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MTBE in Gasoline: Clean Air and Drinking Water Issues

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Summary

As gasoline prices have risen in March and April 2006, renewed attention has been given to methyl tertiary butyl ether (MTBE), a gasoline additive being phased out of the nation's fuel supply. Many argue that the phaseout of MTBE and its replacement by ethanol have been a major factor in driving up prices.

MTBE has been used by refiners since the late 1970s. It came into widespread use when leaded gasoline was phased out — providing an octane boost similar to that of lead, but without fouling the catalytic converters used to reduce auto emissions since the mid-1970s. MTBE has also been used to produce cleaner-burning Reformulated Gasoline (RFG), which the Clean Air Act has required in the nation's most polluted areas since 1995. The act didn't mandate the use of MTBE (ethanol or other substances could have been used to meet the act's oxygenate requirement), but price and handling characteristics of the additive led to its widespread use.

Under the Energy Policy Act of 2005 (P.L. 109-58), the RFG program's oxygen mandate terminates on May 6, 2006, and refiners are scrambling to remove MTBE from the nation's gasoline supply by that date. The phaseout of MTBE (like its use) is not required by federal law, but gasoline refiners have focused on the May 6 date because of concerns over their potential liability for its continued presence. MTBE has contaminated drinking water in a number of states, and about half have passed legislation to ban or restrict its use. Hundreds of suits have been filed to require petroleum refiners and marketers to pay for cleanup of contaminated water supplies, the cost of which has been estimated to be in the billions of dollars. The petroleum industry has maintained that it used MTBE to meet the RFG program's oxygen mandate and therefore should not be held liable. That position could become more difficult to maintain once the oxygen mandate is removed.

To replace MTBE, refiners are switching to ethanol as swiftly as they can, leading temporarily to supply shortages and higher prices. The ethanol industry maintains that there will be sufficient ethanol to meet demand but concedes that temporary shortages exist in some parts of the country that could affect prices until the end of June. These shortages and higher prices have led to renewed discussion by some of exempting gasoline refiners from liability for MTBE cleanup (a so-called "safe harbor" provision). Others have renewed their call for federal legislation to stimulate the construction of new refining capacity.

Besides removing the RFG program's oxygen requirement, Congress provided a major incentive to the production of ethanol in the Energy Policy Act of 2005. Under a Renewable Fuels Standard, an increasing amount of the nation's motor fuels must consist of renewable fuel, such as ethanol. The law requires 4.0 billion gallons in 2006 (a level already being achieved) and an increase of 700 million gallons each year through 2011, before reaching 7.5 billion gallons in 2012.

This report provides background regarding MTBE and summarizes the actions taken by states and Congress to address problems raised by MTBE contamination of the nation's water supplies. It will be updated if future developments warrant.

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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. It includes a discussion of legislation in the 109th Congress.

Under the Clean Air Act Amendments of 1990, numerous areas with poor air quality were required to add chemicals called "oxygenates" to gasoline as a means of improving combustion and reducing emissions. The act had two programs that required the use of oxygenates, but the more significant of the two was the reformulated gasoline (RFG) program, which took effect January 1, 1995.[1] Under the reformulated gasoline program, areas with "severe" or "extreme" ozone pollution (124 counties with a combined population of 73.6 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 (see **Table 1** and **Figure 1**); about 30% of the gasoline sold in the United States is RFG.

The law required that RFG contain at least 2% oxygen by weight. Refiners could 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 needed to contain 11% MTBE by volume to meet the 2% requirement.

By far the most commonly used oxygenate has been MTBE. In 1999, 87% of RFG contained MTBE. As restrictions on MTBE use took effect in California, New York, and Connecticut at the end of 2003, this number was reduced, but even with these state bans, 46% of RFG nationally contained MTBE in 2004.

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[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 has been the primary oxygenate used in winter oxygenated fuels and MTBE the primary oxygenate used in RFG, although either can be used in both fuels.

Table 1. Areas Using Reformulated Gasoline, as of February 2005

Mandatory RFG Areas[a]
Baltimore, MD
Chicago, IL (and portions of Indiana and Wisconsin)[b]
District of Columbia (and suburbs in MD and VA)
Hartford, CT
Houston, TX
Los Angeles, CA
Milwaukee, WI[b]
New York, NY (and portions of CT and NJ)
Philadelphia, PA (and portions of DE, MD, and NJ)
Sacramento, CA
San Diego, CA
San Joaquin Valley, CA
Southeast Desert, CA
Ventura County, CA
Opt-In RFG Areas[c]
Connecticut (entire state)
Dallas / Fort Worth, TX
Delaware (entire state)
Kentucky portion of Cincinnati metropolitan area
Louisville, KY
Massachusetts (entire state)
New Hampshire portion of Greater Boston
New Jersey (entire state)
New York (counties near New York City)
Rhode Island (entire state)
St. Louis, MO
Virginia (Richmond, Norfolk - Virginia Beach - Newport News)

Source: U.S. EPA.

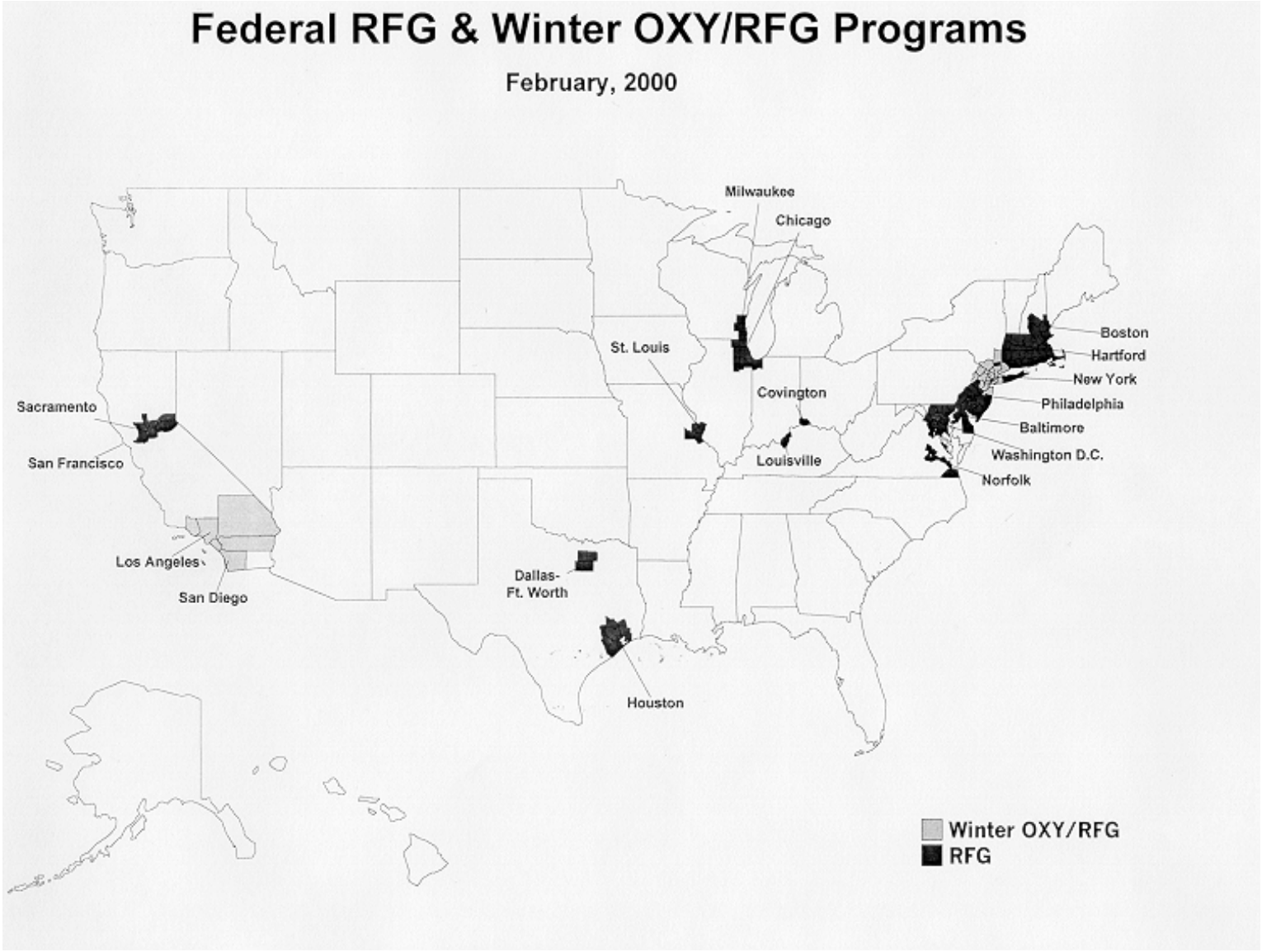
Notes:

a. RFG use required by the Clean Air Act. In addition to these areas, Atlanta, GA, and Baton Rouge, LA, are now also required to use RFG because they have been reclassified as severe ozone nonattainment areas; but implementation of the RFG requirement has been stayed in both areas pending the resolution of court challenges.

b. In the Chicago and Milwaukee areas, RFG has been made with ethanol rather than MTBE since 1995.

c. RFG use required by State Implementation Plan as a means of attaining the ozone air quality standard. These "opt-in" areas may opt out of the program by substituting other control measures achieving the necessary reductions in emissions.

Figure 1. Federal RFG & Winter OXY/RFG Programs



Also, MTBE has been used since the late 1970s in gasoline as an octane enhancer. MTBE use grew rapidly in the 1980s, as it replaced lead in gasoline and was used in premium fuels. As a result, gasoline with 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 debate. 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

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[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 [http://www.epa.gov/otaq/consumer/fuels/oxypanel/blueribb.htm].

oxygenated gasoline programs find a reduction in ambient CO concentrations of about 10%."[5]

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 based its conclusions both on 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 nine-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. After oxygenated fuels containing MTBE were introduced, residents in several cities complained of a variety of health effects from exposure to MTBE/RFG exhaust: headaches, dizziness, nausea, sore eyes, and respiratory irritation. Some complaints centered around the use of MTBE in cold weather; two of the principal areas noting complaints were 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 health effects research is being conducted by EPA, universities, and others. Under the authority of Section 211 of the Clean Air Act, EPA has requested refiners to conduct health effects studies on conventional, reformulated, and oxygenated (particularly MTBE-oxygenated) gasoline. These studies examine health effects associated with the inhalation of evaporative emissions, and several are near completion. Very little research has been done to assess the potential health risks associated with exposure to MTBE in drinking water (ingestion).

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[5] Executive Office of the President, National Science and Technology Council, *Interagency Assessment of Oxygenated Fuels*, Washington, D.C., June 1997, p. iv. Referred to hereafter as the OSTP Report. (The executive summary, recommendations, and full report are available at [http://www.ostp.gov/NSTC/html/MTBE/mtbe-top.html]). 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.

Much discussion has centered on whether MTBE has the potential to cause cancer. Although there are no studies on the carcinogenicity of MTBE in humans, EPA's Office of Research and Development (ORD) reported in 1994 that

> inhalation carcinogenicity studies in mice and rats show evidence of three types of animal tumors [testicular, liver, and kidney]. These particular studies are difficult to interpret because of some high-dose general toxicity. Nevertheless, ORD believes the inhalation carcinogenicity evidence would support placing MTBE in Group C as a "possible human carcinogen."[9]

Also, one metabolite of MTBE (formaldehyde) is considered a probable human carcinogen, and another metabolite (tertiary butyl alcohol (TBA)) induces male rat kidney tumors.[10]

Based on animal studies, 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 estimation of risk at low exposure levels.[11] The Interagency Task Force assessing oxygenated fuels concluded that the weight of the evidence supports regarding MTBE as having a carcinogenic hazard potential for humans.[12]

In 1998, the International Agency for Research on Cancer (IARC) and the U.S. National Toxicology Program determined not to list MTBE as a known human carcinogen. The IARC noted that MTBE was "not classifiable as to its carcinogenicity in humans," based on inadequate evidence in humans and limited evidence in experimental animals.[13] In 1999, California's Environmental Protection Agency determined that the MTBE carcinogenicity studies were of similar quality to studies on many other carcinogens, and established a public health goal for MTBE in drinking water based on cancer risk.[14]

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[9] U.S. Environmental Protection Agency, *Health Risk Perspectives on Fuel Oxygenates*. Office of Research and Development, EPA 600/R-94/217, December 1994, p. 8. Detailed information is available in ORD's 1993 MTBE risk assessment, *Assessment of Potential Health Risks of Gasoline Oxygenated with Methyl Tertiary Butyl Ether (MTBE)*, EPA/600/R-93/206, at [http://www.epa.gov/ncea/pdfs/mtbe/gasmtbe.pdf].

[10] U.S. Environmental Protection Agency, *Assessment of Potential Health Risks of Gasoline Oxygenated with Methyl Tertiary Butyl Ether (MTBE)*, EPA/600/R-93/206, p. 30.

[11] 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, pp. 1-2, 9-10. This and other health effects information is available at [http://epa.gov/waterscience/criteria/drinking/mtbe.html].

[12] OSTP Report, pp. 4-26.

[13] International Agency for Research on Cancer, *IARC Monographs on the Evaluation of Carcinogenic Risks to Humans and Their Supplements: Methyl tert-Butyl Ether (Group 3)*, World Health Organization, v. 73, 1999, pp. 339-340.

[14] California Environmental Protection Agency, *Public Health Goal for Methyl Tertiary Butyl Ether (MTBE) in Drinking Water*, Office of Environmental Health Hazard Assessment, March 1999, pp. 1-2.

Regarding noncancer effects, a California advisory committee determined that there was not clear scientific evidence to support listing MTBE as a toxic substance affecting human development or reproduction. In reviewing the research on cancer and noncancer effects, these groups generally noted that research gaps exist, and that the data were particularly limited on health effects associated with MTBE ingestion.

In response to the need for research to evaluate the potential health risks from exposure to MTBE and other oxygenates in drinking water, EPA in 1998 published a document that identified the most critical and immediate research needs. The document was intended to serve as a guide to planning future research; however, EPA has not pursued research to address the needs identified in this document.[15]

For practical purposes, the interpretation of any health risks associated with the addition of MTBE to gasoline could benefit from 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 replaced. 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."[16] Such a comparison might be of limited usefulness, however, given the data gaps regarding MTBE's health effects and MTBE's ability to reach water supplies more readily than conventional gasoline.

Water Quality and Drinking Water Issues

A major issue regarding the use of MTBE concerns its detection in ground water at thousands of locations nationwide, and, usually at low levels, in various municipal drinking water supplies, private wells, and reservoirs. Although MTBE has provided air quality benefits, the inclusion of MTBE in gasoline has been a growing concern as an environmental risk since the 1980s, for several reasons. Specifically, compared to other gasoline components, MTBE (1) is much more soluble in water, (2) has a lower taste and odor threshold, (3) has a higher transport rate, and (4) often requires more time to be remediated and must be treated by more complicated and expensive treatment technologies.[17] MTBE is extremely soluble and, once released, it moves through soil and into 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.

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[15] U.S. Environmental Protection Agency, *Oxygenates in Water: Critical Information and Research Needs*, Office of Research and Development, EPA/600/R-98/048, 1998.

[16] OSTP Report, p. vii.

[17] See, e.g., U.S. Environmental Protection Agency Memorandum from Beth Anderson, Test Rule Development Branch, re. *Division Director Briefing for Methyl tert-Butyl Ether (MTBE)*, April 1987, which notes that "[t]he tendency for MTBE to separate from the gasoline mixture into ground water could lead to widespread drinking water contamination."

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.[18]

The primary source of MTBE in ground water has been 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. The most significant source of MTBE in lakes and reservoirs appears to be exhaust from motorized watercraft, while smaller sources include gasoline spills, runoff, and ground water flow.[19]

Occurrence of MTBE in Drinking Water. Available information on the occurrence of MTBE in public drinking water supplies has increased substantially in recent years, but has been 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 among the states, so has the number of public water systems and private wells showing low-level detections of MTBE.

The most extensive MTBE monitoring data for drinking water are available for California, where testing for MTBE was made mandatory for most water systems in 1997. Through April 2002, some 2,957 systems had tested 9,905 sources of drinking water. MTBE was detected in 85 (0.9%) of these sources, including 54 (0.6%) of 9,234 ground water sources and 31 (4.6%) of 671 surface water sources. Overall, 53 (1.8%) of the 2,957 public water systems reported detections of MTBE in at least one of their drinking water sources, and 13 (0.4%) of the systems reported that a total of 21 (0.2%) sources of water had MTBE concentrations exceeding California's MTBE drinking water standard of 13 micrograms per liter (μg/L). As of October 2005, monitoring results had been reported for 13,620 sources. Nearly all of these results were nondetections, while 113 sources had two or more MTBE detections.[20]

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 μg/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 below 1 μg/L; the remaining 6% of samples were between 1 μg/L and 35 μg/L.[21]

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[18] Arturo Keller 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.

[19] Keller, pp. 33-34.

[20] California EPA, *MTBE in California Drinking Water*, Oct. 18, 2005. For more information, see [http://www.dhs.ca.gov/ps/ddwem/chemicals/MTBE/mtbeindex.htm]. (Micrograms per liter(μg/L) are equivalent to parts per billion (ppb) for fresh water.)

[21] Maine Department of Human Services, Department of Environmental Protection, and (continued...)

Nationwide, the data on the presence of MTBE in drinking water have been 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 tested 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 roughly 1% of detections exceeding 20 μg/L.[22]

In a study completed in 2001, the United States Geological Survey (USGS), in cooperation with EPA, assessed the occurrence of MTBE and other volatile organic compounds (VOCs) in public water supplies in 10 mid-Atlantic and northeastern states where MTBE use is common.[23] The study analyzed water from 1,194 randomly selected community water systems. The USGS reported that MTBE was detected in 8.9% of the tested water systems and was strongly associated with areas where reformulated and/or oxygenated (RFG/OXY) fuels are used. Fifteen percent of systems in RFG/OXY areas reported detecting MTBE at concentrations of 1 μg/L or more, while 3% of systems outside of RFG/OXY areas reported such detections. Most MTBE concentrations ranged from 0.5 to 5 μg/L, and less than 1% of the systems reported MTBE at levels equal to or exceeding 20 μg/L, the lower limit of EPA's drinking water advisory.[24]

A 2003 nationwide survey conducted by the American Water Works Association Research Foundation (AWWARF) reported similar results. This survey monitored sources of drinking water for 954 randomly selected community water systems (including 579 samples from groundwater-supplied systems and 375 samples from surface-water-supplied systems). MTBE was found in 8.7% of the community water system source waters, at concentrations ranging from 0.2 to 20 μg/L.[25] AWWARF also conducted a focused survey, including 451 samples collected from 134 community water systems source waters (including ground water, reservoirs,

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[21] (...continued)
Department of Conservation, *The Presence of MTBE and Other Gasoline Compounds in Maine's Drinking Water*, preliminary report, October 1998, 24 pp. (Maine was not required to use RFG, but had done so voluntarily; the state opted out of the RFG program in October 1998 because of concerns over MTBE contamination of ground water and drinking water wells.)

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

[23] For information on this 2001 study and other MTBE research at the USGS, see [http://sd.water.usgs.gov/nawqa/vocns/mtbe.html].

[24] Stephen J. Grady and George D. Casey, *MTBE and Other VOCs in Drinking Water in the Northeast and Mid-Atlantic Region*. Available at [http://sd.water.usgs.gov/nawqa/vocns/dw_12state.html]. MTBE was the second most frequently detected VOC in drinking water, after trihalomethanes (disinfection byproducts), which were detected in 45% of systems tested. Chloroform, the most frequently detected trihalomethane, was found in 39% of systems.

[25] American Water Works Association Research Foundation, *Occurrence of MTBE and VOCs in Drinking Water Sources of the United States*, 2003, p. xxiii, p. 101.

lakes, rivers, and streams) that were suspected or known to contain MTBE. The researchers found MTBE in 55.5% of the water systems.[26]

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 often. Nationally, the most comprehensive ground water research has been conducted by the 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 to 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. In all, MTBE was detected in ground water 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.[27]

MTBE has been detected most frequently in ground water associated with leaking underground storage tank (UST) sites. The California Environmental Protection Agency has estimated that, based on monitoring information available for these 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).[28] Moreover, a report by the Lawrence Livermore National Laboratory found that MTBE was not significantly degrading in the monitoring networks for these leaking UST sites.[29] The situation in other states may be similar. In a September 2000 survey of state leaking underground storage tank (LUST) programs, 31 states reported that MTBE was found in ground water at 40% or more of gasoline-contaminated sites in their states; 24 states reported MTBE at 60% to 100% of sites.[30] A 2003 update to that survey found that, averaged among the states, MTBE was found in groundwater at 60% of gasoline-contaminated sites.[31]

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[26] Ibid., p. 120.

[27] 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 [http://www.epa.gov/otaq/consumer/fuels/oxypanel/blueribb.htm#Presentations].

[28] California Environmental Protection Agency, *MTBE Briefing Paper*, p. 17.

[29] Anne Happel, 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.

[30] New England Interstate Water Pollution Control Commission (NEIWPCC), *Survey of State Experiences with MTBE Contamination at LUST Sites (August 2000).* Available at [http://www.neiwpcc.org]. The survey notes that some states began requiring testing at LUST sites in the 1980s (Maine in 1986 and Minnesota in 1987).

[31] New England Interstate Water Pollution Control Commission (NEIWPCC), *Survey of State Experiences with MTBE and Other Oxygenate Contamination at LUST Sites (August 2003)*. Available at [http://www.neiwpcc.org/Index.htm?MTBE.htm~mainFrame].

EPA's Responses to MTBE Occurrence in Water

Safe Drinking Water Act Initiatives. MTBE has not been regulated under the Safe Drinking Water Act (SDWA), but to address concerns raised by the detection of MTBE in ground water and drinking water supplies, EPA has pursued several initiatives. 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 SDWA.[32] 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 would 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.[33]

In addition, EPA has taken steps that could lead to the development of an enforceable 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. Compounds on the contaminant candidate 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 contaminants for which further occurrence data collection and health effects research are priorities. Thus, while EPA has not selected MTBE for regulation to date, the agency is pursuing research to fill the existing data gaps so that a regulatory determination may be made.

The Safe Drinking Water Act also directed EPA to publish a rule by August 1999 requiring public water systems to conduct monitoring for a list of unregulated

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[32] At least seven states have set health-based drinking water standards for MTBE ranging from 13 parts per billion (ppb) to 240 ppb. (Parts per billion are equivalent to μg/L.) At least five states have adopted a secondary standard (based on aesthetic qualities, i.e., taste and odor), ranging from 5 ppb to 70 ppb. At least 10 states have adopted drinking water advisory levels. At least 32 states have adopted a very wide range of ground water cleanup levels; some are guidelines, some are enforceable, and some vary depending on the use of ground water; some states apply these levels to ground-water cleanup at leaking underground storage tank sites where ground water is used for drinking water.

[33] EPA Drinking Water Advisory, p. 2.

contaminants that may require regulation. EPA included MTBE in this rule and directed large public water systems to begin monitoring for MTBE in January 2001.[34]

The occurrence data generated under the Unregulated Contaminant Monitoring Rule, combined with the results of ongoing health effects studies, are intended to provide information needed by EPA to make a regulatory determination for MTBE. Under SDWA, the next round of regulatory determinations will be made in 2006. EPA typically requires roughly three and one-half years to promulgate a drinking water regulation; thus, the earliest EPA would be expected to issue a drinking water regulation for MTBE is 2010.

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, corrective action, 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 these requirements, the number of petroleum and related MTBE leaks from UST systems should decline significantly. However, MTBE has been detected at thousands of leaking tank sites, and this additive is proving more difficult and costly to remediate than conventional gasoline. A key concern for states is that, as testing increases, it is likely that the number and scope of needed cleanups may increase as well. A 2003 state survey found that many sites have not been tested for MTBE, and most states do not plan to reopen previously closed Leaking Underground Storage Tank (LUST) sites to look for MTBE, although 32 states reported that MTBE plumes are often or sometimes longer than plumes from conventional gasoline leaks.[35] A key concern for community water suppliers and well owners is that fewer than half of the states are taking steps to ensure that MTBE and other oxygenates are not migrating beyond standard monitoring boundaries for LUST cleanup,[36] thus leaving an unknown number of MTBE plumes unremediated and ground water supplies at risk for future contamination.

In 1986, Congress created a federal response program for cleaning up releases from leaking petroleum USTs through the Superfund Amendments and Reauthorization Act, which amended RCRA Subtitle I. These provisions created the LUST Trust Fund and authorized EPA and states to use the fund to clean up

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[34] 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.

[35] New England Interstate Water Pollution Control Commission (NEIWPCC), *Survey of State Experiences with MTBE and Other Oxygenate Contamination at LUST Sites (August 2003)*, Executive Summary, pp. 1-2.

[36] Ibid.

underground storage tank spills and leaks in cases where tank owners or operators do not clean up sites. EPA and states use the annual trust fund appropriation primarily to oversee and enforce corrective actions performed by responsible parties. EPA and states also use fund monies to conduct corrective actions where no responsible party has been identified, where a responsible party fails to comply with a cleanup order, or in the event of an emergency, and to take cost recovery actions against parties. For FY2006, Congress provided $73 million from the LUST Trust Fund for states and EPA to administer the LUST remediation program. EPA allocates approximately 80% of the appropriated amount to the states.[37]

Since the federal underground storage tank program began, nearly 1.6 million of the roughly 2.2 million petroleum tanks subject to regulation have been closed, and, overall, the frequency of leaks from UST systems has been reduced. Through FY2005, 653,621 tanks subject to UST regulations remained in service, 452,041 releases had been confirmed, 421,924 cleanups had been initiated, and 332,799 cleanups had been completed. During FY2005, 7,421 releases were newly confirmed, compared with 8,850 in FY2004 and 12,000 in FY2003.[38]

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 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.[39] The panel:

- recommended that Congress act to remove the 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;

- 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 phaseout), 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;

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[37] For more information on the LUST program and related legislation, see CRS Report RS21201, *Leaking Underground Storage Tanks: Program Status and Issues*, by Mary Tiemann.

[38] For state-by-state information, see [http://www.epa.gov/oust/cat/camarchv.htm].

[39] A list of Blue Ribbon Panel members is provided, along with the panel report and related materials, at [http://www.epa.gov/oar/caaac/mtbe.html].

- 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.

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 above-ground 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 watercraft; and accelerate research for developing cost-effective drinking water treatment and remediation technologies.

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.

Then-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."[40]

On March 20, 2000, the former administrator announced that EPA would begin the process of issuing regulations to reduce or phase out use of MTBE. Recognizing that this process could take several years to complete, she renewed her call for congressional action to "amend the Clean Air Act to provide the authority to significantly reduce or eliminate the use of MTBE," to "ensure that air quality gains are not diminished," and to "replace the existing oxygen requirement contained in the Clean Air Act with a renewable fuel standard for all gasoline."[41]

In its few public statements on MTBE, the Bush Administration has not indicated any change in the Clinton Administration's policy, although EPA's effort to regulate MTBE using its existing authority slowed noticeably and now appear to have been terminated. Five years after EPA began the development of regulations to reduce or phase out MTBE, the agency quietly published a note in the *Federal Register* stating that its efforts to control MTBE were being "withdrawn."[42] This Administration, like the previous one, appears to have preferred a legislative solution.

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[40] Statement by former 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.

[41] U.S. Environmental Protection Agency, "Clinton-Gore Administration Acts to Eliminate MTBE, Boost Ethanol," EPA Headquarters Press Release, March 20, 2000, pp. 7-8.

[42] U.S. EPA, Semiannual Regulatory Agenda, 70 *Federal Register* 27604, Sequence Number 3106.

State Initiatives

Among the states, California has arguably been the most active in addressing MTBE issues. Actions taken by the state legislature and the governor 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 phaseout of MTBE from gasoline in California.[43] 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. (This date was amended, in March 2002, to December 31, 2003.) The governor also required the 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 resulted in months of negotiation between EPA and CARB, with EPA expressing skepticism that it had authority to grant a waiver under the circumstances.[44] More than two years later, on June 12, 2001, the agency finally denied California's request. Without a waiver, gasoline sold in ozone nonattainment areas in the state was required to contain another oxygenate once the MTBE ban took effect. During 2003, California's motor fuels gradually phased out MTBE in favor of ethanol.[45]

Following California's decision to phase out MTBE, at least 24 other states have acted to limit or phase out its use. The largest of these, New York, set a date of January 1, 2004, to ban MTBE. (**Table 2** summarizes state actions to ban MTBE.)

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[43] See Arturo Keller 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 at [http://www.tsrtp.ucdavis.edu/mtberpt/homepage.html].

[44] The Clean Air Act, in Section 211(k)(2)(B), 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. The law does not address other impacts, such as drinking water contamination.

[45] In January 2004, Governor Schwarzenegger again requested EPA to grant California a waiver from the oxygenate requirement. The governor noted that EPA's Blue Ribbon Panel concluded that a minimum oxygen content is not needed in California, and that CARB had demonstrated that the oxygen requirement is detrimental to the state's efforts to improve air quality. Governor Schwarzenegger further stated that the oxygenate requirement greatly increases fuel costs and "is no longer required to ensure substantial and sustained ethanol use in California." EPA denied Governor Schwarzenegger's request on June 2, 2005.

Table 2. State Actions Banning MTBE

State	Phaseout Date	Complete or Partial Ban?
AZ	1/1/05	Partial: no more than 0.3% (vol.) MTBE in gasoline
CA	12/31/03	Complete ban
CO	4/30/02	Complete ban
CT	1/1/04	Complete ban by 1/1/04, coordinated with NESCAUM (North East States for Coordinated Air Use Management) regional fuels task force
IL	7/24/04	Partial: may not use, sell, or manufacture MTBE as a fuel additive; may sell motor fuel containing no more than 0.5% (vol.) MTBE
IN	7/24/04	Partial: no more than 0.5% (vol.) MTBE in gasoline
IA	7/1/00	Partial: no more than trace amounts (0.5% by vol.) MTBE in motor vehicle fuel
KS	7/1/04	Partial: may not sell or deliver any motor vehicle fuel containing more than 0.5% (vol.) MTBE
KY	1/1/06	Partial: no more than trace amounts of MTBE in fuel
ME	1/1/07	Partial: no more than 0.5% (vol.) MTBE in gasoline sold
MI	6/1/03	Complete ban by 6/1/03; can be extended if determined by 6/1/02 that phaseout date is not achievable
MN	7/2/00 (partial) 7/2/05 (full)	Partial/then complete: no more than 1/3 of 1% oxygenate as of 7/2/00; complete ban as of 7/2/05. Ban also applies to ethyl tertiary butyl ether (ETBE) and tertiary amyl methyl ether (TAME)
MO	7/31/05	Partial: no more than 0.5% (vol.) MTBE in gasoline sold or stored
MT	1/1/06	Partial: no more than trace amounts in gasoline sold, stored, or dispensed
NE	7/13/00	Partial: no more than 1% (vol.) MTBE in any petroleum product
NH	1/1/07	Partial: no more than 0.5% (vol.) MTBE in gasoline sold or stored. Ban applies to other gasoline ethers and tertiary butyl alcohol (TBA)
NJ	1/1/09	Partial: no more than 0.5% (vol.) MTBE in gasoline distributed in commerce for sale in the state
NY	1/1/04	Complete ban as of 1/1/04
NC	1/1/08	Partial: no more than 0.5% (vol.) MTBE in motor fuel

State	Phaseout Date	Complete or Partial Ban?
OH	7/1/05	Partial: no more than 0.5% (vol.) MTBE in motor vehicle fuels
RI	6/1/07	Partial: no more than 0.5% (vol.) MTBE in gasoline sold, delivered, or imported. Ban also applies to other gasoline ethers, and TBA.
SD	7/1/01	Partial: no more than trace amounts (less than 0.5% vol.) resulting from commingling during storage or transfer
VT	1/1/07	Partial: no more than 0.5% (vol.) MTBE or other gasoline ethers in fuel products sold or stored
WA	1/1/04	Partial: may not be intentionally added to fuel or knowingly mixed in gasoline above 0.6% (vol.)
WI	8/1/04	Partial: no more than 0.5% (vol.) MTBE in gasoline

Source: Environmental Protection Agency, EPA 420-B-04-009, June 2004, updated July 2005 by CRS.

Alternatives to MTBE

The major potential alternatives to MTBE are other oxygenates. Oxygenates possess several advantages, including high octane and the ability to replace toxic components of conventional gasoline.

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.[46]

Ethanol and other alcohols are considered relatively innocuous on their own; they generally do not persist in ground water and are readily biodegraded. However, research suggests that the presence of ethanol in a gasoline plume can extend the spread of benzene and other toxic constituents of gasoline through ground water.[47] This is largely because ethanol is likely to be degraded preferentially by

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[46] Blue Ribbon Panel Report, p. 8.

[47] 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.

microorganisms that would otherwise feed on other chemical components of gasoline, including benzene, toluene, ethylbenzene, and xylene (BTEX).

In announcing the phaseout of MTBE in his state on 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."[48]

A more recent article, based on the California ethanol review, focused specifically on the relative risks of ground water contamination by spills of ethanol-blended gasoline, MTBE-blended gasoline, and non-RFG gasoline. The authors concluded that

> relative to risks associated with standard formulation gasoline, *there is an increase in the risk that wells will be contaminated by RFG using either MTBE or ethanol as an oxygenate* [emphasis added]. With ethanol, the risk of contaminating wells decreases after approximately five years. However, the risk continues to grow for MTBE because of the assumption that this chemical is not degraded in the subsurface. The conservative approach used in this analysis, including the low biodegradation rates and assumption that the gasoline source areas are not remediated, results in an overstatement of the risks associated with these additives to gasoline. Nevertheless, the relative trends do favor ethanol when considering risk associated with RFG spills.[49]

The switch from MTBE to ethanol is not without technical problems, as well. Ethanol costs substantially more to produce than MTBE; and it poses challenges to the gasoline distribution system (it separates 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).[50] Because most ethanol is produced in the Midwest, whereas most RFG is consumed on the East and West Coasts, transportation of ethanol to markets poses logistical problems and adds cost to any gasoline-ethanol blend.

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[48] 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, vol. 1, Executive summary, pp. 1-22. Report is available at [http://www-erd.llnl.gov/ethanol/]).

[49] Susan Powers et al., "Will Ethanol-Blended Gasoline Affect Groundwater Quality?" *Environmental Science & Technology*, American Chemical Society, January 1, 2001, p. 28A.

[50] For additional information on ethanol, see CRS Report RL33290, *Fuel Ethanol: Background and Public Policy Issues*, Brent D. Yacobucci.

Since 1997, some refiners have discussed the possibility of making gasoline that meets the performance requirements for RFG without using oxygenates.[51] However, in the absence of congressional action, this was not permitted. Now, with the enactment of the Energy Policy Act of 2005, which ends the oxygenate requirement in May 2006 and imposes a renewable fuels requirement for gasoline, refiners generally are choosing to use ethanol to replace MTBE. Temporarily, this has led to shortages of ethanol and has contributed to higher gasoline prices in March and April 2006. Ethanol producers, represented by the Renewable Fuels Association (RFA), assert that these shortages are temporary: 500 million gallons of additional annual capacity are expected online before July, 2006, according to RFA, and another 900 million gallons by the end of the year. With additional imports from Brazilian and Caribbean suppliers, reallocation of ethanol within the marketplace, and the use of ethanol stored at terminals in anticipation of the transition, RFA says, "...virtually every refiner and gasoline analyst now acknowledges there will be sufficient ethanol supplies to meet the demand created by MTBE replacement."[52]

The increased demand for ethanol has stimulated the market for corn. Nearly 13% of the nation's corn crop was used to produce ethanol in 2004, and ethanol production has grown at least 20% since then. As much as 30% of the corn crop may be dedicated to ethanol production by 2012. Federal tax credits for ethanol blending and other state and federal legislation have played key roles in promoting this growth. (For background on ethanol and a discussion of ethanol issues, including the effect of the Energy Policy Act, see CRS Report RL33290, *Fuel Ethanol: Background and Public Policy Issues*, by Brent D. Yacobucci.)

Legislation

Building on the work of earlier Congresses, the 109th Congress addressed MTBE, ethanol, and many other energy issues in H.R. 6, the comprehensive energy bill enacted in the summer of 2005. The bill passed the House April 21, 2005; a different version passed the Senate June 28, 2005.[53] Both houses — in their separate legislation — would have banned future use of MTBE in motor fuels, with some exceptions, and authorized transition assistance for MTBE producers, although the

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[51] In earlier versions of this report, we quoted Chevron and Tosco, two firms with large stakes in the California gasoline market, who asked permission to produce RFG without oxygenates in October and December 1997.

[52] Testimony of Bob Dinneen, President and CEO, Renewable Fuels Association, "The Impact of the Elimination of MTBE in Gasoline," Hearing, U.S. Senate, Committee on Environment and Public Works, March 29, 2006. Mr. Dinneen's testimony quotes the CEOs of Valero Energy, the nation's largest refiner, and ExxonMobil in support of his statement.

[53] Legislation that could affect MTBE use has been introduced in every Congress since the 104th. In the 108th Congress, both the House and Senate passed comprehensive energy bills (H.R. 6) that addressed MTBE. A conference report on the legislation (H.Rept. 108-375) was adopted by the House, November 18, 2003, on a vote of 246-180. In the Senate, however, a cloture vote on the conference report, November 21, 2003, failed to achieve the 60 votes necessary to limit debate, in large part because of the MTBE safe harbor provision contained in the conference report.

specifics of these provisions differed. The House bill would also have provided a "safe harbor" from product liability suits for MTBE producers.

Conferees on the legislation could not reach agreement on most of these provisions, so the version of H.R. 6 that emerged from conference and was signed by the President August 8, 2005 (P.L. 109-58), was stripped of many MTBE-related elements. As a result, controls on the use of MTBE and liability for cleanup of MTBE in ground water and drinking water will be left to the states and the courts respectively.

The reasons why these provisions were left out of the final version are complicated. The conferees faced time pressure as the result of a White House demand that energy legislation be delivered to the President by August 1. For that deadline to be met, the conferees needed to reach agreement on a range of issues quickly. The safe harbor and the provisions on the phaseout of MTBE, described in more detail below, were not amenable to a quick compromise. Thus, the path of least resistance was to remove them.

In the enacted version, Congress did address two issues that will affect future MTBE use. The act removes the Clean Air Act's mandate to use oxygenates (such as MTBE or ethanol) in reformulated gasoline, eliminating a major incentive for continued use of MTBE. However, the enacted bill will also require a substantial increase in the use of renewable fuels, such as the competing oxygenate, ethanol, in both conventional and reformulated gas. With ethanol use required, there will be less need for gasoline refiners to use MTBE.

Refiners began reacting to these provisions almost immediately: Valero Energy, the nation's largest petroleum refiner, announced August 2, 2005, that it will discontinue production of MTBE in May 2006, when the RFG oxygenate requirement is eliminated.[54]

The remainder of this section discusses the principal features of the House and Senate bills and how they were addressed in the enacted legislation.

Safe Harbor Provision. Perhaps the most controversial element in H.R. 6 was the House version's inclusion of a safe harbor provision protecting manufacturers and distributors of renewable fuels and fuels containing MTBE from product liability claims. The Senate bill contained a safe harbor for renewable fuels, but not for MTBE.

The effect of the House provision would have been to protect anyone in the product chain, from manufacturers to retailers, from liability for damages for contamination related to MTBE and renewable fuels, or for personal injury or property damage based on the nature of the product. The safe harbor provision would have applied retroactively to September 5, 2003, potentially barring lawsuits filed on or after that date, including those filed by the State of New Hampshire and numerous

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[54] "Valero to Quit Making Additive," MySA.com, posted August 2, 2005, [http://www.mysanantonio.com/business/stories/MYSA080305.01E.Valero.12325438.html].

cities, towns, counties, municipal water suppliers, and schools. Prior to that date, five lawsuits had been filed. After that date, more than 150 suits have been filed on behalf of some 210 communities in 15 different states.[55]

The safe harbor provision stated that the defective products liability shield would not affect the liability of a person for environmental cleanup costs, drinking water contamination, negligence for spills, or other liabilities other than liability based upon a claim of defective product. However, MTBE manufacturers and those who blend fuels would likely have been more difficult to reach under these other bases of liability.[56]

State attorneys general, local governments, and drinking water suppliers noted that providing a products liability shield would effectively leave only gas station owners liable for cleanup, and because these businesses often have very limited resources, the effect of the safe harbor provision would have been that the burden for cleanup would fall to local communities, drinking water utilities, and the states. In light of this, the Congressional Budget Office identified the safe harbor provision as an intergovernmental and private-sector mandate in its review of the House version of H.R. 6.[57] The Attorneys General for at least 14 states, including states where RFG has been heavily used, strongly opposed the MTBE safe harbor provision. Others questioned the fairness of placing the liability burden primarily on gas station owners, who were not made aware of MTBE's exceptional contamination potential.

Oil companies and other proponents of the provision argued that a safe harbor provision was reasonable, given that the fuels were used to meet the 1990 federal oxygenated fuels and reformulated gasoline mandates, and that the key problem lay

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[55] Environmental Working Group. *Like Oil and Water: As Congress Considers Legal Immunity for Oil Companies More Communities Go to Court Over MTBE Pollution*. April 2005, at [http://www.ewg.org/reports/oilandwater/execsumm.php].

[56] For a more detailed discussion, see CRS Report RS21676, *The Safe-Harbor Provision for Methyl Tertiary Butyl Ether (MTBE),* Aaron M. Flynn.

[57] Congressional Budget Office, "Cost Estimate for H.R. 6, the Energy Policy Act of 2005, as Introduced in the House of Representatives." Addressed to Honorable David Dreier, Chairman of the Committee on Rules, U.S. House of Representatives, April 19, 2005, 4 pp. This document is available at [http://www.cbo.gov/CESearch.htm]. The CBO determined that the MTBE and renewable fuels liability safe harbor "would impose both an intergovernmental and private-sector mandate as it would limit existing rights to seek compensation under current law.... Under current law, plaintiffs in existing and future cases may stand to receive significant amounts in damage awards, based, at least in part, on claims of defective product. Because section 1502 would apply to all such claims filed on or after September 5, 2003, it would affect more than 100 existing claims filed by local communities, states, and some private companies against oil companies. Individual judgments and settlements for similar lawsuits over the past several years have ranged from several million dollars to well over $100 million. Based on the size of damages already awarded and on information from industry experts, CBO anticipates that precluding existing and future claims based on defective product would reduce the size of judgments in favor of state and local governments over the next five years. CBO estimates that those reductions would exceed the threshold established in UMRA (Unfunded Mandates Relief Act) [$62 million] in at least one of those years."

not with MTBE, but with leaking underground storage tanks, which are the primary source of MTBE contamination. Even so, MTBE producers appeared to remain concerned about potential liability exposure. MTBE production and use grew rapidly during the 1980s, and several oil companies experienced some incidents of MTBE contamination of groundwater and drinking water wells before the RFG and oxy-fuel mandates. In 1984, oil company engineers estimated that, if MTBE use in gasoline became widespread, the number of well contamination incidents would triple, and treatment costs would increase by a factor of five compared to conventional gasoline incidents.[58] In 1985, Exxon engineers "recommend[ed] that from an environmental risk point of view MTBE not be considered as an additive to Exxon gasolines on a blanket basis throughout the United States."[59]

The total costs of treating MTBE contaminated drinking water are unknown, but are expected to be in the billions. Two studies by water utilities place their best estimates of the costs, given the limited data, at $25 billion[60] and $33.2 billion.[61] A study sponsored by the American Petroleum Institute estimated that the costs of MTBE cleanup for UST sites, public wells, and residential wells that are not covered by a private party, the LUST Trust Fund, state cleanup funds, or insurance, could range from $500 million to $1.5 billion.[62]

The conference did not reach agreement on the safe harbor issue. Unable to persuade Senate conferees to accept the provision without some concessions to the local governments and water utilities that might bear the cost of cleanup (in place of MTBE producers), Representatives Barton and Bass, on behalf of the House conferees, offered to establish an $11.43 billion MTBE cleanup fund, financed by the petroleum industry, states, and federal contributions over a 12-year period.[63] Lawsuits filed by a state attorney general (i.e., New Hampshire) after September 5,

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[58] Memorandum from B. J. Mickelson to V. M. Dugan, *MTBE Contamination of Ground Water*, Exxon Oil Company, August 23, 1985, presented in *South Tahoe Public Utility District v. Atlantic Richfield Co.*, Case No. 999128 (San Fran. Super. Ct. Aug. 5, 2002).

[59] Memorandum from B. J. Mickelson to Mr. J. M. E. Mixtar, *Introduction of Methyl Tertiary Butyl Ether (MTBE) in the Texas Eastern Transmission, Jacksonville, Florida; Charleston, South Carolina; and Wilmington, North Carolina Areas*, Exxon Oil Company, April 19, 1985, presented in *South Tahoe Public Utility District v. Atlantic Richfield Co.*, Case No. 999128 (San Fran. Super. Ct. Aug. 5, 2002).

[60] American Water Works Association. *A Review of Cost Estimates of MTBE Contamination of Public Wells*. June 21, 2005.

[61] Association of Metropolitan Water Agencies. *Cost Estimate to Remove MTBE Contamination from Public Drinking Water Systems in the United States*. June 20, 2005.

[62] American Petroleum Institute. *Analysis of MTBE Groundwater Cleanup Costs*. June 2005.

[63] See "Bass Presents MTBE Cleanup Plan," News, House Committee on Energy and Commerce [http://energycommerce.house.gov/108/News/07222005_1608.htm#Related], July 22, 2005. Additional detail can be found in numerous places, including "Barton, Bass Unveil MTBE Cleanup Plan; Petroleum Industry Refuses to Give Support," *Daily Environment Report*, July 25, 2005, p. A-9. The text of the proposal is available from CRS upon request.

2003, would also have been exempt from the safe harbor provision. But the offer did not pick up additional support, and the safe harbor died.

Renewable Fuels Standard. Both the House and Senate versions of H.R. 6 and the enacted version of the bill amend the Clean Air Act to establish a new requirement that an increasing amount of gasoline contain renewable fuels such as ethanol. The House bill would have required that 3.1 billion gallons of renewable fuel be used in 2005, increasing to 5.0 billion gallons by 2012. (This compares to 3.4 billion gallons actually used in 2004.) The Senate bill would have required 4.0 billion gallons in 2006, increasing to 8.0 billion in 2012. The enacted bill is closer to the Senate version, requiring 4.0 billion gallons in 2006, and an increase of 700 million gallons each year through 2011, before reaching 7.5 billion gallons in 2012.

Changes to the RFG Requirements. As noted above, the enacted bill, like the earlier House and Senate versions, repeals the RFG program's 2% oxygen requirement. This step removes a major incentive for refiners to use MTBE in their fuel. The enacted bill also contains anti-backsliding provisions: gasoline refiners and importers, with some exceptions, must maintain the reduction in emissions of air toxics that they achieved in gasoline produced or distributed during 2001 and 2002.

Phase-out of MTBE and Transition Assistance. Many of the other MTBE provisions in the House- and Senate-passed bills did not make it into the enacted version. Both House and Senate would have banned the use of MTBE in motor vehicle fuel, with exceptions — the House version by December 31, 2014; the Senate, four years after the date of enactment. The conferees dropped the ban entirely.

The House and Senate bills would also have authorized funds to assist the conversion of merchant MTBE production facilities to the production of other fuel additives ($2.0 billion in the House bill, $1.0 billion in the Senate). These provisions were also dropped by the conferees.

Leaking Underground Storage Tank Issues. Both chambers addressed the issue of MTBE leaks from underground storage tanks (USTs). Adopting provisions from the House bill, Title XV, Subtitle B, of the Energy Policy Act of 2005 comprises "The Underground Storage Tank Compliance Act" (USTCA). The USTCA amends SWDA Subtitle I to add new leak prevention and enforcement provisions to the UST regulatory program and impose new requirements on states, EPA, and tank owners. The USTCA requires EPA or states that receive funding under Subtitle I to conduct UST compliance inspections every three years. It also requires states to comply with EPA guidance prohibiting fuel delivery to ineligible tanks, develop training requirements for UST operators and individuals responsible for tank maintenance and spill response, prepare compliance reports on government-owned tanks in the state, and implement groundwater protection measures for UST manufacturers and installers. The act also requires EPA to implement a strategy to address UST releases on tribal lands.

As amended in January 2006, the USTCA authorizes the appropriation of $155 million annually for FY2006 through FY2011 from the Leaking Underground Storage Tank (LUST) Trust Fund for states to use to implement the new UST leak

prevention requirements and to administer state programs.[64] However, the Energy Policy Act's fuels tax extension language (§1362) prohibits the use of LUST Trust Fund appropriations for any new purposes. Thus, the Energy Policy Act significantly expands states' leak prevention responsibilities, while at the same time, it prohibits the use of the trust fund money by states to implement the new requirements, some of which have tight deadlines. States that receive funds under Subtitle I are required to implement these provisions.

The USTCA authorizes annually, from the Trust Fund, for FY2006 through FY2011, the appropriation of $200 million for the LUST clean-up program for petroleum tanks and another $200 million specifically for responding to tank leaks involving MTBE or other oxygenated fuel additives (e.g., ethanol). The Senate bill would have authorized a one-time appropriation of $200 million for the cleanup of MTBE and other ether fuels (but not ethanol) from USTs and other sources. (For a detailed comparison of the MTBE and ethanol provisions of the House and Senate bills with the enacted version, see CRS Report RL32865, *Renewable Fuels and MTBE: A Comparison of Selected Provisions in the Energy Policy Act of 2005*, by Brent D. Yacobucci, Mary Tiemann, James E. McCarthy, and Aaron M. Flynn.)

NAFTA Arbitration

Another MTBE issue that emerged in the wake of California's decision to phase out the use of MTBE in gasoline concerns the applicability of certain provisions in the North American Free Trade Agreement (NAFTA). 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.

In June 1999, 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 NAFTA, claiming that the phaseout of MTBE ordered by the governor of California on 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 estimated at $970 million. (Methanol is a major component of MTBE and is Methanex's only product. The California market for MTBE reportedly accounted for roughly 6% of global demand for methanol.) The 1999 Methanex claim asserted that California's phaseout was motivated by a desire to favor an MTBE competitor, ethanol, which is produced in the United States. In August 2002, an arbitration panel ordered Methanex to file a new claim more specifically relating the actions of California to the company's manufacture of

[64] Technical corrections to the Energy Policy Act were enacted in P.L. 109-168 on January 10, 2006. The single substantial correction to the USTCA was the revision of the dates authorizing appropriations for Subtitle I from FY2005-FY2009 to FY2006-FY2011.

methanol. Methanex did so, and a hearing was held in June 2004. In August 2005, a NAFTA arbitration panel dismissed the claim.[65]

Conclusion

Numerous detections in ground and surface water, and particularly in municipal and private drinking water wells, have raised significant concerns about the continued use of MTBE in gasoline. Half the states have now taken action to phase out its use, and Congress, in enacting H.R. 6, has removed the federal requirement that oxygenates (such as MTBE) be used in reformulated gasoline.

These actions may lead refiners to phase out the substance entirely. Within days of final passage of the 2005 energy bill, the nation's largest refiner, Valero, announced that it will discontinue production of MTBE. Other producers appear to be following suit.

Whether this marks the end of congressional action on MTBE remains to be seen. More than 150 suits have been filed over liability for cleanup of MTBE-contaminated water. With substantial sums of money in play, the results of this litigation will be closely watched, and may generate further pressure for congressional action.

The effects of MTBE removal on gasoline supply and price are also of concern. In mid-April 2006, gasoline prices were near record highs, and many analysts blamed the phaseout of MTBE and shortages of ethanol for a significant part of the run-up in price. Whether these factors prove transitory will bear watching

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[65] U.S. Department of State. *NAFTA Tribunal Dismisses Methanex Claim*. August 10, 2005, available at [http://www.state.gov/r/pa/prs/ps/2005/50964.htm]. See also CRS Report RL31638, *Foreign Investor Protection Under NAFTA Chapter 11*, by Robert Meltz.