

Forum on Ethanol Blending in Gasoline in the Northeast and Mid Atlantic

June 27, 2000

Forum Report

Overview and Purpose

This Forum Report is intended to provide a summary and outline of key issues that were explored in the “Forum on Ethanol Blending in Gasoline in the Northeast and Mid Atlantic,” which took place on June 27, 2000 in Manchester, New Hampshire. The Forum Report provides an overview of key discussion topics communicated by each speaker. It concludes with a discussion of issues requiring further attention, areas of potential consensus, and likely next steps for policy-makers in Northeast and Mid Atlantic States.

The Forum consisted of separate panels on the following three topics:

- 1) The Role of Gasoline Blended with Ethanol in the Environment
- 2) The Infrastructure and Cost Implications of Increased Ethanol Blending
- 3) The Potential for a “Homegrown” Ethanol Industry in the Northeast

The Forum was hosted by a variety of regional stakeholders, including the CONEG Policy Research Center, Inc., Northeast States for Coordinated Air Use Management, New Hampshire Governor’s Office of Energy and Community Services, New England Interstate Water Pollution Control Commission, and U.S. Department of Energy’s Northeast Regional Biomass Program.

The Forum can be viewed as a timely response to the ongoing legislative and regulatory debate over the future of the federal reformulated gasoline (RFG) program instituted under the 1990 Clean Air Act Amendments. In the wake of the discovery of the gasoline additive MTBE in the nation’s water resources, uncertainty surrounds the future of the RFG program. One alternative to MTBE is ethanol, a biodegradable, domestically produced renewable fuel that provides many of the same air quality benefits of MTBE when added to gasoline. However, although ethanol appears to be a safer, environmentally preferable alternative to MTBE, environmental and economic issues associated with its use in gasoline still merit consideration.

The potential use of ethanol in Northeast gasoline also gives rise to a number of issues specific to the Northeast and Mid Atlantic states. For instance, the U.S. ethanol supply presently is produced almost entirely from corn, with key production centers located primarily in the corn-belt of the Midwest. Use of ethanol in the Northeast will therefore require shipping ethanol over long distances via barge, rail, or truck. Dedicated pipelines do not exist. Efficient and economical use of ethanol in the Northeast region will require development of a new regional ethanol infrastructure, capable of both producing and transporting the fuel in significant quantities. Over the long-term, production capability would likely be met through the use of cellulosic biomass ethanol technology, an evolving technology that enables the production of ethanol from biomass wastes, including agricultural, wood, and municipal solid waste.

As state, regional, and federal policy makers debate the future role of ethanol blending in gasoline, fostering an understanding of key issues among decision-makers in the Northeast is a critical first step. The purpose of the Forum and this Forum Report is therefore to inform key state and regional policy

makers about the potential role of ethanol in gasoline and related issues, as they endeavor to develop a regional solution to this complex debate.

A total of 20 speakers/moderators, representing a diverse collection of private, not for profit, and public interests, participated in the Forum. The event was attended by approximately 80 individuals, mostly representing various branches of state governments in the Northeast and Mid Atlantic states. The Forum concluded with a moderated roundtable discussion involving panelists as well as Forum attendees.

Forum Welcome

Jack Ruderman, Assistant Director for Energy Policy, New Hampshire Governor's Office of Energy and Community Services

In his welcome address to Forum attendees, Mr. Ruderman highlighted the timeliness of the Forum and the direct relevance of the topic of biomass ethanol to the state of New Hampshire. After noting the nation's skyrocketing gas prices and ethanol's recent rise from obscurity to front page news, Mr. Ruderman extolled the potential benefits that ethanol could bring to New Hampshire and the Northeast as a whole. He pointed out the potential for cellulosic ethanol to provide a market for the state's burgeoning low grade wood waste, a result of the potential closure of the state's six biomass energy plants. He referred to cellulosic ethanol as a homegrown renewable resource that could reduce greenhouse gas emissions and provide a win-win solution for the region, given adequate technology, economical feedstock, and sufficient demand in the Northeast. Mr. Ruderman asked attendees to use the Forum as a means to become informed about the potential for ethanol blending in the Northeast, and concluded by noting that a federal Renewable Fuel Standard could provide economic benefits to the Northeast and Mid Atlantic states.

John Ferrell, Director, Office of Fuels Development¹, Energy Efficiency and Renewable Energy, Department of Energy

In his welcome address, Mr. Ferrell began by providing participants with an overview of the research and development focus and goals of the Department of Energy (DOE). As described by Mr. Ferrell, the DOE has focused its R & D program on meeting certain specific cost goals with regard to cellulosic ethanol production. Key goals include:

- The demonstration of competitive costs in the oxygenate market using low cost biomass by 2002; the validation of fermentation technology for energy crops by 2005;
- The development and demonstration of technologies capable of producing ethanol at an average cost of \$1.02 per gallon by 2010; and
- The nationwide production of 2.2 billion gallons of cellulosic ethanol by 2010.

To meet these goals, the DOE has focused attention on feedstock development and conversion research, as well as leveraging partnerships to build commercial demonstration facilities.

Mr. Ferrell went on to discuss the challenges of the DOE program, program progress, and issues of concern. Regarding the former, Mr. Ferrell identified technology process guarantees, the need for ethanol markets, the necessity of feedstock contracts, and site agreements as critical to obtaining project financing. He suggested that recent events, including the President's Executive Order and bi-partisan interest in Congress, have finally made the time ripe for development of cellulosic ethanol production.

¹ The Office of Fuels Development is the Department of Energy office that provided funds to the Northeast Regional Biomass Program to conduct this workshop.

He went on to describe key areas of concern with regard to ethanol, including MTBE phase out, rising oil prices, and supply of and access to ethanol. He described these challenges in the context of the Northeast states, and concluded with a description of the day's panel topics.

Panel One, "The Role of Gasoline Blended with Ethanol in the Environment"

Moderator: **Kent Finemore**, Air Resources Division of the NH Department of Environmental Services

Mr. Finemore introduced the panelists and the panel topic by noting the potential for ethanol growth in the Northeast U.S., the growing interest of Northeast states in a renewable fuel standard, and the need to form a cooperative coalition of ethanol interests in the Northeast in order to address salient issues.

Panelists:

Marika Tatsutani, Senior Policy Analyst, NESCAUM

"The Role of Ethanol in the Northeast"

Ms. Tatsutani began by clarifying the role of the Northeast States for Coordinated Air Use Management (NESCAUM) in the MTBE/RFG debate and by outlining NESCAUM's goal of finding a federal solution to the current problem. She summarized NESCAUM's principles as follows:

- Preserve RFG benefits while addressing water quality concerns
 - Waive 2% oxygenate requirement.
 - Substantially curtail/eliminate the use of MTBE as an additive.
 - Enhance RFG performance standards to fully maintain actual benefits of the existing program regarding VOC, NO_x, CO, and toxic emissions.
 - Promote consistency in fuel specifications through timely implementation of federal requirements.
 - Provide enough lead time to ensure adequate fuel supply and price stability.

She noted that although the principles do not explicitly say anything about ethanol, for political and other substantive reasons, "ethanol will and should be part of the solution."

Ms. Tatsutani went on to highlight NESCAUM's primary concerns with ethanol use, including summertime VOC emissions (commingling), increased acetaldehyde emissions, increased direct and indirect NO_x emissions², and the subsidy issue. She also highlighted NESCAUM's perceived benefits of ethanol, including its ability to reduce air toxics, climate change benefits (especially cellulosic), potential for developing an indigenous resource base, reduced oil dependence, and economic benefits to farmers.

Ms. Tatsutani proceeded to discuss the aforementioned benefits and concerns in greater detail. After summarizing key elements of Senator Smith's (R- NH) latest legislative proposal for a Clean Alternative Fuels Program, she concluded by noting the need for expedient Congressional action, a future role for ethanol predicated on its strengths, and flexibility in any market mandates.

² Indirect NO_x emissions are the result of having to ship ethanol via fossil fuel powered trucks and barges due to the present lack of dedicated ethanol pipelines.

Questions for Ms. Tatsutani

What is the basis for NESCAUM's finding that ethanol cannot be shipped via pipeline?

I believe it is due to its affinity for water.

(Another audience member noted that a 100 mile test had successfully been completed by the industry).

S. Trivikrama Rao, Assistant Commissioner for Science and Technology, New York State Department of Environmental Conservation; and Professor of Environmental Statistics and Research Professor of Atmospheric Science, University of Albany, State University of New York

"Overview of National Research Council Report: Ozone-Forming Potential of Reformulated Gasoline"

Dr. Rao's discussion summarized the key findings of the National Research Council's Report on the "Ozone-Forming Potential of Reformulated Gasoline." As outlined by Dr. Rao, the report focused on the use of oxygenates in RFG, with specific attention given to MTBE and ethanol.

Key findings, as communicated by Dr. Rao, include the following:

- Overall emissions of ozone precursors from vehicles have substantially decreased in recent decades. If projections are correct, the potential impact of using RFG on near-ground ozone will decrease with time. Air quality models suggest the RFG program reduces ozone by a few percent, although it is difficult to attribute the trend to the use of RFG.
- The committee found no compelling scientific reasons to recommend that fuel certification under the RFG program be evaluated on the basis of the reactivity of the emission components.
- Tests and studies indicate that RFG can cause a decrease in vehicle exhaust and evaporative emissions.
- The use of oxygenates in RFG has little impact on improving ozone air quality and has disadvantages. For instance, the decrease in mass VOC and CO exhaust (and their combined reactivity) that can be attributed to oxygenates is quite small. Oxygenates may lead to higher NO_x emissions. The greatest advantage of oxygenates in RFG appears to be displacement of some air toxics.
- Reactivity of exhaust emissions from vehicles using ethanol-blended RFG appears to be lower, but not significantly lower, than MTBE-blended RFG, with data showing that only CO emissions are somewhat lower for ethanol-blended RFG.
- Evaporative emissions, based on mass and reactivity, were significantly higher for vehicles using ethanol-blended RFG relative to MTBE-blended RFG. The higher emissions were attributable to a higher RVP (1.0 psi); this higher reactivity outweighs the small decrease in reactivity of exhaust emissions. Based on this finding, it appears likely that the use of ethanol-blended RFG with RVP that is 1.0 psi higher than other RFG blends would be detrimental to air quality in terms of ozone. (It is worth noting that there was considerable objection to this point from a number of attendees. The key point of contention is that the study's consideration of ethanol-blended RFG with RVP that is 1.0 psi higher than other RFG blends is inconsistent with actual RFG standards, and is actually an illegal gasoline.)
- An atmospheric measurement program is needed to assess the impact of Phase II RFG on precursor emissions from on and off-road vehicles, as well as their ozone-forming potentials.

Mike Scheible (via telephone), Deputy Executive Director, California Air Resources Board

Mr. Scheible spoke to Forum participants about the following key issues:

- He noted that MTBE use in California will be banned as of 2002 and that the state is now pursuing a waiver from the oxygenate requirement. U.S. EPA is now evaluating this request.
- California has modified its reformulated gasoline rules to ensure no loss in air quality benefits. Among these modifications are lowering the RVP of gasoline from 7.0 to 6.9, lowering maximum allowable benzene content from 1.0% to 0.8%, and reducing sulfur content from 40 to 20 ppm.
- Mr. Scheible offered an explanation of California's policies toward and expectations for ethanol use. In summary, the California Air Resources Board's (CARB) models show benefits and disadvantages that would result from the use of ethanol in RFG. To compensate, refiners must use a low RVP base gasoline stock. Additionally, to compensate for NOx impacts from adding oxygenates to gasoline, sulfur (or other components) must be decreased.
- California analyses of the environmental threats of ethanol regarding air quality, water quality, and health risks concluded that no significant adverse impacts on air, water, or soil would be expected from a change to ethanol so long as air modeling accounts for the different properties of ethanol. Analysis of the water impacts of ethanol use did show the potential for some threats, though these were perceived as minimal relative to MTBE.
- Outstanding issues that California is now studying include: the potential of a carbon monoxide credit for oxygen blends greater than 2.0%; the impacts of ethanol on permeation, a potential concern in older vehicles; and the effects of commingling different fuel formulations on increased RVP and NOx. The present CARB model has built in a small buffer for commingling, although it may not be sufficient.

Ron White, Assistant Vice President for National Policy, American Lung Association

"Ethanol, Gasoline And Air Quality: The American Lung Association's Perspective"

Mr. White's presentation described the potential air quality benefits and problems associated with the use of ethanol in gasoline. Mr. White began by describing the American Lung Association (ALA) as oxygenate neutral, with a focus on air quality performance standards. He went on to describe the benefits of ethanol, including CO benefits, its ability to provide clean octane (no aromatics, low sulfur), and its use in RFG to help meet toxics and sulfur gasoline limits. He then described a number of air quality concerns with ethanol, including the Blue Ribbon Panel's finding that Midwest cities that use ethanol-blended RFG had lower toxic air emissions reductions than Northeast cities that use MTBE-blended RFG. Mr. White reported that ALA was also concerned with the increased volatility and ozone precursors associated with ethanol use. Other ALA concerns included: ethanol's increased NOx tailpipe emissions; the potential for permeation to increase evaporative emissions; the effects of commingling; and the impacts of increased acetaldehyde and ambient PAN emissions, especially on sensitive populations.³

Mr. White concluded his presentation with the following comments:

- MTBE phase down will lead to increased ethanol use. It's not a question of "if," but of "how much more." A renewable fuel standard would result in even more ethanol use.

³ An audience member pointed out here that a study by CARB found that PAN would not increase significantly as a result of the use of ethanol in gasoline. Mike Scheible from CARB confirmed this assertion, although Marika Tatsutani from NESCAUM emphasized that CARB's results were based on California meteorological conditions. Ron White said the issue required further study.

- Regarding air emissions, the impacts of increased ethanol use on evaporative emissions, carbon monoxide, and NOx require further quantification. Increases in air toxics, ozone, and particulate matter from increased ethanol use must be offset. Meanwhile, the 1.0 psi RVP waiver should be eliminated for non-RFG and ozone non-attainment areas.
- An accelerated national study needs to be conducted to assess the ambient air health effects of the use of ethanol.

Questions for Mr. White

ALA has extensively studied air issues related to the use of ethanol. Does ALA have similar concerns if non-oxygenate alternatives are used in gasoline?

We have similar concerns with a number of different components.

Are you concerned about other high volatility components?

Yes, that's why we focus on performance.

Bob Judge from U.S. EPA Region 1 brought up the topic of the RVP waiver. He noted that presently there is no RVP waiver for RFG, but that there is a performance standard. With ethanol a base stock fuel with lower RVP is necessary, but the final ethanol RFG must comply with the RVP limit. Assuming this is the case, the overall difference between MTBE and ethanol is negligible. Marika Tatsutani noted that this was true except for commingling, and that there is a 1.0 psi waiver for non-RFG. Kent Fenimore added that if ethanol was used everywhere, there would be no concerns about commingling.

Susan Powers, Associate Professor, Department of Civil and Environmental Engineering, Clarkson University

"Subsurface Fate of Ethanol as a Gasoline Oxygenate"

Dr. Powers's presentation on the subsurface fate of ethanol as a gasoline oxygenate examined the impact of a switch to ethanol-blended gasoline on water quality. As described by Dr. Powers, there is no doubt that gasoline with ethanol, or ethanol itself, will migrate into the subsurface following a spill. But, ethanol itself is very biodegradable, so it is not expected to migrate far from a spill site. However, the presence of ethanol in the subsurface can affect the migration of other more hazardous chemicals. Several transport and fate processes could be affected by the presence of ethanol. These include: 1) increasing the effective solubility of BTEX and other toxic gasoline compounds, 2) depleting electron acceptors necessary for biodegradation of other gasoline contaminants, thereby reducing the potential for natural attenuation, and 3) altering the bulk fluid properties of gasoline allowing the gasoline pool to spread further in the presence of ethanol.

Dr. Powers highlighted research results and critical questions to consider related to the significance of the co-solvency effect, the speed of ethanol degradation, and the net effect of the presence of ethanol on plumes. Key findings include the following:

- In the case of ethanol-gasoline blends, the resulting impacts on BTEX concentration are minimal. However, in a case where pure ethanol is spilled into a gasoline-contaminated aquifer, the effects may be more severe. Field research is necessary to quantify this effect.

- Ethanol leaches rapidly from a gasoline pool to groundwater. In the presence of ethanol, BTEX biodegradation will be delayed resulting in longer plumes. Research studies show that ranges are 25-33% farther (for ethanol-gasoline blends).
- Overall, ethanol will have much less impact on wells than MTBE.

Due to considerable uncertainties, Dr. Powers recommends further research to help fit all the pieces together. Further research should include life cycle analysis of ethanol in gasoline, seek to gain a greater understanding of degradation rates of ethanol and BTEX, further examine processes that affect ethanol-blended gasoline and pure ethanol in the unsaturated zone, and involve the identification of sites for field studies to support modeling assumptions.

John Courtis, Principal, Daedalus LLC, Environmental Management and Consulting

"An Overview of the Issues Involved with Ethanol Blending in Reformulated Gasoline"

Mr. Courtis provided a summary of key benefits and concerns associated with the use of ethanol-blended gasoline. As outlined by Mr. Courtis, key benefits include emissions reductions (CO and exhaust hydrocarbons), dilution impacts of ethanol, greenhouse gas emission reductions, and other environmental benefits, such as reduced solid waste disposal, associated with cellulosic ethanol. Concerns outlined by Mr. Courtis include increased evaporative hydrocarbon emissions, emissions from commingling, emissions from permeation, higher NOx exhaust emissions, increased toxics emissions (acetaldehyde, others), and water quality issues.

Mr. Courtis described weighing the advantages and disadvantages as a balancing act, also dependent upon fleet composition, fuel and vehicle standards, regional environmental needs, and the outcome of ongoing and future research efforts.

Panel One Discussion

An audience member asked what secondary NOx emissions from ethanol use (referred to by Marika Tatsutani in her presentation) were based on?

Kent Finemore noted that these were a result of having to transport ethanol via barge or rail in the absence of pipelines. Marika Tatsutani cited the Argonne report⁴ and noted no differences in tailpipe emissions for ethanol versus MTBE. S.T. Rao noted that at 2% oxygen there are no differences in NOx tailpipe emissions for ethanol versus MTBE, but this was not necessarily true for higher oxygen levels. An audience member noted that this was an area of disagreement - some data show that there are no NOx increases with ethanol up to 3.5%. Another audience member pointed out that non-road sources will be important, and even more so as standards move beyond Tier II.

An audience member asked Susan Powers if she knew of any field studies of gasohol plumes. She answered no -- because ethanol is not regulated it has not been studied. Another audience member noted that the University of Nebraska is beginning to study this topic. Susan Powers noted that there is a site at Lake Tahoe that California will study. The site consists of complex fractured bedrock.

An audience member asked Ron White to comment on the fact that a commingling effect is also observed with non-ethanol RFG blends. Ron White said the bottom line is that we are talking about a massive change.

⁴ Argonne National Laboratory, Center for Transportation Research, U.S. Department of Energy (1999). "Effects of Fuel Ethanol Use on Fuel-Cycle Energy and Greenhouse Gas Emissions." Argonne, IL. January.

An audience member asked S.T. Rao about the NRC conclusions, noting that if there is indeed very little ozone benefit from using oxygenated gas, why don't we use conventional gas. S.T. Rao replied that we are required to by the Clean Air Act.

Panel Two, "The Infrastructure and Cost Implications of Increased Ethanol Blending"

Moderator: **Jim Brooks**, Director of Air Quality, Maine Department of Environmental Protection

Mr. Brooks introduced the panel and panelists by acknowledging the importance of developing a long-term solution to the MTBE problem in the Northeast. He stressed the importance of a regional solution and the need to avoid the development of boutique gasoline markets. He noted that there are a lot of questions concerning the environmental impacts of each alternative additive, but stressed that there is equal interest in the infrastructure needs and costs of using ethanol.

Panelists:

Barry McNutt, U.S. Department of Energy, Office of Policy

"Gasoline Manufacturing, Supply and Logistics Implications of using Ethanol in RFG II"

Mr. McNutt began his discussion by expressing his disappointment in the small amount of new information that he had heard thus far at the Forum (exclusive of Susan Power's presentation). He asked the audience if anyone had been paying attention to gasoline prices for the last year and a half. He then criticized the Northeast for taking a "hold me harmless" policy towards ethanol. For example, he noted that some panelists expressed support for ethanol use, except during the summer. He translated this sentiment into, "how can we have the benefits of ethanol, without being burdened by any of its problems?" According to Mr. McNutt, this lack of commitment is inconsistent with developing an ethanol market and local ethanol industry. He then stressed that an air quality and public health debate should consider other public benefits. Mr. McNutt added that removing MTBE from gasoline will increase imports, increase greenhouse gas emissions, and increase the cost of manufacturing gasoline (even if ethanol is added to gasoline).

Mr. McNutt went on to highlight several points concerning the nation's gasoline market:

- *National Gasoline Market and RFG II* --- U.S. refining capacity is not increasing as fast as U.S. demand for gasoline. In addition, there are lower product inventories across the board. These factors are contributing to increased dependence on imports and hard to access domestic inventories. The Northeast and Midwest are not supply sufficient and these factors contribute to increased volatility in the price of gasoline.
- *Cost of Manufacturing RFG II*--- U.S. DOE analysis has focused on average refining cost (not marginal costs). This is why forecasts and estimates are off-base. In tight supply markets, marginal cost is a much more relevant indicator than average cost.
- *Logistical Limitations* --- The Midwest is critically dependent on one pipeline. The Northeast has access to European markets. For instance, the Northeast has 6-day access to Rotterdam; Chicago has 20-day access to the Gulf if pipeline capacity is available. This creates a volatile supply situation. If the Northeast uses ethanol, a pipeline will be built.
- *Supply Sources and Competition* --- There are six independent suppliers in Chicago. Who knows if there is non-competitive behavior in the region. But, ensuring adequate supply and competition is very important.

Mr. McNutt expressed that none of the four issues are unmanageable as individual problems, but together they create an unattractive situation. He went on to say that RFG II is different from RFG I, and that the pricing model will look different for RFG II. For example, he noted that Chicago is faced with limited access to fuel supply and already needs to use significant amounts of alkylates to make base gasoline for blending with ethanol. He added that the marginal cost of a barrel for RFG II is about the cost of a barrel of alkylates, and concluded that under this situation, blending ethanol actually brings the overall cost down, and increases the overall fungible fuel supply.

Questions for Mr. McNutt

What if there is not an oxygenate requirement?

Ethanol will still be used. It extends the fuel supply, and overall it looks like the economics will favor making low RVP gasoline to blend with ethanol as long as the marginal cost of RFG II is the cost of a barrel of alkylates.

If the Northeast takes MTBE out of gasoline, can it still access the European Market?

The Northeast will be able to access European base capacity market, however, it will probably not be able to access the European swing market.

Ron Miller, President, Williams BioEnergy and Chair, Renewable Fuels Association

“Increased Ethanol Use in the Northeast”

Mr. Miller initiated his discussion with an overview of the goods and services that Williams BioEnergy provides. He noted that Williams is the nation’s second largest ethanol producer (but number one in the hearts of its customers). Mr. Miller specified that Williams BioEnergy has two plants, both of which are ISO 9002 certified, and that the plants command about 15% of the U.S. ethanol market.

Focusing on cost and infrastructure issues, Mr. Miller noted that ethanol has been and could be transported by water vessels, tank cars, trucks, and even pipeline. He also added that motorists have driven over a trillion miles on ethanol fuel. Additionally, compared to MTBE which was priced at \$1.63 per gallon in NY Harbor, ethanol costs about \$.81 in the Midwest (tax credit included). He estimated that it would cost about \$.10 to \$.12 per gallon to transport ethanol to the Northeast.

Mr. Miller cited reports by AUS Consultants and the USDA that demonstrate the potential for the ethanol industry to replace MTBE with ethanol. He pointed out that the U.S. EPA determined that ethanol demand in the Northeast would be about 677 million gallons per year when MTBE is phased out. He explained the robust nature of ethanol industry competition by noting that ADM has been steadily losing market share. Presently there are 47 ethanol plants with 30 different owners. There is great potential for biomass ethanol technology to increase competition as well, for example by creating a local ethanol industry in the Northeast. He also mentioned that there is far less consolidation in the ethanol industry than in the petroleum or MTBE industries.

In conclusion, Mr. Miller stated that vehicle compatibility and performance issues related to ethanol have all but vanished, and added that several Northeast refiners are already seasonally blending ethanol. He pointed out that ethanol will be used in the Northeast, ethanol will be supplied and shipped at reasonable cost, and that Williams will be a leader in this market. (A representative from Buckeye Pipeline also acknowledged that neat ethanol could be shipped via pipeline and that if a significant market for ethanol

develops in the Northeast that existing and new infrastructure could be used to ship ethanol from the Midwest and around the region.)

Questions for Mr. Miller

Why not ship ethanol to Gulf and blend it there?

Ethanol will mostly be shipped via pipeline as neat ethanol and spot blended because this avoids water affinity and pipe diameter issues associated with the lines from the Gulf to the Northeast.

Have you looked at transporting it via ship to Brunswick?

That would be feasible.

Do you have any projects planned in the Northeast?

Right now, we are discussing a project with Lacrosse that would use brewery waste to make ethanol?

What is the impact of increased ethanol use on the food supply?

Ethanol production uses about 5 percent of corn production. Plus, ethanol production only uses the starch components of ethanol. Fat and fiber go back into the food chain.

Andy Paymer (via telephone), Director of Product Supply, Procurement Division, Getty Petroleum Marketing, Inc.

Mr. Paymer was joined on the telephone by Paul Dinardi, Getty's Director of Terminal Operations. Mr. Paymer said that Getty has been using ethanol for ten years during non-VOC periods. He added that this required work on infrastructure, but nothing uneconomical. According to Mr. Paymer, Getty currently blends a total of over 40 million gallons of ethanol each year in Rhode Island, New York, New Hampshire, and New Jersey. He then opened up to questions.

Questions for Mr. Paymer

Are renewable fuels part of Getty's overall fuel strategy?

Yes, Getty will continue to use ethanol during the non-VOC seasons. Right now, we have a problem getting low RVP gasoline for blending with ethanol during the summer. We need a .5 psi RVP waiver in order to make it economical for us to use ethanol during the summer. Our discussions with refiners reveal that at present time, the manufacture of low RVP gasoline would throw off the production yields of other refinery products. At this time none of the refiners want to commit to that type of program.

What if other retailers ask for low RVP gasoline?

This might change the economics. (Barry McNutt added that Northeast refiners would be able to respond to the market, if it created sufficient demand for low RVP gasoline.)

David Layton, Health and Ecological Assessment Division Leader, Lawrence Livermore National Laboratory

“Use of Ethanol as a Fuel Oxygenate in Reformulated Gasoline: A California Analysis”

Mr. Layton stated that Task 10 of California Governor Gray Davis's Executive Order to remove MTBE required an analysis of the environmental transport and fate of ethanol in air, surface water, and groundwater, as well as a health-risk assessment on ethanol.

He noted that the study investigated three mechanisms by which ethanol could contaminate surface waters in California: 1) rainout of ethanol from the atmosphere; 2) discharges to lakes from watercraft; and 3) accidental discharges to surface water during ethanol transport.

He stated that as part of the studies California's Office of Environmental Health Hazard Assessment (OEHHA) which was responsible for the analysis of the potential health risks of ethanol developed a draft Health Protective Concentration for ethanol in drinking water of 1100 mg/L. He stressed that the concentration for MTBE is dramatically lower at 0.013 mg/L.

According to Mr. Layton, the study found that biodegradation rates of ethanol released to surface waters will vary according to water temperature, oxygen content, levels of ethanol-metabolizing microorganisms, adaptation periods, etc. He added that levels of ethanol contamination found in models will not significantly impact health. He also noted that while a recent ethanol spill in Tennessee killed a number of fish, the ethanol biodegraded rapidly; the same spill of MTBE and other gasoline would also kill large numbers of fish but would require significant clean-up. In general, he stressed that there is a lot of data on ethanol, and that regulation should be established to show that the levels in which it is likely to be found in the environment will not pose any significant danger to public health.

Switching the discussion to alkylates, Mr. Layton said that alkylates are already present in gasoline, but their concentrations will increase during the phase out of MTBE. At a minimum they are needed for octane. He added that alkylates are not very soluble in water, which might make them easier to clean-up. But, in conclusion Mr. Layton recommended increased research on the biodegradation potential of alkylates and toxic impacts of increasing the use of alkylates.

Questions for Mr. Layton

If alkylates are already present in gasoline, how much of an increase will be necessary to make up the octane boost?

Alkylate use would increase from about 12 percent to 28 percent of gasoline.

Panel Two Discussion

During the Panel Two Discussion, Barry McNutt responded to Andy Paymer's concerns about the lack of low RVP gasoline in the Northeast. Mr. McNutt reported that he had had extensive conversations with six refiners in the Midwest that are making RFG II gasoline with ethanol. He reported that each refiner made a sizeable capital investment in order to make RFG II with ethanol (about \$1 to \$10 million). Modifications included adjustments to their splitters and reformers to enable them to make low RVP components. In addition, he added that even low capability refiners could make the adjustments required to make RFG II with ethanol. In conclusion, he has no doubt that Northeast refiners and retailers could make the adjustments required to make RFG II with ethanol, if the demand is there.

Panel Three, "Potential for a "Homegrown" Ethanol Industry in the Northeast"

Moderator: Chris Carroll, Maine Department of Community and Economic Development

After brief mention of his small ethanol factory in Northern Maine, Mr. Carroll introduced the panelists.

Panelists:

Todd Sneller, Nebraska Ethanol Board

After providing an overview of different types of ethanol production technologies and the feedstock employed by each, Mr. Sneller used the remainder of his presentation to examine existing and proposed federal and state public policy initiatives, and their potential impacts on the ethanol industry. He emphasized the need for Northeast states, in their consideration of public policies to aid the industry, to evaluate both whether to use ethanol and how to attract developers. A first step will be to determine the primary goals of incentives -- for instance, should they encourage the use of ethanol, the production of ethanol, or both? Mr. Sneller also discussed some of the pros and cons of state policies for encouraging ethanol use. For example, he pointed out that while state incentives provide a local option for encouraging ethanol use consistent with a state's economic goals, state incentives can actually create competition among states. This could potentially have negative repercussions.

Regarding federal policies, Mr. Sneller underscored the importance of the oxygenate standard in promoting significant ethanol growth in the Midwest. Similar national and state level public policy mechanisms, such as excise tax investments, directives to public entities to maintain alternative fuel fleets, tax credits, equity investments, and bonds will prove instrumental in encouraging ethanol production and development of a stable industry in the Northeast.

Colin High, Vice President and Co-Founder, Resource Systems Group, Inc.

"Ethanol Production, Economic and Community Impacts, Incentives and the Development of an Ethanol Industry in the Northeastern States"

Dr. High is presently working with CONEG to study the economic impacts of ethanol production in Northeast States. His presentation conveyed his preliminary findings and conclusions to Forum attendees. Key findings include the following:

- Ethanol production in Northeast states provides significant, positive economic benefits at the state level.
- Economic benefits are greatest when ethanol production is viable without state financial support. In general, the greater the state or local subsidy needed, the lower the net economic benefit.
- The economic impacts of ethanol production are site and feedstock specific and also depend on the form of any subsidy.
- Economic impacts need to be analyzed on a project basis. Analysis of projects currently being developed in the Northeast U.S. shows that many of these are "niche" projects which will take advantage of locally favorable situations.

It is important to note that Dr. High stressed the fact that economic impact analyses should consider relative economic impacts, including the displacement of other activities. In addition, the results of economic impact analyses are also dependent on the area being considered.

John Sheehan, National Renewable Energy Laboratory

“Bioethanol: A Technology Prospectus”

Mr. Sheehan's presentation summarized the present status of bioethanol technology and the National Renewable Energy Laboratory's (NREL) vision for the future direction for research and development. He began by discussing the benefits of ethanol in terms of its sustainability relative to fossil fuels. Noting increasing demand for foreign oil and limited supplies, Mr. Sheehan stressed the renewable and life cycle benefits of ethanol fuel. For example, E95 produced from biomass waste has been shown to provide 4.0 units of fuel energy for every unit of fossil fuel consumed in its life cycle; this compares to 0.8 units for RFG. Regarding CO₂ benefits, Mr. Sheehan noted that E95 emits approximately 91% less CO₂ than RFG and that E10 emits 5.1% less CO₂ than gasoline.

Mr. Sheehan proceeded to make some observations about the marketplace, primarily noting the relative advantage of ethanol due to widespread uncertainties associated with the future price of oil. As we look ahead to the future, feedstock availability should continue to grow, with the evolution of dedicated energy crops. For now, agricultural waste is by far the most abundant feedstock source.

Mr. Sheehan concluded his presentation with a discussion of present and emerging bioethanol technologies and their potential impacts on the cost of ethanol. Present bioethanol manufacturing technologies consist of concentrated acid and 2-stage diluted acid techniques; these technologies have been around for many years. Even more promising are enzymatic technologies that NREL is currently developing. The use of enzymatic technology will help to significantly reduce the costs of cellulosic ethanol production in the future, with costs potentially reaching \$1 per gallon of ethanol (unsubsidized) by 2005. NREL models that project cellulosic ethanol market growth according to different scenarios show that if the present ethanol tax subsidy is taken away, the industry will grow initially (until 2007 when the subsidy ends), then fall off. He concluded that a more optimal scenario for cellulosic ethanol growth is a gradual leveling off of the incentive over time.

Tom Koehler, Celilo Group

Mr. Koehler concluded Panel Three with a discussion of how the Northeast could begin to pull all the necessary pieces together. He identified four key policy goals necessary for the emergence of a Northeast biomass ethanol industry:

- *Demand* -- Without demand, production facilities will not be built. The oxygenate standard has provided the demand necessary to stimulate development in the Midwest. If a renewable fuel standard is to be the choice of policy-makers, it needs to be structured to ensure that demand exists in the Northeast region.
- *Certainty* -- Certainty is fundamental to obtaining the investor capital necessary to develop any new industry. This is particularly true for new technologies, as in the case of the cellulosic ethanol industry. One current legislative proposal would have ethanol competing with other clean cars for fuel credits. This is an example of an uncertainty that may deter potential investors.
- *Supportive Regulatory Environment* -- The ability of ethanol production and use to become widespread in the Northeast U.S. depends upon the existence of a supportive regulatory environment. There is not one ethanol issue that cannot be addressed within a regulatory framework. For instance, ethanol can be used in the summer, but requires sub-RVP gas for doing so.
- *Patience and Perseverance* -- The Midwest has taken twenty years to reach its present level of production and use. Similarly, the Northeast region cannot expect changes to happen overnight. Patience and perseverance are therefore critical.

Roundtable Discussion

Moderator: Robert Post, President, Research Technology Associates

The Roundtable Discussion provided Forum attendees and Panelists with an opportunity to discuss, clarify, and explore potential areas of consensus on issues critical to the development of cellulosic ethanol production and markets in Northeast states. By way of introduction to the Roundtable, Mr. Post invited participants to try to answer the questions: Where do we go from here? and What can be done cooperatively? The following provides a description of major issues that were raised in the roundtable discussion, and any agreed upon next steps or potential areas of consensus that arose from the discussion.

1. Feedstock Availability in the Northeast

Feedstock availability for biomass ethanol production in the Northeast was identified as a critical factor in the potential development of production facilities. Rick Handley noted that in 1994 CONEG conducted a study of likely Northeast feedstock. The study found that feedstocks are both time and location dependent, with availability highly dependent on cost. The study found that economic considerations aside, there is enough waste feedstock in the Northeast to produce 1.5 to 1.8 billion gallons of ethanol annually. If dedicated energy crops are included, up to 4.0 billion gallons may be available. Although no comprehensive regional inventory of feedstock has been compiled, the CONEG study shows that a significant supply does exist.

An audience member pointed out that New York State recently completed an inventory of feedstock for ligno-cellulosic and corn ethanol.

2. Transportability of Ethanol via Pipeline

The feasibility of transporting ethanol via pipeline is an important consideration for Northeast ethanol stakeholders. A representative from Buckeye Pipeline addressed this issue. According to Buckeye, neat ethanol can be shipped via pipeline. This has been proven by Brazil Petrogas, which has been transporting ethanol via pipeline for 20 years. They have not transported ethanol blends. However, Buckeye has run test shipments of ethanol blends. The test showed that by the third shipment, the ethanol was sufficiently uncontaminated; no long term unsolvable problems were evident.

According to Buckeye, a number of reports have asserted it will not be possible to transport ethanol blends over long distances. However, Buckeye anticipates that pipelines will be able to transport neat ethanol over long distances via pipeline given adequate demand, investment, time, and planning.

An audience member asked if existing pipelines in the Northeast could be used for ethanol, or if they would have to be built. According to the Buckeye representative, the answer depends on the specific location. In most areas where pipelines need to be built, permits should be attainable. Regarding costs, Buckeye added that pipeline is the most efficient and economical way to transport ethanol.

Based on this discussion, it appears that it will be feasible to ship ethanol via pipeline in the Northeast. However, it may require the use of dedicated ethanol pipelines, many of which will have to be constructed. As a result, at least initially, ethanol will have to be transported via truck, barge, or rail.

3. Local Siting Issues

Kent Fenimore asked attendees to address the potential for local siting issues to arise, noting potential problems with odor and waste handling. A number of participants responded, citing various evidence showing that odor has not presented a serious problem for developers. Ron Miller suggested that odor depends on the particular technology; Williams technology has minimal odor associated with its ethanol production processes. Additionally, relative to an oil refinery, a typical ethanol plant has virtually no odor. Colin High noted that odor concerns are no different than those associated with any medium to large industrial facility. Chris Carroll noted an example where the smell from a facility was entering a town. As a solution, a taller stack was built. Todd Sneller warned participants that because plants tend to be near people, permitting can take time. Lead time for permitting is a large part of project development. He also suggested that working with existing infrastructure makes sense when possible.

Based on this discussion, it seems that ethanol developers should not have significant problems siting ethanol facilities, although allowing adequate lead time for the siting process will help to increase the chance of success.

4. Commingling

The commingling discussion surfaced in response to a question about the degree to which commingling has been a concern in the Midwest. Todd Sneller responded that while commingling concerns have not been addressed or studied in the Midwest, ethanol is used fairly uniformly in the Midwest so commingling is not of significant concern. Ron White added that commingling studies should include areas that employ non-ethanol strategies, and emphasized the importance of looking at all potential RFG scenarios. Another participant pointed out that twelve years ago U.S. EPA conducted a study on commingling and found that in a worst- case scenario, an approximate 0.2 to 0.3 psi increase in RVP would result. CARB is now conducting a study of the effects of commingling. Barry McNutt suggested that since commingling is primarily a fringe issue, expanding the RFG area in the Northeast may be one potential solution.

No consensus was reached on the potential impact that commingling may have on NO_x and VOC emissions. A study currently being conducted by CARB may help to clarify this issue.

5. Refiner Issues

Hayes Gahagan of Gahagan and Associates in Maine noted the critical importance of addressing refiner issues related to ethanol blending. Presently, for economic reasons associated with the high cost of low RVP base gasoline, Getty is able to blend ethanol only in non-summer months. Without a regulatory framework that enables use of ethanol blends year round, refineries will not be able to purchase ethanol on a year-round basis. This will prove detrimental to ethanol developers, who will have trouble financing plants that are unable to operate throughout the year. In response, one participant noted the importance of developing the E85 market in the Northeast to help provide a high volume market for developers. He also stressed the importance of a systemic approach – for instance, rather than talk about the problems of increased acetaldehyde emissions from ethanol, why not challenge engineers to design a new catalytic converter that solves the problem.

6. Value of a Field Study on Ethanol Fate and Transport

An individual from the Maine Department of Environmental Protection expressed his state's interest in conducting a field study involving a controlled ethanol spill into a gasoline-contaminated aquifer.

He expressed a desire to work with NESCAUM and other Northeast states that may be interested. Todd Sneller suggested contacting the National Water Research Institute in Sacramento, California. Susan Powers emphasized the importance of such a field study, due to ethanol's rapid degradation. She noted a huge gap in data describing what takes place immediately following a spill.

7. Public Policy Options for Creating Markets for Ethanol

Barry McNutt stressed that ethanol should be treated as a solution, and thus far it was being treated as if it were the problem. In response, Marika Tatsutani pointed out that NESCAUM is not saying that the issues at hand are ethanol show-stoppers. But, they are still issues, and therefore warrant specific types of policies. She cautioned attendees against instituting, for instance, unjustified market mandates. Such mandates could actually result in a backlash effect against the ethanol industry if potential problems are not addressed in a proactive manner.

8. Need for a Coalition of Northeast Policy-makers and/or Working Groups to Study Ethanol Issues in the Northeast

John Ferrell asked participants to discuss the questions: Where should efforts to promote ethanol-blended gasoline in the Northeast begin? What markets will be easiest to penetrate? New York? Maine? These questions prompted participants to ask if there was a single regional organization in the Northeast that could oversee and facilitate a Northeast ethanol working group and associated issues. CONEG was suggested as one possibility. Rick Handley clarified the role of CONEG, noting that it is an organization of governors, and its activities are controlled by a Board of Directors. CONEG's next move will be based on what the states want them to do. CONEG is prepared to sponsor a follow-up to this Forum. Additionally, CONEG will be writing a briefing paper for governors to help them understand key issues.

Sonia Hamel, Massachusetts Executive Office of Environmental Affairs, communicated her intention to figure out a way to coordinate ethanol issues among Massachusetts environmental offices, such as Air and Water. She also suggested that CONEG may be one group capable of leading a Northeast-based ethanol working group, but there may also be others. Several audience members went on to stress the importance of looking at ethanol in a systemic way, characterized by interagency discussions involving energy, environmental, agriculture, and economic development offices. John Ferrell noted that this was the approach taken in California.

Based on this discussion, it appears that participants are very interested in continuing to evolve a dialogue on key issues. They are potentially interested in having one group oversee this process for the Northeast, although it is not clear what group should take this responsibility. CONEG is one possibility. Importantly, they would like to involve as wide a group of government agencies as possible in the process.