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Testimony – MTBE, Ethanol and Their Impacts
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Chairman White, Chairman Musto, and members of the committee, it is my privilege to testify before you today on Methyl-tertiary-butyl-ether (MTBE), ethanol and their environmental and market impacts. As you know, some of the issues discussed in DEP Secretary Kathleen A. McGinty's testimony before the House Environmental Resources and Energy Committee on April 14, 2004 concerning a ban on the sale of the gasoline additive MTBE remain the same, however, important developments have occurred on the part of the federal government and industry in the last 18 months.

MTBE - How did it get here?

As stated in the April 14, 2004 testimony, Methyl-tertiary-butyl-ether (MTBE) is a synthetic, organic ether that has been used as a gasoline additive since 1979. It was originally added as an octane enhancer as a replacement for lead. The 1990 federal Clean Air Act Amendments (CAAA) created the federal Reformulated Gasoline (RFG) program in order to improve air quality in our nation's worst ozone nonattainment areas. In Pennsylvania, the RFG program is mandated in the five-county Philadelphia area (Bucks, Chester, Delaware, Montgomery and Philadelphia counties). These counties were originally designated as a "severe" nonattainment area for the old one-hour ozone national ambient air quality standard and are currently in "moderate" nonattainment for the new eight-hour ozone standard. Pittsburgh area also has a special fuel requirement that will be discussed later.

The RFG program requires specially formulated gasoline blends that ensure significant reductions of ground-level ozone forming pollution when it is used in our vehicles. Part of the RFG program is the requirement that the fuel contain no less than 2% by weight of oxygen. While specific oxygenates are not mandated, economics has led refiners and importers (including the owners of refiners and importers in the Northeast/Mid-Atlantic region) to use MTBE to meet the oxygen requirement. To meet the oxygen weight requirement, up to 11% of the volume of a typical gallon of RFG is comprised of MTBE.

RFG has been an important part of our overall strategy in the five-county Philadelphia area to reduce toxics and automotive exhaust emissions causing the formation of ground-level ozone. In fact, during the past ten years, as much as one-quarter of the smog-forming emission reductions from highway vehicles have come from the use of this cleaner gasoline. RFG has reduced toxic pollution from gasoline by one-third. Its use has lowered cancer risks and respiratory effects to people exposed to vehicle pollution. Experts continue to disagree about how much if any of this benefit is attributable only to the oxygenate mandate. The RFG program is administered and enforced by the federal government.

In recent years, there have been numerous incidents of substantial drinking water and groundwater contamination and high remediation costs, which led to bans of MTBE in states like California and New York. To date, 25 states have enacted MTBE bans. At very low concentrations, MTBE's turpentine-like smell and unpleasant taste are noticeable in drinking water. To attain Pennsylvania cleanup standards, MTBE concentrations in groundwater must be no more than 20 parts per billion (ppb). Compared to other components of gasoline, MTBE dissolves and spreads more readily and rapidly in groundwater, does not degrade easily, and is difficult and costly to remove. Accidental releases at dispensing sites, leaking product pipelines and leaks from underground storage tanks have forced wells to close, run up millions of dollars in cleanup costs nationally, sparked numerous lawsuits and generated significant national concern about the continued use of MTBE in gasoline.

In 2003, the United States Department of the Interior's U.S. Geological Survey, with the cooperation of PA DEP, completed a comprehensive evaluation of the extent of MTBE contamination of the Commonwealth's groundwater. The Survey found that 11% of over 350 "ambient" groundwater samples contained trace levels of MTBE and, in statewide water samples associated with leaking underground storage tanks, 22% were found to be contaminated with MTBE. Survey results for the Southeastern portion of Pennsylvania alone, where RFG is used year-round, showed that up to 21% of the "ambient" samples and 45% of leak-associated groundwater samples were impacted by MTBE. While the vast majority of the detections were well below 20 ppb, the Survey found that MTBE contamination of the Commonwealth's groundwater is not the result of exceptional occurrences, nor is it completely isolated to limited geographic areas.

MTBE contamination remediation costs have risen into the millions of dollars. One example is the Blue Bell Gulf cleanup, a site located in Whitpain Township, also in Montgomery County. In this 1998 incident, a release of approximately 13,000 gallons of gasoline from an underground storage tank system resulted in significant groundwater contamination. To date, nearly \$11 million has been spent to determine the extent of the MTBE groundwater plume, provide water to affected residents, temporarily relocate residents, and design and construct a groundwater treatment system. Years of operation and maintenance of the groundwater treatment system lie ahead, along with associated costs.

Not all of the problems occur in the Southeast. Another example of significant MTBE contamination occurred as a result of a gas station release in Lehman Township, Luzerne County. In the five-year period from 1993 to 1998, EPA expended nearly \$3 million to recover over 10 million gallons of gasoline-contaminated groundwater, provide maintenance and residential carbon filter systems and provide bottled water. The release affected about 50 residences and a school in the Lehman area. From 1998 to the present, DEP has spent approximately \$2.5 million in constructing a new groundwater treatment system, providing operation and maintenance of the treatment system, and continuing to maintain residential carbon filter units and provide bottled water.

Recent Impacts on MTBE

As mentioned earlier, 25 states have enacted MTBE laws. Some of these states (in specific areas) are required to use RFG or opted in the RFG program voluntarily. In addition to the MTBE bans, the Federal Energy Policy Act of 2005 (EPACT 05) removed the oxygen content requirement for reformulated gasoline (RFG) in section 211(k) of the Clean Air Act (CAA). This rule also removes requirements that were included in the regulations to implement and ensure compliance with the oxygen content requirement. EPACT 05 also mandates a Renewable Fuels Standard including ethanol. It is important to note that EPACT 05 did not afford the industry any defective product liability protection for their use of MTBE in gasoline. This provision allowing the unjustified escape from liability would be an unfair imposition of cost on taxpayers and was opposed strongly by the Department.

Where are we now?

Federal law requires that gasoline used by motorists nationwide have lower volatility in the summer than in the winter. This affords significant air quality benefits by reducing the emissions of ground level ozone forming chemicals. This summer period runs from June 1 to September 15 of any given year. To ensure that the only fuel sold by retail outlets on June 1 is summer fuel, federal rules allow for a transition period at terminals beginning May 1. On May 1, terminals that provide fuel to retail outlets can only offer summer fuels to their customers. This, in effect, gives retail outlets a month to sell through their winter fuels. Terminals begin receiving their summer fuels from refiners in mid to late April so that they can meet their requirement to provide only summer fuels May 1. These transition requirements are the same for any gasoline regardless of formulation. In years past, this transition has been smooth and relatively un-noticed by the consumer.

The winter to summer RFG transition for 2006, though, may be different and there are three reasons for this: repeal of the oxygenate requirement, the federal renewable fuels standard and perceptions of adverse liability due to the continued use of MTBE.

Barring any adverse comment about the actual date of the repeal of the federal RFG oxygenate requirement, on May 5, 2006, refiners will no longer be required to add 2% by weight oxygenate to RFG. This date is a few days after the May 1 federal regulatory requirement to have summertime, low-volatility fuels alone in the terminals. This does not mean that RFG is no longer legally required in the five county Philadelphia areas. Repeal of the oxygenate requirement simply means that a fuel will not “fail” if it doesn’t have 2% by weight oxygenates. RFG is still required but the nature of the formulation itself may change as refiners choose alternatives.

As stated earlier, refiners were not afforded defective product liability protection for MTBE use as part of EPACT 05. Refiners, therefore, believe that they must quickly limit or eliminate their use of MTBE in order to protect themselves from water contamination lawsuits. As MTBE is used predominately in RFG to meet the oxygenate requirement and the oxygenate requirement will be repealed, it holds that refiners may perceive it is in their best interests to remove MTBE from RFG.

The final piece is the EPCACT 05 requirements for the federal renewable fuels standard. EPA's regulations for implementing the first year of the standard require that the industry collectively use almost 4 billion gallons of ethanol. **With the voluntary removal of MTBE from RFG, refiners believe ethanol is the best alternative to replace the lost fuel and octane. Removal of MTBE creates a volume and octane deficit, which must be replaced.**

The advantages of ethanol are:

Ethanol from corn will increase octane in gasoline and reduce greenhouse gases by 10-20%. Ethanol from cellulose could cut greenhouse gases by 90% and optimistically is predicted to be carbon-neutral, or possibly even net-carbon-negative.

Ethanol is less hazardous and easier to remediate than MTBE in the event of a spill in local waterways. While ethanol is non-toxic, the scientific community indicated that more study is needed to determine its full environmental effects.

Ethanol can also be produced from low-end carbonaceous waste materials (used tires, petrowaste, waste coal, wood wastes, raw sewage, discarded corn stalks, residential waste, industrial waste and agricultural byproducts). Using waste to produce fuel has the clear benefit of a virtually free feedstock because energy is generally expended to create the product, not the waste.

As far as energy balance, according to the U.S. Department of Energy, for every one unit of energy available at the fuel pump, 1.23 units of fossil energy are used to produce gasoline, 0.74 of fossil energy are used to produce corn-based ethanol, and only 0.2 units of fossil energy are used to produce cellulosic ethanol.

While Ethanol has energy advantages there are some air quality concerns. Using ethanol at 10% volumes in RFG may have a slightly negative effect on air quality as the character of the emissions of toxic components are altered. While the emissions of air toxics such as formaldehyde can decrease, toxics such as acetaldehyde may increase. In some cases, total toxic emissions may increase. There is concern that widespread use of ethanol in RFG will reduce the significant over-compliance that has been achieved with the RFG program as a whole but federal requirements under the Mobile Source Air Toxics rule should prevent significant increases in air toxics emissions. This program establishes a refinery-specific baseline of emissions resulting from the use of their refined gasoline (RFG or conventional) based on the average of each refinery's estimated emissions from the use of their gasoline of certain toxic compounds over a three-year period (1998, 1999, and 2000). Refiners must ensure that for each subsequent year, the gasoline produced from that refinery results in emissions less than the baseline. There are some indications in California, which has a special blend of RFG, that the ethanol may cause an increase in evaporative emissions from a vehicle's fuel system due to ethanol's tendency to degrade and permeate plastic fuel hoses and seals not designed to accommodate ethanol. There are also some reports of overall increases in NOx emissions. Neither of these claims have been verified by the Department and the EPA has provided no guidance on how to effectively model the emissions from ethanol RFG blends, but we have been told that such a guidance will be made available later this year. As refiners have some flexibility in how to formulate RFG, there is no

one set “formula” and minor changes in the formulation alter the nature of the emissions. These formulas can vary, not only by refiner, but also by refinery and by each “batch” produced by a refinery. This makes emissions estimation all the more difficult. The Bureau of Air Quality is monitoring developments in the area of emissions estimation from using fuels containing ethanol.

Ethanol Supply

Though it warrants continued monitoring, based on the following figures and on Departmental conversations with sources from outside state government, it appears Pennsylvania should have sufficient supplies of ethanol to meet the increased demand this driving season. According to industry sources, Pennsylvania’s coastal port in Philadelphia also increases our flexibility in obtaining ethanol, as compared to other states that rely solely on rail and barge delivery.

According to 2002 data (the most recent available) from the U.S. Department of Energy’s Energy Information Administration (EIA), the U.S. consumed 215,000 barrels per day of MTBE (domestic supply) and 58,000 barrels a day of imported MTBE, for a total 273,000 barrels a day. That is **4.2 billion gallons of MTBE per year.**

According to EIA, U.S. ethanol producers have the capacity to produce roughly 4.3 billion gallons per year in 2006. The United States imported more than 150 million gallons of ethanol in 2005 and a greater volume is expected to be imported this year, mostly from Brazil. That would leave the **United States with about 4.5 billion gallons of ethanol capacity.**

In 2004, **Pennsylvania consumed 4.7 billion gallons of motor gasoline** (all grades; EIA), including 1.3 billion gallons of RFG. Assuming that ethanol is used to replace MTBE at a 10% volume, PA would need more than 130 million gallons of ethanol.

Pennsylvania has a **535 million gallon** per year potential for cellulosic ethanol coming from sustainably harvested, small diameter thinnings from the timber industry (these are very real numbers; not theoretical; the data was coordinated with PA Hardwoods Council).

Currently, there are several ethanol plants proposed for PA with a cumulative total of 290 million gallons per year. At least one of these proposed plants would use wood chips to produce 60 million gallons per year.

In 2004, the US used 3.43 billion gallons of ethanol-blended fuel.

DEP’s OETD staff have been and will continue to monitor ethanol prices and supply.

Immediate Challenges

In the short-term through the summer transition, these are our immediate challenges:

While ethanol has the advantage of reducing our reliance on fuels that are less clean, its use in motor gasoline (conventional or RFG) poses some challenges to the petroleum industry. When blended with gasoline it has the tendency to exhibit four effects due to its chemical nature: it

phase separates, it is corrosive to pipelines, it attracts water, and it disproportionately increases volatility of the resultant fuel when added in even small amounts to gasoline.

With phase separation, ethanol blended into a gasoline mix has the tendency to separate from the remaining gasoline constituents. In the event of separation in a storage tank, gasoline marketers have little choice but to remove all of the separated product from the tank and have it re-blended off-site. This property also limits ethanol's use in pipelines as it can attract water from the pipeline in sufficient quantities to render the batch unusable. With proper handling at all levels the effect in tanks can be minimized.

Ethanol also has an affinity for water. Storage tanks that have not had water completely removed before filling with an ethanol-blended product could sufficiently contaminate the entire batch of fuel with water. Water-laden gasoline can greatly reduce engine performance, if not stall the engine out-right and render it temporarily inoperable. Again, with proper tank and dispenser preparation, monitoring, and handling, these effects can be eliminated.

An unusual property of ethanol is that in its pure form it has a volatility (expressed as Reid Vapor Pressure or RVP) of about 2.3 pounds per square inch (psi). Summertime RFG has a higher volatility of about 6.8 psi, while summertime conventional gasoline is about 8.7 psi. Even as ethanol has a very low comparative volatility, adding small amounts (1% or more by volume) can increase the overall fuel volatility above the required limits. Refiners and gasoline blenders are afforded, under the federal regulations, an additional 1 psi RVP only if they blend ethanol into conventional gasoline at volumes of 9 to 10% by volume. Even then, refiners must make a base conventional gasoline that can accommodate the ethanol-induced RVP increase and must not blend ethanol into regular conventional gasoline. Given that ethanol can increase the overall volatility of gasoline, it would be unlikely (mostly for cost competitive reasons for the industry) that it would be blended into RVP 7.8 gasoline. RVP 7.8 is required by Pennsylvania in the Pittsburgh area during the summer months to help reduce ground-level ozone formation. The RVP 7.8 gasoline program in Pittsburgh does not allow an additional 1 psi RVP for ethanol blends, further adding to the difficulty in making an ethanol-blended RVP 7.8 fuel. Data from the Oil Price Information Service (OPIS), though, indicates that 10% ethanol blends have been and are currently available in Pittsburgh during the winter months (as in most of the rest of Pennsylvania except the Philadelphia RFG area), but this is not due to any mandates but because ethanol is available to these markets and refiners can receive federal tax credits.

To accommodate ethanol into RFG, refiners produce what is called RBOB (pronounced R-“BOB”) or Reformulated gasoline Blendstock for Oxygenate Blending. This is a fungible blendstock that in and of itself is not usable as a finished gasoline product but when splash blended with a set percentage of ethanol, makes a finished RFG. RBOB generally is refined to either a 5.7% or 10% by volume addition of ethanol and is easily transported without any ethanol (including pipelines). Terminals receive RBOB and then splash blend the ethanol they store separately onsite into trucks at the preset volume to deliver to retail outlets. Thus a terminal that would deliver 1 million barrels of finished RFG blended from a 10% ethanol RBOB would require the ability to store roughly 900,000 barrels of RBOB and 100,000 barrels of ethanol. This would require a terminal to establish dedicated tankage for storing ethanol and the capability to

handle the blending of the final product. Given ethanol's corrosiveness and affinity for water, this requires some additional capital investment and special handling.

Department staff has been in touch with the New York State Energy Research & Development Authority (NYSERDA) staff to talk about their transition to ethanol last spring. NYSEDA staff indicated legislation enacting an MTBE ban allowed the industry four years to prepare for a transition. The staff indicated that they did not receive any calls from the terminals indicating that they had any supply issues. They did indicate that they would bear some costs to build the infrastructure however; most of the ethanol could be barged in since most of their RFG areas exist along waterways. Additionally, the NY Department of Environmental Quality helped expedite any necessary permit requirements, such as tank permitting. The NYSEDA staff indicated that this year's ethanol transition could be different because more states are transitioning at the same time. Additionally, NY does not use as much RFG as PA. Connecticut also went through the transition and their RFG usage was also minimal. So the two states were not "competing" with other states for ethanol compared to what is occurring now. The NYSEDA also indicated they did not see the price spikes because the transition occurred prior to the start of the large crude oil price spikes. Overall, the NYSEDA staff indicated that the transition from MTBE to ethanol went smoothly.

According to several sources, (OPIS, American Petroleum Institute [API], terminal surveys), all the major refineries are confident they have enough ethanol supply and that the terminals and retail stations are preparing to receive product.

Conclusion

In conclusion, with this convergence of influences during winter/summer transition (the RFG oxygenate repeal, the EPACT 05 renewable fuels standard, the perception of increased MTBE liability, and the properties of ethanol), the industry has responded. By choosing to eliminate MTBE from RFG and replace the lost volume and octane with ethanol during the 2006 transition, refiners will likely accomplish a number of goals.

Significantly reduce or eliminate any new MTBE liability,
Help ensure collective compliance with the federal renewable fuels standard, and
Minimize operational impacts by having a single, ethanol RBOB derived RFG fuel blend through out the summer.

Given the industry has voluntarily chosen ethanol in place of MTBE, a ban on MTBE would most likely have a minimal affect in the long run. OPIS speculated there may be some companies that chose to use MTBE to gain a market advantage and a ban would prevent any future MTBE product in the state. The most immediate concerns are the terminals' and retailers' preparation of the necessary infrastructure to receive product. Supply and prices will need to be monitored closely.

Again, I would like to thank you Chairman White, Chairman Musto, and members of this committee for the opportunity to present this information to you today. I would be happy to answer any questions at this time.