

CRS Report for Congress

MTBE in Gasoline: Clean Air and Drinking Water Issues

Updated February 25, 2000

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ABSTRACT

This report provides background information concerning methyl tertiary butyl ether (MTBE), an additive used to produce cleaner burning gasoline, and legislation that might affect its use. Controversy has surrounded the use of MTBE, most recently because of concern over contamination of drinking water supplies by leaking gasoline storage tanks, pipelines, and marine engines. The report briefly summarizes information concerning the environmental impacts of the additive's use and potential regulatory and legislative options. As of January 2000, eleven bills had been introduced to address MTBE-related issues. The report will be updated if developments warrant.

MTBE in Gasoline: Clean Air and Drinking Water Issues

Summary

Concern over ground and surface water contamination caused by the gasoline additive methyl tertiary butyl ether (MTBE) has raised new questions concerning the desirability of using the additive as a means of producing cleaner burning fuel. It is used by most refiners to produce the reformulated gasoline required in portions of 17 states and the District of Columbia. MTBE is credited with producing marked reductions in emissions of carbon monoxide; reformulated gasoline, of which it is a component, has also reduced the volatile organic compounds that react with other pollutants to produce smog. Over the last few years, however, incidents of drinking water contamination by MTBE, particularly in California, have raised concerns and led to calls for restrictions on its use. On March 25, 1999, Governor Davis of California ordered a phase-out of MTBE use in the state by December 31, 2002.

EPA has taken a variety of actions to address the MTBE issue. Based on current research, the Agency's view has been that MTBE poses some risk, although no greater risk than that posed by other gasoline components. The Agency has responded to the ground water contamination problem by providing information, intensifying research, and focusing on the need to minimize leaks from underground fuel storage tanks. In late 1998, EPA formed an advisory panel of state, industry, environmental, and other stakeholders (dubbed the Blue Ribbon Panel) to review MTBE issues and make recommendations. In its final report (July 1999), the panel recommended (and EPA agreed) that MTBE use should be notably reduced.

If MTBE is removed from gasoline, there would still be a need, unless the Clean Air Act were amended, for refiners to use alternative sources of oxygen in gasoline. The major potential alternatives to MTBE are other forms of ether, such as ethyl tertiary butyl ether (ETBE), and alcohols such as ethanol. These other oxygenates may pose health and environmental impacts, but inadequate data make definite conclusions difficult. In announcing the phase-out of MTBE in his state, California's Governor Davis required three state agencies to conduct additional research on the health and environmental impacts of ethanol, the most likely substitute. In reports approved in January 2000, the agencies concluded that there would be no significant adverse impacts to public health or the environment from switching to ethanol.

The switch from MTBE to ethanol is not without problems, however. Ethanol costs more to produce than MTBE, poses challenges to the gasoline distribution system, and, in the short term, is unlikely to be available in sufficient quantity to replace MTBE nationwide. Gasoline that meets the performance requirements for reformulated gasoline without using oxygenates can be made, but the cost of doing so is uncertain, and current law requires the use of oxygenates in RFG.

The principal issue for Congress is whether Clean Air Act provisions concerning reformulated gasoline should be modified to allow refiners to discontinue or lessen their use of oxygenates. Legislation to permit California refiners to do so has substantial support among that state's congressional delegation. Bills allowing additional flexibility in all states have also been introduced, as have bills that would phase out use of MTBE.

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MTBE in Gasoline: Clean Air and Drinking Water Issues

Introduction

This report provides background information concerning the gasoline additive methyl tertiary butyl ether (MTBE), discusses air and water quality issues associated with it, and reviews options available to congressional and other policy-makers concerned about its continued use.

Under the Clean Air Act Amendments of 1990, numerous areas with poor air quality are required to add chemicals called "oxygenates" to gasoline as a means of improving combustion and reducing emissions. The Act has two programs that require the use of oxygenates, but the more significant of the two is the reformulated gasoline (RFG) program, which took effect January 1, 1995.¹ Under the reformulated gasoline program, areas with "severe" or "extreme" ozone pollution (82 counties with a combined population of 55 million) must use reformulated gasoline; areas with less severe ozone pollution may opt into the program as well, and many have. In all, portions of 17 states and the District of Columbia use reformulated gasoline; a little more than 30% of the gasoline sold in the United States is RFG.

The law requires that RFG contain at least 2% oxygen by weight. Refiners can meet this requirement by adding a number of ethers or alcohols, any of which contain oxygen and other elements. Because these substances are not pure oxygen, the amount used to obtain a 2% oxygen level is greater than 2% of the gasoline blend. For example, MTBE is only 19% oxygen and, thus, RFG made with MTBE must contain 11% MTBE by volume to meet the 2% requirement.

By far the most commonly used oxygenate is MTBE. In 1997, 76% of RFG contained MTBE. MTBE has also been used since the late 1970s in non-reformulated gasoline, as an octane enhancer, at lower concentrations. As a result, gasoline with

¹ The requirements for reformulated gasoline (RFG), to reduce air toxics and the emissions that contribute to smog formation, are found in Section 211(k) of the Clean Air Act. Separate requirements for oxygenated fuel, to reduce carbon monoxide formation, are contained in Section 211(m). Of the two programs, that for RFG has a much larger impact on the composition of the nation's gasoline, because RFG requirements are in effect year-round and apply to a larger percentage of the country. The Section 211(m) requirements, by contrast are in effect during winter months only and affect a small percentage of the nation's gasoline. Ethanol is the primary oxygenate used in winter oxygenated fuels and MTBE the primary oxygenate used in RFG, although either can be used in both fuels.

MTBE has been used virtually everywhere in the United States, whether or not an area has been subject to RFG requirements.

Air Quality Benefits Resulting from MTBE Use

State and local environmental agencies and EPA attribute marked improvements in air quality to the use of fuels containing MTBE and other oxygenates, but the exact role of oxygenates in achieving these improvements is subject to discussion. In Los Angeles, which has had the worst air quality in the country, the use of reformulated gasoline was credited with reducing ground-level ozone by 18% during the 1996 smog season, compared to weather-adjusted data for the same period in 1994 and 1995. Use of RFG also reduced the cancer risk associated with exposure to vehicle emissions by 30 to 40%, according to the California EPA, largely because it uses less benzene, a known human carcinogen.²

Whether the oxygenates themselves should be given credit for these improvements has been the subject of debate, with the answer depending to some extent on what one assumes would replace the oxygenates if they were removed. Asked to look at the ozone-forming potential of different oxygenates used in reformulated gasoline, a National Academy of Sciences panel concluded that "... the addition of commonly available oxygenates to RFG is likely to have little air-quality impact in terms of ozone reduction."³ An EPA advisory panel, by contrast, concluded that the use of oxygenates "appears to contribute to reduction of the use of aromatics with related toxics and other air quality benefits."⁴

Less controversy exists regarding oxygenates' role in reducing carbon monoxide emissions. Both EPA and an interagency group chaired by the White House Office of Science and Technology Policy (OSTP) have reported improvements in carbon monoxide (CO) levels due to the use of oxygenates. According to the June 1997 OSTP report, "analyses of ambient CO measurements in some cities with winter oxygenated gasoline programs find a reduction in ambient CO concentrations of about 10%."⁵

² See "Reformulated Fuels Help Curb Peak Ozone Levels in California," *Daily Environment Report*, November 6, 1996, pp. A-1 and A-2.

³ Committee on Ozone-Forming Potential of Reformulated Gasoline, National Research Council, *Ozone-Forming Potential of Reformulated Gasoline*, May 1999, p. 5. The NAS study concluded that other characteristics of RFG, notably "lowering the Reid Vapor Pressure (RVP) of the fuel, which helps depress evaporative emissions of VOC [volatile organic compounds], and lowering the concentration of sulfur in the fuel, which prevents poisoning of a vehicle's catalytic converter" result in a reduction of about 20% in VOC emissions.

⁴ U.S. Environmental Protection Agency, Blue Ribbon Panel on Oxygenates in Gasoline, Executive Summary and Recommendations, July 27, 1999, Appendix A. Available at Internet website: [<http://www.epa.gov/oms/consumer/fuels/oxypanel/blueribb.htm>].

⁵ Executive Office of the President, National Science and Technology Council, *Interagency Assessment of Oxygenated Fuels*, Washington, D.C., June 1997, p. iv. (Available at Internet website [<http://www.sd.cr.usgs.gov/nawqa/pubs/abstracts/zogorski/ostp.exec.sum.html>])

(continued...)

EPA also “believes that the reductions estimated in air quality studies are significant and that these reductions help to protect the public from the adverse health effects associated with high levels of CO in the air.”⁶ The Agency bases its conclusions on both its own analysis and on a report prepared for two industry groups. The latter, using hourly data for more than 300 monitoring sites gathered over a 9-year period, concluded that use of oxygenated fuels was associated with a 14% reduction in ambient CO concentrations.⁷

Health-related Questions

The improvements in measured air quality have not come without questions. In several cities, residents have complained of a variety of health effects from exposure to MTBE/gasoline exhaust: headaches, dizziness, nausea, sore eyes, and respiratory irritation. Some complaints have centered around the use of MTBE in cold weather, two of the principal areas noting complaints being Alaska and Milwaukee, Wisconsin.

The Interagency Task Force examined these complaints and concluded:

With regard to exposures ... experienced by the general population and motorists, 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.⁸

Additional research is being conducted by EPA, universities, and others. Under the authority of Section 211 of the Clean Air Act, EPA has requested that refiners conduct a number of health effects studies on oxygenated, reformulated, and conventional gasoline, which should provide additional information.

Much discussion over the past 2 years has centered on whether MTBE has the potential to cause cancer. Although there are no studies on the carcinogenicity of MTBE in humans, several rodent studies have been done. Based on these animal studies (which looked primarily at inhalation effects), EPA has concluded that MTBE poses a potential for carcinogenicity to humans at high doses; however, because of uncertainties and limitations in the data EPA has been unable to make a confident

⁵ (...continued)

Referred to hereafter as the OSTP Report. The report expressed some hesitation about its conclusions, particularly regarding the impacts of MTBE in colder weather. It also noted methodological difficulties in identifying statistically significant reductions smaller than 10%, and recommended additional research.

⁶ U.S. EPA Response to Interagency Assessment of Oxygenated Fuels, undated, p. 2.

⁷ Systems Applications International, Inc., for the Renewable Fuels Association and the Oxygenated Fuels Association, *Regression Modeling of Oxyfuel Effects on Ambient CO Concentrations*, Final Report, January 8, 1997, p. 1.

⁸ OSTP Report, p. vi. The report did suggest that “greater attention should be given to the potential for increased symptoms reporting among workers exposed to high concentrations of oxygenated fuels containing MTBE,” however.

estimation of risk at low exposure levels.⁹ In 1998, the International Agency for Research on Cancer (IARC), the U.S. National Toxicology Program, and California's Carcinogen Identification Committee all determined not to list MTBE as a human carcinogen. Regarding noncancer effects, another California advisory committee determined that there was not clear scientific evidence to support listing MTBE as a toxic substance affecting human development or reproduction. These groups generally noted that research gaps exist regarding the potential health effects of MTBE, and that the data were particularly limited on health effects associated with MTBE ingestion.

For practical purposes, the interpretation of any health risks associated with the addition of MTBE to gasoline requires a comparison to the health risks associated with conventional gasoline. The Interagency Task Force, EPA, and some environmental groups have all argued that current knowledge suggests that MTBE is a less serious pollutant than the gasoline components it replaces. According to the OSTP report, the cancer risk from exposure to MTBE is “substantially less than that for benzene, a minor constituent of gasoline that is classified as a known human carcinogen; and more than 100 times less than that for 1,3-butadiene, a carcinogenic emission product of incomplete fuel combustion.”¹⁰

Water Quality and Drinking Water Issues

A major issue regarding the use of MTBE concerns its detection at low levels in ground water in numerous locations nationwide and at elevated levels in some municipal drinking water wells and reservoirs. MTBE is very soluble and, once released, it moves through soil and into ground water more rapidly than other chemical compounds present in gasoline. Once in ground water, it is slow to biodegrade and is more persistent than other gasoline-related compounds. In surface water, it dissipates more rapidly: studies show that most of it evaporates from the upper levels of surface water in a few weeks, while it persists longer at greater depths.¹¹

The primary source of MTBE in ground water appears to be petroleum releases from leaking underground storage tank (UST) systems. Other significant sources include leaking above ground storage tanks, fuel pipelines, refueling facilities, and accidental spills.¹² Data indicate that the most significant source of MTBE in lakes

⁹ U.S. Environmental Protection Agency. *Drinking Water Advisory: Consumer Acceptability Advice and Health Effects Analysis on Methyl Tertiary-Butyl Ether (MTBE)*. EPA-822-F-97-009, December 1997. p. 1-2. This and other health effects information is available at Internet website: [<http://www.epa.gov/OST/drinking/mtbe.htm>].

¹⁰ *Ibid.*, p. vii.

¹¹ Keller, Arturo, et al., *Health and Environmental Assessment of MTBE*, Report to the Governor and Legislature of the State of California as Sponsored by SB 521, Volume I, Summary and Recommendations, University of California, November 1998. p. 35.

¹² See, for example, OSTP Report, Executive Summary, pp. 2-5 - 2-13.

and reservoirs is exhaust from motorized watercraft, while smaller sources include gasoline spills, runoff, and ground water flow.¹³

Occurrence of MTBE in Drinking Water. Available information on the occurrence of MTBE in public drinking water supplies has increased substantially over the past few years but remains somewhat limited geographically. Although a number of serious contamination incidents have been reported, particularly in California, the available data generally do not indicate a broad presence of MTBE in drinking water supplies at levels of public health concern. However, as monitoring has increased in various states, so has the number of public water systems showing detections of MTBE.

The most extensive MTBE monitoring data are available for California. The state requested community water systems to begin testing for MTBE in 1996, and made the testing mandatory for most public water systems in February 1997. As of January 2000, 1,444 systems had tested 6,492 sources of drinking water. MTBE was detected in 52 (0.8%) of these sources, including 31 of 6,076 ground water sources (0.5%) and 21 of 416 surface water sources (5%). Overall, 30 (2.1%) of the 1,444 public water systems reported detections of MTBE in at least 1 of their drinking water sources.¹⁴ Very few sources had MTBE concentrations exceeding the EPA taste and odor drinking water advisory of 20-40 micrograms per liter ($\mu\text{g/L}$).¹⁵ The state database did not include some contaminated wells that have been closed, however.

In 1998, the state of Maine tested nearly 800 public water supplies and 950 randomly selected private wells and found detectable levels of MTBE in 16% of the public water supplies and 15.8% of the private wells. None of the public water supply samples exceeded the state drinking water standard of 35 $\mu\text{g/L}$, while 1% of private well samples contained MTBE concentrations above the standard. Roughly 94% of public water supply samples showed MTBE levels that were either not detectable or were below 1 $\mu\text{g/L}$; the remaining 6% of samples were between 1 $\mu\text{g/L}$ and 35 $\mu\text{g/L}$.¹⁶

Nationwide, the data on the presence of MTBE in drinking water are more limited. In July 1999, the EPA-appointed Blue Ribbon Panel on Oxygenates in Gasoline reported that between 5% and 10% of drinking water supplies in high oxygenate use areas show at least detectable amounts of MTBE, and that the vast majority of these detections have been well below levels of public health concern, with

¹³ Keller. p. 33-34.

¹⁴ California Environmental Protection Agency. *MTBE in California Drinking Water*, January 21, 2000, available at Internet website: [http://www.dhs.cahwnet.gov/ps/ddwem/chemicals/MTBE/mtbe_overview.htm].

¹⁵ Micrograms per liter ($\mu\text{g/L}$) are equivalent to parts per billion (ppb) for fresh water.

¹⁶ Maine Department of Human Services, Department of Environmental Protection, and Department of Conservation. *The Presence of MTBE and Other Gasoline Compounds in Maine's Drinking Water*, A Preliminary Report. October 13, 1998. 24 p.

roughly 1% of detections exceeding 20 µg/L.¹⁷ In a 1998 survey of state Leaking Underground Storage Tank (LUST) programs undertaken by the University of Massachusetts and EPA, 19 states reported detections of MTBE in public water systems. Among these states, the total number of public wells with MTBE detections was estimated to range from 251 to 422 wells, with preliminary data indicating that the vast majority of detections were below 10 µg/L.¹⁸

Occurrence of MTBE in Ambient Ground Water. Looking at ground water generally (not only drinking water wells) the data indicate that low-levels of MTBE are found more often. The California Environmental Protection Agency has estimated that, based on monitoring information available for UST sites, MTBE can be expected to be found in shallow, unused ground water at thousands of UST sites in the state, and often at high concentrations (in the parts per million range).¹⁹ Furthermore, a 1998 report by the Lawrence Livermore National Laboratory found that MTBE was not significantly degrading in the monitoring networks for leaking UST sites.²⁰

Nationally, the most comprehensive research has been conducted by the United States Geological Survey (USGS) through the National Water Quality Assessment Program (NAWQA). USGS data for some 2,743 monitoring, observation, and water supply wells in 42 states (from 1993-1998) showed MTBE present in about 5% (145) of the wells, with MTBE levels exceeding 20 µg/L in 0.5% (12) of the wells.²¹ In all, MTBE was detected in 22 of the 42 states. The USGS further evaluated the occurrence data based on whether or not detections occurred in RFG or winter oxyfuel program areas. The researchers reported that low concentrations of MTBE were detected in 21% of ambient ground water samples in high MTBE-use areas and in 2.3% of samples in low or no-MTBE use areas.²²

Additional federal and state monitoring initiatives now underway should further advance knowledge about the presence and behavior of MTBE in ambient water and drinking water. Most significantly, the USGS, in cooperation with EPA, has been assessing the occurrence of MTBE and other volatile organic compounds in surface and ground water in 12 mid-Atlantic and Northeastern states where MTBE use is

¹⁷ The Blue Ribbon Panel on Oxygenates in Gasoline. Executive Summary and Recommendations. July 27, 1999. Summary and full report are available at Internet website: [<http://www.epa.gov/oms/consumer/fuels/oxypanel/blueribb.htm>].

¹⁸ Hitzig, Robert, P. Kostecki, and D. Leonard. *Study Reports LUST Programs are Feeling Effects of MTBE Releases*. Soil and Groundwater Cleanup, Aug./Sept. 1998. p. 15-19.

¹⁹ California Environmental Protection Agency, *MTBE Briefing Paper*, p. 17.

²⁰ Happel, Anne, E. H. Beckenbach, and R. U. Halden. *An Evaluation of MTBE Impacts to California Groundwater Resources*. Lawrence Livermore National Laboratory and the University of California, Berkeley. June 11, 1998. p. iv.

²¹ U.S. Geological Survey. Data summary submitted to the EPA Blue Ribbon Panel on the Use of MTBE and Other Oxygenates in Gasoline. January 22, 1999. Available at Internet website: [<http://www.epa.gov/oms/consumer/fuels/oxypanel/blueribb.htm#Presentations>].

²² Ibid.

common. The study focuses on community water systems, and the results are expected to be available this year.²³

EPA's Responses to MTBE Occurrence in Water

Safe Drinking Water Act Initiatives. To address concerns raised by the detection of MTBE in ground water and drinking water supplies, EPA has undertaken a range of activities. In December 1997, the Agency issued a drinking water advisory for MTBE based on consumer acceptability (for taste and smell). EPA issues drinking water advisories to provide information on contaminants in drinking water that have not been regulated under the Safe Drinking Water Act (SDWA). Advisories are not enforceable, but provide guidance to water suppliers and other interested parties regarding potential health effects or consumer acceptability. While the MTBE advisory is not based on health effects, EPA notes that keeping MTBE levels in the range of 20-40 µg/L or lower for consumer acceptability reasons will also provide a large margin of safety from adverse health effects. Specifically, the advisory states that,

[c]oncentrations in the range of 20 to 40 µg/L are about 20,000 to 100,000 (or more) times lower than the range of exposure levels in which cancer or noncancer effects were observed in rodent tests. This margin of exposure is in the range of margins of exposure typically provided to protect against cancer effects by the National Primary Drinking Water Standards under the Federal Safe Drinking Water Act. This margin is greater than such standards typically provided to protect against noncancer effects. Thus, protection of the water source from unpleasant taste and odor as recommended will also protect consumers from potential health effects.²⁴

EPA also is taking steps that could lead to the development of an enforceable National Primary Drinking Water Standard for MTBE. In February 1998, EPA included MTBE on a list of contaminants that are potential candidates for regulation under the Safe Drinking Water Act. Every 5 years, EPA is required to develop a list of contaminants that may require regulation. By August 2001, the Agency must select at least five contaminants from the list and determine whether each contaminant should be regulated.

Compounds on the candidate contaminant list are categorized as regulatory determination priorities, research priorities, or occurrence priorities. Because of data gaps on MTBE health effects and occurrence, EPA placed MTBE in the category of

²³ For more USGS research information see, U.S. Geological Survey. *MTBE in the Nation's Ground Water. National Water-Quality Assessment (NAWQA) Program Results*. April 29, 1999, available at Internet website: [<http://wwwsd.cr.usgs.gov/nawqa/vocns/>].

²⁴ EPA Drinking Water Advisory, p. 2. By late 1999, 4 states had adopted health-based drinking water standards for MTBE ranging from 20-40 parts per billion (ppb) (equivalent to µg/L) to 70 ppb; California had adopted a secondary standard (based on aesthetic qualities) of 5 ppb; and 14 states had adopted guidelines or action levels ranging from 10 ppb (aesthetically-based) to 240 ppb (health-based).

contaminants for which further occurrence data collection and health effects research are priorities. Thus, while EPA is not likely to select MTBE for regulation in this 5-year cycle, the Agency is pursuing research to fill the data gaps that currently exist so that a regulatory determination may be made.

In addition, the Safe Drinking Water Act directed EPA to publish in August 1999 a regulation requiring public water systems to conduct monitoring for a list of unregulated contaminants. In the final regulation,²⁵ EPA included MTBE on the monitoring list, and public water systems will be required to monitor for MTBE beginning January 2001.

The occurrence data generated under the Unregulated Contaminant Monitoring Rule, combined with the results of ongoing health studies, are intended to provide information needed by EPA to make a regulatory determination for MTBE. Because this information is unlikely to be available in time for the first round of determinations to be made in August 2001, EPA will not be able to make a regulatory determination for MTBE before 2006. EPA requires approximately three and one-half years to promulgate a drinking water regulation; consequently, the earliest EPA is expected to have a drinking water regulation for MTBE is 2010.²⁶

Underground Storage Tank Regulation. A key EPA and state contamination prevention effort involves implementing the underground storage tank program established by the 1984 amendments to the Resource Conservation and Recovery Act (RCRA). Under this program, EPA has set operating requirements and technical standards for tank design and installation, leak detection, spill and overfill control, and tank closure. As of 1993, all tanks were required to comply with leak detection regulations. Additionally, all tanks installed before December 1988 (when standards for new tanks took effect) were required to be upgraded, replaced or closed by December 22, 1998. Federal and state regulators anticipate that as tank owners and operators comply with the new requirements, the number of petroleum and related MTBE leaks from UST systems should decline significantly.²⁷ EPA has roughly estimated that perhaps 85% of tanks were in compliance with the December 1998 requirements by the end of FY 1999.

Blue Ribbon Panel on Oxygenates in Gasoline

As part of its effort to gather information and focus research, in November 1998, EPA established an independent Blue Ribbon Panel on Oxygenates in Gasoline to

²⁵ 64 *Federal Register* 50555, September 17, 1999. The law requires monitoring by all large public water systems (serving more than 10,000 people) and requires a representative sampling of smaller systems.

²⁶ Conceivably, this schedule might be shortened. Since 1996, SDWA has authorized EPA to promulgate an interim health-based drinking water standard for any contaminant that the Administrator determines presents an urgent threat to public health (§1412(b)(1)(D)).

²⁷ This UST leak prevention program complements a federal/state program for cleaning up releases from leaking tanks. For more information on these programs, see CRS Report 97-471, *Leaking Underground Storage Tank Cleanup Issues*, February 17, 1999, 6 p.

review the broad range of issues posed by the use of MTBE and other oxygenates. The panel was established under the auspices of the Clean Air Act Advisory Committee, and its membership reflected a broad range of experts and stakeholders.²⁸

The panel was directed to perform the following tasks:

- examine the role of oxygenates in meeting the nation's goal of clean air,
- evaluate the efficiency of each of the available oxygenates in providing clean air benefits and the existence of alternatives,
- assess the behavior of oxygenates in the environment,
- review any known health effects, and
- compare the cost of production and use, and each product's availability.

The panel also was directed to study the causes of ground water and drinking water contamination from motor vehicle fuels, to explore prevention and cleanup technologies for water and soil, and to make recommendations to EPA "on how to ensure public health protection and continued improvement in both air and water quality."

In releasing its recommendations July 27, 1999, the Blue Ribbon Panel stressed that "RFG has provided substantial reductions in the emissions of a number of air pollutants from motor vehicles, most notably volatile organic compounds (precursors of ozone), carbon monoxide, and mobile-source air toxics (benzene, 1,3-butadiene, and others), in most cases resulting in emissions reductions that exceed those required by law."²⁹

Nevertheless, the panel made a number of recommendations. The panel:

- recommended that the winter oxygenated fuels program be continued;
- agreed broadly that use of MTBE should be reduced substantially (with some members supporting its complete phase out), and that Congress should act to provide clear federal and state authority to regulate and/or eliminate the use of MTBE and other gasoline additives that threaten drinking water supplies;
- recommended that Congress act to remove the current Clean Air Act requirement that 2% of RFG, by weight, consist of oxygen, in order to ensure that adequate fuel supplies can be blended in a cost-effective manner while reducing usage of MTBE;

²⁸ The MTBE Blue Ribbon Panel home page, which includes a list of panel members and their affiliations, can be found at [<http://www.epa.gov/oms/consumer/fuels/oxypanel/blueribb.htm>].

²⁹ Blue Ribbon Panel on Oxygenates in Gasoline, "Panel Calls for Action to Protect Water Quality While Retaining Benefits from National Clean Burning Gas," press release, July 27, 1999, p. 2. Available at [<http://www.epa.gov/oms/consumer/fuels/oxypanel/blueribb.htm>]. Regarding dissenting views, one member endorsed the water protection reforms but disagreed with the recommendation to limit the use of MTBE, noting that the panel had not identified any increased public health risk associated with MTBE use in gasoline; another member supported maintaining the existing oxygenate standard for the air quality benefits.

- recommended that EPA seek mechanisms to ensure that there is no loss of current air quality benefits (i.e., no backsliding); and
- recommended a comprehensive set of improvements to the nation's water protection programs, including over 20 specific actions to enhance Underground Storage Tank, Safe Drinking Water, and private well protection programs.³⁰

The panel's numerous water protection recommendations addressed prevention, treatment, and remediation. For example, the panel recommended that EPA work with Congress to determine whether aboveground petroleum storage tanks (which generally are not regulated) should be regulated; work to enhance state and local efforts to protect lakes and reservoirs that serve as drinking water supplies by restricting use of recreational water craft; and accelerate research for developing cost-effective drinking water treatment and remediation technologies.

With regard to the recommendation to reduce substantially the use of MTBE, the panel noted that accomplishing such a major change in gasoline supply without disruptions to fuel supply and price would require up to 4 years lead time if the use of MTBE were eliminated (or less if use was substantially reduced).

The panel also suggested that EPA and others should accelerate ongoing health effects and environmental behavior research of other oxygenates and gasoline components that would likely increase in use in the absence of MTBE.

EPA Administrator Carol Browner concurred with the recommendation of the Blue Ribbon Panel calling for a significant reduction in the use of MTBE. She also stated her commitment to work with Congress for "a targeted legislative solution that maintains our air quality gains and allows for the reduction of MTBE, while preserving the important role of renewable fuels like ethanol."³¹

Alternatives to MTBE

The major potential alternatives to MTBE are other oxygenates. This is so both for practical and for regulatory reasons: at present, oxygenates are required by the Clean Air Act, and, they possess several advantages, including high octane and the ability to replace toxic components of conventional gasoline.³²

³⁰ Ibid.

³¹ Statement by EPA Administrator Carol Browner on Findings by the EPA's Blue Ribbon MTBE Panel, July 26, 1999, available on the Blue Ribbon Panel home page, previously cited.

³² From the water perspective, ethanol and other alcohols have another advantage: they generally do not persist in ground water as they are readily biodegraded. U.S. Geological Survey. *MTBE in the Nation's Ground Water. National Water-Quality Assessment (NAWQA) Program Results*. April 29, 1999. See Internet website: [<http://www.wsd.cr.usgs.gov/nawqa/vocns/>].

Oxygenates that could replace MTBE include ethers, such as ethyl tertiary butyl ether (ETBE), and alcohols such as ethanol. These other oxygenates may pose health and environmental impacts, but inadequate data make it difficult to reach definite conclusions. EPA's Blue Ribbon Panel concluded:

The other ethers (e.g., ETBE, TAME, and DIPE) have been less widely used and less widely studied than MTBE. To the extent that they have been studied, they appear to have similar, but not identical, chemical and hydrogeologic characteristics. The Panel recommends accelerated study of the health effects and groundwater characteristics of these compounds before they are allowed to be placed in widespread use.³³

Ethanol and other alcohols are considered relatively innocuous on their own, but some research suggests that their presence in a gasoline plume extends the spread of benzene and other toxic constituents of gasoline through ground water.³⁴

In announcing the phase-out of MTBE in his state, March 25, 1999, California's Governor Davis required three state agencies to conduct additional research on the health and environmental impacts of ethanol, the most likely substitute. In reports approved in January 2000, the agencies concluded that if ethanol were substituted for MTBE, there would be "some benefits in terms of water contamination" and "no substantial effects on public-health impacts of air pollution."³⁵

The switch from MTBE to ethanol is not without problems, however. Ethanol costs substantially more to produce than MTBE; it poses challenges to the gasoline distribution system (it would separate from gasoline if transported long distances by pipeline, so it must be mixed with non-oxygenated gasoline blendstock close to the market in which it is to be sold); and, in the short term, it is unlikely to be available in sufficient quantity to replace MTBE nationwide.³⁶

Since late 1997, some refiners have discussed the possibility of making gasoline that meets the performance requirements for RFG without using oxygenates. Tosco and Chevron, two firms with large stakes in the California gasoline market, have alluded to this possibility, and asked for changes in the rules to allow the sale of RFG not meeting the oxygenate requirement. In October 1997, Tosco expressed concern about the growing evidence of the potential for extensive MTBE contamination in

³³ Blue Ribbon Panel Report, p. 8.

³⁴ See, for example, "Ethanol-Blended RFG May Cause Small Hike in Gasoline Plume Size," *Mobile Source Report*, December 2, 1999, p. 11, or "Experts Charge Cal/EPA Rushing Approval of Ethanol in RFG," *Inside Cal/EPA*, January 14, 2000, p. 1.

³⁵ California Air Resources Board, Water Resources Control Board, and Office of Environmental Health Hazard Assessment. *Health and Environmental Assessment of the Use of Ethanol as a Fuel Oxygenate*. Report to the California Environmental Policy Council in Response to Executive Order D-5.-99. Dec. 1999. Volume 1, Executive summary. P. 1-22. Report is available at Internet website: [<http://www-erd.llnl.gov/ethanol/>].

³⁶ For additional information on ethanol, see CRS Report RL30369, *Fuel Ethanol: Background and Public Policy Issues*.

asking the California Air Resources Board to “take decisive action” to “begin to move away from MTBE.”³⁷ Chevron, California’s largest refiner, followed suit, announcing that it “may be possible to make a cleaner burning gasoline without oxygenates, and still reduce emissions to the same extent achieved with current standards.”³⁸ The company has stated its support for legislation allowing it to stop or reduce its use of oxygenates. These statements were supported by the Western States Petroleum Association. The American Petroleum Institute now also supports legislation to remove the RFG oxygenate requirement.

Affected industries are not united in seeking authority to replace MTBE, however. The major producers of MTBE, notably ARCO, have not joined the efforts to promote alternatives, and ethanol producers and agricultural interests (most ethanol is made from corn) are concerned that removing the oxygenate requirement would negatively affect the sales of their products.

Impact of Phase 2 of the RFG Program

The consideration of alternatives to the use of MTBE has taken place at a time when the requirements for reformulated gasoline are changing. The 1990 Clean Air Act Amendments, which established the RFG program, required its implementation in two phases. Phase 1 of the program took effect January 1, 1995. Phase 2, which sets more stringent performance standards for emissions of volatile organic compounds (VOCs) and toxic air pollutants, took effect January 1, 2000.

Both phases of the program require that RFG contain 2% oxygen. As in Phase 1, Phase 2 leaves refiners free to choose which oxygenate they will use. Nevertheless, some observers, including representatives of the ethanol industry, argue that Phase 2 provides additional incentives to use MTBE, because in order to achieve the VOC reduction target specified in the statute, Phase 2 RFG will have to have a lower Reid Vapor Pressure (RVP). Gasoline blended with ethanol has a higher RVP than that blended with MTBE, unless additional costly steps are taken to reduce the RVP of the base gasoline to which the ethanol is blended. Thus, absent a change in the VOC reduction target, MTBE might more likely be used to meet the new Phase 2 requirements.

Because of statutory requirements, EPA has limited flexibility to modify the VOC reduction target; but, in response to requests from the ethanol industry and the Governors' Ethanol Coalition (a coalition of 19 governors), the Agency has agreed to provide credits toward the required VOC reductions for use of ethanol blends containing at least 3.5% oxygen by weight.³⁹ The credit proposal stems in part from

³⁷ Letter of Duane B. Bordvick, Vice President, Environmental and External Affairs, Tosco, to John D. Dunlap III, Chairman, California Air Resources Board, October 17, 1997.

³⁸ “Chevron Seeks Changes to Reformulated Gasolines,” Press Release, Chevron Corporation Public Affairs Department, December 1, 1997.

³⁹ Letter from EPA Assistant Administrator Bob Perciasepe to Thomas V. Skinner, Director, Illinois Environmental Protection Agency, September 9, 1999, attached to Testimony of Tom
(continued...)

a report from the National Academy of Sciences' National Research Council that found that in addition to lowering VOCs directly, RFG made with ethanol lowered ozone formation through its impact on carbon monoxide formation.⁴⁰

Legislation

Legislation which could affect MTBE use has been introduced in the 104th, 105th, and 106th Congresses. In the current Congress, about a dozen bills related to MTBE had been introduced as of early February 2000. Several (H.R. 11 / S. 266, H.R. 1705, H.R. 3449, S. 645, and S. 1886) would repeal the RFG program's oxygenate requirement or allow waivers. At least five bills (H.R. 1367, H.R. 1398, H.R. 1705, H.R. 3449, and S. 1037) would phase out or ban the use of MTBE in gasoline.⁴¹ Other introduced bills address specific aspects of the MTBE issue: H.R. 3536, for example, would require research and monitoring of the substance; S. 267 would direct the EPA Administrator to give priority to cleanup of petroleum contaminants in drinking water under the underground storage tank program; and S. 268 would accelerate the schedule for new emission standards for marine engines, in order to reduce the amount of fuel and MTBE emitted to surface waters.

As in previous years, two of the bills in the current Congress (H.R. 11 / S. 266) aim to change the regulatory requirements for reformulated gasoline as they pertain to California. California has unique status under Section 211(c)(4)(B) of the Clean Air Act. Because its air pollution program predated the federal program and because air quality in portions of the state has historically been worse than that anywhere else in the country, California is allowed to have separate regulations for fuels. As a result of this unique status, gasoline sold in portions of the state (Los Angeles, Sacramento, and San Diego) must meet two separate sets of requirements — state and federal. The federal requirements mandate that RFG contain at least 2% oxygen by weight (a requirement now generally met by adding MTBE to the fuel). These standards apply in areas containing about two-thirds of the state's population. California's standards, which became effective a year later than the federal, include an oxygen content

³⁹ (...continued)

Skinner, Subcommittee on Energy and Environment, Committee on Science, U.S. House of Representatives, Hearing on Reformulated Gasoline (RFG) - (Part I), September 14, 1999. The proposed rule was reported to be undergoing review at the Office of Management and Budget in late February. See "Proposal Expected to Increase Ethanol, Lower MTBE Use in Reformulated Gasoline," *Daily Environment Report*, February 24, 2000, p. AA-1.

⁴⁰ In its report reviewing the ozone-forming potential of reformulated gasoline, the National Research Council concluded that, in addition to VOCs, carbon monoxide (CO) emissions act as precursors of ozone, contributing about 20% of the overall reactivity of motor vehicle emissions. Oxygenated fuels, whether using MTBE or ethanol, reduce these CO emissions. According to the study, however, "some data indicate that exhaust emissions of CO from ... RFG blended with ethanol are somewhat lower than those of ... MTBE-blended RFG." See Committee on Ozone-Forming Potential of Reformulated Gasoline, National Research Council, *Ozone-Forming Potential of Reformulated Gasoline*, Washington, May 1999, p. 6.

⁴¹ In related action, on August 4, 1999, the Senate adopted an amendment to the FY2000 agricultural appropriations bill [S. 1233], offered by Senator Boxer, expressing the sense of the Senate that use of MTBE should be phased out.

specification “because of the oxygen requirements in the federal RFG program.”⁴² According to Cal EPA, however, “a key element of the California program is a mathematical or ‘predictive’ model that allows refiners to vary the composition of their gasoline as long as they achieve equivalent emission reductions. ... [F]or areas not subject to federal RFG requirements, refiners can use the predictive model to reduce or even eliminate the use of oxygenates,” except during the four winter months, when they are subject to separate oxygenate requirements to reduce carbon monoxide.⁴³

The complicated regulatory requirements faced by California refiners and marketers of gasoline led Representative Brian Bilbray, of San Diego, to introduce legislation to provide for more flexible federal requirements in California’s case. Similar legislation was introduced in the Senate by Senator Dianne Feinstein. The legislation (H.R. 11 / S. 266) would apply only to California, dispensing with the federal oxygen requirement, provided that the fuel continues to achieve the required reductions in emissions of toxic air pollutants and ozone-forming compounds specified elsewhere in Section 211(k). The legislation is supported by a number of oil companies, the California Air Resources Board, and the Governor of California, and it is cosponsored by 51 members of the California congressional delegation.

A hearing on H.R. 11 was held by the House Commerce Committee’s Subcommittee on Health and Environment May 6, 1999,⁴⁴ and the subcommittee approved the bill, with an amendment, September 30, 1999. The discussion during markup, however, indicated an uncertain future for the bill in its present form. Numerous amendments were offered and withdrawn without a vote, with the promise of further negotiations before the bill is brought to the full committee. Amendments offered would have broadened the bill's coverage to other states, phased out the use of MTBE, and addressed international trade issues related to the MTBE phase-out.

In part, the difficulties encountered by H.R. 11 reflect wider concerns over MTBE use. Organizations initially opposed or indifferent to legislation affecting California now favor action, but on a broader scale. These organizations include the U.S. Environmental Protection Agency (which initially opposed legislation), the American Petroleum Institute (API), and environmental interests such as the Natural Resources Defense Council (NRDC) and American Lung Association (ALA). API, NRDC, and ALA now support a set of principles adopted by the Northeast States for Coordinated Air Use Management (NESCAUM). NESCAUM represents the air pollution program directors in New York, New Jersey, and the 6 New England states. It has played a significant role in building consensus among the Northeastern states

⁴² California Environmental Protection Agency, *MTBE Briefing Paper*, p. 6.

⁴³ *Ibid.*

⁴⁴ See U.S. House of Representatives. Committee on Commerce. Subcommittee on Health and Environment. *Reformulated Gasoline*. Hearing. May 6, 1999. Serial No. 106-18. Washington. U.S. Government Printing Office. 1999. 129 p. The same subcommittee held a hearing in the 105th Congress on similar legislation (*Implementation of the Reformulated Gasoline Program in California*, April 22, 1998, Serial No. 105-94).

required to use reformulated gasoline. In a report issued in August 1999,⁴⁵ and in subsequent principles adopted by a task force of state air and water officials, NESCAUM has called for:

- repealing the two percent oxygen mandate for RFG in the Clean Air Act;
- phasing down and capping MTBE content in all gasoline;
- clarifying state and federal authority to regulate, and/or eliminate, MTBE or other oxygenates if necessary to protect public health or the environment;
- maintaining the toxic emissions reductions benefits achieved to date by the RFG program (Note: the reductions *achieved* are substantially higher than the reductions *required* by the Clean Air Act);
- promoting consistency in fuel specifications through the timely implementation of effective federal requirements; and
- providing adequate lead time for the petroleum infrastructure to insure adequate fuel supply and price stability.

While support for waiving the oxygenate requirement seems to be building among environmental groups, the petroleum industry, and states, a potential obstacle to enacting legislation lies among agricultural interests. About 6% of the nation's corn crop is used to produce the competing oxygenate, ethanol. If MTBE use is reduced or phased out, but the oxygenate requirement remains in effect, ethanol use would likely soar, increasing demand for corn. Conversely, if the oxygenate requirement is waived by EPA or by legislation, not only would MTBE use decline, but so, likely, would demand for ethanol. As a result, Members, Senators, and Governors from corn-growing states have taken a keen interest in MTBE legislation. Unless their interests are addressed, they might pose a potent obstacle to its passage.

Current Statutory Authority

Clean Air Act Authorities. Whether EPA has authority to take steps to regulate or ban MTBE use in the absence of specific congressional authorization is a question some have raised as the Agency and Congress consider their responses to MTBE contamination. The answer to that question is not a straight yes or no. EPA does have authority under Section 211(c) of the Clean Air Act to regulate fuel and fuel additives, and under Section 303 of the Act to take emergency action to protect public health, welfare, or the environment. In theory, if the Agency determined that MTBE posed what it considered a significant threat to air quality, water quality, or human health, it could take action to restrict or ban the substance without new legislative authority.

⁴⁵ See *Summary of RFG/MTBE Findings and Program Recommendations*, August 1999, available at web site [<http://www.nescaum.org/RFG/RFGPh2.shtml>]

To do so, however, would require findings that EPA is unlikely to be able to justify. Section 211(c), for example, gives the Administrator authority to regulate or prohibit the sale of fuel additives if she determines that any emission product of such additives contributes “to air pollution which may reasonably be anticipated to endanger the public health or welfare....” Since the major concern over MTBE is contamination of drinking water, this clause does not appear to provide the appropriate authority.

Section 303 provides broader authority, allowing the Administrator to seek a restraining order (and temporarily to issue such orders on her own authority) in cases where “a pollution source or combination of sources ... is presenting an imminent and substantial endangerment to public health or welfare, or the environment....” In EPA’s assessment, however, studies to date suggest that MTBE is less toxic than certain other gasoline components, such as benzene, so it might be difficult to justify a finding of imminent and substantial endangerment.

Toxic Substances Control Act Authority. One other law provides what might appear to be useful regulatory authority. Section 6 of the Toxic Substances Control Act (TSCA) allows EPA to prohibit or limit the production or distribution in commerce of a chemical substance. But to use this authority, the Agency would have to conclude that MTBE posed an unreasonable risk to health or the environment. This is a difficult standard to meet. In the 24 years since TSCA was enacted, the Agency has successfully invoked this authority against fewer than half a dozen classes of chemicals.

California Initiatives

Among the states, California has arguably been the most active in addressing MTBE issues. Actions taken by the State Legislature and the Governor have helped propel the issue to national prominence. Legislation, signed October 8, 1997, required the state to set standards for MTBE in drinking water, and required the University of California to conduct a study of the health effects of MTBE and other oxygenates and risks associated with their use. The UC report, which was issued in November 1998, recommended a gradual phase-out of MTBE from gasoline in California.⁴⁶ Based on the report and on public hearings, Governor Davis issued a finding that “on balance, there is a significant risk to the environment from using MTBE in gasoline in California,” and required the state’s Energy Commission to develop a timetable for the removal of MTBE from gasoline at the earliest possible date, but not later than December 31, 2002.⁴⁷ The Governor also required the

⁴⁶ See Keller, Arturo, et al., *Health & Environmental Assessment of MTBE*, Report to the Governor and Legislature of the State of California As Sponsored by SB 521, November 1998. Available on the web at [<http://www.tsrtp.ucdavis.edu/mtberpt/homepage.html>].

⁴⁷ Governor Gray Davis, Executive Order D-5-99. The Executive Order can be found on the Governor’s Internet site at [<http://www.ca.gov/s/governor/d599.html>]. For a news account, see “Davis Moves To Phase Out MTBE Additive: Oil Industry To Hear Governor’s Plan Today,” *San Francisco Chronicle*, March 25, 1999, p. A1. California is not the only state to consider phasing out MTBE. Faced with similar water quality concerns, Maine (which is
(continued...)

California Air Resources Board (CARB) to make a formal request to U.S. EPA for a waiver from the requirement to use oxygenates in reformulated gasoline and required three state agencies to conduct additional research on the health and environmental impacts of ethanol, the most likely substitute for MTBE.

The waiver request has resulted in months of negotiation between EPA and CARB, with EPA initially expressing skepticism that it had authority to grant a waiver under the circumstances.⁴⁸ The Clean Air Act authorizes waiver of the RFG oxygenate requirement only if the Administrator determines that oxygenates would prevent or interfere with the attainment of a National Ambient Air Quality Standard.⁴⁹ A decision on the request is not expected before summer 2000.

NAFTA Arbitration

A new MTBE issue emerged in the wake of Governor Davis' decision to phase out the use of MTBE in gasoline in California. On June 15, the Methanex Corporation, a Canadian company that produces methanol in the United States and Canada, notified the U.S. Department of State of its intent to institute an arbitration against the United States under the investor-state dispute provisions of the North American Free Trade Agreement (NAFTA), claiming that the phase-out of MTBE ordered by the Governor of California March 25, 1999 breaches U.S. NAFTA obligations regarding fair and equitable treatment and expropriation of investments, entitling the company to recover damages which it estimates at \$970 million.⁵⁰

Chapter 11, Article 1110, of the NAFTA requires the United States, Canada, and Mexico to treat each other's investors and investments in accordance with the principles set out in the Chapter. It also allows these investors to submit to arbitration a claim that a NAFTA party has breached Chapter 11 obligations and to recover damages from any such breach. The NAFTA requires the disputing investor to deliver a written notice of its intent to the NAFTA country involved at least 90 days before the claim is submitted to arbitration under the appropriate international arbitral rules. NAFTA also requires 6 months to elapse "since the events giving rise to a claim" before the investor may proceed with arbitration. Methanex stated that this period would end 6 months from the date the Governor's order was announced or September 25. Because no settlement was reached by that date, the matter proceeded to arbitration.

⁴⁷ (...continued)

not required to use RFG, but had chosen to do so) opted out of the RFG program in October 1998 and subsequently chose to substitute a low-volatility gasoline to provide similar reductions in emissions of ozone-forming compounds.

⁴⁸ See statements of Robert Perciasepe, Assistant Administrator for Air and Radiation, U.S. EPA, at the May 6, 1999 House Commerce subcommittee hearing, previously cited, pp. 47-52.

⁴⁹ The waiver language is found in Section 211(k)(2)(B).

⁵⁰ Methanol is a major component of MTBE and is Methanex's only product. The California market for MTBE reportedly accounts for roughly 6% of global demand for methanol.

Conclusion

Controversy continues to surround the use of MTBE in gasoline. Research conducted to date suggests that the air quality benefits of its use are substantial. However, increasing detections of MTBE in ground and surface water, and particularly in municipal and private drinking water wells, have raised significant concerns about the use of this oxygenate. Research on MTBE and other oxygenates is ongoing and should provide additional information to help advance the current understanding of MTBE-related health and environmental issues.

Legislation introduced in Congress initially focused on the limited issue of MTBE use in California, where federal requirements have prevented refiners from adopting a more flexible approach permitted by state regulations. Modifying the federal requirements as they pertain to California (as provided by H.R. 11 / S. 266) has substantial support among the California congressional delegation. As MTBE has been detected in drinking water wells in other parts of the country, and in surface waters in addition to underground sources, broader legislation has been introduced. These bills emerge in a context of ongoing activities aimed at reducing releases of petroleum, generally, or MTBE, specifically. The effectiveness and sufficiency of these efforts (such as the continued implementation of UST regulations and stricter emissions standards for marine engines) add complexity to the debate.

Developments in the states, particularly California and the Northeast, are now driving a reconsideration of the petroleum industry's reliance on MTBE as the principal means of meeting RFG requirements. This reconsideration, by refiners and by policy-makers at the state level, will continue to influence congressional consideration of the issue in coming months.

