1-1-2012

Reducing Air Emissions Sources Reliance on Fuel Oil

Maine Department of Environmental Protection

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, Director
Bureau of Air Quality
287-6104

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
287-6104

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

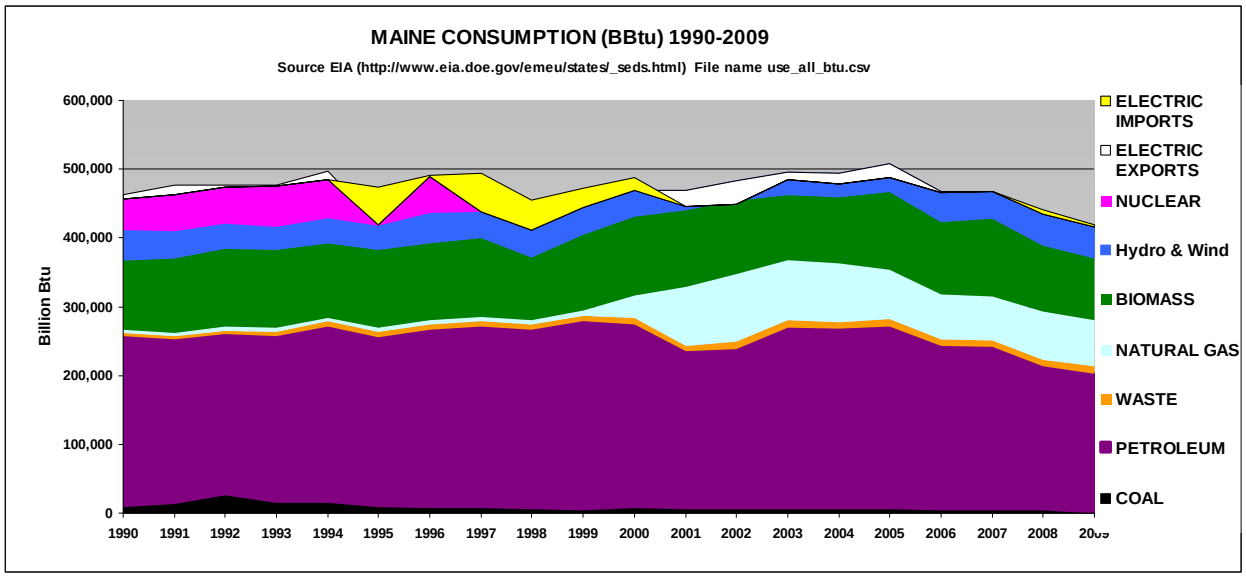
Public Law, Chapter 604 of the 124th Legislature (2009 PL 604) established limits on the sulfur content of residual and distillate fuel oil to reduce emissions of sulfur dioxide (SO_2) from fuel combustion in an effort to help reduce regional haze impacts at federally designated Class I areas in Maine, 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."

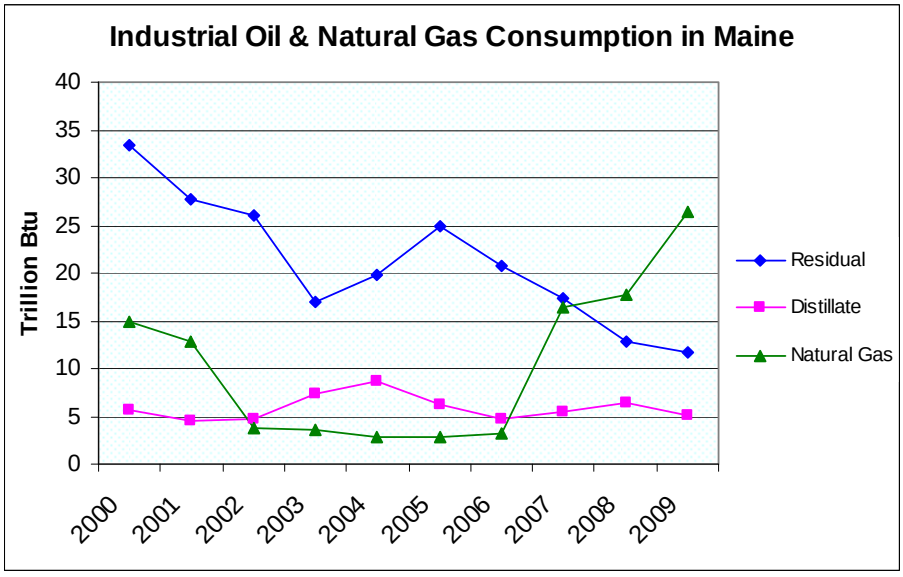
In accordance with 2009 PL 604, the Commissioner appointed members to the advisory committee, including representatives from the American Petroleum Institute, Conservation Law Foundation, Efficiency Maine Trust, Governor's Office of Energy Independence and Security, Lincoln Paper and Tissue, Maine Energy 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.

Recommendations

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