accepted written comments through December 31, 2015. Below is a summary of comments received by the Department.

MEMA indicated that today's energy market is very different than the market that existed when this Legislation was originally passed, and has continued to change significantly over the last six months; including an increase in petroleum product exports. MEMA also expressed concerns with pricing, stating that the difference in price between ULSD and non-ULSD products is currently 20 to 30 cents per gallon. MEMA indicated that this may also create border issues with New Hampshire if heating oil sulfur content requirements are not the same in both states. Mr. Py emphasized that the energy market is likely to continue to evolve in response to implementation of the new ULS requirements starting in July of 2016, and other factors.

The Department received one written comment, from EPA, suggesting clarification of the adoption of lower sulfur fuels in the MANE-VU area, which was incorporated into the report.

Conclusion:

Presently the ULSD from Gulf Coast refineries should be sufficient to supply the demand for distillate in the Northeast region, not just in Maine. Transportation of distillate from different sources may add complexity to the supply chain; industry will likely find transporting product from locations such as PADD 3 and Canada to the Northeast as the most economical source of ULSD. The declining demand for residual fuel in the State of Maine coupled with a significant portion going to uses outside of Maine's jurisdiction such as marine shipping means the industry may only need meet a small additional demand for low sulfur residual fuel oil. This demand should be able to be supplied by existing capacity, however as demand for residual fuel oil declines, the spot market may become exceedingly tight and end users should carefully manage their supply and contacts to avoid interruption. These findings are based on current energy markets and projections; the evolving nature of energy markets could ultimately influence future supply in unanticipated ways.

[i] The Maine Department of Environmental Protection, *State Implementation Plan for Regional Haze,* pg. 26 (2010) http://www.maine.gov/dep/bep/2010/12-02-10/Regional_Haze.pdf.

[ii] *State Implementation Plan for Regional Haze,* pg. 30.
[iii] 38 M.R.S.A. §603-A(2) (2013).
[iv] Maine Governor's Energy Office, *Oil Dependence Reduction Assessment,* pg.3 (2013) http://www.maine.gov/energy/pdf/oilreductionreportfinal4_13.pdf.
[v] U.S. Energy Information Administration, *Sales of Distillate Fuel Oil by End Use,* (Nov. 10, 2014) http://www.eia.gov/dnav/pet/pet_cons_821dst_dcu_SME_a.htm.
[vi] *Sales of Distillate Fuel Oil by End Use* and U.S. Energy Information Administration, *Adjusted Sales of Distillate Fuel Oil by End Use,* (Nov. 10, 2014) http://www.eia.gov/dnav/pet/pet_cons_821dsta_dcu_SME_a.htm.
[vii] U.S. Energy Information Administration, *This Week in Petroleum: Changes in heating oil sulfur specification in the U.S. Northeast will likely increase ultra-low sulfur demand this winter* (last visited November 10, 2014) http://www.eia.gov/petroleum/weekly/archive/2014/140910/twipprint.html.
[viii] U.S. Energy Information Administration, *Today in Energy: Heating Oil Futures Contracts Now uses Ultra-low Sulfur Diesel Fuel* (last visited November 10, 2014) http://www.eia.gov/todayinenergy/detail.cfm?id=11211.
[ix] U.S. Energy Information Administration, *Petroleum & other Liquids: Northeast Reserves* (last visited November 10, 2014) http://www.eia.gov/petroleum/supply/weekly/nehor.cfm.
[x] U.S. Energy Information Administration, *Today in Energy: Sulfur Content of Heating Oil to be Reduced in Northeastern States* (last visited November 10, 2014) http://www.eia.gov/todayinenergy/detail.cfm?id=5890.
[xi] *Id.*
[xii] National Oilheat Research Alliance, *Ultra-low Sulfur Diesel Fuel/Heating Oil Market Study* pg. 4 & 18 (2010).
[xiii] *Id* at 25.
[xiv] *Id* at 4 and 7.
[xv] Pennsylvania Petroleum Marketers and C-Store Association, *Pennsylvania Heating Oil Market Study,* pgs. 3, 4, and 14 (2010).
[xvi] *Id* at 14.
[xvii] U.S. energy Information Administration, *Potential Impacts of Reduction in Refinery Activity on Northeast Petroleum Markets* pg. 12 (2012) http://www.eia.gov/analysis/petroleum/nerefining/update/pdf/neprodmkts.pdf.
[xviii] *Id.*
[xix] U.S. Energy Information Administration, *Glossary* (last visited November 10, 2014) http://www.eia.gov/tools/glossary/index.cfm?id=residual%20fuel%20oil.
[xx] 06-096 CMR 106(2)(E).
[xxi] Maine Department of Environmental Protection, *Report of the Advisory Committee on Reducing Air Emissions Sources' Reliance on Fuel Oil* pg. 4 (2012).

Appendix A

PL 2009 C 604

An Act To Improve Maine's Air Quality and Reduce Regional Haze at Acadia National Park and Other Federally Designated Class I Areas

Be it enacted by the People of the State of Maine as follows:

Sec. 1. 38 MRSA §603-A, sub-§2, as amended by PL 2007, c. 95, §5, is further amended to read:

2. Prohibitions. Except as provided in subsections ~~4, 5~~ and ~~8~~9, ~~no~~a person may not use any liquid fossil fuel with a sulfur content exceeding the limits in paragraph A or any solid fossil fuel with a sulfur content to heat content ratio exceeding the limits of paragraph B.

A. The sulfur content for liquid fossil fuels is as follows.

(1) In the Central Maine, Downeast, Aroostook County and Northwest Maine Air Quality Control Regions and the Metropolitan Portland Air Quality Control Region outside the Portland Peninsula Air Quality Control Region, ~~no~~a person may not use any ~~liquid fossil~~residual fuel oil with a sulfur content greater than ~~2.5% until November 1, 1991, and~~ 2.0% by weight ~~any time thereafter~~; beginning January 1, 2018, the limit for those regions is 0.5% by weight. ~~In the Metropolitan Portland Air Quality Control Region outside the Portland Peninsula Air Quality Control Region, no person may use any liquid fossil fuel with a sulfur content greater than 2.5% until November 1, 1991, and 2.0% by weight any time thereafter.~~

(2) In the Portland Peninsula Air Quality Control Region, ~~no~~a person may not use any ~~liquid fossil~~residual fuel oil with a sulfur content greater than 1.5% by weight ~~any time after November 1, 1975~~; beginning January 1, 2018, the limit for that region is 0.5% by weight.

(3) Statewide, a person may not use a distillate fuel:

(a) Beginning January 1, 2016, with a sulfur content greater than 0.005% by weight; and

(b) Beginning January 1, 2018, with a sulfur content greater than 0.0015% by weight.

The sulfur content requirements in this subparagraph do not apply to the use of distillate fuel for manufacturing purposes.

B. The sulfur content for solid fossil fuels is as follows:

(1) One and two-tenths pounds sulfur per million British Thermal Units until November 1, 1991, and .96 pounds sulfur per million British Thermal Units thereafter, calculated as a calendar quarter average for sources in the Central Maine, Downeast, Aroostook County, Northwest Maine Air Quality Control Regions and that portion of the Metropolitan Portland Air Quality Region outside the Portland Peninsula Air Quality Region. A calendar quarter is composed of the months as follows: (1) January, February, March; (2) April, May, June; (3) July, August, September; and (4) October, November, December; and

(2) Seventy-two hundredths pounds sulfur per million British Thermal Units calculated as a calendar quarter average for sources in the Portland Peninsula Air Quality Region. A calendar quarter is composed of the months as follows: (1) January, February, March; (2) April, May, June; (3) July, August, September; and (4) October, November, December.

Sec. 2. 38 MRSA §603-A, sub-§9 is enacted to read:

9. Equivalent alternative sulfur reduction application. The department shall adopt major substantive rules as defined in Title 5, chapter 375, subchapter 2A that provide an opportunity for a licensed air contamination source that holds a license on the effective date of this subsection to apply for an equivalent alternative sulfur reduction strategy to the residual fuel oil and distillate fuel requirements in subsection 2. The rules must provide for the achievement of equivalent sulfur emission reductions through other means, including, but not limited to, reductions in consumption of residual fuel oil and distillate fuel, early sulfur emission reductions from a baseline emissions inventory year of 2002 and conversions to alternative fuels. The department shall submit the major substantive rules to the Legislature by January 31, 2014. Approved alternate sulfur reduction strategies must be in effect by January 1, 2018.

Sec. 3. Advisory committee on reducing reliance on fuel oil. The Department of Environmental Protection shall establish an advisory committee to assess the barriers and impediments to air emissions sources' reducing their reliance on fuel oils, including, but not limited to, the feasibility of increased gas supply, conversion to other fuels that reduce air pollution including greenhouse gases and the reductions in demand for energy derived from fuel oil. The advisory committee shall present its findings with initial recommendations to the Legislature by January 15, 2011 and a final report with recommendations by January 15, 2012. The advisory committee consists of 9 members including the Commissioner of Environmental Protection, who serves as the chair. The commissioner shall appoint the members of the advisory committee, which include 4 members representing the industrial sector, 2 members representing environmental interests and 2 representatives from other state agencies.

Sec. 4. Fuel oil supply study. The Department of Environmental Protection shall conduct a fuel oil supply study in 2014 and submit the results of its findings to the Legislature by January 15, 2015. The department shall hold a public hearing on the subject matter of this section and allow for submittal of oral and written comment.

Effective 90 days following adjournment of the 124th Legislature, Second Regular Session, unless otherwise indicated.

Appendix B

38 MRSA §603-A

Maine Revised Statutes

Title 38: WATERS AND NAVIGATION

Chapter 4: PROTECTION AND IMPROVEMENT OF AIR

§603-A. LOW SULFUR FUEL

1. **Scope.** This section applies to those fuel-burning sources in the State that are not required to achieve the lower emission rates of new source performance standards or as required to satisfy the case-by-case requirements of best available control technology or best available retrofit technology.

[2007, c. 95, §4 (AMD) .]

2. **Prohibitions.** Except as provided in subsections 4 and 9, a person may not use any liquid fossil fuel with a sulfur content exceeding the limits in paragraph A or any solid fossil fuel with a sulfur content to heat content ratio exceeding the limits of paragraph B.

A. The sulfur content for liquid fossil fuels is as follows.

(1) In the Central Maine, Downeast, Aroostook County and Northwest Maine Air Quality Control Regions and the Metropolitan Portland Air Quality Control Region outside the Portland Peninsula Air Quality Control Region, a person may not use any residual fuel oil with a sulfur content greater than 2.0% by weight; beginning January 1, 2018, the limit for those regions is 0.5% by weight.

(2) In the Portland Peninsula Air Quality Control Region, a person may not use any residual fuel oil with a sulfur content greater than 1.5% by weight; beginning January 1, 2018, the limit for that region is 0.5% by weight.

(3) Statewide, a person may not use a distillate fuel:

(a) Beginning July 1, 2016, with a sulfur content greater than 0.005% by weight; and

(b) Beginning January 1, 2018, with a sulfur content greater than 0.0015% by weight.

The sulfur content requirements in this subparagraph do not apply to the use of distillate fuel for manufacturing purposes. [2013, c. 300, §15 (AMD).]

B. The sulfur content for solid fossil fuels is as follows:

(1) One and two-tenths pounds sulfur per million British Thermal Units until November 1, 1991, and .96 pounds sulfur per million British Thermal Units thereafter, calculated as a calendar quarter average for sources in the Central Maine, Downeast, Aroostook County, Northwest Maine Air Quality Control Regions and that portion of the Metropolitan Portland Air Quality Region outside the Portland Peninsula Air Quality Region. A calendar quarter is composed of the months as follows: (1) January, February, March; (2) April, May, June; (3) July, August, September; and (4) October, November, December; and

(2) Seventy-two hundredths pounds sulfur per million British Thermal Units calculated as a calendar quarter average for sources in the Portland Peninsula Air Quality Region. A calendar quarter is composed of the months as follows: (1) January, February, March; (2) April, May, June; (3) July, August, September; and (4) October, November, December. [2007, c. 95, §5 (AMD).]

[2013, c. 300, §15 (AMD) .]

3. **Records.**

[1991, c. 663, §1 (RP) .]

4. **Flue gas desulfurization.** Any source that installs any approved flue gas desulfurization system or other prescribed sulfur removal device must be permitted to use fuel with a sulfur content in excess of the limitations of subsection 2 such that, after control, total sulfur dioxide emissions do not exceed 1.92 pounds of sulfur dioxide per million British Thermal Units in any 24-hour period or emission rates corresponding to the fuel sulfur limitations required for sources on the Portland peninsula.

Except for lime kilns at pulp and paper mills, the department may require any person achieving compliance by means of an approved flue gas desulfurization system or other prescribed sulfur removal device to operate a continuous emission monitoring device for sulfur dioxide.

[1993, c. 464, §2 (AMD) .]

4-A. **Electrical generating facilities.**

[1999, c. 657, §25 (RP) .]

5. **Fuel blending.**

[1991, c. 663, §2 (RP) .]

6. **Test methods and procedures.**

[1991, c. 663, §2 (RP) .]

7. **Emergency variance.**

[1991, c. 663, §2 (RP) .]

8. **Best available retrofit technology or BART requirements.** For those BART eligible units determined by the department to need additional sulfur air pollution controls to improve visibility, the controls must:

A. Be installed and operational no later than January 1, 2013; and [2007, c. 95, §6 (NEW).]

B. Either:

(1) Require the use of sulfur oil having 1% or less of sulfur by weight; or

(2) Be equivalent to a 50% reduction in sulfur emissions from a BART eligible unit based on a BART eligible unit source emission baseline determined by the department under 40 Code of Federal Regulations, Section 51.308 (d)(3)(iii)(2006) and 40 Code of Federal Regulations, Section 51 Appendix Y (2006). [2007, c. 95, §6 (NEW).]

[2007, c. 95, §6 (NEW) .]

9. **Equivalent alternative sulfur reduction application.** The department shall adopt major substantive rules as defined in Title 5, chapter 375, subchapter 2-A that provide an opportunity for a licensed air contamination source that holds a license on the effective date of this subsection to apply for an equivalent alternative sulfur reduction strategy to the residual fuel oil and distillate fuel requirements in subsection 2. The rules must provide for the achievement of equivalent sulfur emission reductions through other means, including, but not limited to, reductions in consumption of residual fuel oil and distillate fuel, early sulfur emission reductions from a baseline emissions inventory year of 2002 and conversions to alternative fuels. The department shall submit the major substantive rules to the Legislature by January 31, 2014. Approved alternate sulfur reduction strategies must be in effect by January 1, 2018.

[2009, c. 604, §2 (NEW) .]

SECTION HISTORY

1983, c. 504, §10 (NEW). 1985, c. 162, §9 (AMD). 1989, c. 501, §§CC1-3 (AMD). 1989, c. 890, §§A40,B173 (AMD). 1991, c. 663, §§1,2 (AMD). 1993, c. 464, §2 (AMD). 1999, c. 657, §§24,25 (AMD). 2007, c. 95, §§4-6 (AMD). 2009, c. 604, §§1, 2 (AMD). 2013, c. 300, §15 (AMD).

Appendix C

Department Chapter 106 LOW SULFUR FUEL

Chapter l06: LOW SULFUR FUEL

SUMMARY: This section establishes the maximum sulfur content of fossil fuels allowed to be burned in various air quality control regions in the state unless the source is equipped with sulfur dioxide controls or subject to more stringent sulfur limitations by other requirements.

l. Scope. This regulation shall apply to those persons who distribute, import or blend fossil fuels in Maine and to fuel burning sources in the State of Maine which are not required to achieve the lower emission rates of New Source Performance Standards or as required to satisfy the case-by-case requirements of Best Available Control Technology or other requirements that may impose more stringent sulfur limitations.

2. Definitions

A. Baseline emissions. "Baseline emissions" for the purpose of this Chapter, means the actual emissions, in tons per year, which were emitted during 2002. The baseline emissions shall be adjusted downward to exclude any non-compliant emissions that occurred while the source was operating above any emission limitation that was legally enforceable during 2002.

B. Distillate fuels. "Distillate fuels" means any fuel meeting the requirements of the following grades of fuel oil as prescribed in ASTM D396: No. 1 Low Sulfur; No. 1; No. 2 Low Sulfur; and No. 2.

C. Early sulfur emission reductions. "Early sulfur emission reductions" means reductions in sulfur emissions occurring at a licensed source between January 1, 2002 and September 12, 2009, inclusive.

D. Manufacturing. "Manufacturing", for the purpose of this Chapter, means the non-combustion related mechanical, physical, chemical, or electronic use or transformation of distillate fuel into new products.

E. Residual fuels. "Residual fuels" means any fuel meeting the requirements of the following grades of fuel oil as prescribed in ASTM D396: No. 4 (light); No. 4; No.5 (Light); No. 5 (Heavy); and No. 6.

3. Prohibitions. Except as provided in Sections 5, 6, 8 and 9, no person shall use any liquid fossil fuel with a sulfur content exceeding the limits in Subsection A or any solid fossil fuel with a sulfur content to heat content ratio exceeding the limits of Subsection B.

A. Liquid Fossil Fuels

(1) **Residual Fuels**

(a) No person shall use any residual fuel containing over 2.0 percent sulfur by weight as fired, except that in the Portland Peninsula Air Quality Control Region, no person shall use any residual fuel with a sulfur content greater than 1.5% by weight.

(b) Beginning January 1, 2018, no person shall use any residual fuel with a sulfur content greater than 0.5% by weight statewide.

(2) **Distillate Fuel**

(a) Beginning July 1, 2016, no person shall use any distillate fuel with a sulfur content greater than 0.005% by weight statewide.

(b) Beginning January 1, 2018, no person shall use any distillate fuel with a sulfur content greater than 0.0015% by weight statewide.

The sulfur content requirements in this subsection do not apply to the use of distillate fuel for manufacturing purposes.

B. Solid Fossil Fuels

(1) After November 1, 1991, no person shall use fuel containing over ninety-six hundredth (0.96) pounds sulfur per million British Thermal Units, calculated as a calendar quarter average for sources in the Central Maine, Downeast, Aroostook County, Northwest Maine Air Quality Control Regions and that portion of the Metropolitan Portland Air Quality Region outside the Portland Peninsula Air Quality Region. A calendar quarter is composed of the months as follows: January, February, March (quarter 1); April, May, June (quarter 2); July, August, September (quarter 3); and October, November, December (quarter 4).

(2) No person shall use fuel containing over seventy-two hundredths (0.72) pounds sulfur per million British Thermal Units calculated as a calendar quarter average for sources in the Portland Peninsula Air Quality Region. A calendar quarter is composed of the months as follows: January, February, March (quarter 1); April, May, June (quarter 2); July, August, September (quarter 3); and October, November, December (quarter 4).

4. Records

A. Any person who imports or receives for wholesale distribution residual oil or bituminous coal in the State of Maine must submit to the Commissioner quarterly reports itemizing the quantity, sulfur content, ash content and heat content for each shipment of such fuel. It is the responsibility of the person importing or receiving such fuel to maintain a record of the certified fuel analyses upon which the quarterly reports are based and provide the user a copy of the certification.

Any person who uses residual oil or bituminous coal shall maintain certification records of the fuel analysis provided by the supplier.

B. Any person achieving compliance by means of blending fuels shall file with the Commissioner quarterly reports indicating the respective fuel volumes, sulfur contents and heat contents.

C. Any person achieving compliance by means of flue gas desulfurization or other sulfur removal processes shall file with the Commissioner quarterly reports indicating delivered fuel sulfur contents, a summary of sulfur dioxide concentrations from a continuous in-stack monitor, and identifying any period of malfunction or other outage of the flue gas desulfurization or other sulfur removal processes.

D. Where this rule requires the filing of quarterly reports with the Commissioner, the deadlines for filing such reports shall be as follows:

(1) The report for the calendar quarter of January, February and March shall be filed by April 30;

(2) The report for the calendar quarter of April, May and June shall be filed by July 30;

(3) The report for the calendar quarter of July, August and September shall be filed by October 30; and

(4) The report for the calendar quarter of October, November and December shall be filed by January 30 of the following year.

E. After November 1, 1991, any person who receives residual fuel oil greater than 2.0 percent sulfur content, or greater than 1.5 percent content in the Portland Peninsula Air Quality Control Region, must:

(1) notify each subsequent user or purchaser of such residual fuel that the fuel is not a compliance fuel, and

(2) notify the Commissioner of the receipt of a non-compliance fuel, its quantity, sulfur content, ash content, heat content, and, if applicable, the name and location of subsequent users or purchasers for each shipment of such fuel. This notification must be submitted within 5 days of receipt of a non-compliance fuel oil.

F. After January 1, 2018, any person who receives residual fuel oil greater than 0.5 percent sulfur content must:

(1) notify each subsequent user or purchaser of such residual fuel that the fuel is not a compliance fuel; and

(2) notify the Commissioner of the receipt of non-compliance fuel, its quantity, sulfur content, ash content, heat content, and, if applicable, the name and location of subsequent users or purchasers for each shipment of such fuel. This notification must be submitted within 5 days of receipt of a non-compliance fuel oil, except for facilities subject to Section 5 of this Chapter.

G. Copies of all records and reports required by this regulation must be kept at the source for a minimum period of three years. These records shall be available during normal business hours and copies provided to the Commissioner or his representative upon request.

5. Flue Gas Desulfurization. Any source that installs any approved flue gas desulfurization system or other prescribed sulfur removal device shall be permitted to use fuel with a sulfur content in excess of the limitations of Section 3 such that after control, total sulfur dioxide emissions do not exceed:

A. 1.92 lbs. of sulfur dioxide per million BTU in any 24 hour period; or emission rates corresponding to the fuel sulfur limitations required for sources in the Portland Peninsula Air Quality Control Region.

6. Fuel Blending. Any source may achieve compliance with the fuel sulfur limitations of Section 3 by means of blending low sulfur fuel with a higher sulfur fuel, proportioned on the basis of relative heat content of each fuel.

NOTE: Fuel blending is considered to be mixing of fuels by mechanical devices.

7. Test Method and Procedures

A. Any source achieving compliance using flue gas desulfurization or other sulfur removal processes shall demonstrate compliance through the installation and operation of an approved continuous in-stack sulfur dioxide monitor.

B. Any source achieving compliance using fuel blending involving one or more noncompliance grade fuels shall demonstrate compliance in accordance with the provisions of 40 CFR Part 75 (revised July 1, 1998).

C. Whenever compliance is demonstrated by the analysis of bulk residual oil, EPA Method 19 as published at 40 CFR Part 60, Appendix A shall be used. Method 19 includes the following procedures:

(1) ASTM D270-65 and D4177 for Sample Collection, and

(2) ASTM D129 and 1552 for Sample Analysis.

Equivalent procedures may be approved by the Commissioner and the U.S. Environmental Protection Agency.

D. Whenever compliance is demonstrated by the analysis of bulk coal, EPA Method l9 as published at 40 CFR Part 60, Appendix A shall be used. Method l9 includes the following procedures:

(l) ASTM D2234 for sample collection,

(2) ASTM D2013 for sample preparation,

(3) ASTM D177 for sulfur analysis,

(4) ASTM D 3173 for moisture analysis, and

(5) ASTM D3176 for gross calorific value determination.

Equivalent procedures may be approved by the Commissioner and the U.S. Environmental Protection Agency.

8. Emergency Variance. If, during periods of energy crisis or equipment outage or natural disasters, an oil supplier is unable to supply conforming fuel, that supplier may apply to the Commissioner of the Department of Environmental Protection for a temporary variance subject to EPA approval. The Commissioner may, without hearing, issue that variance for the supplier and his regular users for a period not to exceed 60 days if the application, in his judgment, meets the criteria of the applicable statutory variance requirements and that such emergency action is necessary to avoid an immediate threat to public health, safety or general welfare. Such temporary variance cannot be renewed.

A. Any oil supplier requesting an emergency variance under this Section shall submit the request in writing to the commissioner.

B. The written request must provide the following:

(1) the name, location and relevant contact information sufficient for the Department to make immediate electronic or telephonic contact with owner or operator of the supplier requesting the variance;

(2) information sufficient to demonstrate:

(a) that an emergency event has occurred;

(b) the duration and nature of the emergency event;

(c) such other circumstances as the Commissioner deems relevant to the request; and

(d) the authenticity and relevance of other information submitted by the applicant in support of its request.

C. The Commissioner may request additional information from the applicant if necessary to review the request for a temporary variance.

D. If in the judgment of the Commissioner the evidence submitted demonstrates that an emergency variance is justified, the Commissioner will issue an order granting the temporary variance. A decision of the Commissioner under this subsection is final agency action.

9. Equivalent Alternative Sulfur Reduction. Notwithstanding Section 5 of this Chapter, any licensed air emission source that held an air emission license on September 12, 2009 may submit an application to amend the facility's existing air emission license to achieve equivalent sulfur emission reductions through other means, including but not limited to reductions in the consumption of residual and distillate fuel, early sulfur emission reductions from the 2002 baseline emissions inventory year, and conversion to alternative fuels.

A. Any source choosing to apply for an equivalent alternative sulfur reduction plan must submit an application for Department and EPA approval no later than one (1) year after the effective date of this Chapter.

B. Approved alternative sulfur reduction strategies must be in effect no later than January 1, 2018.

NOTE: In all cases, ambient air quality standards and increment standards must be met.

STATUTORY AUTHORITY: 38 M.R.S.A. §§ 585 and 585A

EFFECTIVE DATE:
January 3l, l972

AMENDED:
February 8, l978
January 24, 1983
September 23, 1991

EFFECTIVE DATE (ELECTRONIC CONVERSION):
May 8, 1996

AMENDED:
July 4, 1999
February 3, 2014 – filing 2014-013
June 27, 2014 – filing 2014-105 (Final adoption, major substantive)

Appendix D

Report of the Advisory Committee on Reducing Air Emissions Sources' Reliance on Fuel Oil

January 2012

Report of the Advisory Committee on Reducing Air Emissions Sources' Reliance on Fuel Oil

January 2012

Submitted by:
Maine Department of Environmental Protection

Contact:
Melanie Loyzim, Maine DEP

State of Maine

January 1, 2012

Senator Thomas B. Saviello, Chair
Representative James M. Hamper, Chair
Joint Standing Committee on Environment and Natural Resources
2 State House Station
Augusta, ME 04333

RE: Report of the Advisory Committee on Reducing Emissions Sources' Reliance on Fuel Oil

Dear Senator Saviello and Representative Hamper:

Public Law, Chapter 604 of the 124th Legislature directed the Department of Environmental Protection to establish an advisory committee to assess the barriers and impediments to air emissions sources' reducing their reliance on fuel oil and to submit a report to the Legislature.

The Advisory Committee found that consumption of residual fuel oil and associated emissions of sulfur dioxide in Maine has already declined substantially since 2008. Many of Maine's large industrial facilities have invested in new or modified equipment that utilizes natural gas and/or achieves greater energy efficiency. Natural gas is one of the cleanest burning and currently lowest cost fossil fuels available, but it is not yet widely available to most areas of Maine. Numerous commercial facilities have also switched to lower sulfur fuels, converted to renewable sources of energy or taken advantage of more efficient energy technologies.

The Advisory Committee recommends that additional steps be taken to assist facilities in their efforts to reduce consumption of fuel oil, including continuing efforts to evaluate expansion of natural gas pipelines across Maine, and that both regulatory and non-regulatory programs should continue to support energy efficiency projects at Maine's facilities.

Sincerely,

Melanie Loyzim
Director, Bureau of Air Quality
Executive Summary

The Advisory Committee found that substantial reductions in fuel oil consumption and sulfur dioxide emissions have already occurred and will likely continue to occur in coming years due to relatively low natural gas prices spurring facilities to convert to natural gas, implementation of heat recovery projects, and other process and equipment improvements that increase energy efficiency. The Advisory Committee expects that implementation of low sulfur fuel programs in other Northeast states will drive sufficient market supply of ultra low sulfur distillate fuel in Maine and across the region, and that many facilities will be seeking to minimize their use of residual fuel oil by 2018.

The Advisory Committee recommends that additional steps be taken to assist facilities in their efforts to reduce consumption of fuel oil, including continuing efforts to evaluate expansion of natural gas pipelines across Maine, and that both regulatory and non-regulatory programs should continue to support energy efficiency projects at Maine's facilities.

Background

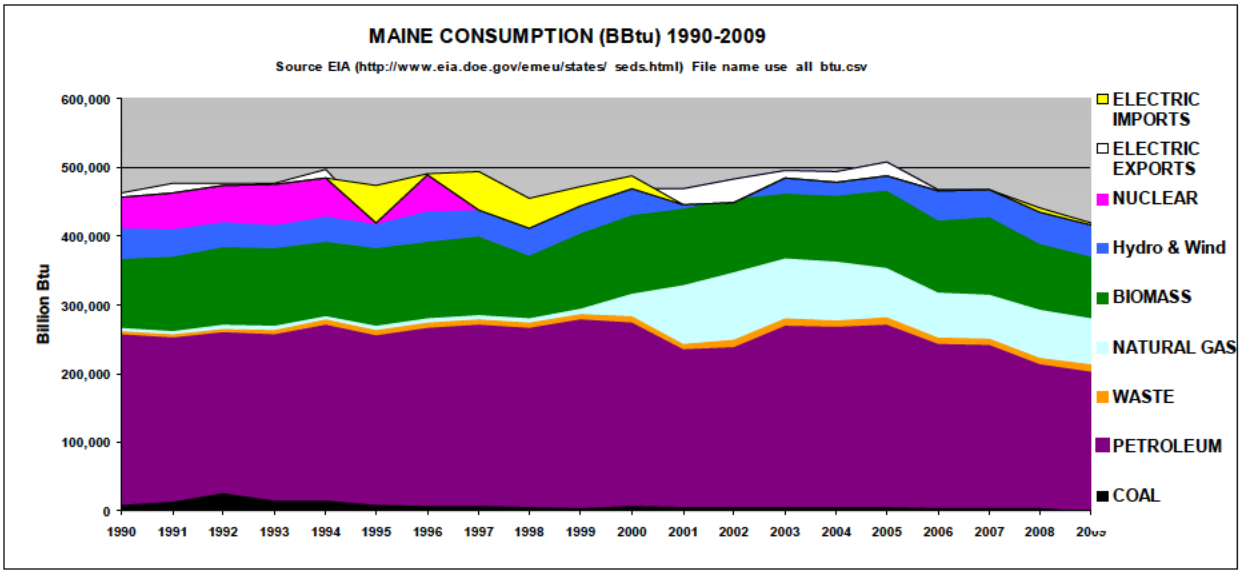
Public Law, Chapter 604 of the 124th Legislature (2009 PL 604) established limits on the sulfur content of residual and distillate fuel oil to reduce emissions of sulfur dioxide (SO_2) from fuel combustion in an effort to help reduce regional haze impacts at federally designated Class I areas in Maine, including Acadia National Park. The sulfur content limit for residual fuel oil will be reduced from the current limit of 2% to a limit of 0.5% by weight beginning January 1, 2018. The sulfur content for distillate fuel oil will be reduced from the current limit of 0.5% to a limit of 0.005% by weight beginning January 1, 2016 and will be further reduced to 0.0015% by weight beginning January 1, 2018. Interested parties voiced concern during the legislative process that sufficient supplies of the required low sulfur fuels may not be available, or may be so costly that these requirements would place a substantial economic burden on facilities designed to utilize fuel oil. In response to this concern, 2009 PL 604 directed the Commissioner of the Maine Department of Environmental Protection to:

> "establish an advisory committee to assess the barriers and impediments to air emissions sources' reducing their reliance on fuel oils, including, but not limited to, the feasibility of increased gas supply, conversion to other fuels that reduce air pollution including greenhouse gases and the reductions in demand for energy derived from fuel oil."

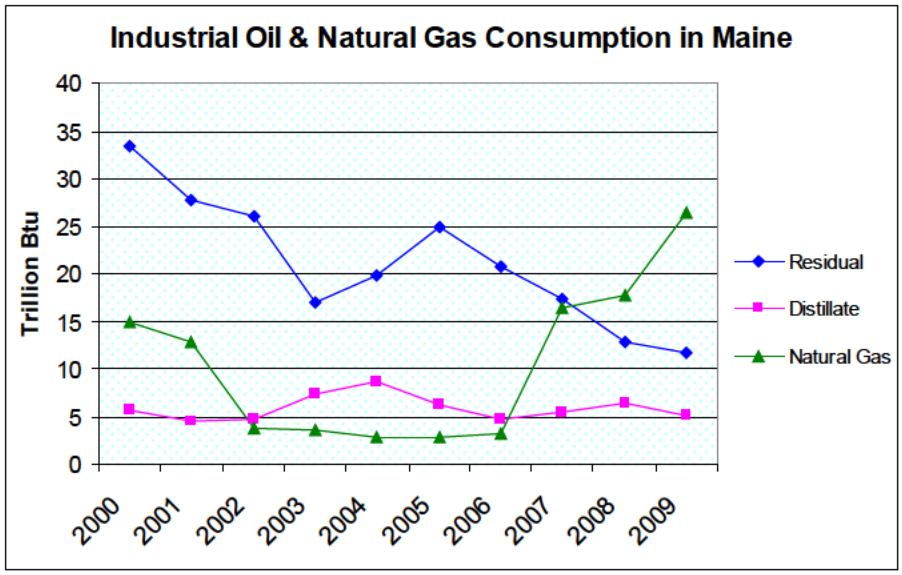
In accordance with 2009 PL 604, the Commissioner appointed members to the advisory committee, including representatives from the American Petroleum Institute, Conservation Law Foundation, Efficiency Maine Trust, Governor's Office of Energy Independence and Security, Lincoln Paper and Tissue, Maine Energy Marketers Association, Maine Pulp and Paper Association, and Natural Resources Council of Maine. The Advisory Committee convened in October through December 2011. The Advisory Committee evaluated quantities of distillate and residual fuel oil consumed by licensed air emission sources subject to annual reporting requirements and their associated emissions, recent energy efficiency, fuel switching and renewable energy projects undertaken by those some of same sources, and plans for additional projects in coming years. The Committee's efforts focused primarily on large industrial, commercial and institutional fuel oil consumers, with particular focus on industrial use of residual fuel oil because it has been the largest contributor to sulfur dioxide emissions in Maine.

Fuel oil use in Maine

The U.S. Department of Energy's Energy Information Administration (EIA) compiles energy consumption information for each state, using reports from electric utilities and surveys of energy consumers in the industrial, commercial, residential, and transportation sectors. Although state-specific data from the EIA is not yet available for 2010, their national estimates indicate energy consumption was slightly higher in 2010 than 2009. The figure below illustrates energy consumption in Maine by energy source from 1990 through 2009.



Data compiled by EIA for Maine's industrial sector over the past decade indicates distillate fuel oil use has remained fairly steady while residual fuel oil use has declined. Natural gas use increased significantly in Maine following the extension of the natural gas pipeline and the construction of natural gas fired combustion turbines in Veazie, Bucksport, Rumford, Jay, and Westbrook in the late 1990's. The combination of this extended pipeline and the recent drop in natural gas prices well below those of fuel oil on a heat value basis has resulted in a continued decline in residual fuel oil use as more facilities replace their use of fuel oil with natural gas.



Source: EIA, State Energy Data System Table CT6

Maine's emissions sources

2009 PL 604 focused on reducing regional haze impacts and the contributing impact of sulfur dioxide (SO_2) emissions. Most emissions of SO_2 are produced by combustion of fuels and other materials across all sectors of the economy – industrial, commercial, residential and transportation. Many industrial facilities in Maine (referred to as "point sources" in this report) have air emission licenses from the Department and submit annual emission reports covering criteria air pollutant emissions, including SO_2 emissions. More than half of all SO_2 emissions statewide come from fewer than 200 point sources.

The quantity of SO_2 emitted from a point source facility depends on several factors, including the types and quantities of fuels burned, the sulfur content of the fuels, and emission controls utilized. The table below illustrates how much SO_2 is emitted, in pounds per million British thermal units of energy generated, by combustion of various fuels in a typical industrial boiler without add-on SO_2 controls.

Fuel Type	Sulfur Content Range/Limit	Timing of Limit	Lb/MMBtu
Distillate Fuel Oil (#2 Fuel Oil/Diesel)	0.5%	Current Limit	0.5
Distillate Fuel Oil (#2 Fuel Oil/Diesel)	0.05%	January 1, 2016	0.05
Distillate Fuel Oil (#2 Fuel Oil/Diesel)	0.0015%	January 1, 2018	0.0015
Residual Fuel Oil (#6 Fuel Oil)	2.0%	Current Limit	2.1
Residual Fuel Oil (#6 Fuel Oil)	0.5%	January 1, 2018	0.52
Waste Oil	0.2% to 2.0%	N/A	0.2 to 2.1
Propane	N/A	N/A	0.001
Natural Gas	N/A	N/A	0.0006
Biomass	N/A	N/A	0.025

An examination of emissions reported from Maine's point sources shows a 50 percent decrease in total SO_2 emissions in recent years, from 13,590 tons in 2008 to 6,633 tons in 2010. Reported emissions also specifically show a substantial decrease in SO_2 emissions from combustion of residual fuel oil, from 8,979 tons in 2008 to 3,551.81 tons in 2010. However, significant individual sources of SO_2 still exist. For example, NextEra Energy Resources LLC's Wyman Station alone contributed 863 tons of SO_2 emissions in 2010 from residual oil combustion.

Trends in reported emissions indicate that Maine's emission sources are already finding ways to reduce their reliance on fuel oil. High energy costs have driven most of Maine's emission sources to evaluate their energy consumption and to seek opportunities to improve efficiencies. Many of Maine's largest facilities have recently implemented major capital improvement projects to increase energy efficiency and switch to lower cost, cleaner burning fuel sources.

Fuel Switching

Oil is currently one of the most costly fuels available. Simple economics are driving facility owners to seek lower cost alternatives such as gaseous fuels, biomass, and waste materials. The table below shows the range of fuel prices in Fall 2011 for the most common fuels available in Maine.

Fuel	$/MMBtu
Propane	30-32
#2/Distillate	21-25
#6/Residual	15-20
LNG	12-14
Natural gas	8-10
Biomass	3-5

Distillate oil sulfur limits of 0.0015 percent go in to effect in the State of New York in January 2012. This is projected to significantly increase the availability of this specification fuel in the Northeast, because New York is the largest consumer of distillate oil in the Northeast region. New York and other Northeast states will also have a 0.5 percent sulfur content limit for residual oil in place by or before 2018, which should also increase availability of that specification fuel for Maine's facilities. However, demand for residual fuel oil in Maine has already decreased significantly due to fuel switching at many of Maine's paper mills. There is some de minimis level of demand for residual oil below which it will no longer be economical for terminals to continue storing and supplying the fuel. Sufficient information is not available to identify that threshold for each of Maine's terminals.

Biomass currently costs approximately $3.20 per million Btu, but its use has other additional costs such as materials handling, particulate emission control equipment, and waste management. Biomass is not an efficient fuel source for stand-alone electricity generation when compared to fuel oils, although the efficiency of biomass combustion is improved when used at a combined heat and power facility. At least one large paper mill recently converted to an efficient heat and power biomass boiler. Although the switch in that instance was not from fuel oil, it reflects the potential for combined heat and power biomass to supplant other more costly, non-domestic and dirtier fuels with woody biomass sustainably harvested in Maine. Maine has many large industrial multi-fuel boilers, where boiler operators have some flexibility to adjust their fuel mix based on fuel prices and availability, emission limits, and other considerations. Maine also has many institutional facilities that have recently converted from residual and distillate fuel oil for space heating to wood chips and pellets. This year, with help from a $1 million grant from Efficiency Maine Trust, the Jackson Laboratory in Bar Harbor installed a large pellet fired boiler that is expected to reduce distillate oil consumption by over 1.2 million gallons per year.

Pipeline natural gas is not currently available in the many areas of Maine, placing facilities in those regions at a competitive disadvantage with facilities that have access to this lower cost and

lower emission fuel. Due to recent extensions in the pipeline, Woodland Pulp and Bath Iron Works replaced over 11.5 million gallons of annual residual oil consumption with natural gas. If all residual oil use in Maine was replaced with natural gas, it would cut statewide SO_2 emissions at least in half and significantly reduce emissions of other pollutants.

The primary obstacle to the expansion of the natural gas pipeline infrastructure within the state is the relatively high initial capital cost of the infrastructure investment and the presence of high oil consuming "anchor" customers who can support long term "take or pay" demand contracts. Private sector pipeline investors generally require a 10-15 year capital recovery period. Trucked liquefied natural gas (LNG) is becoming a "bridge" supply method and may even become the longer term supply option for high oil usage customers in more remote locations. Potential future anchor users such as Lincoln Paper and Tissue, Madison Paper and Backyard Farms have already replaced or retrofitted equipment to increase efficiency and utilize LNG with the hope that a natural gas pipeline will make their fuel switch even more cost effective in the future. Natural gas liquefaction facilities on natural gas pipelines could make LNG more accessible to remote facilities and be used to support fleet growth for natural gas-powered vehicles. If truck transportation in northern Maine could utilize LNG as a transportation fuel, it would reduce transportation emissions and could reduce costs for biomass transportation. Further evaluation of potential natural gas expansions in Maine will be conducted by the Governor's Office of Energy Information and Security and addressed in a separate analysis.

Waste materials also have a growing role in energy supply in Maine. The University of Maine in Orono is licensed to burn landfill gas, when it becomes available, to replace up to 500,000 gallons of residual oil use per year. McCain Foods in Easton plans to use a potato waste reactor to produce methane for fuel, which will displace a large portion of the 3 million gallons of residual oil burned at the Easton facility each year. The project will result in the closure of the potato waste processing plant in Presque Isle, eliminating over 700,000 gallons of fuel oil used at that facility.

Energy Efficiency

Energy efficiency efforts can be a cost-effective way to reduce fuel consumption, thereby reducing fuel costs and emissions. A great deal of information and tools are available to consumers of fuel oil to help them evaluate their energy needs, energy consumption, and options for achieving reductions. Large projects are less common due to capital investment requirements, while smaller projects are more frequently implemented. Many small improvements in energy efficiency combined with increased participation from Maine's industrial facilities in demand response programs could ultimately eliminate the need for high cost and high emission peak load electrical generating facilities.

The Efficiency Maine Trust awarded $8.8 million in grants in 2009 and 2010 for projects that substantially increased the energy efficiencies or generated renewable electricity at 18 industrial facilities across Maine. Funding for these large greenhouse gas reduction projects was made available through the American Reinvestment and Recovery Act and the proceeds from the Regional Greenhouse Gas Initiative. Through these grants Efficiency Maine Trust incentivized

projects that could not otherwise have been possible, including projects at Twin Rivers Paper, Madison Paper, New Page Paper, and GAC Chemical that will all reduce residual fuel oil consumption. The Twin Rivers heat recovery project is projected to reduce their use of residual fuel oil by more than 44,000 gallons per year. The heat recovery system at Lincoln Tissue and Paper is expected to reduce their distillate fuel oil consumption by ten percent. Funding for the coming years is expected to be significantly less, however.

The use of alternative energy sources such as geothermal, electric thermal and solar thermal has the potential to expand further in Maine and to supplant fuel oil usage for heating purposes in more commercial, institutional and small-industrial facilities. The Maine Public Utilities Commission has been exploring various time of use pricing and off-peak rate opportunities that may further the availability and enhance the economics of renewable-supported electric thermal storage. State and federal government incentives and significant reductions in the cost of solar thermal units make them a viable alternative for small to medium thermal heating applications. Maine has seen geothermal systems utilized in several businesses and institutions including Hannaford's supermarkets, University of Southern Maine, Portland International Jetport.

The U.S. Department of Energy funds Industrial Assessment Centers (IAC) at 24 colleges and universities across the country. These centers mobilize trained faculty and engineering students to conduct energy assessments at facilities with gross annual sales below $100 million, annual energy bills greater than $100,000, and fewer than 500 employees at the plant site. Industrial Assessment Centers provide services to eligible facilities within 150 miles of a host campus. The closest center in the Northeast is located at the University of Massachusetts in Amherst. Establishment of an IAC at a Maine university could provide additional opportunities for developing Maine's future workforce and finding additional energy savings for Maine's facilities.

<u>Recommendations</u>

Effective strategies for reducing emissions sources' reliance on fuel oil vary geographically across the 35,000 square miles of the State of Maine. The best overarching strategies to reduce reliance on fuel oil and oil combustion emissions are energy efficiency improvements and fuel switching.

- While converting to natural gas as a primary or alternate fuel source may be a cost effective way to reduce reliance on fuel oil in areas of Maine where the natural gas pipeline infrastructure is already in place, efforts in other areas of the state should focus on energy efficiency projects, utilizing LNG where economically viable, conversion to biomass, renewable thermal energy sources and beneficially reusing waste materials for fuels.

- Regulatory and licensing programs should encourage and support cost-effective energy efficiency projects

- Lessons learned from energy efficiency efforts at larger industrial facilities should be transferred to smaller emissions sources, such as institutional facilities.

- Maine should reach out to the Department of Energy to establish an Industrial Assessment Center at the University of Maine.

- Efficiency Maine should continue to pursue opportunities that support industrial energy efficiency projects