

12-1997

Final Report of the Select Committee to Study the Health Effects of Reformulated Gasoline, 1997

Maine State Legislature

Office of Policy and Legal Analysis

Amy Holland
Maine State Legislature

Follow this and additional works at: https://digitalmaine.com/opla_docs

Recommended Citation

Maine State Legislature; Office of Policy and Legal Analysis; and Holland, Amy, "Final Report of the Select Committee to Study the Health Effects of Reformulated Gasoline, 1997" (1997). *Office of Policy and Legal Analysis*. 14.
https://digitalmaine.com/opla_docs/14

This Text is brought to you for free and open access by the Legislature at Digital Maine. It has been accepted for inclusion in Office of Policy and Legal Analysis by an authorized administrator of Digital Maine. For more information, please contact statedocs@maine.gov.

**STATE OF MAINE
118TH LEGISLATURE
FIRST REGULAR AND FIRST SPECIAL SESSIONS**

**Final Report
of the**

**SELECT COMMITTEE TO STUDY THE HEALTH
EFFECTS OF REFORMULATED GASOLINE**

December 1997

Staff:
Amy B. Holland, Legislative Analyst

**Office of Policy & Legal Analysis
13 State House Station
Augusta, Maine 04333
(207)287-1670**

Members:
Sen. Philip E. Harriman, Chair
Rep. Verdi L. Tripp, Chair
Sen. Richard J. Carey
Rep. Scott W. Cowger (1997)
Rep. Richard Gould (1996)
Rep. Glenys P. Lovett
Rep. Christine R. Savage

TABLE OF CONTENTS

EXECUTIVE SUMMARY..... i
 Findings and Recommendations..... i
I. INTRODUCTION..... 1
II. THE REFORMULATED GASOLINE PROGRAM..... 2
 Clean Air Act Amendments..... 2
 Ozone..... 2
 State Implementation Plans..... 3
 The Federal Reformulated Gasoline Program..... 3
 The Reformulated Gasoline Program in Maine..... 5
III. EFFECTS OF USE OF RFG ON AIR QUALITY..... 9
 AQIRP Report..... 9
 Air Monitoring..... 10
 Public Testimony..... 11
IV. EFFECTS OF USE OF RFG ON HEALTH OF INDIVIDUALS EXPOSED TO RFG..... 13
 State Studies..... 13
 Federal Studies..... 16
 Other Studies..... 19
 Upcoming Studies..... 20
 Public Testimony..... 21
V. EFFECTS OF USE OF RFG ON WATER QUALITY..... 23
 Public Testimony..... 25
VI. EFFECTS OF USE OF RFG ON ENGINES..... 27
 Motor Vehicle Performance..... 27
 Mileage..... 27
 Small Engines..... 28
 Public Testimony..... 28
VII. OTHER ISSUES RAISED BY THE PUBLIC..... 30
VIII. OXYGENATED FUELS IN OTHER STATES..... 31
 Alaska..... 31
 North Carolina..... 31
 California..... 31
NOTES..... 33

EXECUTIVE SUMMARY

The Select Committee to Study the Health Effects of Reformulated Gasoline, composed of 6 legislators, met 5 times between July 1996 and December 1997. At its first meeting on July 25, 1996, the committee heard 9 presentations made by invited speakers representing state agencies, industry and active citizens. The committee then held public hearings in three different locations on September 12 and September 24, 1996, and September 29, 1997, respectively. The committee also solicited written testimony from the public. The final meeting of the committee was held on December 2, 1997.

The committee found that there is an enormous amount of very complex and often contradictory information available regarding reformulated gasoline and one of its constituents, methyl tertiary butyl ether (MTBE). Sorting through numerous reports and listening to extensive public testimony, the committee identified 4 major policy areas on which to focus: air quality effects, health effects, water quality and engine performance.

During the study, the committee received extensive information and testimony from many individuals and public and private entities, including: many members of the public, the Maine Department of Environmental Protection, the Maine Bureau of Health, the Maine Petroleum Association, the Maine Automobile Dealers Association, ARCO Chemical Company, the Oxygenated Fuels Association, the American Methanol Institute, Downstream Alternatives, the American Lung Association of Maine, the Natural Resources Council of Maine, J&S Oil and the U.S. Environmental Protection Agency.

Findings and Recommendations

The Reformulated Gasoline Program

Finding: The committee finds that Maine's 15% VOC (volatile organic compounds) reduction plan, of which RFG is an integral part, complies with the requirements of federal law. The committee is frustrated, however, by the lack of agreement on whether there is compelling scientific evidence that actual VOC reductions can be attributed to RFG.

Finding: The committee finds that there may be gasoline with MTBE, either reformulated or conventional, sold statewide. State law requires that gasoline containing at least 1 percent by volume of any oxygenate must be identified as containing the oxygenate. The committee further finds that the Department of Agriculture's Division of Quality Assurance and Regulations should investigate whether there may be improper labeling of gasoline pumps to identify gasoline as containing an oxygenate, particularly in the attainment areas of the state.

Water Quality

Finding: The committee finds that there is cause for great concern that the use of RFG has and will continue to result in the contamination of groundwater and surface water drinking water supplies in the State. The committee further finds that this concern is heightened by MTBE's solubility in water, its relative mobility in soils and its resistance to degradation, as well as the lack of consensus in the scientific community regarding the carcinogenicity of MTBE.

Recommendation: The committee strongly endorses the adoption by the Department of Human Services of a legally enforceable primary drinking water standard (Maximum Contaminant Level) for MTBE in public water systems.

Minority Recommendation: Two members of the committee (Sen. Harriman and Rep. Cowger) recommend authorizing the Department of Human Services to adopt a secondary drinking water standard for MTBE in public water systems in addition to a primary standard.

Minority Recommendation: One member of the committee (Rep. Cowger) recommends that the Department of Environmental Protection's action level for beginning remediation of private water wells contaminated with MTBE be 1/2 the Bureau of Health's drinking water guideline or 25 ppb, whichever is less.

Engines

Majority Finding: The majority of the committee finds that there is concern about the negative effects of RFG on internal combustion engines, including damage to hoses, fuel pumps, gaskets, carburetors and the potential for car fires. The committee further finds that there is not conclusive evidence to make a specific recommendation for action at this time, but further study is warranted.

Minority Finding: One member of the committee (Rep. Cowger) finds that there is a great deal of anecdotal and experiential concern about the negative effects of RFG on engine performance, but finds that there is not sufficient scientific evidence to make a specific recommendation for action at this time, but further study is warranted.

General Finding: The committee finds that the lack of consensus on issues relating to RFG and the amount of new information emerging as a result of studying RFG justify continued study in the public's best interest.

General Recommendation: The committee recommends that the Select Committee or members of it, in conjunction with the Joint Standing Committee on Natural Resources, continue to monitor and report on issues surrounding the use of RFG, including monitoring progress in implementing the recommendations made in this report.

I. INTRODUCTION

On January 9, 1996, Representatives Verdi Tripp, Glenys Lovett and Belinda Gerry requested by letter that then Senate President Jeffrey Butland and then House Speaker Dan Gwadosky appoint a special bipartisan committee of the Maine Legislature to review information regarding reformulated gasoline (RFG). The legislators requested that the committee be authorized to hold a public hearing in each of the seven counties where RFG is used.

The Presiding Officers established the Select Committee to Study the Health Effects of Reformulated Gasoline, and authorized the committee to hold 4 meetings, including 2 public hearings to be held in affected counties.

The Select Committee to Study the Health Effects of Reformulated Gasoline is composed of 6 legislators. During 1996, the committee held 3 meetings. At its first meeting on July 25, 1996, the committee heard 9 presentations made by invited speakers representing state agencies, industry and active citizens. The committee then held public hearings in Scarborough (Cumberland County) and Wiscasset (Lincoln County) on September 12 and September 24, 1996. The committee did not issue a report prior to its authorization expiring at the end of the 117th Legislature. At the request of Representative Tripp, the Legislative Council of the 118th Legislature voted on August 22, 1997 to re-establish the committee and authorized an additional public hearing and a final wrap-up meeting. Speaker Elizabeth Mitchell appointed Representative Scott Cowger to the study committee, replacing Richard Gould who is no longer a legislator. All other members were reappointed. The committee held a third public hearing in Lewiston (Androscoggin County) on September 29, 1997, and a final meeting on December 2, 1997.

To permit as many people as possible to attend the public hearings, both afternoon and evening sessions were held in each location. 27 people testified in Scarborough, 29 people testified in Wiscasset, and 4 people testified in Lewiston. In addition, written testimony was received from 15 people who did not attend the hearings. The majority of people who testified at the public hearings and sent written testimony voiced strong opposition to the mandatory use of reformulated gasoline for a variety of reasons, including health issues, groundwater contamination and engine performance issues. Most of those people who testified in support of the reformulated gasoline program cited its central role in the State's clean air strategy.

Ozone Standards

The current National Ambient Air Quality Standard (NAAQS) for ozone is 0.12 parts per million (ppm) averaged over a one-hour period, and allows three exceedances over a three-year period. EPA has recently revised the ozone standard and will phase out and replace the 0.12 ppm 1-hour standard with a new 0.08 ppm 8-hour standard. The current state standard for purposes of rules and licensing determinations is the same as the national standard,² but the Maine Department of Environmental Protection (DEP) is required by statute to issue a health warning whenever ozone concentrations exceed or are predicted to exceed 0.081 ppm.³

Air quality regions in Maine that are in nonattainment of the ozone standard are classified according to the severity of their ozone pollution. Maine areas classified as in “moderate” ozone nonattainment are York, Cumberland, Sagadahoc, Kennebec, Androscoggin, Knox and Lincoln counties. Waldo and Hancock counties were classified as marginal ozone nonattainment areas until they were redesignated to attainment by the EPA on April 29, 1997. Based on recent ozone monitoring data, the State of Maine has petitioned the EPA to also redesignate Knox, Lincoln, Kennebec and Androscoggin counties as ozone attainment areas. If the redesignation is approved, they will be Maintenance Areas and the State must ensure that the ozone standard is maintained. Oxford, Somerset and Franklin counties are designated attainment/unclassifiable for ozone.

State Implementation Plans

Under the Clean Air Act, states are required to develop state implementation plans (SIPs) that detail how each state will provide for the implementation, maintenance, and enforcement of air quality standards.⁴ The Clean Air Act provides for sanctions for states that fail to submit a SIP or to implement a program included in a SIP that has been approved by the EPA. Federal highway funds may be withheld, industrial expansion may be severely limited, and the federal government may step in and operate air pollution control programs in the State.⁵

The Federal Reformulated Gasoline Program

The Clean Air Act requires the EPA to establish requirements for reformulated gasoline (RFG) to be used in specified ozone nonattainment areas. Areas with severe levels of ozone are required to participate in the reformulated gasoline program. The Act also allows certain other nonattainment areas to choose to participate (opt in) in the program.⁶ As of July, 1997, all or parts of 18 states and the District of Columbia are in the federal RFG program, either because they are required to participate or because they have opted-in to the program.⁷

RFG is gasoline that has been reformulated by introducing oxygenates and by reducing certain components, with the goal of achieving reductions in emissions of ozone forming volatile organic compounds during the high ozone season and emissions of toxic air pollutants during the entire year.

The formula standards for reformulated gasoline include the following:

- the oxygen content must be at least 2% by weight;
- the benzene content must not exceed 1% by volume;
- must not contain any heavy metals, including lead or manganese; and
- must contain detergent additives to prevent the accumulation of deposits in engines or vehicle fuel supply systems.

The performance standards for RFG are divided into two phases. The standards for Phase I RFG apply from 1995 through 1999, and require:

- no increase in NOx emissions relative to 1990 baseline levels;
- a 15% reduction in VOC emissions from 1990 baseline levels; and
- a 15% reduction in the aggregate emissions of toxic air pollutants (Benzene, 1,3 Butadiene, Polycyclic organic matter, Acetaldehyde, and Formaldehyde) from 1990 baseline levels.

The standards for Phase II RFG apply beginning in the year 2000, and require a 4-7% reduction in NOx emissions from 1990 baseline levels, a 25% reduction in VOC emissions from 1990 baseline levels and a 25% reduction in the aggregate emissions of toxic air pollutants from 1990 baseline levels.ⁱ

The following table shows a comparison of various fuel parameters between a typical conventional gasoline and a typical Phase I RFG.ⁱⁱ

FUEL PARAMETER	CONVENTIONAL GASOLINE	RFG PHASE I
Oxygenate (% by weight)	<0.5	2.1
RVP ¹ (psi)	8.7 / 7.8	8.0 / 7.1
Benzene (% by volume)	1.5	0.95
Sulfur (ppm)	339	305
Aromatics ² (% by volume)	32	27
Olefins ³ (% by volume)	13	12
E200 ⁴ (%)	41	49
E300 (%)	83	87

Source: United States Environmental Protection Agency

It is important to note the difference between the federal reformulated gasoline program and the wintertime oxygenated fuels program. RFG is designed for use in areas in nonattainment

ⁱ 42 USC §211(k) and 40 C.F.R. § 80.41 (1995).

ⁱⁱ United States Environmental Protection Agency. *Reformulated Gasoline: What Is It?* (handouts from a presentation by David J. Kortum).

¹ Reid Vapor Pressure (RVP) is a measure of a gasoline's volatility or evaporative tendencies at a specific temperature.

² Aromatics are ring-structured hydrocarbon compounds. The three most common types are benzene, toluene and xylene.

³ Olefins are certain hydrocarbon components that contain double bonds between carbons.

⁴ E200 and E300 are the percents of fuels evaporated at 200 and 300 degrees F.

for ozone, while oxygenated fuel is designed for use during the winter months in areas in nonattainment for carbon monoxide (CO). RFG, in addition to being formulated to reduce the levels of certain toxic chemicals, must contain at least 2% by weight oxygen, usually achieved through the addition of 11% by volume methyl tertiary butyl ether (MTBE) or 5% by volume ethanol. Oxygenated fuel must contain at least 2.7% oxygen by weight, usually achieved through the addition of about 15% by volume MTBE or 7.5% by volume ethanol to conventional gasoline. MTBE is the mostly widely used oxygenate in the country.

The Reformulated Gasoline Program in Maine

Maine is not required by the Clean Air Act to use reformulated gasoline. On June 26, 1991, Governor John McKernan petitioned the EPA to opt-in the entire State of Maine to the federal reformulated gasoline program. Because only ozone nonattainment areas are permitted to opt-in to the RFG program, the EPA permitted the 9 nonattainment counties in Maine to opt-in, effective January 1, 1995.¹⁰ Prior to the effective date of the program, the State petitioned EPA to exempt Waldo and Hancock counties, both marginal nonattainment areas, from the program. Because there were no formal procedures for opting-out at that time, the EPA stayed implementation of the program in those two counties while it developed opt-out provisions. EPA's final rule outlining opt-out procedures was issued on June 21, 1996.¹¹ That final rule also officially removed Waldo and Hancock counties from the federal RFG program.

The RFG program was implemented in Maine's 7 southern counties (York, Cumberland, Sagadahoc, Kennebec, Androscoggin, Knox and Lincoln) at the retail level on January 1, 1995.

RFG As Part of the 15% Plan

The Clean Air Act requires a 15% reduction in volatile organic compound (VOC) emissions from 1990 baseline levels by November 1996 in areas that are in moderate ozone nonattainment. The State's original plan to reduce VOC emissions by 15%, as proposed by the McKernan administration in January 1995, relied heavily on the motor vehicle inspection and maintenance (I&M) program.

Although federal law originally required enhanced I&M testing in the Portland and Kittery metropolitan areas and a basic testing program in the Lewiston-Auburn metropolitan area, in 1992 the Legislature approved an enhanced I&M program for the entire moderate nonattainment area (7 counties). By extending the enhanced I&M program, the emissions reductions achieved from the areas where the program was not required by federal law could be counted toward the 15% reduction requirement. The McKernan administration expected the program to result in almost one-third of the required 15% VOC reduction. The original 15% plan also included the use of RFG in 7 counties, Stage I vapor recovery and additional VOC controls on industry.

The enhanced I&M program was implemented in the 7 counties on July 1, 1994 and suspended on September 1, 1994.¹² The 117th Legislature repealed the program effective April 28, 1995.¹³

Without the enhanced I&M program, a new combination of programs was needed to achieve the required 15% reduction in VOC emissions. After his election as Governor, Angus King appointed the Clean Air Stakeholders Conference to review options for reducing emissions. As part of that review, the Governor formed the RFG Health Effects Task Force and the RFG Performance Issues Task Force to look at concerns that had arisen with the recent introduction of RFG in Maine.

The Clean Air Stakeholders met in the Spring of 1995 and developed four alternative plans for meeting the 15% VOC emission reduction requirements, but did not agree on recommendations. All four plans relied on a core group of strategies but varied in whether they required I&M testing programs, RFG or other alternative strategies. One plan would have required the core strategies and reformulated gasoline, a second plan would have required the core strategies, reformulated gasoline and a number of additional alternative control strategies, including Stage II vapor recovery. A third plan would have required the core strategies, an I&M testing program and additional alternative controls. A fourth plan would have required the core strategies, an I&M program and RFG.¹⁴

On April 13, 1995, Governor King announced his 15% VOC reduction plan, which was adopted by the Maine Board of Environmental Protection in July 1995. RFG is the cornerstone of the plan, and other key components are Stage II vapor recovery and controls on consumer products. The plan does not include an I&M program. Maine's 15% plan requires that VOC emissions be reduced by 33.92 tons of VOCs per summer weekday. The use of RFG is expected to result in a reduction of 6.93 tons of VOCs per summer weekday, or 20% of the planned reductions.

If the State were to opt out of the federal RFG program, it would have to implement an alternative control measure to meet the requirements of the Clean Air Act, or face federal sanctions. According to DEP Commissioner Sullivan, the only strategy that would likely achieve enough reductions would be an enhanced I&M program. Another alternative is the extension of Stage II vapor recovery to additional stations, but that alone would not provide enough reductions.¹⁵

If the State opted out of the RFG program without amending its SIP to include alternative control measures, it would be subject to federal sanctions that might include offset sanctions, requiring new or modified sources of air pollution to offset increased emissions with emission reductions at a ratio of 2:1, and withholding of federal highway funds.

Legislative Action

117th Legislature: During the First Regular Session of the 117th Legislature, there were two bills introduced that would have repealed the RFG program in Maine. *An Act to Exempt the State from the Mandatory Use of Reformulated Fuel* (LD 376) would have required the Commissioner of Environmental Protection to petition the federal Environmental Protection Agency to remove Maine counties from the federal RFG program. A majority of the Legislature's Natural Resources Committee voted Ought Not to Pass on the bill, while a minority voted to

amend the bill to require the Commissioner to petition the EPA to remove all Maine counties from the program and also to prohibit the sale of RFG in the State unless the sale of non-reformulated gasoline is prohibited by federal law. The minority report was initially accepted by both the House and the Senate, but was later indefinitely postponed. *An Act to Repeal the Automobile Emissions Testing Law, to Repeal the Requirement to Use Reformulated Gasoline and to Withdraw Maine from the Ozone Transport Region* (LD 1260) would also have required the Commissioner to petition the EPA to remove all Maine counties from the federal RFG program. The Natural Resources Committee voted unanimously Ought Not to Pass on that bill.

During the Second Regular Session of the 117th Legislature, *An Act Concerning the Seasonal Sale of Reformulated Gasoline* (LD 1651) was enacted. The original bill would have prohibited the sale of reformulated gasoline in the State except during a 4-month period between May 15 and September 15, unless the sale of non-reformulated gasoline is prohibited by federal law. During that 4-month period, all service stations in the State would have been required to sell RFG. The Natural Resources Committee's unanimous amendment, which was enacted by the Legislature, required the Commissioner of Environmental Protection to consult with legislators, the EPA and interested parties in the development of recommendations regarding the seasonal sale and geographic distribution of RFG in the State.¹⁶ The Commissioner's report, submitted to the Natural Resources Committee on January 31, 1997, concluded that it is "unlikely... that the State could meet the requisite burden of proof" under the Clean Air Act to impose a requirement for RFG on a statewide basis or a seasonal basis. The Commissioner recommended that Maine continue to use RFG in its moderate nonattainment and maintenance areas.¹⁷

118th Legislature: During the First Regular Session of the 118th Legislature, there were three bills introduced that related to RFG. *An Act to Prohibit the Use of Harmful Additives in Gasoline* (LD 1499) would have required the Bureau of Health to issue an order prohibiting the sale of gasoline with additives that had not been proven to be without long-term or short-term effects on public health. The Natural Resources Committee voted unanimously Ought Not to Pass on the bill.

An Act to Reduce MTBE in Maine Drinking Water (LD 658) would have established in statute a maximum allowable contaminant level for MTBE in public water systems of 5 parts per billion. The Natural Resources Committee voted unanimously to amend the bill to require the Commissioner of Human Services to adopt rules establishing a maximum allowable contaminant level for MTBE, the oxygenate most commonly added to RFG. The rules must be provisionally adopted and submitted to the Natural Resources Committee for review prior to final adoption no later than February 1, 1998.¹⁸

An Act to Opt out of the Federal Requirement to Use Reformulated Fuel (LD 660) would prohibit the state or federal government from requiring the use of RFG in any area of the State. The Natural Resources Committee voted to carry over the bill to the Second Regular Session.

Findings and Recommendations

Finding: The committee finds that Maine's 15% VOC (volatile organic compounds) reduction plan, of which RFG is an integral part, complies with the requirements of federal law. The committee is frustrated, however, by the lack of agreement on whether there is compelling scientific evidence that actual VOC reductions can be attributed to RFG.

Finding: The committee finds that there may be gasoline with MTBE, either reformulated or conventional, sold statewide. State law requires that gasoline containing at least 1 percent by volume of any oxygenate must be identified as containing the oxygenate. The committee further finds that the Department of Agriculture's Division of Quality Assurance and Regulations should investigate whether there may be improper labeling of gasoline pumps to identify gasoline as containing an oxygenate, particularly in the attainment areas of the state.

III. EFFECTS OF USE OF RFG ON AIR QUALITY

The State of Maine uses reformulated gasoline as a strategy in its air quality plan to meet three requirements of the Clean Air Act: to attain the NAAQS for ozone, to achieve the 15% reduction in VOC emissions and to achieve emissions reductions comparable to statewide Stage II vapor recovery controls. The Clean Air Act requires that RFG be formulated to reduce VOCs, reduce emissions of toxic air pollutants and, starting in 2000, reduce NOx emissions.

AQIRP Report

The Auto/Oil Air Quality Improvement Research Program (AQIRP), a six-year research effort established by 14 oil companies and three domestic automakers, studied the effect of changes in fuel composition on automotive emissions by conducting emissions tests on several different vehicle fleets. The vehicle fleets included older models (1983-1985 models), then-current models (1989), 1993 California models, Federal Tier 1 models (1994), and advanced models (mid-1990s prototypes). The tests measured the effect of fuel composition on the contribution of light-duty vehicles to ozone formation and on emissions of hydrocarbons, carbon monoxide, oxides of nitrogen and toxic air pollutants.¹⁹

The AQIRP studies found that the predicted contribution of light-duty vehicles to peak ozone was reduced by reformulating gasoline to reduce the distillation points, reduce the olefin content, reduce the sulfur content and reduce RVP (Reid vapor pressure). The program found no significant effect on peak ozone from adding MTBE to gasoline.

The studies found that exhaust hydrocarbons are reduced by reducing the distillation points of gasoline, reducing the sulfur content, reducing RVP, and adding oxygenates. The reduction in hydrocarbons from using oxygenates was found in pre-1989 vehicles; the study found no significant effect on emissions from 1993 and later model vehicles.

The studies found that exhaust NOx emissions are reduced by lowering the sulfur content of gasoline and decreasing gasoline olefins. Decreasing the distillation points was found to increase NOx in newer vehicles but not to significantly affect NOx emissions in older vehicles. The study found that adding oxygenates had, on average, no significant effect on NOx emissions. In low aromatic fuels, however, the addition of oxygenates increased NOx by about 5%.

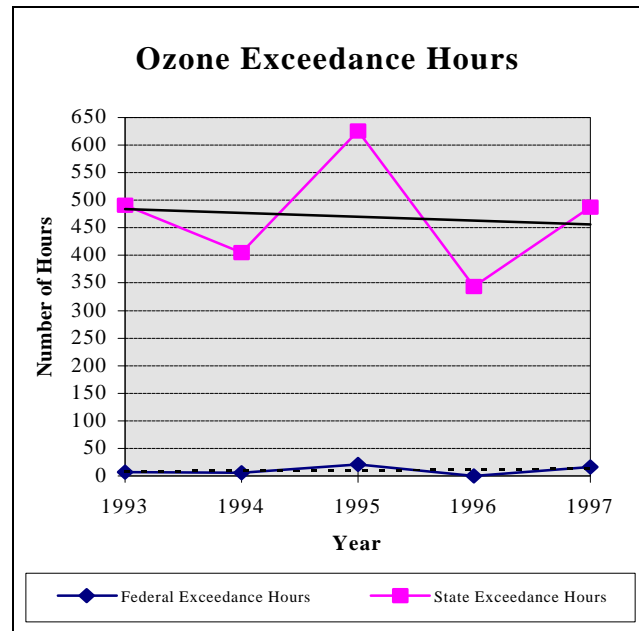
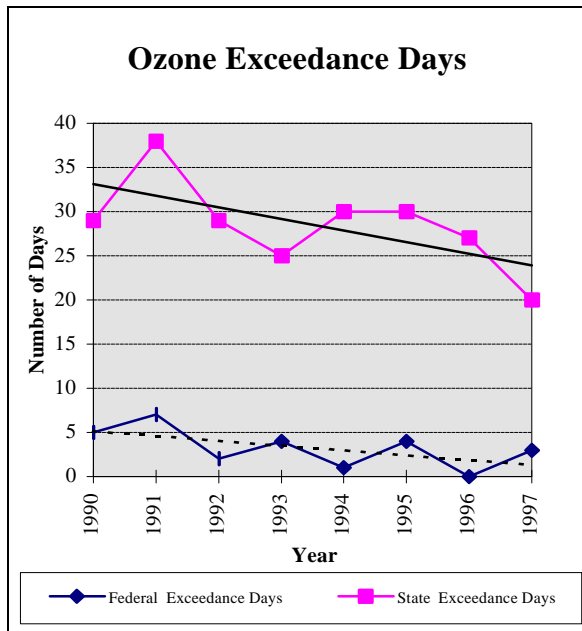
AQIRP found that reducing the distillation points of gasoline reduced exhaust toxics in all but the older vehicles. Reducing the sulfur content in gasoline also reduced exhaust toxics. Reducing fuel benzene reduced exhaust and evaporative benzene emissions. The study found that adding oxygenates reduced benzene emissions but increased aldehyde emissions and did not have a significant reduction effect on total exhaust toxics.²⁰

Air Monitoring

Ozone

The Department of Environmental Protection has monitored ozone statewide for many years. The DEP currently monitors ozone at 15 sites in Maine. Ozone is measured 24 hours a day at these sites from April 1 to September 30 of each year.

The summer before RFG was introduced in the state, Maine had 1 federal ozone standard exceedance day (0.12 ppm). In 1995, the first year of RFG use, Maine had 4 federal ozone standard exceedance days. In 1996, the second year of use, Maine had no federal ozone standard exceedance days. In 1997, Maine had 3 federal ozone exceedance days. Maine is currently out of compliance with the ozone standard in Planning Area #1 (York, Cumberland and Sagadahoc counties) because of the number of exceedances.²¹ According to the DEP, the impact of meteorological and climatological conditions on the formation of ground level ozone “make it difficult to show exactly how much of a part the RFG plays in emissions reductions.”²²



Source: Maine Department of Environmental Protection, Bureau of Air Quality

Volatile Organic Compounds (VOCs)

The Clean Air Act Amendments require that the aggregate emissions of VOCs during the summer season from vehicles using RFG must be 15% less than the baseline (1990 levels). The Department of Environmental Protection has only recently begun monitoring VOCs in the State. In 1994, EPA established a national monitoring network, called Photochemical Assessment Monitoring Stations (PAMS) to gather information on the underlying causes of ozone pollution. A PAMS site has been operating in Cape Elizabeth since 1993 and sites were established in Acadia National Park and Kittery (operated by New Hampshire) in 1996. These sites monitor

which hydrocarbons and in what amount are present during the summer months. PAMS monitoring produces pollutant values for 56 VOCs every hour, including the BTEX compounds (Benzene, Toluene, Ethylbenzene and Xylene) that are associated with gasoline use.

The recent data shows a decline in both the total amount of VOCs measured as well as a decline in the BTEX compounds. Monitoring data from the Cape Elizabeth site shows that benzene decreased 44% from the 1994 seasonal average to the 1996 seasonal average, toluene decreased 57% over the period, ethylbenzene decreased 58%, and m/p xylene decreased 1%.²³

According to the DEP, the decrease in these compounds between 1994 and 1996 “can be attributed, largely in part, to the introduction and use of RFG, both in Maine and upwind areas.”²⁴

Nitrogen Oxides (NO_x)

Nitrogen oxides (nitric oxide and nitrogen dioxide) are also ozone precursors, and RFG requirements specify that the emissions of NO_x from vehicles using RFG must be no greater than baseline levels. NO_x have been measured on and off at one or two sites in Maine since 1980. In 1997, NO_x was measured at 3 sites during the summer months. Monitoring has changed over the years from a focus on determining compliance with the federal nitrogen dioxide standard to a focus on providing data on the inter-relationships between total reactive nitrogen oxides, VOCs and ozone. The data shows a downward trend in NO₂ through the early 1990s, but there is not enough data yet to see a trend in the concentration of nitrogen compounds. According to the DEP, RFG has “most likely not contributed to any trend (or the lack thereof) in total reactive nitrogen oxides.”²⁵

Air Toxics

RFG is required to reduce the aggregate emissions of toxic air pollutants from vehicles by 15% from baseline gasoline. Of the 5 toxic air pollutants included in this requirement (Benzene, 1,3 Butadiene, Polycyclic organic matter, Acetaldehyde and Formaldehyde), only benzene is monitored at the PAMS sites in Maine. The monitoring of ambient air concentrations of benzene is discussed above. EPA does not require or fund monitoring of the other 4 toxics in the state, but national PAMS monitoring data indicates that the median percent change from the summer of 1994 to the summer of 1995 was a decrease of 14% for acetaldehyde and an increase of 4% for formaldehyde.²⁶

Public Testimony

Persons who testified in support of the reformulated gasoline program at the committee’s public hearings cited its central role in the State’s clean air strategy. Several people testified to the serious health problems associated with ground-level ozone and the potential for RFG to reduce ozone levels as well as particle pollution and toxins. Others testified that RFG is preferable to other strategies for meeting the requirements of the Clean Air Act, particularly auto emissions testing, and still others cited RFG as the most cost effective strategy for reducing air pollutants.

A number of citizens testified that RFG is not an effective strategy for reducing VOCs in Maine, and believe it actually does more harm by increasing exhaust emissions of MTBE, formaldehyde and NOx. In a report submitted to the committee, Julian Holmes, a citizen who testified in opposition to the use of RFG in Maine, wrote that 92% of VOCs in Maine are biogenic, and that “modest reductions of volatile organic compound (VOC) emissions from motor vehicles is not an effective approach to controlling ozone in Maine”.²⁷ Holmes wrote that reducing NOx is a more important strategy than reducing VOCs, but that some studies have shown increased NOx emissions with the use of oxygenated gasoline and others have shown that NOx emissions are unaffected by the use of oxygenates in gasoline.

Findings and Recommendations

Finding: The committee finds that there have been measurable reductions over the last few years in VOCs and aggregate toxic air pollutants in Maine, but there has not been a reduction in NOx attributable to RFG. The committee further finds that there is significant confusion about the contribution of RFG relative to trends in emissions of these pollutants given the state of knowledge about transport of ozone and other pollutants.

IV. EFFECTS OF USE OF RFG ON HEALTH OF INDIVIDUALS EXPOSED TO RFG

According to the Maine Department of Human Services, Bureau of Health, soon after the RFG program was initiated in Maine, people began to report symptoms such as headaches, dizziness, lightheadedness and breathing problems.²⁸ These complaints were similar to those reported in certain other areas where RFG and wintertime oxygenated gasoline had been introduced, including Alaska, New Jersey and Wisconsin. In other areas where these fuels are used, however, widespread complaints have not been received.

State Studies

Alaska

An oxygenated fuels program was implemented in Anchorage and Fairbanks, Alaska in November, 1992, using oxygenated fuel containing 15% by volume MTBE. People in Fairbanks began reporting symptoms such as headaches, dizziness and nausea. An epidemiologic investigation was conducted by the Centers for Disease Control and the Alaska Division of Public Health. Three groups were interviewed: taxi-cab drivers (heavy exposure), health-care workers (moderate exposure) and university students (control group). A case of possible oxyfuel related illness was defined as a person who reported experiencing an increase in headaches or an increase in two or more other symptoms (nausea or vomiting, burning sensation in the nose or mouth, cough, dizziness or disorientation) since the date oxyfuel was introduced.

The results showed a greater proportion of persons meeting the case definition among taxi drivers and health-care workers compared to students. Acknowledging many limitations in the study, the researchers summarized their findings as follows: "Symptoms appear to be consistent with those reported elsewhere and are more prevalent among those more heavily exposed compared to a control group. Symptoms are mostly acute, mild, and of short duration. No serious illness is known to have occurred due to exposure."²⁹ A follow-up study was conducted in Anchorage, with very similar results.³⁰

Connecticut

In 1993, the Centers for Disease Control, with assistance from the National Institute for Occupational Safety and Health, conducted an epidemiologic study in Stamford, Connecticut, an area using oxygenated fuel containing MTBE. Stamford was selected as the study site because there had not been widespread complaints about adverse health effects due to the use of oxygenated fuel. Subjects fell into three categories of occupationally exposed workers: workers inside car-repair garages, gasoline service station attendants, and other workers who spent time in traffic. A fourth subject category was commuters.

Health questionnaires with questions about 15 health symptoms were administered to the subjects; personal-breathing-zone samples for MTBE, benzene, toluene, and xylene were collected from subjects; and blood samples were collected from some of the subjects and analyzed for MTBE and TBA. Levels of MTBE in the blood of workers in car-repair shops were generally

much higher than levels of MTBE in the blood of commuters. Blood levels of MTBE in workers who pumped gasoline were one or two orders of magnitude higher than the levels measured among commuters. Levels of MTBE in the blood of other workers who spent time in traffic were comparable with levels in commuters. Differences by job group in median blood levels of TBA, a metabolite of MTBE, were consistent with median levels of MTBE in blood. Personal-breathing-zone concentrations of MTBE were correlated strongly with blood levels of MTBE and TBA. The 11 workers with the highest blood levels of MTBE were significantly more likely to report one or more key symptoms than were subjects with lower blood levels of MTBE.³¹

New Jersey

In 1993, the Environmental and Occupational Health Sciences Institute conducted a study of garage workers in two parts of New Jersey. At the time of the study, northern New Jersey was in the wintertime oxygenated fuels program, while in southern New Jersey the program had been discontinued for the season. The garage workers were asked about symptoms they had experienced over the last 30 days, and were given preshift and postshift questionnaires about symptoms at that time. No increased rates of symptom reporting were found among the garage workers in northern New Jersey with higher exposures to MTBE compared to the garage workers in southern New Jersey with the lower exposures to MTBE. Both groups reported feeling worse by the end of the work day, but there was no difference between the groups in the symptoms experienced across the work shift.³²

Wisconsin

Beginning on January 1, 1995, the Milwaukee and Chicago metropolitan areas have been required to be in the reformulated gasoline program. As a result of numerous reported health problems, the Wisconsin Division of Health (DOH) conducted an investigation of the reported health problems. In February and March, 1995, DOH conducted a random telephone survey in three regional areas: the Milwaukee metropolitan area with required RFG use, the Chicago metropolitan area with required RFG use and the state of Wisconsin exclusive of areas required to use RFG (a control region with minimal or no use of RFG).

In the Milwaukee area, 23% of respondents reported experiencing unusual symptoms since November, 1994, while only 6% of respondents in both the Chicago area and the Wisconsin non-RFG area reported experiencing unusual symptoms. Familiarity with MTBE as an additive in RFG was reported by 54% of Milwaukee respondents, 23% of Chicago respondents and 40% of other Wisconsin respondents. In Milwaukee and the rest of Wisconsin, individuals who reported purchasing RFG since November 1, 1994 were more likely to report specific symptoms than those stating that they had not or did not know if they had purchased RFG. Because all gasoline purchased in Milwaukee was actually RFG, this finding led the researchers to conclude that “this suggests that knowledge about RFG, including the likely awareness of the potential negative effects of reformulated gasoline in Milwaukee and Wisconsin, may have heightened perception of current health status and resulted in the assumption that any health symptoms experienced were unusual and attributable to gasoline exposure.” Although the study did not support the conclusion that RFG exposure is associated with widespread acute health effects in Milwaukee,

the researchers stated that the study did not “rule out subtle effects of RFG exposure, or the possibility that a relatively small number of individuals may have a greater sensitivity to RFG mixtures.”³³

Kenneth Rudo, toxicologist for the state of North Carolina, participated in the scientific peer-review of the study, and dissented from the peer-review group’s statement that the study “does not support a conclusion that exposure to RFG is associated with widespread or serious acute adverse health effects.” Based on several limitations and problems with the study, including the low response rate in Chicago, Rudo concluded that “the utility of Chicago as a comparative population may be extremely limited or nonexistent.” Rudo suggested that comparing Milwaukee and the rest of Wisconsin would be more useful, and concluded that “RFG may have been responsible for widespread health effects in Milwaukee compared to greater Wisconsin and that the conclusions put forward by DHSS are inaccurate.”³⁴

The Division of Health conducted a second phase of its investigation by administering the same telephone survey used in the first phase to all individuals who had called government agencies about adverse health effects of RFG, and who had provided names, addresses or telephone numbers. The researchers found that compared to the Milwaukee random telephone survey group, older age groups, retired individuals and individuals with physician diagnosed allergies had a higher representation among those contacting government agencies to report RFG-related health concerns. Individuals who had called to report health concerns were significantly more aware of RFG-related issues than were individuals in the random telephone group.³⁵

Maine

In March, 1995, approximately 3 months after the introduction of RFG with 11% MTBE in Maine, Governor King formed the RFG Health Effects Task Force to survey existing medical studies and look into claims made by Maine people of health problems caused by exposure to RFG, and to report on the health effects associated with reformulated gasoline. Task Force members reviewed a significant amount of literature on RFG and its health effects, as well as health surveys received and analyzed by the Maine Bureau of Health.

The Task Force found that there is no data available on the chronic effects of MTBE on humans or the human cancer risk from MTBE, but that estimates of cancer risk from animal studies extrapolated to humans suggest the risk to be small. The Task Force found that more study is needed on chronic exposures and cancer risk.

The Task Force concluded that acute health effects experienced by Maine people and attributed to RFG appear to be primarily odor related, although a population subset with a specific sensitivity to RFG with MTBE cannot be ruled out, and that RFG with MTBE appears to represent a reasonable alternative to conventional gasoline with a modest potential for long term positive health impacts.³⁶

The Bureau of Health reviews major reports and key primary scientific literature on health effects from exposure to RFG. The bureau told the committee that the carcinogenic potency of

MTBE appears to be low relative to other carcinogens known to be present in exhaust and evaporative emission from RFG. If MTBE has a relative potency of 1, the relative potency of benzene is 60, the relative potency of 1,3-butadiene is 1900, the relative potency of formaldehyde is 90 and the relative potency of acetaldehyde is 15. The bureau stated that there “is insufficient data at this time to allow for a meaningful assessment of relative carcinogenic risk of conventional gasoline versus RFG.”³⁷

In a briefing memorandum prepared for the Governor in June 1997 and presented to the committee, the Bureau reviewed new findings on the potential health effects from using RFG. In that memo, the Bureau summarized the major findings and conclusions from the primary scientific literature on three health-related issues: the health effects from contamination of drinking water with MTBE, the acute health effects from exposure to RFG evaporative and exhaust emissions, and the chronic health effects from long-term exposure to low levels of RFG evaporative and exhaust emissions.

With regard to the potential acute health effects from short-term inhalation of RFG vapors, the Bureau concluded the following: "Epidemiological studies have failed to establish a causal relationship between inhalation exposure to MTBE-RFG and reported acute health symptoms. However, one cannot rule out that exposure to the MTBE-RFG mixture may cause acute health effects among certain individuals, especially those individuals exposed to higher air concentrations (e.g. occupational exposures)."³⁸

Regarding potential health risks associated with chronic exposures to RFG exhaust and evaporative emissions, the Bureau concluded the following: "The evidence that MTBE is carcinogenic in animals raises concern that it may be carcinogenic to humans. However, MTBE appears to be no more potent at inducing tumors in test animals than traditional gasoline and thus its addition to gasoline would not be expected to increase the overall carcinogenic hazard of the mixture. It is possible that the MTBE-RFG mixture may result in aggregate evaporative and exhaust emissions that are of less carcinogenic hazard than similar emissions from traditional gasoline."³⁹

Federal Studies

EPA, 1993

In 1993, when 39 areas of the country were required to use oxygenated gasoline, the EPA's Office of Research and Development (ORD) undertook an assessment of potential health risks of MTBE-oxygenated gasoline. The assessment looked at epidemiological studies, human clinical studies and animal studies. With regard to acute health effects, the report stated that “There is unlikely to be a substantial risk of acute health symptoms among healthy members of the public receiving ‘typical’ environmental exposures under temperate conditions (i.e., not subarctic temperatures). This leaves the question open about more subtle health risks, especially among susceptible subpopulations.”⁴⁰

With regard to chronic health effects, the 1993 report concluded that based on animal studies, there does not appear to be a significant risk of chronic noncancer effects from exposure to MTBE at annual human exposure estimates. A final carcinogenicity classification for MTBE had not been determined at the time of the report, but the report states that “the current carcinogenicity assessment supports a hazard classification of ‘possible’ human carcinogen, based upon ‘limited’ animal evidence.” The effect of adding MTBE to gasoline, which is classified as a probable human carcinogen, is not known, but the researchers state that “putting MTBE in gasoline is unlikely to affect the current cancer classification of the mixture.”⁴¹

EPA, 1994

In 1994, EPA continued its evaluation of the use of fuel oxygenates and released a report developed by ORD in December, 1994, entitled “Health Risk Perspectives on Fuel Oxygenates.” Little new information had become available since the previous assessment, but the 1994 evaluation considered the different levels of exposure to MTBE in oxyfuels and reformulated gasoline. There is a lower concentration of MTBE in reformulated gasoline (11%) than in oxygenated fuel (15%), but reformulated gasoline is used year-round rather than just in the winter, resulting in higher annual exposures to MTBE. ORD estimated that highly exposed members of the general public living in areas with oxygenated fuel during the winter and reformulated gasoline the rest of the year might receive annual exposures of about 0.03 ppm.⁴²

Based on studies of laboratory animals and annual human exposure estimates, ORD concluded that “it does not appear that there is a significant risk for MTBE alone to cause chronic noncancer effects.” ORD acknowledged again in the 1994 report that the noncancer effects from exposure to MTBE as part of a complex gasoline mixture is not known. Based on inhalation carcinogenicity studies in mice and rats, ORD continued to view MTBE as a possible human carcinogen. ORD noted in the report that “reformulated fuel with MTBE will result in lower net emissions (on a mass basis) of total hydrocarbons, some of which are ‘known or probable’ human carcinogens (i.e., benzene and butadiene), even though emissions of MTBE and aldehydes increase.”⁴³

National Research Council

In 1996, the White House Office of Science and Technology Policy oversaw the drafting of an interagency report assessing MTBE-oxygenated fuels in terms of public health, air quality, water quality, fuel economy and engine performance. The draft report was independently reviewed by the National Research Council (NRC) for scientific credibility, comprehensiveness and internal consistency. Both the interagency report and the NRC’s report examined only the winter oxygenated fuels program, not the reformulated gasoline program.

The interagency report’s assessment of the potential health effects of oxygenated gasoline incorporates two separate reports, the *Interagency Assessment of Potential Health Risks Associated with Oxygenated Gasoline*, prepared by an interagency group of health scientists under the direction of the White House Office of Science and Technology Policy (OSTP), and

The Potential Health Effects of Oxygenates Added to Gasoline: A Review of the Current Literature, prepared by the Health Effects Institute (HEI).

With regard to acute health effects, the OSTP report concludes that the limited epidemiologic studies that have been conducted “suggest that most people do not experience adverse health effects from MTBE in gasoline, but the studies cannot rule out the possibility that some people do experience more acute symptoms from exposure to oxygenated gasoline than to conventional gasoline.”⁴⁴ The HEI report concludes that “the available data suggest that most people do not experience unusual symptoms or significant acute medical consequences when inhaling MTBE in fuel, but some may experience acute symptoms under some circumstances.”⁴⁵

The NRC report concludes that “while the epidemiologic data currently available do not establish a causal relationship between exposure to gasoline containing MTBE and the development of symptoms, the studies do indicate that some people have experienced acute symptoms associated with exposure to gasoline containing MTBE.” The NRC found that the data consistently suggest an association between exposures to gasoline containing MTBE in certain occupational settings and increased rates of acute symptoms.⁴⁶

An issue that the NRC recommended be addressed in the final interagency report is the toxicity of tertiary-butyl formate (TBF). TBF is a major product of the photo-oxidation of MTBE, and the NRC report indicated that routine ambient monitoring of TBF should be initiated. If increased levels are found in the ambient air then the available literature on TBF should be reviewed in the interagency report.⁴⁷

With regard to the carcinogenicity of MTBE, the NRC reviewed the various animal studies and concluded that “[b]ecause of the inconsistencies and unsolved questions with regard to the animal-carcinogenesis studies, cancer-potency estimates of MTBE as proposed in the OSTP report should be considered carefully.” The NRC suggested that the male rat kidney-tumor data should not be used because its probable causation was by a biological mechanism thought to be unique to the male rat and not relevant to humans and that the female rat lymphoma and leukemia data should be questioned until an independent in-depth review of the data is conducted.⁴⁸

Interagency Assessment of Oxygenated Fuels

In June 1997, the National Science and Technology Council (NSTC) released the final *Interagency Assessment of Oxygenated Fuels*, incorporating findings and comments from the NRC review. As mentioned previously, this report reviews the scientific literature on oxygenated fuels and assesses the effects of the wintertime oxygenated fuels program on public health, air quality, water quality, fuel economy and engine performance; but does not specifically assess the reformulated gasoline program.

With regard to acute human health effects from exposure to fuels containing oxygenates, the NSTC concluded that “[a]t the lower concentrations that are experienced by the general population, the limited epidemiological studies and controlled exposure studies conducted to date

do not support the contention that MTBE as used in the winter oxygenated fuels program is causing significant increases over background in acute symptoms or illnesses. The anecdotal reports of acute health symptoms among some individuals cannot yet be explained or dismissed.” The NSTC also stated that “greater attention should be given to the potential for increased symptom reporting among workers exposed to high concentrations of oxygenated gasoline containing MTBE.”⁴⁹

The NSTC concluded that chronic non-cancer health effects “would not likely occur at environmental or occupational exposures to MTBE.”⁵⁰ With regard to cancer risk, the NSTC notes that no studies on the carcinogenicity of MTBE in humans have been done, and that there is a great deal of uncertainty about the relevance of the studies showing carcinogenicity in animals to human risk assessments. The NSTC states, however, that there are multiple animal studies providing sufficient evidence that MTBE is an animal carcinogen. The NSTC concludes that there is sufficient evidence “to regard MTBE as having a human hazard potential”, but notes that “estimates of human risk from MTBE contain large uncertainties in both human exposure and cancer potency.”⁵¹

Other Studies

Myron Mehlman, Adjunct Professor of Environmental and Community Medicine at the UMDNJ-Robert Wood Johnson Medical School, has done extensive research on MTBE. Based on studies of New Jersey consumers operating vehicles using fuels containing MTBE, he found that gasoline containing MTBE causes respiratory and allergic reaction and causes neurotoxic symptoms including headaches, anxiety, inability to concentrate and lightheadedness. Mehlman cites three chronic animal cancer bioassays studies of MTBE (Chun, et al, 1992; Burleigh-Flayer et al, 1992; Belpoggi et al, 1995) that conclude that MTBE and its metabolites are carcinogenic in animals. Based on these findings that MTBE causes cancer in animals, Mehlman concludes that “there is clear and unquestionable evidence that MTBE is a probable human carcinogen...”⁵² Because of this, Mehlman concludes that the standard for MTBE in drinking water should not exceed 5 parts per billion.⁵³

Mehlman also analyzed the National Research Council’s review and found that the NRC’s suggestion that the animal cancer studies should be questioned is “totally unpersuasive.” He also concluded that there “is no sustainable credible evidence that oxygenated gasoline has any real benefit on the improvement of environmental quality.” He cites in particular the potential increase in formaldehyde and NOx concentrations.⁵⁴

Mehlman is also North American Secretariat of the Collegium Ramazzini, an independent organization of physicians and scientists dedicated to occupation health. In 1995, the Collegium Ramazzini concluded “that exposure to MTBE in gasoline should be avoided in order to prevent needless illnesses of both consumers and workers. The Collegium Ramazzini urges that the toxicity of MTBE be fully and vigorously examined.”⁵⁵

Upcoming Studies

University of California

The California Legislature recently passed legislation requiring the University of California “to conduct an independent study and assessment of the human health and environmental risks and benefits, if any, associated with the use of MTBE, as compared to ETBE, TAME, and ethanol.”⁵⁶ The assessment must include, among other components, an assessment of the risks and benefits of MTBE and its combustion byproducts, an assessment of the risks associated with MTBE leaking from underground and aboveground storage tanks, an analysis of the current levels of MTBE in the state’s drinking water, and a comparison of the incidence of asthma before and after the level of MTBE was increased in California gasoline. The university must submit a draft report to the Governor by January 1, 1999.

American Petroleum Institute Test Group

On August 20, 1997, the EPA notified the American Petroleum Institute (API) test group consortium of a test program that the EPA is proposing to require under the Alternative Tier 2 provisions required pursuant to sections 211(b)(2) and 211(e) of the Clean Air Act. According to EPA’s notice letter, the proposed testing regimen “is designed to provide information for identifying and evaluating the potential adverse effects and risks associated with conventional gasoline and various oxygenate-gasoline blends... and to inform future agency decision making pursuant to Section 211 of the Act.”⁵⁷ The tests proposed to be required are inhalation toxicology studies of evaporative emissions and population exposure studies. For the baseline gasoline and gasoline containing MTBE, the proposed toxicity tests include a subchronic inhalation toxicity test, immunotoxicity screening, neurotoxicity assessments, a two-generation reproductive study, a two-species developmental study, and a carcinogenicity study. The proposed testing schedule extends as long as 62 months for the carcinogenicity study. The testing schedule will commence when EPA issues final requirements after receiving comments from API and the general public.

Rutgers University

Ongoing controlled human chamber studies are being conducted at Rutgers University to assess the acute health effects of MTBE on sensitive populations. The studies will assess the response of self-described sensitive individuals to exposure to RFG with MTBE compared to their response to conventional fuel blends and compared to the response of a control group.

Public Testimony

Concern was expressed by many people at the committee's public hearings that RFG was not adequately tested prior to being introduced for widespread use. People testified to experiencing adverse health effects relating to the use of RFG and cited an increased incidence of one or more of the following symptoms: headaches, sinus trouble, burning eyes, nosebleeds, colds, breathing trouble, sore throats, nausea, sleepiness, confusion and dizziness. These symptoms were reported by people who are exposed to RFG in a variety of ways: people exposed during vehicle refueling or driving; service station attendants, mechanics and toll takers exposed at work; and people exposed while using their lawnmowers, snowblowers or chainsaws. Some testified that they had experienced or knew someone who had experienced more serious illness that they attributed to RFG, including asthma, skin cancer, breast cancer and chronic fatigue syndrome.

Some people also expressed concern about the dangers of ingesting RFG through the skin. One person testified that when he gets RFG on his skin while repairing engines his skin turns bright red. Another testified that when RFG gets on the skin it enters the bloodstream and metabolizes and the metabolites may cause effects similar to drunkenness, and may even cause high breathalyzer readings.

People testified that they were very concerned about the potential carcinogenic risk to humans from exposure to MTBE, and the fact that MTBE is listed as a hazardous air pollutant in the Clean Air Act. Formaldehyde and tertiary-butyl-ether (TBA) were specifically identified as metabolites of MTBE that may be responsible for many of the acute and chronic health effects of using RFG. The suggestion was made that gas pumps should be labeled with health warnings.

The Libertarian Party of Maine sent to the committee a copy of a resolution it adopted in opposition to the mandated use of RFG in Maine, saying that "the Libertarian Party of Maine is against any new or existing governmentally decreed regulation that has not been proven by independent scientific research to have unquestionable health and/or safety benefits."

A few people who testified expressed their view that RFG does not pose a major health risk to the population at large. The American Lung Association of Maine expressed qualified support for RFG based on current scientific evidence, while encouraging further study of its health effects.

Findings and Recommendations

Finding: The committee finds that there is concern about the negative health effects on individuals exposed to RFG, particularly individuals exposed to high levels through occupational exposure, and that the lack of conclusive data and conflicting information on the health effects of RFG is a source of significant concern.

Recommendation: The committee encourages research into the development of alternatives to MTBE as the oxygenate of choice to address health complaints of a

sensitive portion of the population and other concerns. The committee recommends consideration of the use of public research funds or tax incentives for the development of alternative fuel blends.

Majority Recommendation: The majority of the committee recommends that the Department of Human Services, Bureau of Health undertake a study of the levels of MTBE, known carcinogens in gasoline and tertiary-butyl alcohol in the blood of humans and in the tissue of roadside animal carcasses. The majority recommends that the study involve human volunteers and animal carcasses in different areas of the State, and compare the levels found in areas of the State where RFG is predominantly used and areas where conventional gasoline is predominantly used. The majority further recommends that the Bureau of Health's study be funded through revenues received from the current cigarette tax.

Note: Four members of the committee (Sen. Carey, Rep. Tripp, Rep. Lovett, and Rep. Savage) voted for an original proposal to recommend that the Bureau of Health undertake a study of MTBE levels in humans and animal carcasses. Rep. Cowger voted against the study proposal but voted in favor of adding known carcinogens and tertiary-butyl alcohol to the chemicals being studied and linking the funding to the current cigarette tax.

Minority Recommendation: Two members of the committee (Sen. Harriman and Rep. Cowger) recommend that the Department of Human Services, Bureau of Health continue to closely monitor health studies, including the controlled human chamber studies being conducted at Rutgers University to assess the acute health effects of RFG with MTBE, and report to the Joint Standing Committee on Natural Resources with the results of those studies and recommendations for a prudent course of action.

V. EFFECTS OF USE OF RFG ON WATER QUALITY

The effect of MTBE on water quality, particularly drinking water supplies, is a concern that has been raised by the introduction of reformulated gasoline that contains MTBE. MTBE is very soluble in water, relatively mobile in soils and groundwater, and resistant to degradation.

MTBE may be released to the environment several ways. It may be released during refueling at service stations, in the exhaust emissions from vehicles, or from point sources such as leaking underground storage tanks or spills. When MTBE is released to the air, it can mix with precipitation and eventually be carried to ground water or surface water. It can also move from leaks or spills directly to ground water or surface water.⁵⁸

The EPA has not established a Federal drinking water standard, which would be legally enforceable, for any fuel oxygenate.⁵⁹ EPA recently issued a drinking water advisory for MTBE, including consumer acceptability advice and a health effects analysis. The advisory recommends that keeping levels of contamination in the range of 20 to 40 micrograms per liter of water (equal to 20-40 ppb) to protect consumer acceptance of the drinking water would also provide a large margin of safety from toxic effects.⁶⁰ The EPA has recently included MTBE on a draft list of contaminants that are known or anticipated to occur in public water systems and that may be selected for regulation under the Safe Drinking Water Act. It may not be until 2001 that EPA decides whether to regulate MTBE under the SDWA.⁶¹

The Maine Bureau of Health has established a Maximum Exposure Guideline for MTBE of 50 ppb, but this guideline is advisory only. Resolves 1997, chapter 58 requires the Bureau to establish a Maximum Contaminant Level (MCL) for MTBE. Once an MCL is established, public drinking water systems will be required to be tested for the presence of MTBE. The Bureau has proposed a primary drinking water standard of 70 micrograms per liter (equal to 70 ppb).⁶² The Technical Support Document supporting the proposed standard has been released for public review and the proposed standard has been posted to public hearing. In its Technical Support Document, the Bureau of Health suggests that the proposed MCL may not be adequately protective of public welfare in terms of objectionable odor and taste, which would likely require a secondary drinking water standard in the range of 15 to 50 micrograms per liter. The Bureau does not believe it has statutory authority to issue a secondary drinking water standard in the absence of a national secondary drinking water regulation promulgated by EPA.⁶³

Recently all public water supplies in Maine have begun to be monitored for MTBE as part of other routine monitoring, but this is not yet a requirement. As of October 1997, 39 of 570 (6.8%) tested public drinking water systems had detectable levels of MTBE. The median concentration of MTBE in those systems testing positive was 3 ppb and the range was 1 to 16 ppb. The highest concentration of MTBE seen in a public drinking water system in Maine as of October 1997 was 16 ppb.⁶⁴

Between 1992 and the end of 1996, the DEP documented 345 private wells in Maine as being contaminated with MTBE. Almost all of those wells were contaminated by leaks from underground or aboveground gasoline storage tanks. 6% of the wells had concentrations of

MTBE exceeding the Bureau of Health advisory guideline of 50 ppb, while 85% of the wells had concentrations of MTBE below DEP's action level of 25 ppb. The number of wells contaminated in concentrations above 50 ppb increased from 4 in the period 1992-1994 (before RFG) to 17 in the period 1995-1996 (RFG in use). However, only 3 of the 17 wells were contaminated by gasoline leaks that occurred after November 1994.⁶⁵

In Maine, the DEP's Bureau of Remediation and Waste Management is responsible for remediating ground water and drinking water supplies contaminated by gasoline. The bureau uses an action level of half the Bureau of Health's advisory drinking water guideline for the contaminant to determine when to begin remediation measures. In the case of MTBE, the action level is currently 25 ppb. According to the DEP, by using this action level the bureau is able to take remediation measures on a newly contaminated water supply before the water quality exceeds the actual drinking water guideline.⁶⁶

Most states do not have requirements to monitor concentrations of MTBE or other oxygenates in water. The National Research Council stated strongly in its review of the White House Office of Science and Technology Policy's draft interagency report that the final report "should clearly recommend that state and federal agencies immediately begin monitoring for MTBE and related oxygenates immediately."⁶⁷ The NRC notes that the absence of monitoring data prevents an accurate assessment of human exposure to MTBE. The NRC concludes that based on the limited monitoring data available, "MTBE has been detected in less than 5% of the groundwater samples analyzed, suggesting that drinking water is not currently a major MTBE exposure pathway for much of the population."⁶⁸

In the *Interagency Assessment of Oxygenated Fuels*, the NSTC concluded that "[c]omprehensive national monitoring to describe the occurrence of MTBE and other fuel oxygenates in all compartments of the hydrologic cycle and drinking water has not been completed to date." The NSTC report makes three broad recommendations regarding water quality:

1. Obtain more complete monitoring data and other information that would: (a) enable an exposure assessment for MTBE in drinking water, (b) characterize the relation between use of MTBE and other alkyl ether oxygenates in gasoline and water quality, and (c) identify and characterize major sources of MTBE to the environment.
2. Complete additional behavior and fate studies to expand current knowledge.
3. Complete aquatic toxicity tests to define the threat posed to aquatic life and establish, if warranted, a Federal water-quality criteria."⁶⁹

As part of the National Water Quality Assessment (NAWQA) Program, the U.S. Geological Survey measured the concentration of MTBE and 59 other VOCs in samples of shallow ground water from 211 urban wells and 524 agricultural wells in 1993 and 1994. The wells were randomly located within specific land-use areas in 8 urban areas and 20 agricultural areas. MTBE was detected in 27 percent of urban wells and in 1.3 percent of agricultural wells, with concentrations ranging from less than the detection level of 0.2 µg/L to 23,000 µg/L (micrograms per liter). In wells where MTBE was detected, the median concentration of MTBE

was 0.6 µg/L. 3 percent of the urban wells had concentrations of MTBE that exceeded the lower limit of the EPA draft drinking water health advisory level. In New England (35 monitoring wells were located in urban areas within Connecticut, Massachusetts and Vermont), 37 percent of the wells had detectable concentrations of MTBE, but all of these wells had concentrations less than the lower limit of the EPA draft health advisory level. None of the shallow urban wells were being used as a source of drinking water, and there are few data showing concentrations of MTBE at the deeper depths from which public water supplies generally draw water.⁷⁰

California has experienced contamination of drinking water sources by MTBE. Effective since February 1997, the California Department of Health Services (DHS) has a regulation requiring public drinking water systems to monitor their water supplies for MTBE. The California DHS has established an interim action level for MTBE in drinking water of 35 parts per billion. The advisory level is not an enforceable standard, but if it is exceeded, the water supplier is advised to notify customers of the presence of MTBE and to find another source of drinking water. As of July 1997, 2,000 drinking water sources had been sampled for MTBE, and 26 had reported detectable concentrations of MTBE. Of these, 3 sources reported concentrations above the EPA draft health advisory level. In Santa Monica, two well fields have been contaminated with MTBE from leaking underground storage tanks, and the city is buying replacement water from another utility.⁷¹ Legislation recently passed by the California legislature and awaiting the Governor's signature requires the DHS to adopt a primary drinking water standard for MTBE on or before July 1, 1999 and to adopt a secondary drinking water standard on or before July 1, 1998.⁷²

Public Testimony

Several people testified at the committee's public hearings about their concern that RFG may contaminate drinking water supplies in Maine and across the nation. People testified that water supplies in several cities, including Santa Monica, California, Liberty, New York and Wilmington, North Carolina, have already been contaminated by RFG. One person suggested that the chemicals in vehicle exhaust may get into the snow piles that form on the side of the road as a result of plowing, and as the snow piles melt nearby groundwater may be contaminated. Other people mentioned outboard motors as a potential pathway for contamination of surface waters in the state.

Findings and Recommendations

Finding: The committee finds that there is cause for great concern that the use of RFG has and will continue to result in the contamination of groundwater and surface water drinking water supplies in the State. The committee further finds that this concern is heightened by MTBE's solubility in water, its relative mobility in soils and its resistance to degradation, as well as the lack of consensus in the scientific community regarding the carcinogenicity of MTBE.

Recommendation: The committee strongly endorses the adoption by the Department of Human Services of a legally enforceable primary drinking water standard (Maximum Contaminant Level) for MTBE in public water systems.

Minority Recommendation: Two members of the committee (Sen. Harriman and Rep. Cowger) recommend authorizing the Department of Human Services to adopt a secondary drinking water standard for MTBE in public water systems in addition to a primary standard.

Minority Recommendation: One member of the committee (Rep. Cowger) recommends that the Department of Environmental Protection's action level for beginning remediation of private water wells contaminated with MTBE be 1/2 the Bureau of Health's drinking water guideline or 25 ppb, whichever is less.

VI. EFFECTS OF USE OF RFG ON ENGINES

When RFG was introduced in Maine, there were reports that gasoline-powered engines were experiencing decreased performance. Consumer concerns were focused on reduced mileage in motor vehicles and damage to machines with two-cycle engines, such as snowmobiles, chain saws and outboard motors.

In response to these apparent problems, Governor King appointed the Engine Performance Task Force on March 29, 1995 to study engine performance issues related to the use of RFG. Many other studies have also been conducted by government and industry groups.

Motor Vehicle Performance

RFG is made from the same ingredients as conventional gasoline, using different levels of those ingredients. The higher oxygen content in RFG, added in the form of oxygenates such as methyl tertiary butyl ether (MTBE) and ethanol, is intended to provide for a more complete combustion of the gasoline in the engine and therefore reduce emissions of carbon monoxide and hydrocarbons. The oxygen, however, also chemically enleans the air/fuel mixture, which may cause hesitation during warm up in older vehicles that have the air/fuel ratio set too lean. According to a manual for auto technicians, this is not a problem in newer vehicles equipped with onboard computer control systems.⁷³

All major automobile manufacturers approve the use of reformulated gasoline containing MTBE or ethanol. Some manufacturers, including Chrysler, Ford and General Motors even recommend its use.⁷⁴

Mileage

Based on evaluations of numerous studies, the EPA reports that RFG can be expected to reduce automobile fuel economy an average 1.0% during the summer and 3.0% during the winter. This reduction in fuel economy is a result of the lower energy content in RFG as compared to conventional gasoline.⁷⁵

In March 1995, the Wisconsin Department of Natural Resources conducted a study in conjunction with the EPA that compared the fuel efficiency of reformulated gasolines with conventional gasoline. The on-road study used eight vehicles of various ages and technologies, which were driven over a fixed route with urban, suburban and rural segments. The study concluded that the average difference in fuel economy between conventional gasoline and reformulated gasoline was 2.8%.⁷⁶

The Maine Engine Performance Task Force reviewed information from the Wisconsin study, the EPA, Downstream Alternatives and auto manufacturers and concluded that "RFG, by itself, has a small impact on fuel economy, and that a number of other factors related to weather and personal driving habits have a combined effect which could far outweigh the impact of RFG alone."⁷⁷

Small Engines

RFG is being used in a wide range of small engine products, which can be divided into four categories: power equipment, motorcycles, recreational equipment such as snowmobiles and ATVs, and boats. Concerns about the use of RFG in these engines fall into four major areas: materials compatibility, lubricity, enleanment and phase separation.

Some equipment manufacturers have upgraded some of the materials used in their fuel systems since the early 1980s, and some marine and recreational manufacturers recommend minor modifications to compensate for enleanment. Many manufacturers also make specific recommendations for storage of equipment fueled with RFG.⁷⁸

According to the Portable Power Equipment Manufacturers Association, research indicates that the use of reformulated fuels does not have any performance impact on portable power equipment.⁷⁹

A technical service bulletin from Yamaha motorcycles states that, “Extensive testing has been done on the effects of RFG on lubricity and material compatibility, particularly with 2-stroke engines. Results show no adverse effects or catastrophic failures when using RFG.”⁸⁰

A service bulletin from Outboard Marine Corporation states that, “All engines 1985 and newer, originally approved to run on unleaded fuel, will not require any modifications to run on RFG.” Engines older than 1985 may require modifications.⁸¹ A MerCruiser service bulletin states that RFG may cause reduced fuel economy and a leaner running engine, but that “this should not cause any problems with MerCruiser engines providing they haven’t been ‘altered’ and the fuel system is in good operating condition.” MerCruiser does recommend regular inspection of fuel system components in engines produced before 1987, changing the fuel filters more frequently, and draining all fuel systems before storing.⁸²

The Maine Engine Performance Task Force concluded in its final report that, “From all the information available, it seems that the issues related to small engines are mostly customer expression of concerns as to what might happen, not complaints as to what did happen.”⁸³

Public Testimony

Several people testified at the public hearings that their vehicles’ mileage had dropped much more than the EPA had predicted. Other testimony concerning engine performance asserted that older cars do not run as well using RFG; marine engines run leaner and hotter, burning out the exhaust systems; motorcycle engines run hotter causing the oil pressure to drop; and 2-cycle engines do not run well on RFG.

The committee heard testimony from individuals that vehicle parts do not last as long when RFG is used. Problems cited include holes burned in the pistons, deteriorated gaskets, degraded rubber parts, carburetor problems and deposits on oxygen sensors. People expressed a

great deal of concern about the increased cost for maintenance and repairs necessary with the use of RFG.

The committee also viewed a video of a San Francisco television station's investigative report on car fires reportedly caused by RFG. The report alleged that the MTBE in RFG breaks down rubber parts in the fuel system, leading to fuel leaks and possibly engine fires.⁸⁴

Findings and Recommendations

Majority Finding: The majority of the committee finds that there is concern about the negative effects of RFG on internal combustion engines, including damage to hoses, fuel pumps, gaskets, carburetors and the potential for car fires. The committee further finds that there is not conclusive evidence to make a specific recommendation for action at this time, but further study is warranted.

Minority Finding: One member of the committee (Rep. Cowger) finds that there is a great deal of anecdotal and experiential concern about the negative effects of RFG on engine performance, but finds that there is not sufficient scientific evidence to make a specific recommendation for action at this time, but further study is warranted.

VII. OTHER ISSUES RAISED BY THE PUBLIC

A number of other comments were made at the public hearings in opposition to RFG, including the following: it smells terrible, it is turning trees brown along the roadside, it has a short shelf-life, and it causes fiberglass tanks to deteriorate thereby clogging fuel filters with fiberglass strands. Speakers also suggested that the economy of the region suffers in RFG areas as a result of people traveling to buy their gasoline in non-RFG areas, perhaps even out of state where Maine does not benefit from the tax revenues; and as a result of tourists trying to avoid RFG areas. A speaker also expressed concern about the sulfur content in gasoline.

Numerous people testifying at the hearings commented that little air pollution is generated in Maine, and that mid-West states, whose pollution is transported into Maine, should be required to clean up their pollution first. Several people expressed the sentiment that the Legislature and the Governor should stand up for state's rights by banning RFG regardless of federal law. Some of these pointed to the State of Alaska, where the use of oxygenated fuels was discontinued in Fairbanks and federal sanctions were not imposed.

Some members of the public suggested that the majority of people do not have any problems with the use of RFG, and that those testifying in opposition to the use of RFG represent a small minority of the Maine population. There was also testimony in support of expanding the RFG program statewide.

VIII. OXYGENATED FUELS IN OTHER STATES

All or parts of 18 states and the District of Columbia are in the federal RFG program and many other states are required to have a wintertime oxygenated fuels program because they are in nonattainment for carbon monoxide. Alaska, North Carolina and California are 3 of the states that use or have used fuels oxygenated with MTBE.

Alaska

The State of Alaska implemented a wintertime oxygenated fuels program in Anchorage and Fairbanks in November 1992 because both cities were in nonattainment for carbon monoxide (CO).⁸⁵ The oxygenated fuel originally used when the program was implemented contained 15% by volume MTBE. When oxygenated fuel supplies begin to be used in October 1992, a substantial number of complaints began to be made by citizens in Fairbanks. Epidemiologic studies were undertaken in Fairbanks by the Alaska Division of Public Health and the National Centers for Disease Control, with follow-up studies in Anchorage (see section on Health Effects).

Alaska Governor Walter J. Hickel ordered the oxygenated fuel program suspended in Fairbanks on December 29, 1992. Anchorage remained in the oxygenated fuel program for the duration of the winter control period, which ended on March 1, 1993. In August 1993, prior to the November 1 start of the 1993-94 oxygenated fuel season, the Anchorage Assembly voted to suspend the use of oxygenated fuel. In 1994 the Department of Environmental Conservation confirmed that the State of Alaska would discontinue using MTBE as an oxygenate, and began testing oxygenated fuel blended with ethanol.

In 1994, the Anchorage Assembly adopted an oxygenated fuel program with a January 1, 1995 start date using ethanol to meet the oxygenate requirement. The oxygenated fuel program is currently in place in Anchorage, using ethanol. Fairbanks does not have any oxygenated fuel program. Both Anchorage and Fairbanks remain in nonattainment for CO.

North Carolina

Under the Clean Air Act, North Carolina was also required to implement a wintertime oxygenated fuels program in Winston-Salem and Raleigh/Durham because those areas were in nonattainment for CO. Both areas have since been redesignated to attainment and the program was discontinued after the winter of 1994-95. The oxygenated fuels program is in North Carolina's contingency plan for the Winston-Salem, Raleigh/Durham and Charlotte areas. The contingency plan will be triggered upon a violation of the ambient air quality standard for CO.⁸⁶

California

California also implemented the wintertime oxygenated fuels program in 1992. Although the entire state was not in nonattainment for CO, the requirement was originally adopted as a statewide requirement because of distribution issues and to maximize the benefits.

California adopted its Cleaner Burning Gasoline regulations in 1991 and they became effective on March 1, 1996. The regulations include a requirement for 2% oxygen by weight. Most of the state is also subject to the requirements of the federal RFG program. MTBE is the oxygenate used in almost all the gasoline used in California.⁸⁷

During the 1997 legislative session, a number of measures relating to the use of MTBE were considered, and 3 bills were recently signed into law by Governor Pete Wilson. SB 521 (Chapter 816) appropriated \$500,000 from the Motor Vehicle Fuel Account in the transportation Tax Fund to the University of California for a study and assessment of MTBE to be submitted to the Governor by January 1, 1999 (see section on Health Effects). The bill also requires the Governor to certify, based on the assessment, whether there is a significant risk to human health and the environment from using MTBE in gasoline, and to discontinue the sale and use of MTBE in gasoline if the Governor certifies that there is such a significant risk.

The bill also provides that no public water system or its customers are responsible for remediation or treatment costs associated with MTBE. Any public water system that incurs MTBE remediation or treatment costs may seek recovery of those costs from responsible parties.⁸⁸

SB 1189 and AB 592 require the Department of Human Services to adopt a primary drinking water standard for MTBE by July 1, 1999 and to adopt a secondary drinking water standard by July 1, 1998. The bills also require two pilot studies on drinking water vulnerability by mapping underground tanks, pipelines and drinking water wells, and allow the State Water Resources Board to annually expend up to \$5 million to reimburse costs incurred by public drinking water supply sources that have been contaminated by MTBE.⁸⁹

NOTES

- ¹ American Lung Association. *Fact Sheet - Ozone Air Pollution*. 1996.
- ¹ 38 MRSA §584-A, sub-§4-A.
- ¹ 38 MRSA §584-F.
- ¹ 42 USC §7410
- ¹ 42 USC §7410(m)
- ¹ 42 USC §211(k)
- ¹ United States Environmental Protection Agency. *List of Reformulated Gasoline Program Areas - July 17, 1997*. The 18 states are Arizona, California, Connecticut, Delaware, Illinois, Indiana, Kentucky, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Texas, Virginia, and Wisconsin.
- ¹ 42 USC §211(k) and 40 C.F.R. § 80.41 (1995).
- ¹ United States Environmental Protection Agency. *Reformulated Gasoline: What Is It?* (handouts from a presentation by David J. Kortum).
- ¹ 56 Fed. Reg. 46119 (1991).
- ¹ 61 Fed. Reg. 35673 (1996).
- ¹ For more information on the implementation and suspension of the auto emissions inspection program, see the *Final Draft Report of the Joint Select Committee to Review Implementation of the Auto Emissions Inspection Program*. February 1995.
- ¹ Public Law 1995, chapter 50.
- ¹ April 12, 1995 Draft: *The Clean Air Stakeholders Conference Recommended Strategies for Meeting the 15% Rate of Progress Requirements*
- ¹ Commissioner Edward O. Sullivan. Statements to the Select Committee to Study the Health Effects of Reformulated Gasoline. July 25, 1996.
- ¹ Private and Special Law 1995, chapter 60.
- ¹ Maine Department of Environmental Protection. *The Ability of Maine to Go Seasonal Statewide With Reformulated Gasoline*. January 31, 1997.
- ¹ Resolves 1997, chapter 58.
- ¹ Auto/Oil Air Quality Improvement Research Program. *AQIRP Final Report*. January 1997.
- ¹ Ibid.
- ¹ Maine Department of Environmental Protection. *Answers to Questions Asked by the Select Committee to Study the Health Effects of RFG*. October 27, 1997.
- ¹ Ibid.
- ¹ Ibid.
- ¹ Ibid.
- ¹ Ibid.
- ¹ United States Environmental Protection Agency. *Brochure on National Air Quality: Status and Trends*. October 1996.
- ¹ Julian C. Holmes. *Dirty Water, Dirty Air: The Politics of RFG and Cartest -- A Report to the Select Committee to Study the Health Effects of Reformulated Gasoline*. March 21, 1997.
- ¹ Task Force on Health Effects of Reformulated Gas. *An Assessment of the Health Effects of Reformulated Gasoline in Maine*. May 1995.
- ¹ State of Alaska Department of Health and Social Services. *Potential Illness Due to Exposure to Oxygenated Fuels in Fairbanks, Alaska*. December 11, 1992.
- ¹ State of Alaska Department of Health and Social Services. *Potential Illness Due to Exposure to Oxygenated Fuels in Anchorage, Alaska*. December 23, 1992.
- ¹ White, M.C., C.A. Johnson, D.L. Ashley, T.M. Buchta, D.J. Pelletier. *Exposure to Methyl Tertiary-Butyl Ether from Oxygenated Gasoline in Stamford, Connecticut*. Archives of Environmental Health 50:183-189. May/June 1995.
- ¹ Mohr, S.N., N. Fiedler, C. Weisel, K. Kelly-McNeil. *Health Effects of MTBE Among New Jersey Garage Workers*. Inhalation Toxicology 6:553-562. 1994.

¹ Anderson, H.A., L. Hanrahan, J. Goldring, B. Delaney. *An Investigation of Health Concerns Attributed to Reformulated Gasoline Use in Southeastern Wisconsin: Final Report*. Wisconsin Department of Health and Social Services, Division of Health. May 30, 1995.

¹ Kenneth Rudo. *Editorial: Review of the Wisconsin DHSS Report on Health Concerns Attributed to Reformulated Gasoline Use in Southeastern Wisconsin*. Toxicology and Industrial Health, Vol. 11, No. 5. 1995.

¹ Anderson, H.A., L. Hanrahan, J. Goldring, B. Delaney. *An Investigation of Health Concerns Attributed to Reformulated Gasoline Use in Southeastern Wisconsin: Phase 2 Telephone Registered Health Concerns*. Wisconsin Department of Health and Social Services, Division of Health. September 18, 1995.

¹ Task Force on Health Effects of Reformulated Gas. *An Assessment of the Health effects of Reformulated Gasoline in Maine*. May 1995.

¹ Maine Bureau of Health. Presentation to Select Committee. July 25, 1997.

¹ Maine Bureau of Health, Environmental Toxicology Program. *Briefing Memorandum to Governor Angus King*. June 24, 1997.

¹ Ibid.

¹ United States Environmental Protection Agency, Office of Research and Development. *Assessment of Potential Health Risks of Gasoline Oxygenated with Methyl Tertiary Butyl Ether (MTBE)*. November 1993.

¹ Ibid.

¹ United States Environmental Protection Agency, Office of Research and Development. *Health Risk Perspectives on Fuel Oxygenates*. December 1994.

¹ Ibid.

¹ Office of Science and Technology Policy through the Committee on Environment and Natural Resources of the President's National Science and technology Council. *Interagency Assessment of Potential Health Risks Associated with Oxygenated Gasoline*. February 1996.

¹ Health Effects Institute. *The Potential Health Effects of Oxygenates Added to Gasoline: A Review of the Current Literature*. A Special Report of the Institute's Oxygenates Evaluation Committee. April 1996.

¹ National Research Council. *Toxicological and Performance Aspects of Oxygenated Motor Vehicle Fuels*. National Academy Press. 1996.

¹ Ibid.

¹ Ibid.

¹ National Science and Technology Council, Committee on Environment and Natural Resources. *Interagency Assessment of Oxygenated Fuels*. June 1997. 4-31.

¹ Ibid.

¹ Ibid.

¹ Myron A. Mehlman. *Dangerous and Cancer-Causing Properties of Products and Chemicals in the Oil Refining and Petrochemical Industry: Part XXII. Health Hazards from Exposure to Gasoline Containing Methyl Tertiary Butyl Ether (MTBE): Study of New Jersey Residents*. Toxicology and Industrial Health, Vol. 12, No. 5. 1996.

¹ Myron A. Mehlman. *Statement on Health Dangers of MTBE in Gasoline Before Joint Standing Committee on Health and Human Services - The Select Legislative Committee to Review the Health Effects of RFG*. March 25, 1997.

¹ Myron A. Mehlman. *Dangerous and Cancer-Causing Properties of Products and Chemicals in the Oil Refining and Petrochemical Industry: Part XXII. Health Hazards from Exposure to Gasoline Containing Methyl Tertiary Butyl Ether (MTBE): Study of New Jersey Residents*. Toxicology and Industrial Health, Vol. 12, No. 5. 1996.

¹ Myron A. Mehlman. *Editorial: Collegium Ramazzini Position on Oxygenated and Reformulated Gasoline*. International Journal of Occupational Medicine, Immunology, and Toxicology. Vol. 5, No. 1. 1996.

¹ California SB 521, Chapter 816 (1997).

¹ Margo Oge, EPA. *Letter to Carol Henry, American Petroleum Institute*. August 20, 1997.

¹ United States Geological Survey, National Water Quality Assessment Program. *Fact Sheet FS-114-95: Occurrence of the Gasoline Additive MTBE in Shallow Ground Water in Urban and Agricultural Areas*. March 1995.

- ¹ Zogorski, John S. et al. *Draft - Fuel Oxygenates and Water Quality: Current Understanding of Sources, Occurrence in Natural Waters, Environmental Behavior, Fate, and Significance (Prepared for Interagency Oxygenated Fuel Assessment)*. February 1996.
- ¹ United States Environmental Protection Agency. *Drinking Water Advisory: Consumer Acceptability Advice and Health Effects Analysis on Methyl Tertiary-Butyl Ether (MtBE)*. December 1997.
- ¹ 62 Fed. Reg. 52194 (1997).
- ¹ Maine Bureau of Health. *Letter to Select Study Committee to Study the Health Effects of RFG*. October 22, 1997.
- ¹ Maine Bureau of Health. *Proposed Maximum Contaminant Level for Methyl Tertiary-Butyl Ether (MTBE) Technical Support Document*. November 26, 1997.
- ¹ Phil Kemp, Toxicologist, Maine Bureau of Health. By telephone. November 7, 1997.
- ¹ Maine Department of Environmental Protection. *Answers to Questions Asked by the Select Committee to Study the Health Effects of RFG*. October 27, 1997.
- ¹ Ibid.
- ¹ National Research Council. *Toxicological and Performance Aspects of Oxygenated Motor Vehicle Fuels*. National Academy Press. 1996.
- ¹ Ibid.
- ¹ National Science and Technology Council, Committee on Environment and Natural Resources. *Interagency Assessment of Oxygenated Fuels*. June 1997.
- ¹ United States Geological Survey, National Water Quality Assessment Program. *Fact Sheet FS-114-95: Occurrence of the Gasoline Additive MTBE in Shallow Ground Water in Urban and Agricultural Areas*. March 1995.
- ¹ California Environmental Protection Agency. *MTBE (Methyl Tertiary Butyl Ether) Briefing Paper*. September 1997.
- ¹ California SB 1189 and AB 592.
- ¹ Downstream Alternatives, Inc. *Changes in Gasoline II: The Auto Technician's Gasoline Quality Guide*. 1992.
- ¹ Downstream Alternatives, Inc. *1995 Fuel Recommendations (Vehicle Owner's Manual Statements)*. February 1995.
- ¹ United States Environmental Protection Agency. *Fuel Economy Impact Analysis of RFG*. August 1995.
- ¹ Wisconsin Department of Natural Resources. *On-Road Study of the Effects of Reformulated Gasoline on Motor Vehicle Fuel Economy in Southeastern Wisconsin*. March 31, 1995.
- ¹ *Final Report of the Engine Performance Task Force*. April 19, 1995.
- ¹ Downstream Alternatives, Inc. *The Use of Oxygenated Gasoline in Lawn and Garden Power Equipment, Motorcycles, Boats, and Recreational Equipment*. November 1994.
- ¹ Portable Power Equipment Manufacturers Association. Press Release. March 7, 1995.
- ¹ Yamaha Motor Corporation U.S.A. *Tech Exchange*.
- ¹ Outboard Marine Corporation. *Outboard Service Bulletin*. 1995.
- ¹ MerCruiser. *Service Bulletin No. 95-7*. 1995.
- ¹ *Final Report of the Engine Performance Task Force*. April 19, 1995.
- ¹ KGO-TV (ABC) Channel 7, San Francisco. *Transcript, Channel 7 News At Six*. September 4, 1996.
- ¹ State of Alaska Department of Environmental Conservation. *Chronological Summary -- Oxyfuels in Alaska (Draft)*. November 4, 1994.
- ¹ *North Carolina CO Redesignation Package*. August 29, 1995.
- ¹ California Environmental Protection Agency. *MTBE (Methyl Tertiary Butyl Ether) Briefing Paper*. September 1997.
- ¹ California SB 521, Chapter 816 (1997).
- ¹ California SB 1189 and AB 592 (1997).

APPENDIX A

Additional Comments from Committee Members

Comments of Rep. Verdi L. Tripp

As many may have hoped, this is not the end to the public concern expressed about the use in Maine of MTBE as an oxygenate to reformulated gasoline.

Since its introduction in January 1995, many Maine citizens have worked for its elimination. Because it was the method of choice by Governor Angus S. King, Jr. to comply with requirements established by the Federal Environmental Protection Agency under the Clean Air Act, there has been little support from the King administration or its agencies to prove public concerns unfounded.

Using information provided by the major oil dealers, who make their living refining reformulated gasoline with MTBE, the Maine Department of Environmental Protection has continually told the public that there is no problem with the regular gasoline primarily used in the seven southern counties of Maine.

Now, Maine's Bureau of Health is, at this writing, proposing to lower the standards of MTBE in drinking water from 50 parts per billion to 70 ppb when news reports can be found across the country, particularly in California, about MTBE being found in increasing quantities in public drinking water supplies and private wells. In fact, the California Legislature recently considered a bill to eliminate the use of MTBE. It stopped just short of doing just that and instead has funded a year long \$500,000 study to provide even more information about the infiltration of this toxic substance on health and particularly in its drinking water sources.

The Natural Resources Committee should seriously consider our recommendation to continue this committee or another like it to monitor activities regarding concerns and actions taken by other states regarding MTBE, particularly as it impacts drinking water.

I am not happy that our committee did not have definitive information to make black and white recommendations on the four major areas of study. This tells me that the impact of this reformulated gasoline with MTBE may have done more harm than good to Maine citizens in addressing the state's responsibilities to the Federal Government under the Clean Air Act. There is no evidence that use of this gasoline in Maine vehicles in the seven southern counties has led to a 15% reduction of VOCs.

I am also concerned that this Select Committee to Study the Health Effects of Reformulated Gasoline wasn't able to do a thorough job. Although the initial request was for the committee to hold public hearings in all seven Maine counties using reformulated gasoline with MTBE, we were only allowed two. We were not given the opportunity for additional meetings to investigate the possible occupational hazards of this gasoline either in the field or at a workshop, to visit other states which have changed the percent of MTBE or are being allowed to use another oxygenate, to visit monitoring sites used by MDEP, etc., etc., etc.

We based our findings and recommendations on an organizational meeting, public hearings in Scarborough, Wiscasset and Lewiston, and one wrap-up meeting. Although we provide the Natural Resources Committee with a report, I would be remiss to call it "comprehensive" and hope that will be done in the near future.

There is, however, an excellent book being published by Julian Holmes of Wayne, who has dedicated many years of life to document the history of MTBE in Maine and in other areas of the United States, his opinion about its negative affects, the reaction by the Maine Department of Environmental Protection, and much more. I would suggest everyone on the Natural Resources Committee, and members of the Maine Legislature, read it from cover to cover. You may have many questions of your own after reading it.

Thank you for the opportunity to at least make you aware on behalf of the people of Maine that there is still much concern about the use of MTBE as an oxygenate in our gasoline.

Comments of Rep. Scott W. Cowger

The issue of reformulated gasoline (RFG), and more specifically the component MTBE most commonly used as an oxygenate additive, is a complex, controversial, and often confusing topic. As a society, we have become very dependent upon automobile travel, and as such the use of gasoline fuel is an important element of our everyday lives. The combustion of motor fuel creates a great deal of the air pollution in our country, and the Federal Clean Air Act (CAA) attempts to correct much of this pollution. The state of Maine has selected RFG as part of its obligation to meet the requirements of the CAA.

Clean Air Act

RFG is an effective option to meet the requirements for reduced VOC emissions (one of several ozone precursors) as well as reduced toxic air pollutants. If RFG was not required for Maine's non-attainment areas, alternate options would have to be selected to meet CAA requirements. These would likely include stage II vapor recovery systems statewide, **and** the use of an enhanced automobile I&M testing program similar to "CarTest", and it is felt that RFG provides a more acceptable solution.

If we were to opt out of the use of RFG in the State Implementation Plan (SIP) and not replace it with an EPA-approved alternative such as stage II and enhanced I&M, the federal government would likely impose sanctions that would not be acceptable to most Maine people. The risk of reduced federal highway funds, severe limits on industrial expansion, and a federally-operated air pollution program including an enhanced "CarTest" program is too high. RFG provides an appropriate means of meeting our CAA requirements at this time. We don't like being told that we have to do something, but we need to do our part as a member of the 37-state Ozone Transport Assessment Group (OTAG) in the eastern half of the country. Only through OTAG participation can we encourage stricter controls on out-of-state upwind sources, as well.

MTBE is the most widely used oxygenate in the northeast United States, and is most likely being distributed throughout Maine including those counties where its use is not currently required. It has been an ingredient in premium gasoline for some time, and is used in all products from some refineries. As such, more people are probably buying gasoline containing MTBE than those who were targeted for RFG. If Maine were to ban the use of MTBE in RFG, it is likely to raise the cost of fuel since new supplies (with alternative oxygenates yet to be developed) would have to be brought to Maine markets.

Health Benefits

While there is not overwhelming evidence that RFG plays a major role in reductions of all automotive emissions, the health benefits to the entire population are evident through reduced ozone and air toxics. The 15% reduction in VOC emissions from 1990 baseline levels in non-RFG fuel helps contribute to a steady decline in ozone exceedance days. Reduced ozone as well as air toxics, which are known carcinogens, obviously provides a long-term benefit to the state's population as a whole. The increasing use of RFG in non-attainment areas throughout the country also contributes to improved air quality in downwind areas like Maine.

Health Risks

We must acknowledge that, despite overall health benefits, MTBE has been identified as a "possible" carcinogen, and much more research into the human health effects of MTBE is needed. While there have been some claims of negative health effects due to MTBE, some studies show similar negative effects when exposed to non-RFG gasoline without MTBE. In addition to MTBE, automobile fuel contains known carcinogens such as benzene, and continued exposures especially in occupational settings creates a higher risk for negative health effects. Ongoing research needs to be done to ultimately determine MTBE's effect on human health, but this research must also determine the effect from known carcinogens in RFG and conventional gasoline. MTBE has a much lower potency than some of these other compounds such as benzene, so the relative risks of these fuels needs

to be weighed, as we as a society have accepted the fact that we will continue to utilize automotive fuel containing known carcinogens.

It is also obvious that there is a segment of the population that may be particularly sensitive to MTBE, just as some people are particularly sensitive to other compounds such as latex gloves or food allergies. MTBE sensitivity is particularly troublesome due to the fact that gasoline use has become part of our daily lives. While MTBE appears to be the best choice for an oxygenate that works in our climate at this time, it is imperative that research continues to develop oxygenates such as ethanol that are currently in place in climates such as Alaska.

Action Items

- Continue the use of RFG in the SIP to comply with CAA requirements without requiring a particular oxygenate, in order to avoid federal sanctions.
- Encourage research into the development of alternatives to MTBE as the oxygenate of choice to address health complaints of a sensitive portion of the population and other potential health concerns. Consider public research funds or tax incentives for the development of alternative fuel blends.
- Continue to monitor research on RFG with MTBE toxicity and human health effects relative to conventional gasoline, and require regular reporting to the Legislature.
- Develop and implement a strict drinking water standard for MTBE based on sound scientific evidence, and an "action level" at less than half this level so MTBE contaminated drinking water will be addressed as a high priority in Maine's groundwater program.
- Implement "responsible party" legislation similar to California so that if MTBE is the selected oxygenate by the fuel production and delivery system, responsible actions will be taken in the handling and distribution of RFG.
- Ultimately, if Maine eliminates areas that are considered "non-attainment" through overall implementation of the SIP, petition the EPA to discontinue the requirement for RFG and put RFG use in a contingency plan should non-attainment recur.

Comments of Rep. Glenys P. Lovett

These items should be included in our report:

- MTBE: Risk of Neurotoxic Effects -- Testimony of Dr. Jorge R. Mancillas, presented to the California State Senate Environmental Quality Committee on May 12, 1997. The Select Committee received a copy of this testimony.
- The Breathalyzer Study -- This study of dermal exposure to gasoline containing MTBE was performed by Dr. Richard Saferstein, Ph.D. The Select Committee received a copy of the results of this study.
- Asthma Study -- Growth of asthma prevalence in Lionville Elementary School, Downingtown, PA. The Select Committee received a copy of this data.
- Press Release regarding Dr. Nachman Brautbar's findings on the effects of MTBE on the immune system -- This is an extensive blood test that involved 20 citizens in the State of Maine.

I have two questions in the draft that require answers:

On page 15, last paragraph -- How did the RFG Health Effects Task Force come to any conclusion if they never interviewed any of the people with health ailments from the fuel, especially when the Bureau of Health can't find all the complaints they received regarding health complaints from RFG?

On page 23-24 ("3 of the 17 wells were contaminated by gasoline leaks that occurred after November 1994.") -- How did the other 14 wells get contaminated?