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ALTERNATIVE TRANSPORTATION FUEL ADDITIVES

HEARING

BEFORE THE

SUBCOMMITTEE ON
ENERGY AND AGRICULTURAL TAXATION

OF THE

COMMITTEE ON FINANCE
UNITED STATES SENATE

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ALTERNATIVE TRANSPORTATION FUEL ADDITIVES

WEDNESDAY, SEPTEMBER 29, 1993

U.S. SENATE,
SUBCOMMITTEE ON ENERGY AND
AGRICULTURAL TAXATION,
COMMITTEE ON FINANCE,
Washington, DC.

The hearing was convened, pursuant to notice, at 2:30 p.m., in room SD–215, Dirksen Senate Office Building, Hon. Thomas A. Daschle (chairman of the subcommittee) presiding.

Also present: Senator Rockefeller.

[The press release announcing the hearing follows:]

[Press Release No. H–35, September 27, 1993]

FINANCE SUBCOMMITTEE ON ENERGY TO HOLD HEARING ON ALTERNATIVE TRANSPORTATION FUEL ADDITIVES

WASHINGTON, DC—Senator Tom Daschle (D–SD), Chairman of the Finance Committee's Subcommittee on Energy and Agricultural Taxation, announced today that the Subcommittee will hold a hearing on transportation fuel additives.

The hearing will begin at *2:30 p.m. on Wednesday, September 29, 1993,* in room SD–215 of the Dirksen Senate Office Building.

The Subcommittee will focus on environmental and energy issues associated with two transportation fuel additives, ethanol and methanol, and their respective ether derivatives, ETBE and MTBE. In subsequent hearings, the Subcommittee plans to examine the appropriate tax structure for these and other transportation fuels, including fuel substitutes such as propane and natural gas.

Regarding Wednesday's hearing, Subcommittee Chairman Daschle said, "The tax debate between ethanol and methanol proponents has been characterized by numerous conflicting representations about the environmental and energy aspects of producing and using these two additives and their ether derivatives. Only by resolving these issues can we move forward on the broader question of what changes are needed, if any, in the current structure of tax incentives for these alternative fuels."

OPENING STATEMENT OF HON. THOMAS A. DASCHLE, A U.S. SENATOR FROM SOUTH DAKOTA, CHAIRMAN OF THE SUBCOMMITTEE

Senator DASCHLE. The hearing will come to order. Let me thank all of those in attendance this afternoon, especially the witnesses, who in some cases have come a long distance. Many have been involved in the development of the nation's reformulated gasoline program, and I appreciate their willingness to discuss issues of mutual concern and interest today.

As important as the free market is to the American economy, it does not address all of our Nation's needs. It does not achieve all of the objectives of a thoughtful and progressive society. Important national objectives can be promoted by refining existing Federal

programs, by enacting new legislation, and through appropriate use of the Tax Code.

These are tools available to democratic governments to ensure that our children are educated, that our environment is protected, and that our citizens are housed, clothed, cared for and employed.

Last week President Clinton announced his plan for providing every American access to health care, emphasizing the health and cost benefits of taking preventative measures. Efforts to control air pollution, such as the reformulated gasoline program, improve public health and thus contribute to reducing our Nation's health cost burden.

The reformulated gasoline program, established in the 1990 Clean Air Act Amendments, represents an important step toward improving air quality and bringing some of our dirtiest cities into compliance with Federal air pollution standards.

I am hopeful that this effort, which will lower urban ozone levels and help control the release of toxic chemicals, will help reduce rates of respiratory disease and cancer.

The reformulated gasoline program will be implemented beginning in 1995 in the nine areas of the nation suffering the most from ozone pollution. Other areas can opt into the program if they so choose. Under the program, cleaner fuel made by removing many of the toxic chemicals from base gasoline and replacing them with clean oxygenates must be sold in participating areas.

Sadly, both the RFG program and the oxygenated fuels program have come under attack lately, and questions have been raised about when and how the RFG program will be implemented. The American Petroleum Institute has been trying to convince States not to opt into the RFG program. Rather, API would have States choose a different route, one that would have fewer air quality benefits.

Just last week the Senate accepted an amendment to the VA/HUD appropriations bill which would allow States to opt out of the oxygenated fuels program under certain conditions. This seemingly minor amendment, which was adopted with little debate, could have far-reaching ramifications; and I expect, certainly hope, it will be revisited in the conference.

The ceaseless bickering over the ultimate shape of the RFG program has also contributed to uncertainty and served to undermine support for this precedent-setting policy initiative. If this Nation is truly intent on seriously addressing our air pollution problems, then we must bridge existing differences and move ahead to implement a strong and workable RFG program.

If successfully implemented, the RFG program has the potential to reduce air pollution, reduce our dependence on foreign imports and petroleum and create domestic jobs. The question that we as a nation must ask as we stand on the threshold of this exciting new opportunity is how to ensure that the full potential of this program is realized.

This hearing is the first in a series of three hearings designed to answer that question as well as questions about appropriate structure of tax incentives for an array of alternative fuels.

Today we intend to explore the advantages and disadvantages of using two oxygenates—ethyl tertiary butyl ether known as ETBE;

and methanol tertiary butyl ether, known as MTBE; and the roles they could play in cleaning our Nation's air, improving our health, and creating American jobs.

The second hearing in this series will be held later this fall and will examine the current tax provisions that relate to oxygenates. The third hearing will explore the tax treatment of gasoline for diesel fuel replacements, including neat ethanol and methanol, compressed natural gas, and biodiesel fuel.

Of course, it is no secret that I have been a strong proponent of ETBE in the debate. I would point out that at least one of our witnesses, Mr. Ray Lewis, of the American Methanol Institute, was invited expressly to make statements he wishes about the merits of methanol and MTBE.

MTBE is a well-known and widely-used commodity. ETBE, on the other hand, is a relative newcomer with great potential. It is my hope that this hearing among others will correct some misimpressions about this newer fuel.

As the chart before you indicates, to my right, ETBE as a fuel additive, results in fuel with high octane, substantial toxic dilution, and low evaporative characteristics.

Secondly, ethanol-enhanced ETBE is an efficient fuel, both in terms of net energy balance and cost to the government. This point is further illustrated by two additional charts that we have today.

Once again, I would like to thank our witnesses for coming. I invite them to comment on these and other points relative to the topic under consideration today. I understand that Senator Kerrey, who is scheduled to be our first witness, is not here yet, and as a result I think we will proceed with our lead out-of-town witness, a person whom I have known for some time and have admired greatly for his leadership on many issues, including this one—Hon. Leo McCarthy, the Lieutenant Governor of the State of California.

Governor McCarthy, if you will come to the table, we will take your testimony at this time.

Again, let me express on behalf of the committee and the Senate our appreciation to you for your efforts in this area in the past, your leadership, and the valuable insights that we know you will share with us this afternoon.

STATEMENT OF HON. LEO McCARTHY, LIEUTENANT GOVERNOR, STATE OF CALIFORNIA, SACRAMENTO, CA

Lt. Gov. MCCARTHY. Thank you, Mr. Chairman, not only for inviting me to speak here today but for the foresight you have personally shown in initiating discussions on linking Federal energy policy to job creation goals.

I represent a State that would love to link every Federal policy to job creation. We are 3 years into a bitter recession, a multi-dip plight other regions of America experienced in the early and mid-1980s. The latest figures show that California has 1.5 million people unemployed, roughly around 9.9 percent, way above the national average.

Since July 1990, California has lost approximately 600,000 jobs. The unemployment rates in the Los Angeles, Riverside and San Bernardino Counties, home to about 12 million and hard hit most recently by base closures, are 9.5 percent, 15.7 percent, 11.7 per-

cent, respectively. Half of our 58 counties have an excess of 12 percent unemployment.

According to Governor Pete Wilson's Office of Planning and Research, California stands to lose about 200,000 jobs directly and indirectly and $7 billion in personal income because of base closures proposed and ratified under the Reagan, Bush and Clinton Administrations.

California has suffered a hemorrhage of high-skilled, high-paying manufacturing jobs, jobs that help shape and sustain an enormous middle class whose purchasing power in large part drove this Nation's economy for decades. During these tough times, leaders out in California understand, we have to sweat for every job we try to keep or create.

In the just-ended legislative session in Sacramento, a number of things were achieved that brought about great improvements in the workers' compensation reform area. We passed a unitary tax relief bill that some foreign investors were complaining bitterly about. We supported a creation of a 6 percent investment tax credit for manufacturing equipment purchases, and we passed a 50 percent reduction in capital gains taxes for a great number of small businesses.

As chairman of the California Commission for Economic Development, I try to look at every possible angle to create jobs by helping businesses and industries start and succeed. I just took a group of California medical equipment and heavy machinery manufacturers to China to help them start or expand export opportunities in that market.

I have led seminars to help businesses take advantage of the investment opportunities which were provided by Congress and the last President when he signed the Immigration Act of 1990. We published guides trying to help small businesses through red tape, help them avoid common pitfalls. I have been working with local, State and Federal officials in community economic development groups to facilitate the commercialization of military bases targeted in the 1988 round, 1991 round and this year's round of closure announcements.

My job also includes keeping an eye out for new industries that can be part of the mix of private, State and Federal actions needed to bring California out of what is now 3 years, plus another quarter, of this deep recession that we are in.

Mr. Chairman, to me an exciting prospect is the creation of a domestic oxygenated fuels industry. One reason for our interest, as some economists have suggested, is that funds invested in a domestic oxygenated fuels industry appear to have particularly high job-creation value because they replace dollars that would otherwise be merely exported offshore and unavailable for investment in California and in other States.

As you are very aware of, Mr. Chairman, the reformulated gasoline program mandated under the Clean Air Act amendments of 1990 will establish a national demand for oxygenates that could exceed 7 billion gallons per year by the end of the decade.

The California Energy Commission estimates the California market for oxygenates will reach 1.7 billion gallons annually by the end

of this decade. The jobs generated by this huge American market for oxygenates should be filled by American workers.

Without delving into other testimony that you will receive this afternoon that will be covered by others, clean fuels make sense, both environmentally—in California, certainly with our air pollution problems—and economically. Also, we have seen in the past the perils of relying upon imported fuel sources.

Though our hopes for increased stability in the Middle East are high, prudence suggests that our economic security and our energy security are best served by domestic production. California would be one perfect home for the oxygenated fuels industry. We have a trained and talented work force. We have a tremendous refining capability, one able to equal the more than 14 billion gallons of gasoline we consume each year.

Many of the military bases to be closed are adjacent to the State's established refining centers and attendant infrastructure. My office, with corroboration from the California Energy Commission, estimates it would take four facilities to produce 850 million gallons per year of oxygenates, a realistic target of 50 percent of our oxygenated fuels need in the year 2000.

These four facilities would provide 4,000 to 8,000 construction jobs and 800 to 1,000 direct permanent jobs, 90 percent of which are filled by skilled or highly skilled workers. Because these are manufacturing jobs, they will, as Dean Baker and Thea Lee of the Economic Policy Institute argue, generate four times as many secondary jobs as retail or service equivalents.

In fact, using U.S. Department of Commerce economic multipliers, we estimate each facility would generate roughly $200 million annually in direct and indirect personal income in the communities in which they are located.

Over a 30-year project operation life, the four facilities, again meeting a target of only half California's oxygenate needs, would bring in $1.3 billion to $3.3 billion in tax revenue. It is important to note that without these plants we will be importing oxygenated fuels to the tune of $850 million annually, money leaving California when it is desperately needed for investment in our State.

It should also be noted that these jobs and revenues are in addition to those that would benefit our neighbors in States that produce the bulk of the raw material that is refined into ethanol-based oxygenates.

To meet the 850 million gallons per year goal, the four California facilities of my example would require 60 million bushels of feedstock annually, at least 30 million bushels of which we would import from grain-producing States throughout America. I believe at current prices 30 million bushels would translate to somewhere around $90 million per year for growers outside California.

Looking at these numbers, Mr. Chairman, I do not think any Californian, particularly an unemployed Californian, or any American, particularly an unemployed American, would want the benefits of our oxygenated fuels demand to go to Venezuela or the Middle East or somewhere in the Caribbean.

I want to stress here that California's interest in oxygenated fuels facilities is far from academic. I have been contacted by a constituent at Bakersfield who is making progress towards establish-

ing a facility that utilizes new technology to take grain and other forms of renewable biomass to produce ethanol, methanol, ETBE and MTBE within the same complex and requires only a minimal amount of natural gas.

This project shows that the oxygenated fuels industry is viable in California and that the entrepreneurial spirit is there to be sparked if a domestic oxygenated fuels industry is made a priority in our National energy policy.

My interest in oxygenated fuels industries has been heightened by my active involvement with a consortium of companies interested in building three plants that would use innovative, environmentally sound technologies to produce ethers for use in reformulated gasoline.

Through the California Commission for Economic Development I chair, I have worked to bring together the State's Commerce Department the Energy Commission, and the California Environmental Protection Agency to help advance this project, which is led by Sunthetic Energy of American, CMS Generation Co., John Brown Engineers and Constructors and Kilborn, Inc.

Again, signs of active Federal support for a domestic oxygenated fuels industry will help us take projects such as this from hypothetical to feasible to functioning.

This is not only in California's interest, but in the interests of the States of your colleagues in the Senate and in the House throughout the nation. In an economic recovery, California can be a sail or it can be an anchor for the rest of the country.

Amory Lovins, whose prescience regarding economic and energy issues is widely hailed, writing recently in the pages of "Foreign Affairs" made a simple yet vital point: "the United States needs to adopt the same kind of comprehensive long-term strategy for creating high paying jobs as its major trading partners. The first step—a new energy policy."

A strong domestic oxygenated fuels industry is a clean industry that meets environmental standards and helps achieve environmental goals.

A strong domestic oxygenated fuels industry promotes near-term economic stimulus and long-term energy independence. It will prevent gas lines and reduce unemployment lines. A strong domestic oxygenated fuels industry keeps investment money at home, energizes our beleaguered national manufacturing base, boosts the economies of grain producing States and helps California pull our weight in the recovery.

Mr. Chairman, and through you to your colleagues on the committee when they read all of this testimony given today, I urge you to spur the rest of your colleagues in the Senate, and I urge you to spur the administration in this direction, and I pledge you my strong support in your efforts.

Thank you very much.

Senator DASCHLE. Governor, thank you for a very strong statement, and one with impressive statistics on job creation. I do not think anyone in the country can speak to the job creating potential of others any more ably than you just have. Obviously, you have had a good deal of experience in this area, and you certainly have studied the issue.

To what degree do you find the private sector is interested in investments of the kind you have just described?

Lt. Gov. MCCARTHY. It has already been made clear to me that there are people that sense the direction of Federal policy; and, if they can get some help, both from the State Government and the Federal Government, the State help would be in terms of trying to support appropriate infrastructure, especially road systems and other attendant needs.

The State help would also involve streamlining the regulatory process to cut down on their costs, to widen their profit margin. But I think what they also need, of course, is an even stronger Federal Government statement that we know part of our long-term economic policy must stimulate investment in less costly energy alternatives.

Now, if they see those signs, I have no doubt there are going to be plenty of people in the private sector that jump into this.

Senator DASCHLE. If you were to describe the obstacles that you see in the short term in creating the kind of investment infrastructure that we need to make this happen, what would you describe them as? What would they be?

Lt. Gov. MCCARTHY. I think that we do need to provide some Federal incentives in some form to companies to at least get them started in this area and then let them be competitive in the price determination and the worldwide market. But we need to understand that these alternatives need nurturing at least for some term of years, to get them going and get them established here. That needs to happen at the Federal level.

Senator DASCHLE. Does California have the capacity to create this domestic ether-making capacity on its own or is it going to take some Federal regulation as to imports or some other direct involvement on the part of the Federal Government?

You mentioned Federal incentives. Maybe you could clarify a little bit what kind of Federal incentives would be the most helpful.

Lt. Gov. MCCARTHY. I think that any kind of tax incentive that understands that this is going to produce enormous jobs in this country that will return its own revenues and more would be appropriate. I do not know the exact form that should take.

Senator, you have an attractive option that you have introduced that will be negotiated in the Senate and the House. But I think something of that kind, to give a clear spur to people just waiting out there to get into this industry, would get this off the ground.

Then the States must accept some corollary responsibilities as well in the areas that I mentioned. California, unfortunately, is not in a position right now to give further tax incentives. We just gave the best part of $1 billion in tax incentives as I outlined to you in my statement.

Unfortunately three-plus years of a bitter recession have reduced revenues coming into the State for a whole number of convergent reasons.

Senator DASCHLE. You have had a chance to look at S. 465, I assume, legislation providing new tax treatment for certain alternative fuels. If you can share your views with regard to that tax treatment, it would be very helpful, in writing or at some point in the future.

[The information appears in the appendix.]

Senator DASCHLE. Obviously, one concern we have is the degree to which cheap imports undermine your ability to create that ether market. How would that affect California? If we had a significant level of cheap imports coming in, would you then be unable to create the ether market that you have described with the construction of these facilities?

Lt. Gov. MCCARTHY. I do not think there is any doubt about it, Mr. Chairman. We would simply be creating a new foreign dependency if we have to worry about importing oxygenates when we are quite technically capable of producing them ourselves. I think we would be exporting a lot of dollars to pay the cost of this; and the other side of the coin is, we would be missing the opportunity to create a number of high-skill, high-wage jobs in our economy that we have been losing, and other States have been losing, because of defense cutbacks and a number of other reasons.

Senator DASCHLE. So, not only would we be dependent upon foreign sources, we would virtually be eliminating the prospect of job growth with the flood of cheap imports?

Lt. Gov. MCCARTHY. That is correct, sir. We have done that in other sectors of the economy. We should not let it happen anymore. This would be a good one where we are in a position today to stop it from happening.

Senator DASCHLE. Well, Governor, thank you very much for your comments.

We are accompanied, as you can see, by my very close personal friend and colleague, Jay Rockefeller; and I would ask Senator Rockefeller for any questions or comments that he would like to make at this time.

Senator ROCKEFELLER. Thank you, Mr. Chairman, very much. I would point out that you and I have worked together on this issue over the years and we have, in a sense, competing or different interests but we have kind of agreed that we are going to go at those in the so-called level playing field approach, which we each interpret as we best can.

I am very happy that you are having this hearing because of that fact, and the Clean Air Act and all the affects on—I want to say Leo, but I am not allowed to—a good friend of mine for many, many years.

I think the Energy Act of 1992 creates enormous opportunities, obviously for MTBE, ETBE, ethanol, methanol and all the rest of it.

Governor, I have worked for a long time with—well, particularly Chuck Imbrecht, but others in California, in fact on the Alternative Fuels Council, which was set up by the Alternative Fuels Act, which we finally got passed in 1988. He and I were both on that.

He, of course, is very high in my book. He has been—and he has testified on the importance of alternative fuels. He has been a strong supporter of what I just mentioned with Senator Daschle about so-called level playing field approach to different fuels.

Does that remain the case in California, that you are taking advantage of any and all opportunities?

Lt. Gov. MCCARTHY. Oh, sure. I would say anything that can produce high-wage, high-skilled jobs in California, be competitively

priced and prevent us from such heavy dependency on foreign sources, California business people would be supportive of.

Senator ROCKEFELLER. Chuck in his enormous service —in fact, he was really co-chair of this Alternative Fuels Advisory Council— talked a lot about, obviously, alternative fuels and was very high on the possibilities of methanol. Today one of the ethers that we are focusing on is MTBE which is produced, of course, with methanol.

Can you tell me the relationship between today's market for MTBE and the future markets for methanol, to the extent that you can?

Lt. Gov. MCCARTHY. Well, in California we would have to rely upon both. Our ethanol sources might provide up to 50 percent of our needs. So we would have to rely on other kinds of oxygenates as well.

Senator ROCKEFELLER. Okay. Would it be fair then to say that you depend upon both?

Lt. Gov. MCCARTHY. Yes.

Senator ROCKEFELLER. And who knows in the future, hopefully you will also be depending upon electric vehicles and a lot of other things, that in your judgment as Lieutenant Governor it is in the interests of alternative fuels to have a public policy playing field, which is level as between the various alternative fuels, that one should not be favored as opposed to another, that they all should be given their chance to compete in the marketplace?

Lt. Gov. MCCARTHY. Yes, I would say that.

Senator ROCKEFELLER. I am not trying to trick you.

Lt. Gov. MCCARTHY. No, Senator, I have known you too long. I know you would never try to trick me. You are very straightforward.

Senator ROCKEFELLER. Yes.

Lt. Gov. MCCARTHY. No, I would say that. You know, obviously the business community—from the public policy point of view, we are going to look for, among the alternatives, those things that can help us create jobs in California, since we are losing so many jobs, what we loosely describe as high-skill, high-wage, middle-class jobs. We are losing so many.

So we have to find ways to replace them. Now, whichever of those alternatives helps us from the public policy point of view create the maximum number of jobs, that is what I personally would tend to favor. The business community, of course, is going to look for what is price competitive in creating domestic operations to try to develop the competing oxygenates.

Senator ROCKEFELLER. So the concept of a level playing field within public policy is amenable to you? There is no reason why it would not be?

Lt. Gov. MCCARTHY. Senator, I would not be an elected official that would not favor a level playing field.

Senator ROCKEFELLER. That sounds pretty good. I appreciate it, Governor; and I am really glad to see you again.

Lt. Gov. MCCARTHY. Thank you very much.

Senator ROCKEFELLER. Thank you, Mr. Chairman.

Senator DASCHLE. Thank you, Jay.

Governor, thank you very much for your answers.

Lt. Gov. MCCARTHY. Thank you, Mr. Chairman.

Senator DASCHLE. And for a very strong statement. We appreciate your being here this afternoon.

Lt. Gov. MCCARTHY. Thank you both.

[The prepared statement of Governor McCarthy appears in the appendix.]

Senator DASCHLE. Our colleague, Senator Kerrey, has arrived, and we are pleased he has. In the early 1980s, I can recall watching Nebraska with great interest and admiration as they began to develop perhaps the most aggressive ethanol market in the country.

That did not happen coincidentally. It happened because they had strong State leadership. Senator Kerrey at that time was the Governor of the State, and so it comes as no surprise to us that he has now become a very active and articulate advocate of alternative fuels, and ethanol in particular.

We are delighted he could be with us this afternoon. We will take your testimony at this time, Senator Kerrey.

STATEMENT OF HON. J. ROBERT KERREY, A U.S. SENATOR FROM NEBRASKA

Senator KERREY. Thank you, Mr. Chairman, Senator Rockefeller. I am here to testify in favor of a piece of legislation, S. 465, that I think unquestionably does level the playing field and that I hope this committee reports it out and we have a chance to enact it. Because I believe it is a proposal that will create the very incentives, Mr. Chairman, you were asking the Governor earlier about for American business and American investors; and it will produce a win and it will unquestionably generate American jobs.

A win in that it will unquestionably improve the quality of our air and perhaps provide a breakout opportunity as a result of the problems we are currently having over oxygenated fuels with the Environmental Protection Agency.

It is a win as well for American farmers who will be provided an additional market and a stimulus for prices and a win finally for American taxpayers because the American farm program will be less costly. So my sincere hope in an era when almost all of us go home from here and our people say what are we going to do to create jobs. How do we get the American economy going? Whether your unemployment is 3 percent or 9 percent, their desire for jobs and the insecurity about employment today is very great.

It just seems to me, Mr. Chairman, I understand the competing interests here. But I hope, and sincerely hope, that we are able to resolve whatever level playing field requirements are needed in order to get this piece of legislation out, acted upon and signed by the President this year.

I would like to thank you for your giving me the opportunity to appear before the Subcommittee and to testify in particular about the benefits of ethyl tertiary butyl ether and to brush up on my organic chemistry. Nebraska is a very large corn producing State. We have been very much involved in the production of ethanol for years. We have done an awful lot of research at the University of Nebraska, Lincoln on ETBE and we understand that the continued

widespread production of ETBE will have a very positive effect on the economy of our State.

The broader issue though, Mr. Chairman, is that the positive effects of ethyl-based fuels are not limited to those midwestern States were corn is grown. The use of these fuels will make for a cleaner environment, less dependence on foreign oil, and less need for government farm support.

There are three reasons, Mr. Chairman, by ETBE is environmentally preferable to other traditional fuels, including methyl tertiary butyl ether or MTBE. The first is the additive's higher octane level, which reduces the amount of toxic chemicals in the fuel, thereby allowing it to burn cleaner and reduce harmful emissions. Second, when ETBE is blended with gasoline it actually lowers the evaporation rate and reduces ozone problems associated with a higher Reid Vapor Pressure, which is the issue that we are facing with ethanol.

Third, ETBE is a renewable energy source, which reduces the output of carbon dioxide and reverses damaging global warming trends.

Mr. Chairman, another positive attribute of ETBE is that it can be produced domestically, thereby improving the U.S. economy and reducing America's dependence on foreign energy sources. Currently, the domestic production of oil is at its lowest level in 30 years. Exploration efforts have decreased as well.

The United States presently imports about 50 percent of its oil, a figure that is expected to grow to almost 60 percent by the year 2000.

Mr. Chairman, I believe strongly that we cannot address this problem simply by opening up environmentally sensitive areas, such as the Arctic National Wildlife Refuge. For the sake of our economic and our energy security, we must continue to develop alternative fuel sources that are domestically produced and easily renewable.

In Nebraska alone, Mr. Chairman, there are two ethanol plants in operation, one nearing completion, and two more that are under construction. There are nearly 25 nationwide. At the Nebraska plants, 10 percent of my State's entire annual average corn crop, or 100 million bushels a year are converted into 240 million gallons of ethanol—one-fifth of the U.S. total.

The production of ethanol also produces jobs. And it is estimated by USDA that U.S. production would create 28,000 to 108,000 new jobs by the year 2000.

Finally, Mr. Chairman, the U.S. Department of Agriculture estimates that ethanol production currently raises the price of corn by about 15 cents a bushel, and is expected to raise the price even more by the year 2000. Not only, as I said earlier, would this give vital financial help to our Nation's farmers, but it will also help to reduce the Federal farm outlays.

Each one cent increase in the price of corn saves the taxpayers $55 million in lower corn program costs. Thus, the current benefits of ethanol production saves about $825 million in annual USDA expenditures.

Given these facts, Mr. Chairman, it seems that the expanded production of ETBE is just smart fiscal policy. In closing, again, I

want to thank you for giving me the opportunity to appear before the Subcommittee. I firmly believe that ethanol and ETBE are viable keys toward an energy future that just simply cannot be ignored.

They provide a clean, secure and fiscally responsible energy source, while also supporting an important part of our domestic economy. I appreciate very much your introducing this piece of legislation. Again, as I said, I sincerely hope that the committee is able to report this out and we are able to take action on it and get it signed into law so we can begin to develop American jobs.

There is no other conflict that we are currently having with oxygenated fuels. It would not only promote a cleaner environment, but put more dollars in the pockets of American farmers and require less expenditures on the part of American taxpayers.

Senator DASCHLE. Bob, thank you for an excellent statement. I appreciate very much your calling attention to many of the strengths of ethanol and ETBE, as you have.

You and I have attempted in the Agriculture Committee to come up with ways in which to reduce Federal commitments through subsidization of farm programs.

We have been under extraordinary pressure to reduce expenditures year after year. Again this year with the Budget Reconciliation Act we were required to reduce substantially the amount of Federal dollars spent on subsidies to farmers. For that reason, I think the General Accounting Office report of a couple of years ago, which showed what a significant savings investment in ethanol can mean for agriculture, is critical. It showed that in actual dollar terms we can reduce subsidization and increase the ability of farmers to earn income on the market, rather than through subsidization.

But you say you have had experience in Nebraska in that regard, both as Governor and as Senator you have seen the effect of your ethanol plants in the marketplace at the local level?

Senator KERREY. Absolutely. I mean, the local farmers that have the opportunity to move their product directly to some processor, whether it is ethanol or a cereal manufacturer, typically enjoy higher prices as a consequence.

In the Nation as a whole, higher prices clearly are a consequence of increased consumption of any of our feed grain stocks. The USDA now has to report as a result of a 1990 Farm Bill now has to report their estimates of the cost of the farm program. The number one thing that correlates with the cost of the farm program is the amount of inventory that is held by CCC—the Commodity Credit Corporation—who maintains that inventory on behalf of both producers and consumers.

The lower that inventory, the higher the domestic price for corn or other feedstocks. What ethanol production does or ETBE production does, it gives us another market and locally it unquestionably increases the price. But nationally it does as well. And as I said, it reduces the cost to the taxpayer.

I would say something else, Mr. Chairman, that I know you understand very well because I have heard you talk about it at length and very eloquently. These, all farm jobs that typically are devel-

oped as a consequence of these processing efforts are also extremely important today for the average family farm operation.

Senator DASCHLE. Let me ask you one last question before I turn the microphone over to Senator Rockefeller. Someone not long ago came up to me and argued that our concern for dependence upon foreign sources of fuel is really overstated, exaggerated. That it really is not a very significant concern and ought not be a major determinant in the creation of U.S. energy policy.

To what degree do you agree or disagree with that assertion?

Senator KERREY. I disagree with it strongly. Certainly, it is good news any time we have strength in the domestic market. It means our economy is strong and we have got an appetite and we have the capacity to pay. It means we have got a growing economy and we ought to be proud of that.

But when our trade accounts are in deficits, it means that somebody is selling us more than we are selling them. Our ability to be able to sell into foreign markets is clearly an advantage every time we talk about what we need to do to grow jobs here in America.

We understand that the more we sell, the more we employ people. The same is true in reverse. When somebody else sells to us, the more they influence people. I am prepared to keep the playing field as level as possible so that we have as much opportunity to compete, Mr. Chairman. But it is clear to me in the area of energy that our reliance upon in particular foreign oil, not only creates a situation where we are exporting jobs, but also, Mr. Chairman, it creates a situation where we are heavily dependent upon one of the four economic necessities.

Our dependence upon someone else to provide our energy is not only, I think, bad economics, but I think strategically it is a mistake.

Senator DASCHLE. Just to take that one step further, in formulating tax policy in this area, to what degree do you think we ought to consider job creating potential, environmental consequences and the creation of a domestic energy source, as opposed to simply examining the price competitiveness of various products?

Senator KERREY. Well, I think we should weigh it heavily. I mean, all of us that were involved with the debate around the Persian Gulf War remember very clearly that though there were other interests in the area, the dominant interest in the area was our dependence upon oil in Saudi Arabia.

We were all encouraged about the increased stability that is likely to come as a consequence of the apparent agreement between the Palestinians and the State of Israel, the handshake ceremony between Yassir Arafat and Prime Minister Rabin was very moving. We have a very high probability of more stability in that area.

Mr. Chairman, as you know, we spent a great deal of money, a great deal of taxpayer money, since the Peace Accord at Camp David in 1979, we spent a lot of taxpayer money trying to maintain stability in that region. Our dominant concern in that region economically is the oil that we get out of that region.

So it seems to me, Mr. Chairman, not only are there jobs at stake, but we have significant strategic considerations. The more we rely upon our own abilities, this, it seems to me, is a case where—we grow the product, we have it available, we have the

technology to convert it into fuel, we have resolved the problems that we have had as a result of developing this ether over oxygenated fuels.

We now have a win/win/win proposition. I just feel very strongly, Mr. Chairman, that though I understand the need to be concerned about methanol and keeping the playing field level, that here we have a situation where scientific, economic and strategic evidence is overwhelmingly in favor of making the tax law changes that you have in S. 465.

Senator DASCHLE. Thank you very much, Bob.

Senator Rockefeller?

Senator ROCKEFELLER. Thank you, Mr. Chairman.

I am always delighted to see Senator Kerrey in whatever subject might be under discussion. He is always masterful and articulate and a very good friend.

The point really of my being here at the hearing, Senator Kerrey, is not to disagree with ETBE or ethanol, because I do not. Tom and I made that agreement long ago. But to make sure that public policy is neutral as between the two. And that one does not get an artificial boost as per the other, unless, you know, there is some kind of an extenuating circumstance which would then need to be reflected on by the Finance Committee and the Senate and the Congress as a whole.

So I do not really have a question to ask you. Your State is involved in ethanol and ought to be. That is a major contribution to the country. What I just want you to keep in mind is that there is also another subject called methanol, which is of interest to a different part of the country.

Both of these are important for the future. Both of them will reduce our dependence upon foreign oil. The way we set public policy towards them, including tax policy and including subsidies, is a matter of legitimate concern for those who talk about a level playing field. So that is sort of the reason that I am here. I am always proud to be with you.

Senator KERREY. Thank you, Senator.

The one thing, for those of us who have been involved with ethanol, particularly with the oxygenated and reformulated fuels program that Senator Daschle was so instrumental in making a part of the Clean Air Act, it has been very frustrating because the scientific evaluation of ethanol has made it difficult for us to give what we thought was the intent of the Clean Air Act carried out.

There is some legitimacy to the scientific evaluation. I am willing to allow, you know, whatever scientific evaluation as long as it is done in an open process and you have a chance to get a second opinion on these things done.

But what we have with ETBE is a remarkable technological development that allows us, as I said, to overcome the problems we have been facing with ethanol. It is a tremendous economic fact, a rather exciting economic fact, when you look at the potential this has to reinforce what approximately 600,000 full-time small manufacturers in the United States of America called farmers are doing.

Growing a renewable product that could be converted, a conversion that would add jobs, the distribution of these jobs is extremely important for us, and I appreciate very much your making certain

that methanol is considered on a level playing field as well and I am perfectly willing to do that. I certainly do not want to tip the playing field against methanol or for ethanol.

But we have a very exciting technological advance with this particular ether. One that seems to me to satisfy the demand that is coming from the American people for clean air, for lower taxes, for higher farm prices and for more jobs.

Senator DASCHLE. You get the Hillary Clinton award for your answers in dealing with adversaries. [Laughter.]

Senator KERREY. Thank you.

Senator ROCKEFELLER. That is a very high award.

Senator DASCHLE. It certainly is.

Senator KERREY. Thank you.

Senator DASCHLE. Thank you.

[The prepared statement of Senator Kerrey appears in the appendix.]

Senator DASCHLE. We have a panel next, comprised of four individuals. Roger Conway is the Director of the Energy Office at the Department of Agriculture and has much to do with energy policy articulated from that Department; David Gushee, is a senior specialist in the Environmental Policy Branch of the Congressional Research Service; William Piel, is the manager of business development for oxygenated fuels at ARCO Chemical Co.; and Raymond Lewis, is the president of the American Methanol Institute.

If those four people could come to the witness table at this time, we will take your testimony.

Gentlemen, we are pleased you could be with us. I do not think I mentioned John McClelland, who is also with us, and is an Agriculture Economist from the Department. We are pleased he could be here, too.

Why don't we begin on my left with Dr. Conway, and we will go from left to right. Let me just emphasize to all of you that your entire statement will be made a part of the record. If you choose to summarize, you are welcome to do so. We will make sure that your written statement in its entirety is represented in the record.

Dr. Conway?

STATEMENT OF ROGER CONWAY, PH.D., DIRECTOR, ENERGY OFFICE, U.S. DEPARTMENT OF AGRICULTURE, WASHINGTON, DC, ACCOMPANIED BY DR. JOHN McCLELLAND, ECONOMIST, U.S. DEPARTMENT OF AGRICULTURE

Dr. CONWAY. Thank you, sir. Mr. Chairman and members of the Subcommittee, we appreciate the opportunity to appear here today to discuss the Department's activities regarding the Federal reformulated gasoline program, renewable oxygenates, and the role ETBE might play in that program. My brief remarks will highlight the Department's role in the regulatory process.

USDA was actively involved in discussions that led to the reformulated gasoline regulatory proposal that allowed ethanol and other renewable oxygenates to participate in the reformulated gasoline program by relaxing volatility standards for fuels blended with renewable oxygenate and increasing volatility standards for all other fuels. The outline of that proposal was announced October 1,

1992, and the proposed regulation was published in the Federal Register on February 28, 1993.

The proposal called for providing reformulated fuels blended with ethanol and other renewable oxygenates, such as ETBE, up to a 30 percent market share in northern ozone nonattainment areas. Similar, but more restrictive provisions were granted for some southern ozone nonattainment areas.

The Environmental Protection Agency held public hearings on the February 28 proposal on April 14 and 15 this year. Many of those testifying at that hearing stated their opposition to the proposed rule because they saw it as unworkable and unenforceable.

USDA supported the concept of a renewable oxygenate program in the reformulated gasoline regulation because we believe that such a program would provide ethanol, ETBE, and other renewable oxygenates increased opportunities in this highly regulated market. The Secretary believes that enhancing the use of renewable oxygenates would provide broad benefits for the U.S. agricultural sector. The expanded use of renewable oxygenates would boost the demand for corn and other domestic resources, expand employment opportunities in rural America, as Senator Kerrey noted, and improve U.S. energy security.

We have estimated that an effective renewable oxygenate program as part of the reformulated gasoline regulation could increase ethanol production and use up to 2 billion gallons annually by the year 2000. Such use could expand employment opportunities by an estimated 28,000 jobs, 10,000 of which would be direct and indirect jobs in the ethanol processing industry.

Increased demand for ethanol as a fuel additive or an ether feedstock would provide incentives for new technological developments in ethanol processing. USDA estimates that near-term technological improvements could reduce the costs of ethanol production by 5 to 7 cents per gallon. In the longer term, technological innovations could save as much as 15 cents per gallon over current costs.

These benefits are some of the reasons why Secretary Espy supports a renewable oxygenate program. In his comments to EPA, the Secretary proposed a system of tradable credits to provide improved market opportunities for renewable oxygenates.

All gasoline sold in a reformulated gasoline market area would be required to meet the performance standards specified in the regulation. Refiners or blenders who wish to use renewable oxygenates would earn credits. Refiners and blenders who do not wish to use renewable oxygenates in their reformulated fuels would be required to meet stricter performance standards or to purchase credits as a means of fulfilling their participation requirements.

I should add, however, that the views expressed here are those of the Department and do not necessarily reflect a final administration position. Final regulatory authority for the reformulated gas program rests with EPA. EPA is currently reviewing comments, including the Secretary's proposal. The deadline for publication of the final rule is December 15, 1993.

Mr. Chairman, that concludes my prepared remarks. I will be happy to answer any questions you or any members of the Subcommittee have at this time.

Senator DASCHLE. Thank you very much, Dr. Conway.

[The prepared statement of Dr. Conway appears in the appendix.]

Senator DASCHLE. Dr. McClelland, I understand you are here to answer questions.

Dr. MCCLELLAND. Yes, sir.

Senator DASCHLE. Mr. Lewis?

STATEMENT OF RAYMOND A. LEWIS, PRESIDENT, AMERICAN METHANOL INSTITUTE, WASHINGTON, DC

Mr. LEWIS. On behalf of the American Methanol Institute, the National Trade Association for the U.S. Methanol Industry, I am pleased to appear to present testimony on the energy security and environmental benefits of methanol and methanol fuel additives.

AMI commends the chairman and this subcommittee for taking the important steps of holding today's hearings and subsequent hearings to examine the tax treatment of gasoline additives and alternative motor fuels. They are greatly in need of legislative reexamination.

The taxation of motor fuels has developed in a piecemeal manner resulting in wide and unfair disparities in tax treatment between similar products. This pattern is highly prejudicial to methanol and MTBE as shown in exhibit 1 in AMI's testimony.

I look forward to addressing these issues in upcoming hearings of the Subcommittee. With this background in mind, I am pleased to address the more limited topic of today's hearing. Methanol is a clear liquid produced in the United States from abundant supplies of domestic natural gas. Production of methanol is remarkably efficient and environmentally clean.

It can be produced cleanly from a broad range of other domestic resources ranging from biomass to coal. Promising technology is being developed, for example, to produce methanol very cleanly as part of the steel-making process which will provide major employment, environmental and energy benefits for the nation and will greatly enhance the competitiveness of the U.S. steel industry.

Potential progress has also been demonstrated to produce methanol from a variety of domestic, renewable and recycled products. Methanol and its derivatives can be added to gasoline and produce a fuel that is both clean burning and high in octane. Methanol contains 50 percent oxygen by weight, a property that gives it enormous environmental and performance benefits in blending with gasoline.

While methanol has been approved for blending directly with gasoline, our industry has not sought any environmentally damaging waiver that would improve the economics of that blending. Rather, these benefits have been achieved by blending methanol ethers with gasoline. This retains the benefits of methanol while providing a low volatility to blend stock that can be transported efficiently through normal gasoline pipelines.

The most common ethers today have been MTBE and TAME. MTBE has been providing benefits as gasoline additives since 1979. Last year approximately 2 billion gallons of MTBE were blended into gasoline. More than one-third of the methanol currently marketed in the United States is used to manufacture MTBE and other methanol fuel products.

The market for alcohol gasoline additives consists of methanol ethers and direct ethanol gasoline blends today. Ethanol currently accounts for well over half of the total alcohol market, with sales this last year of some 1.1 billion gallons of ethanol compared to approximately 700 million gallons of methanol.

Eethanol is most often blended directly into gasoline in volumes up to 10 percent. But the ability to produce ETBE in existing MTBE plants has been well demonstrated, as you will hear later today. Methanol and its derivative fuel additives are important domestic industries that provides major energy security benefits.

It is important to recognize that both methanol and MTBE are major domestic products. In California there is currently some 216 million gallons a year of MTBE either operating or under construction today. Domestic methanol production is a reality today providing real jobs. Domestic methanol production must be protected or at least allowed to compete fairly.

Methanol plants built in the United States were built with the anticipation of being able to compete in the oxygenate and neat fuels market. The domestic methanol industry has expanded rapidly and is providing the largest alternative market for domestic natural gas today. We estimate that by 1995 methanol products will provide a market for some 500 billion cubic feet of domestic natural gas to both MTBE and methanol.

This is the best opportunity available to implement the Clinton Administration goal of displacing imported petroleum with domestic natural gas derived products. Currently, some 75 percent of the methanol consumed in the United States is produced domestically with another 16 percent coming from Canada.

Only about 4 percent is produced in remote parts of the world. MTBE is similarly domestic in origin. Major domestic producers include well-known companies like Enron, Beaumont Methanol, Methanex, Valero, Lyondell, Ashland, Global, ARCO Chemical, Texaco Chemical, Texas Petrochemical, Bellevue Environmental Fuels and Amoco, all well-known names that are operating and providing jobs in the United States.

Methanol provides real energy security benefits to the nation. Because it uses no petroleum in its production, methanol provides a powerful means to displace imported oil. In addition, by reacting methanol with highly volatile butanes, otherwise forced out of gasoline by environmental regulations, the natural gas replacement for imported crude oil is leveraged three-fold.

This pattern of strong domestic production will continue if the Tax Code and public policies permit the methanol industry to compete fairly and implement plans to increase domestic production.

However, these plans are dependent upon a balanced tax policy that does not undermine the ability of the industry to compete. AMI welcomes the opportunity at the next hearing of the Subcommittee to present our views on the tax policies that would permit the nation to continue to enjoy the energy security benefit of clean fuel methanol products.

Methanol and its derivatives provide major environmental benefits by making cleaner gasoline economically attractive. They are effective in attacking all three of the major air pollution problems in the Clean Air Act—carbon monoxide, ozone, and air toxics—at-

tracting the support of major environmental organizations and State and local air pollution regulators who have encouraged additional states to opt in to the use of reformulated gasolines containing MTBE.

Adding methanol products to gasoline causes the fuel to burn more efficiently and completely, decreasing emissions of carbon dioxide. Methanol fuel additives achieve this benefit without waivers or other environmental rules that prevent harmful evaporation of gasoline while providing a higher octane and better performing fuel.

Ozone is a primary health concern from urban smog. Methanol products used as gasoline additives reduce smog forming VOC's without increasing NOx and therefore are key components of any strategy to reduce smog.

Even before the Clean Air Act required the use of oxygenated fuels, methanol products were improving the effectiveness of unleaded gasoline. Moreover, methanol additives help refiners reduce benzene—a known carcinogen—and other toxic hydrocarbons in gasoline.

Methanol additives are also safe while producing energy security and environmental benefits. I am pleased to report the positive information to this Subcommittee on the safety of the principle clean air methanol derivative in use today, MTBE. It is the only fuel-additive ether to have undergone rigorous and extensive testing.

Prior to the EPA oxygenated gasoline program in the winter of 1992-93, MTBE has been subjected to rigorous testing. This program involved 11 separate studies, including exposure at levels thousands of times greater than experienced during refueling and driving cars.

These studies and other 30 other studies going as far back as 1969 did not support any adverse health concerns. Additional tests have recently been conducted and as expected are confirming the safety of MTBE.

EPA has raised six-fold the reference concentration of MTBE that can be inhaled without adverse health affects and an EPA official has recently termed MTBE "a safe, effective, and relatively inexpensive solution to making gasoline cleaner and safer."

Since 1979 over 100 billion gallons of gasoline containing MTBE have been used in the United States. MTBE and other methanol products will continue to make our environmental healthier and safer by removing harmful CO, benzene and other pollutants from our gasoline.

Methanol clean air products must be allowed to compete fairly. Methanol and its derivative products have a major role to perform in increasing America's energy security and achieving clean air. If permitted to compete fairly, methanol can provide these benefits in an efficient and cost-effective manner.

Under current law, however, methanol and its derivative products have faced grossly unfair competition from a highly subsidized and protected ethanol industry. In addition, recent tax law changes have disadvantaged all alternative fuels, including both methanol and ethanol.

I look forward to the opportunity to present our position on these significant policy issues at the Subcommittee's next hearing on this

subject. On behalf of the American Methanol Institute, I would like to thank you for the opportunity to participate in these hearings.

Senator DASCHLE. Thank you, Mr. Lewis.

[The prepared statement of Mr. Lewis appears in the appendix.]

Senator DASCHLE. Mr. Piel?

STATEMENT OF WILLIAM J. PIEL, MANAGER OF BUSINESS DEVELOPMENT FOR OXYGENATED FUELS, ARCO CHEMICAL CO., NEWTOWN SQUARE, PA

Mr. PIEL. My name is William Piel, manager of business development for oxygenated fuels in ARCO Chemical Co. As background, ARCO Chemical Company has been involved in the commercial product of alcohols for transportation fuels since 1969, and the production of ethers derived from alcohols since 1979.

During that time period, almost all the oxygenates that we have produced and sold into the transportation fuel markets has been from non-petroleum energy sources. Besides the United States, we also produce fuel oxygenates in Europe and have marketed our oxygenates in all major transportation fuel markets in the world.

Though we do not produce methanol today, we have channeled more methanol into transportation fuels through our products than any other company and we will probably continue to do so through the rest of the decade. In order for us to have grown to be the world largest supplier of fuel oxygenates, we learned early in the business to adapt our products to meet the ever changing requirements of the fuel markets.

Today I would like to share some of our experience with this Subcommittee on the oxygenates such as ethanol, methyl tertiary butyl ether and ethyl tertiary butyl ether (ETBE).

As you may already know, MTBE is made by combining methanol with a very active hydrocarbon compound called isobutylene. Methanol is generally made most economically from natural gas, but can also be derived other carbon containing energy sources such as petroleum, coal or biomass. The non-alcohol part of the ether, known as isobutylene, is usually derived from either petroleum or from natural gas liquids such as butanes.

ARCO Chemical Co. happens to get most of its isobutylene from butanes via a proprietary conversion process. However, we currently acquire all our methanol from the marketplace.

An alternative to using methanol for ethers is to combine ethanol with the isobutylene to make ethyl tertiary butyl ether or ETBE. This switch from methanol to ethanol is relatively easy in existing ether units. As a demonstration of both the process and the product, we made two separate, large commercial production runs of ETBE near the beginning of this year which we then supplied to our refinery customers.

The feedback from these customers is that the product performed above expectations. A few other companies have also commercially produced ETBE on a limited scale in both the United States and in Europe. Again, this was done by switching existing MTBE capacity over to ETBE. We are also not aware of any operating problems associated with these other ETBE productions runs.

From a technical standpoint, ETBE has a number of advantages over both MTBE and ethanol in gasoline. In addition to ETBE hav-

ing a slightly higher octane number than MTBE, its volatility or vapor pressure in gasoline is much lower, approximately half that of MTBE and one-quarter of that in ethanol gasoline.

These properties become more important to the oil refinery as environmentally friendlier gasolines require lower volatility and cleaner sources of octane.

The value of a blending component in gasoline is mostly determined by its vapor pressure and its octane. Included in this part of the written testimony is a short table that shows a simple comparison of the gasoline property changes associated with blending each of the oxygenates into summary grade reformulated gasoline.

What the table illustrates is that ETBE provides the greatest beneficial changes in gasoline octane and vapor pressure when blended for 2 percent oxygen in gasoline.

ETBE's only disadvantage to MTBE and ethanol is its lower oxygen content. This only becomes a significant factor when blending gasoline for a high oxygen content such as in the Oxygenated Fuels programs used in the winter time carbon monoxide non-attainment areas. In this situation, MTBE or ethanol blending is usually at an advantage to ETBE.

However, the lower oxygen content can actually work in ETBE's favor when blending for reformulated gasoline, which must meet many other conditions besides oxygen content. A lower oxygen content allows more volume of the oxygenate to be blended into gasoline. The volume associated with the oxygenates helps dilute many of the environmentally less desirable components found in conventional gasoline such as sulfur, benzene and high boiling aromatics.

An example of this beneficial dilution effect is observed when blending 2 percent oxygen in reformulated gasoline. A refiner could use either 5.7 volume percent ethanol, 11 volume percent MTBE or approximately 13 volume percent ETBE.

In this simple example, ETBE provides more dilution benefit and also more octane to the refiner's gasoline pool because of its higher volume contribution than either ethanol or MTBE. This translates into more flexibility in producing reformulated gasoline and potentially reduces the refineries' investment capital necessary for producing reformulated gasoline. Under these conditions, ETBE is expected to have the highest value to the refinery industry.

Because of these potential additional benefits for manufacturing reformulated gasoline, ARCO Chemical Co. had decided last year to begin providing ETBE as an option for our current MTBE customers, and has been actively discussing the benefits of ETBE with them. We have also been advertising the commercial availability of ETBE in many of the industry journals. We would be disappointed if the refining industry overlooked the ETBE option in the development of their reformulation gasoline strategies and as a result end up investing more capital than necessary in their refineries.

The use of oxygenates in gasoline also involve some less tangible and less technical issues such as greenhouse gases and energy security. Reformulated gasoline generates about 2 to 3 percent less carbon dioxide emissions—a greenhouse gas—than conventional gasoline.

This is a result of reducing the gasoline's aromatic content by replacing their octane with that from the oxygenates. Though aro-

matics are a major source of octane in conventional gasoline, they also happen to be the gasoline components with the highest individual contribution of carbon dioxide emissions from vehicle tailpipes.

Using ETBE instead of MTBE or ethanol in reformulated gasoline will likely replace more aromatics, and therefore lead to even lower carbon dioxide emissions associated with the use of the gasoline.

Separate from the effect of reducing aromatics is the beneficial use of renewable carbon in the form of ethanol containing in the ETBE. Since the carbon in ethanol is renewable, this will lead to a further reduction in carbon dioxide emissions by reducing the combustion of fossil fuels.

Depending on the energy efficiency of growing the corn and converting to ethanol, blending ETBE at the 2 percent oxygen content can potentially reduce carbon dioxide emissions by an additional 2 percent above that realized by reducing the aromatic contents of the gasoline. These two effects combined can potentially reduce carbon dioxide emissions from the gasoline-based vehicle fleet by a total of 4 to 5 percent.

Relative to energy security issues, oxygenates are generally made from the non-petroleum energy sources. So their expanded use in gasoline would generally displace some gasoline derived from imported petroleum. As mentioned earlier, ETBE at 2 percent oxygen in gasoline will require more volume and therefore, displace more gasoline volume than either ethanol or MTBE.

Besides diversifying gasoline production away from petroleum, another issue for energy security is domestic versus foreign supplies for the non-petroleum energy. Methanol is a worldwide commodity and it is most economically made from natural gas located near its source.

The next wave of MTBE capacity expansions are expected to be mostly based on methanol and butanes as their energy raw materials. And much of this new MTBE capacity will likely be built outside the United States because of more favorable feedstock economics.

On the other hand, ethanol production for use in U.S. fuel is generally limited to domestic production because of the limitations on government economic incentives for ethanol. As a result, offshore MTBE units will not likely be able to make ETBE competitively because of inaccessibility to qualifying or economical ethanol. Therefore, any new ether capacity in using ethanol will most likely have to be built in the United States.

In summary, of the three oxygenates—ethanol, MTBE, and ETBE—we would expect refiners to get the most benefit from ETBE, particularly in regard to making reformulated gasoline. It is for this reason that we have been actively promoting the product and educating our customers to the benefits of using ETBE.

From our decades of experience of developing and marketing fuel oxygenates, we can say that one of the most environmentally beneficial and cost effective ways for ethanol to go into gasoline is in the form of an ether such as ETBE. Also, ETBE compared to other oxygenates will likely provide some additional benefits relative to greenhouse gases and energy security.

We appreciate the opportunity to share ARCO Chemical's experience on oxygenates with this committee. I realize much of this discussion is of technical issues that is sometimes difficult to explain in simple terms. Therefore, I would be glad to address any questions that you may have.

Senator DASCHLE. Thank you very much, Mr. Piel, for an excellent statement. I know the people in this room were very interested, and you did very well.

[The prepared statement of Mr. Piel appears in the appendix.]

Senator DASCHLE. Mr. Gushee?

STATEMENT OF DAVID E. GUSHEE, SENIOR SPECIALIST IN ENVIRONMENTAL POLICY, CONGRESSIONAL RESEARCH SERVICE, LIBRARY OF CONGRESS, WASHINGTON, DC

Mr. GUSHEE. Thank you, Mr. Chairman. My name is David Gushee. Until Monday I was a senior specialist at the CRS. I resigned that day to retire, but yesterday I signed a contract, so I am still constrained to speak as a CRS analyst which is objectively without partisan bias, as the Legislative Reorganization Act says.

Senator DASCHLE. Just for the record, can you share with the committee whom you signed the contract with?

Mr. GUSHEE. The Congressional Research Service.

Senator DASCHLE. Oh, I see. You are on a consultant contract now with the Congressional Research Service?

Mr. GUSHEE. Yes, sir. That is why I am still operating under their rules.

Senator DASCHLE. I did not understand. Thank you. Does that mean you will not be as forthcoming as you would have been otherwise?

Mr. GUSHEE. Well, I could speak to that. Basically, when you work in the CRS, you are beset with arguments on all sides and you certainly see the merits on all sides. So it is kind of beneficial many times not to have to take a position.

Senator DASCHLE. Well, we want you to take as many positions as you can in what time you have available to you. But thank you for coming.

Mr. GUSHEE. Thank you, sir.

My assignment is to review the Clean Air Act requirements, to estimate the future demand as a result of these requirements, to describe the place of ethers among the oxygenates, to identify the properties which affect which oxygenates you choose, and to rate the ethers as relative to those properties.

My conclusion is that that oxygenate that would win the lion's share of the market if only performance and cost mattered, and mainly MTBE, may not win because of sociopolitical variables of equal weight, but not necessarily objective, if you see what I mean by that. The issue remains in doubt because those values are still in conflict.

The oxygenate demand that we estimate will be somewhere between 4 and 8 billion gallons per year, probably closer to 4 in 1995 and growing toward 8 later in the decade. If you assume that those are the numbers, that means that something like 35 to 75 billion gallons of gasoline will be involved.

The potential sources of oxygen for oxygenated gasoline include alcohol, such as methanol, ethanol and higher alcohols; and ethers, such as MTBE, ETBE, TAME, tertiary amyl ethyl ether and there is one called Diisopropyl ether that has been put on the table, but so far as I know there are not commercial plans for it.

At this time MTBE and ethanol provide the lion's share of the oxygen. There are many factors boiling on the selection of which oxygenate or mixture to use. The primary technical ones are compatibility, cost, availability, lending volatility, lending octane, and oxygen content.

With respect to compatibility, alcohols have some compatibility problems. Primarily, their tendency to absorb water. Volatility is a key area of what we have been talking about and the lower the volatility, the less fuel is evaporated. The less that is evaporated, the less ozone is formed. And EPA is requiring lower and lower volatilities as they move forward on the requirements to reduce from the baseline levels.

Methanol's blending RVP is so high that it is disqualified as an oxygenate except in some blends not currently being used. Ethanol has a blending RVP of 19 psi, which means that significant efforts are required in mixing and matching refinery streams in order to meet the volatility limits. The difficulty is greater as the target RVP goes down.

MTBE has a blending volatility of about 8 psi. This makes it convenient with respect to meeting the volatility specification for northern tier cities, which is about the same level, 8 psi. ETBE, TAME, and TAEE have blending volatilities of about 4 psi, give or take one.

Whether this is an advantage in measuring gasoline for northern cities will depend on the specifics of the refinery in question, since volatility can be affected by the relative proportions of a number of different refinery blendstocks, and the issue is one of aggregate system cost.

For southern cities, the lower RVP limit removes some of the blending flexibility, thus reducing MTBE's relative advantage compared to ETBE and TAME or TAEE.

All of the oxygenates have blending octane values higher than the base blendstocks from which gasoline is made. Thus, they are all octane enhancers. ETBE and TAME have slightly higher blending octanes than MTBE. The differences are not great, but in some cases, particularly when octane is short, can be the swing factor.

There is also a dilution factor which Mr. Piel has just described. This factor can play a role when benzene content of the gasoline produced by mixing various refinery streams is very close to the upper limit and could be brought within specifications by an ether with a larger dilution ratio, thus avoiding extra changes in the refinery.

Cost is the last factor that I am describing here. Ether cost depends on the cost of the alcohol, the cost of the olefin, and processing cost. ETBE and MTBE use isobutylene as the olefin, the alcohols being ethanol and methanol respectively. The isobutylene cost is common to both; it costs slightly more (a penny or two per gallon) to make ETBE compared to MTBE. Ethanol is priced around 71 cents per gallon, after subsidy. Methanol is priced at about 45

cents per gallon (both sell for less or more from time to time because of temporary market conditions).

Thus, ETBE will cost net to the blender some 10 to 15 cents per gallon more than MTBE. TAME will cost a little bit more than MTBE, because the C5 olefins from which they are made is slightly more expensive than isobutylene. And TAEE will be to TAME as ETBE is to MTBE in relative cost.

According to a recent CRS estimate, the volatility, octane and dilution advantages of ETBE will be of real value in making RFG for summertime use in southern tier cities and in California and will probably result in significant volumes of ETBE, probably in combination with MTBE, in the gasoline going to those markets. In northern tier cities, these values will not be of enough value to close the price gap if the relative alcohol prices do not change.

My conclusion is, when the Clean Air Act Amendments were passed in 1990, it was generally perceived by the petroleum industry and most other observers that the market for oxygenates would skyrocket into the billions of gallons per year, that ethanol and the ethers would share the winter oxygenate market, and that MTBE would capture most of the RFG market in the early years. Other oxygenates, probably ethers, would be developed and capture some of these markets as the years went by.

As the reformulated gasoline era draws nearer, the future for MTBE appears to be much less certain. Of all the various driving forces making it certain, only one—the apparent trend toward lower volatilities—is primarily a technical issue. The others are sociopolitical.

Thank you, Mr. Chairman.

Senator DASCHLE. Thank you very much, Mr. Gushee.

[The prepared statement of Mr. Gushee appears in the appendix.]

Senator DASCHLE. We thank all of you for your excellent statements and the contribution you have made to this hearing today.

I want to ask Senator Rockefeller to offer whatever comments or questions he has at this time. But let me just ask one question prior to the time I turn it over to Senator Rockefeller.

We talked about our real desire to create that level playing field. Senator Rockefeller and I are generally desirous of maintaining that kind of a level playing field. The tax provisions relating to alternative fuels will be the subject of a second hearing, but it has so much a part to play in determining how level the playing field is.

Currently the tax provisions are written so as to be neutral with regard to methanol and ethanol, but not neutral with regard to renewable or nonrenewable. That is, the tax exemption and the tax credit treat both methanol and MTBE and ETBE the same with regard to renewability.

If it is renewable, it is entitled to the same tax credit or the same tax exemption. To what degree could the panel provide me with their judgment as to the fairness of a level playing field which treats both fuels the same as long as they are renewable?

Mr. PIEL. Senator, let me give a shot at that. We are considering looking at the renewable sources and the incentives given to renew-

able alcohols. The credits are there for biomass based methanol as much as they are there for biomass ethanol.

Right now the economics for that look attractive, given the technology that are available for converting biomass to methanol. I am sure that in the near future there will be many people taking advantage of existing credits for producing biomass methanol for use in fuel, such as MTBE.

Senator DASCHLE. So in your view, Mr. Piel, the requirement that in order to be eligible for either, the exemption or the credit, that the fuel be renewable is a legitimate way to ensure that both fuels are treated the same?

Mr. PIEL. Right. Given the incentive, there is equal incentive to produce biomass methanol on paper, given what the government says that are in place today to produce biomass methanol, as much as biomass ethanol. In fact, the economics might be even slightly more favorable if you are just looking at straight economics and making the ethers from ETBE versus MTBE.

Senator DASCHLE. I think that is such an important point as we begin the discussion and our questions, because I think in some circles there is a perception that the credit or the exemption somehow is an ethanol exemption or an ethanol credit, when it is a renewable exemption or credit, available to both kinds of fuel, so long as they are renewable.

So I just emphasize that and ask for any additional comment from our panel before I ask Senator Rockefeller for his questions. Mr. Lewis?

Mr. LEWIS. I agree with your assessment that it is clearly a renewable opportunity for either fuel. As you know, today virtually 100 percent of ethanol is produced from renewable sources and virtually 100 percent of methanol is produced from natural gas.

We have had a major emphasis in talking about jobs here, and talking about developing natural gas, and talking about other ways to create domestic energy resources and to create such a large incentive because when it was originally done, the incentive was set up for splash-blended ethanol that had a major disadvantage in the marketplace.

It had a problem with fungibility in the pipeline and volatility problems, which they gave it a problem with acceptance in the marketplace, and a lot of other problems which will be overcome perhaps with ETBE. To stretch an incentive for something that had a major problem and put it to something that has none of those problems, in fact has advantages and opportunities, needs to be reevaluated as to whether or not it is justified in that regard.

Senator DASCHLE. I think that is true. I think there would be one other factor you would want to weigh in terms of the justification of fuels. That is the domestic and imported nature of the two fuels.

I do not know that we have too much imported ethanol or ETBE.

Mr. LEWIS. Or methanol.

Senator DASCHLE. But we probably—how much of methanol today or MTBE is imported? Do we have any figure on that?

Mr. LEWIS. Virtually none for methanol is imported.

Senator DASCHLE. Zero?

Mr. LEWIS. There is some methanol imported that goes into other areas for the most part. Most of the methanol produced at MTBE

is produced on the Gulf Coast from U.S. sources. About 75 percent of the overall balance is domestic; about 16 percent or so comes in from Canada, our free-trading partner to the north. That will probably diminish because they are putting in some of their own MTBE facilities because we are building more domestic methanol and because they are sending some of their stuff to other places.

Senator DASCHLE. I am not sure I understand this, Mr. Lewis. You are saying 75 percent of the methanol today is domestic and 25 percent is imported?

Mr. LEWIS. Yes, 16 percent of that 25 comes from Canada though.

Senator DASCHLE. Sixteen comes from Canada and 25 percent is imported?

Mr. LEWIS. Yes.

Senator DASCHLE. And of the natural gas made into methanol, how much of that is imported?

Mr. LEWIS. Virtually 100 percent of it is domestic because the only natural gas being used in the U.S. imported—let me start over.

The methanol produced in the United States is usually in the southern tier of States, where natural gas is domestic. Most of the U.S. imports of natural gas come in from Canada and those goes into home heating uses, et cetera, not into methanol production. So essentially 100 percent of the U.S. methanol is produced from U.S. natural gas.

Senator DASCHLE. I thank you for that. I think you are right, that we have to look at a lot of different elements that, as our previous witnesses indicated, ought to weigh into public policy consideration. The imported nature or the domestic nature, the volatility of the fuels, but certainly, when it comes to the basic requirement of tax law, that it be renewable, which I think is a universally accepted principle in determining eligibility that to my knowledge no one has ever disputed.

Senator Rockefeller?

Senator ROCKEFELLER. Thank you, Mr. Chairman. I was just trying to think how to start. I guess I had better start with what you just finished up with. I will ask this to Mr. Lewis. If one sets renewability as a criteria, one has to have a real good in with God in order to be able to recreate natural gas and coal in a planting season, essentially.

In other words, there is no way you can describe coal or natural gas as renewable, is there?

Mr. LEWIS. Not in the short term.

Senator ROCKEFELLER. Except over billions of years or millions of years, whatever it is.

So then taking Senator Daschle's question that if renewability is the philosophical basis for our public tax policy, and I understand this is the subject of another hearing——

Senator DASCHLE. Right.

Senator ROCKEFELLER [continuing.] So that you are being generous in letting me pursue, even though you stuck me way down at the end of this table here—we tease each other about this a lot—that one would have to start then with the concept of renewability. But the point that Senator Daschle made, if you base your tax pol-

icy on renewability and only biomass is renewable in terms of the methanol side of things and there is very little being done with biomass right now, that if it comes to call a natural gas and they are not renewable, then basing tax policy based upon something which they are not, by definition, skews the playing field, does it not?

Mr. LEWIS. There are two aspects of that. I think it clearly unlevels the playing field to a radical extent. It is not a small tilt. It just overwhelms almost all other considerations. When you talk about a subsidy whose value is between State and Federal subsidy combined, greater by a factor of two than the selling price of our product.

When we sell a product for 40 cents and between State and Federal subsidies you approach 80 cents in subsidy, you know, it is not a small leveling. It is not tweaking. It is a gross oversimplification of looking at the value. I think there is another issue involved though.

Depending on whose study you look at, it is not renewable or not renewable; it is degrees of renewability. There are hydrocarbon fuels and there are coal and there are nonrenewable fuels used in all phases of the farming and processing of ethanol to produce that.

Now if you take a product like ethanol that might have—and this would be a very controversial number. The numbers vary anywhere from greater than the value of the energy all the way down to 50 or 70 percent or something. But pick a number like 70 percent of the energy that comes out in ethanol, goes in as nonrenewable energy sources. That means 30 percent of it truly comes from renewable sources.

Does that mean if I take a methanol plant and use 70 percent natural gas or coal and 30 percent totally renewable resources that I have met the test and 100 percent of the product should get the subsidy? Because that is what happens here. You do not get 54 cent Federal subsidy for the percent of energy that comes from the renewal energy on a net basis. But it is arbitrarily defined as renewable. I think that has to be analyzed because we put tags on things and say, this is renewable and this is not renewable.

We have methanol plants today that are taking product off of a sewage treatment plant that otherwise would pollute the environment.

Senator ROCKEFELLER. Mr. Lewis, you are invading my time here; and Mr. Daschle being Chairman can take my time away from me any time he wants. Again, he is being very generous to me by allowing me to go first, which incidentally helps me a lot because I have the President of Union Carbide cooling is heals upstairs. But that has happened before.

The key then to me—and, you know, Senator Daschle and I will need to work on this at some point—but the question is: Should the key to tax policy be renewability? As Senator Daschle says, it is as of this point. And if one measures renewability as the base of philosophical point, then what he says correctly flows from that assumption.

But if one says that, you know, if the issue is how good are they in the environment or how good are the two on energy or how good are they on jobs or how good are they on octane where ethanol is usually a little bit better than methanol, but methanol is a lot bet-

ter than gas, et cetera, then that potentially does another set of criteria for tax policy.

I am not even totally familiar with Senator Daschle's bill which is the subject of this hearing. But I want to ask one question which has me thoroughly confused. In your own chart No. 1—and then, Mr. Chairman, I promise I will shut up, not only shut up, but I will leave—you say that E–85 in your first chart has what I would take to be, because it has parentheses around it, a tax subsidy of 44.05 cents. Is that correct?

This is to you, Ray, I am talking.

Mr. LEWIS. Yes, that is correct.

Senator ROCKEFELLER. Okay. Then you say—that is E–85—and M–85 is 21.42. Now am I right, and I probably should—I am not playing stupid, but I was a really bad math student. I am not trying to be cute here. In that 21 does not have a parentheses around it, does that mean that there is between E85 and M85 under current law approximately a 63 cent price difference or subsidy difference or how do I phrase that?

Mr. LEWIS. Tax difference.

Senator ROCKEFELLER. Just tax difference?

Mr. LEWIS. Difference in whether one being negative or one being positive. A difference in tax treatment of that differential. That only considers Federal policy, not additional State policy, not additional environmental waivers, not additional things that EPA are considering that might be worth another 17.5 cents.

Senator ROCKEFELLER. Okay.

Senator DASCHLE. Just to clarify that, Mr. Lewis—and I am sorry Jay for interrupting here, but I think a point needs to be made. M85 would be entitled to the same tax differential—again, going back to Senator Rockefeller's earlier question—if you made methanol from biomass as opposed to natural gas, is that not correct?

Mr. LEWIS. That is correct.

Senator DASCHLE. Okay.

Senator ROCKEFELLER. And I guess the response on that is it is not being made particularly from biomass and that day may come, but it is not here yet.

Now at the bottom of your chart you have MTBE 22.63, ETBE (without credit) 21.84, and ETBE (with credit) (5.72). From which I, even with my mental limitations, read that without a tax credit MTBE and ETBE would be on approximately the same tax advantage, tax disadvantage or cost basis or however you want to put it. Could you clean up my language for me on that?

In other words, interpret that 22.63, 21.84 and (5.72).

Mr. LEWIS. What we have done on this table is to show the tax effect on various fuels adjusted for their energy content. Because fuels grossly speaking should pay taxes based on the amount consumed per mile, which is roughly equivalent to its energy content.

We have put the effective tax on all the various fuels on a comparable energy basis. When you do that, it shows the gross inequities and the gross differences between the tax applied to various fuels. The difference between those show there is a fairly substantial difference with ETBE getting a net, even though it is an ether

and it is only some 40 percent renewable, getting a net negative 5.72 tax with MTBE getting a net positive 22.63 cents, all done on equal energy content basis.

Senator ROCKEFELLER. I will make this my final question, with incredible gratitude to the Chairman for his courtesy in letting me go first on this, as I sort of look at this—and, Senator Daschle, I have talked about this before; and he has done better at it than I have, which is why I am struggling to try and catch up—that the tie philosophically in our tax policy is based upon two words—one, renewability; and then insofar as methanol is concerned, biomass.

And that there is a tie between renewability and biomass with respect to methanol, but there is no tie between renewability and coal and gas, which is where the future of methanol is.

What I guess I am trying to say is that, it just seems to me that people who mine coal and people who go for gas, you know, in the same way Senator Daschle has corn, West Virginia has more natural gas than any State east of the Mississippi, something unknown in study to most of our own people, and obviously a lot of coal, that that produces jobs, too.

In other words, my people if they were receiving methanol—we do, we have methanol buses running in the Kanawha Valley, as you know—but that produces jobs also. It just happens to produce jobs in a different part of the country than the part of the country which produces corn, which we for the most part do not produce.

Mr. Chairman, let me just leave it at that. One, you have been generous in that tax treatment was not something we were meant to get into today and it was a series of questions which I had, which I was prepared not to ask because that was going to be taken up at the next meeting, which I did not know when it was. So you have been more than generous. I just thank you for your patience.

Senator DASCHLE. Senator Rockefeller, as always, I think your questions were right on the mark, and we appreciate very much your participation. I suspected you might have a busy schedule and was pleased to defer to you.

The next time, if you behave yourself, we will move you up closer to the center.

Senator ROCKEFELLER. Would you, sir?

Senator DASCHLE. Yes.

Senator ROCKEFELLER. I would be most appreciative. If I could just sort of get even just this far.

Senator DASCHLE. Well, maybe by the end of the year you can be right here.

Senator ROCKEFELLER. Yes. Thank you, sir.

Senator DASCHLE. Mr. Lewis, let me just clarify your comment again because I think as we build the record it is important to ensure that we all understand.

The chart that you list here, showing M85 and MTBE as having a certain effective tax rate based upon energy content, is again based upon the assumption that the source of choice is natural gas or coal. The source of choice were it to be biomass would show something entirely different in this chart, is that not correct?

Mr. LEWIS. That is correct.

Senator DASCHLE. That is what we will get into in the next hearing. But I think that if we look back through legislative history, the Congress decided that we needed to find ways with which to advance and promote renewable energy—wind, solar, biomass, and biomass-derived methanol and ethanol and their derivatives, ETBE and MTBE.

So it was clearly with that intent, to promote renewable fuels, that we have come to the point where we are today. It has now had consequences that go beyond renewability. And the competitiveness of various fuels obviously can be determined in a lot of different ways. But the fundamental principle of renewability is something that in my view has created what we have sought to strive for. That is, the level playing field among all renewable fuels.

Now, because the fuel of choice in the methanol industry has been made from sources which are not renewable, you have in a sense created a problem for yourselves reflected in the chart. But certainly that is based upon economics, not upon your lack of desire to base your source on renewability. Is that not correct?

Mr. LEWIS. It is clear that the economics has depicted the choice. Things have changed suddenly. Because there was clear balance in the marketplace. When Congress passed the subsidy that they did, clearly ethanol grew by far the largest market in splash blended ethanol. They chose to do a blended product with a 1-pound waiver and we chose to react.

Congress used the words "blendstocks and mixtures" when they set the subsidy. It was not anticipated that ethanol would be reacted into a product. So they set the level of differential very large to overcome that. Unfortunately, what we are going to be dealing with in the next hearing is that differential in a product where there is not the kind of differences that Congress anticipated when they said blendstocks and mixtures.

It is not a matter of renewable being good and non-renewable being bad. There may be some differential there that can be justified or Congress chose to justify. But the economics have the potential to not just create new jobs versus foreign imports, but to destroy the jobs and the billions of dollars that have been invested in domestic methanol and domestic other facilities as a result of getting that totally out of kilter with what was anticipated.

We are not saying that ETBE is a bad fuel. What you heard in all the testimony is that it has properties that give it value over ethanol. Much larger value. I translate that to mean the refinery will be willing to pay for it more than they would pay for other fuel additives. We saw them willing to pay a high value for ethanol. Why would we think we needed to do more for them to get them to pay a product that has even higher value in the end use? That is our concern.

Senator DASCHLE. Mr. Piel, would you address that question of the value of renewability and the competitiveness of fuels as ARCO looks at the fuel today? How do you see it?

Mr. PIEL. The barriers make it difficult to do ETBE and develop ethanol for use in ETBE, are much the same barriers in developing that are there in biomethanol for MTBE.

Currently the tax incentives for both ethanol or for bioethanol are located or applied at the point-of-sale of gasoline, which makes

it very difficult at way back in the beginning of production of an ether, which is for either use in biomethanol or bioethanol to make the ethers.

I know you are going to get more into this in future hearings, but if the tax credit was located closer to the point of production of the ether or the alcohol itself, the economics would be much clearer for developing both bioethanol for ETBE and biomethanol for MTBE.

Senator DASCHLE. I was going to ask you a question earlier, and we got off on another tangent. But one question, obviously, relates to the projection of domestic versus imported production.

Could Mr. Gushee, or Mr. Piel—I was going to ask you, but since you nodded—Mr. Gushee, I assume that you have thought about this, too. To what extent can we anticipate increases in imports in the future?

Mr. GUSHEE. Do you want to go first?

Mr. PIEL. Okay. I will give you our opinion. As far as in the future, many of the MTBE plants being built in the world today are now being located in countries with many natural resources, be it natural gas or butanes or anything else and in anticipation of exporting to high volume markets such as the United States.

So the expectation, a higher percentage of MTBE in the future, use in the United States will come from imports. Based on DOE estimates this past year, about 10 percent of the MTBE for use in the oxy-fuel program was imported MTBE. That does not include any of the MTBE that happened to be preblended into gasoline that was imported to those same oxy-fuel areas.

So a total percentage might be something higher than that on there. The amount of MTBE in the future that is used to supply oxygen or the methanol in the MTBE is expected to be more and more from imported sources, be it the MTBE itself being imported or possibly some of the methanol being imported from non-U.S. areas.

So the expectation is higher. It is difficult to estimate how much. But the evidence is there as far as based on all the amounts of capacity on both MTBE and methanol plants.

Senator DASCHLE. So you are saying under current tax, trade and energy law the level of imported MTBE is expected to rise?

Mr. PIEL. That is right.

Senator DASCHLE. If that is true, if you were to change tax law in a way that would somehow treat non-renewable energy sources the way we now treat renewable sources, would that be a greater incentive, in your view, for imported product?

Mr. PIEL. Because of the tax treatment available to it for the first time, for biomethanol?

Senator DASCHLE. No, no. If we were to treat MTBE that is not biomass based, that is natural gas or coal-derived MTBE, the same as renewable MTBE, would that generate a greater demand for imported product in your view?

Mr. PIEL. If we treat all MTBE the same, independent of whether it is made domestically or non-domestically, I do not know if it would differentially impact domestic versus imported MTBE. It is hard to estimate.

Senator DASCHLE. Mr. Gushee, you were going to comment on imports?

Mr. GUSHEE. Yes, sir. When I looked at this about a year ago, it looked to me like there would be an increase in the early period of the RFG program, because the demand would increase more rapidly than domestic supply could expand, because of physical constraints on construction rates and that sort of thing.

But that if the interest rates in the United States and the natural gas price in the United States stayed about as they are now, I would foresee that the capacity to fulfill the domestic demand would largely come from domestic construction because the economics are there, if the gas price runs around $2.00 or $2.25 for MCF or thereabouts or less because there is a significant benefit from not having to ship the stuff thousands of miles.

And the second factor would be the interest rates. So that if the interest rates stayed modest, those two factors together would make domestic methanol economic. Of course, those are not necessarily fully ordained, but they look pretty reasonable as premises.

So my estimate is that——

Senator DASCHLE. But, if the cost of domestic natural gas goes up, as it has been depicted to do in this chart, what would then be the effect on demand for imported product?

Mr. GUSHEE. Well, it seems to me quite clear that the incremental methanol capacity would be less domestic.

Senator DASCHLE. That is what I would think.

Dr. Conway, let me turn to you. I do not mean to ignore both you and Dr. McClelland. You have had a lot to do with the new regulations proposed by Secretary Espy. You touched on that in your testimony. But I think for the record it would be helpful if you could be a little more detailed as to the proposal and the changes in Secretary Espy's proposal from what the previous administration had proposed. Could you do that for us?

Dr. CONWAY. Mr. Chairman, if I may, I would like to defer to my colleague to address that question, John McClelland.

Senator DASCHLE. Please do. Dr. McClelland?

Dr. MCCLELLAND. Mr. Chairman, as Dr. Conway mentioned in his testimony, of course the Secretary has made comments to EPA's February 28 reformulated gasoline proposal that was published in the Federal Register. We did attend hearings and listen to the testimony.

The outcome of that was to propose comments. The purpose of the Secretary's comments were to use parts of the existing proposals to create a renewable oxygenate market that used negotiable credits to provide economic incentives for all those participating in the renewable oxygenate program.

The Secretary's program would not require the use of any renewable oxygenate and all renewable oxygenates—that is, oxygenates that would be produced using alcohols from renewable resources, for instance—so bioethanol or biomethanol or any other compounds that people like ARCO Chemical are dreaming up every day in their laboratories could be used, as long as they fulfilled that requirement.

To give you a brief example of how this program would work—and actually, I think that maybe I would like to call this a mecha-

nism as opposed to a program—because I think that one of the things the Secretary wanted to do here was to try to provide some basic ideas that could serve as a sort of a foothold to work out details in the future.

If we just take an example of northern cities, the Class C nonattainment areas, the originally proposed volatility requirements under the so-called simple model were 8.1 psi in Reid vapor pressure. The February 28 proposal that proposed a renewable oxygenate program basically said that if you produce fuel with renewable oxygenates in it, you would be allowed to blend that fuel at 8.8 psi and all other fuel would be blended at 7.8 psi; and that renewables would have an opportunity for 30 percent market share with that volatility allowance.

Secretary Espy's proposal basically takes that same framework, but instead of actually having the economic incentive that would be associated with the volatility allowance tied to the physical properties of the fuel, we have worked out a credit trading system that would be based on those basic RVP levels. This is how it would work.

First of all, every gallon of fuel that was produced, regardless of whether it contained a renewable oxygenate or not would be at the minimum required to meet the 8.1 volatility standard. So there would not be a volatility allowance for any fuels.

Now if you were to make a gallon of fuel with renewable oxygenate in it meeting these requirements at 8.1 psi, then you would receive a credit. In this case a difference between the 8.8 that was contained in the previous RVP waiver and 8.1. So you would receive credits for that seven-tenths of a psi here.

If you were not participating in the renewable oxygenate program, you would be required to blend your gasoline at 7.8 RVP. So the question would be then, would I be willing to buy credits at 7.8 to increase my volatility back up to the 8.1 standard. That is where we see the demand for credits coming into effect.

So we have a supply side of credits by people who are participating in producing fuels with renewable oxygenates. And those who do not wish to participate would either have to meet a stricter performance standard or they could buy credits as a means of participation in the program.

The 30 percent market share or incentivized portion of the market would remain the same. We would foresee here that if you had full participation in this market, in other words, 30 percent of all reformulated gasoline produced in the United States contained renewable oxygenates, then all the fuel would, in fact, be 8.1 psi.

There would be no blending at lower levels and higher levels or anything like that. Because people would produce fuel meeting the standards, create credits, sell those credits to those who did not wish to participate, but also did not wish to be at the disadvantage of having to reduce their volatility or their performance standards.

Senator DASCHLE. To what degree was ease of implementation a factor in your considerations? The concern I had with the past proposal was that implementation was extraordinarily complex and confusing. I sense that this would be an easier plan to implement. But to what extent was that considered?

Dr. MCCLELLAND. I think the single most important comment that we heard at EPA's hearing with regard to those aspects of this regulation was that it was unenforceable. It was unworkable. You have high volatility fuel going into these areas and there is a 30 percent market. How do you really make sure that there is 30 percent there? You know, those sorts of issues.

Other issues, the distribution system does not always flow. You are not always going to have exactly 30 percent of all the fuel in the market at any particular time. So the average volatility of that market, even if you are able to keep gasoline separate and all kinds of different things, how are you going to make sure that you do not have spikes in volatility and those sorts of things.

So that was very important. That seemed to be an extremely difficult problem that was brought out by refiners and blenders and a number of people testifying. That is one of the reasons the Secretary's proposal has basically said that we have to deal with this because the enforcement is too difficult.

Under the Secretary's plan, we do not really worry about where gasoline goes anymore. We do not worry if there is more than 30 percent of the gasoline in a particular market at one time is renewable or not. It all meets the standards that are prescribed by the law, and therefore, fall within those parameters.

Senator DASCHLE. Do you have any sense about what refiners would do as they decided which would be their product of choice—MTBE or ETBE?

Dr. MCCLELLAND. With respect to the program, I do not have a lot of sense of that. I have talked to some refiners about this and they have indicated that they have been particularly interested in ethanol in the past and MTBE. Well, obviously, a lot of refiners are interested in that.

I think as we have heard from Mr. Piel, there has been a lot of interest in ETBE among some of their customers. It is certainly difficult to try to estimate what the economic value of these credits are. You do have transaction costs that are involved. We do not know how this market is going to operate. It is very difficult to say how it will operate before it actually exists.

At the current prices for volatility reduction that I have seen from studies that have been done by the National Petroleum Council, basically a penny a pound in RVP reduction. We would estimate that a credit would be worth about a penny then, minus any transaction costs.

So it would be difficult to say exactly how much a credit would be worth. That would be something that would certainly have to be monitored.

Senator DASCHLE. I know you are familiar with the GAO report that showed a net savings of somewhere between $460 and $610 million per year through a greater dependence upon ethanol and, hence, a lowering of farm program subsidization costs. Do you think that there are similar benefits to be derived from a utilization of ETBE as there is with ethanol?

Dr. MCCLELLAND. I will defer back to Dr. Conway.

Senator DASCHLE. Dr. Conway?

Dr. CONWAY. It depends on—well, in terms of ETBE, yes. Anything which increases the demand for corn, and which increases

corn price is going to reduce deficiency payments and is going to have a beneficial effect in terms of reducing farm program costs.

So for the farmer, his main concern or his or her main concern is a market for the product. If it goes for ethanol, which is splash blended or if it goes into ETBE, it is still an enhanced demand for the product. So I would say yes.

Senator DASCHLE. Mr. Gushee, we talked early about—thank you, Dr. Conway, for that answer, by the way.

Dr. CONWAY. Yes, sir.

Senator DASCHLE. We talked earlier about imports. I wanted to ask you another question, and I got off on the agriculture aspects of ethanol in particular. But if there were a greater demand for ether and we saw that that demand would alleviate some of the dependence upon foreign supplies of petroleum products, is there any way to estimate how much of our reliance upon foreign petroleum supplies could be displaced by a strong domestic ether industry?

Mr. GUSHEE. Yes. You can do it as several levels of complexity. But the first order would be that the domestic content of what you put into the gasoline would displace that much gasoline which you could then as a first order approximation assume would translate to reduced oil imports. That is a first order approximation. It does not actually happen that way.

So then you would have to get more complicated and discount that because the refinery might not just reduce its volume, for example, and there would be some distributional effects among all the various products. But that is the direction that it would go.

Senator DASCHLE. I know you have written on this. But I think for the record it would be helpful for you to expound just a little bit more on the economic dynamics of the marketplace itself. What happens to all of these things as gas prices go up?

Mr. GUSHEE. Natural gas prices?

Senator DASCHLE. No, petroleum. Petroleum-based products, the price of the gasoline that we use in our tanks obviously affects the economic competitiveness of various products, including imported products. To what extent does that factor into creating new capacity for domestic produced MTBE or ETBE?

Mr. GUSHEE. If I understand your question right, and I am not sure that I do, you are saying that a more expensive domestic product becomes economic because what it is competing against, namely the oil, is going up in price. Is that what you mean?

Senator DASCHLE. Well, going up or going down. What I am wondering is, to what degree—if gas prices were to rise significantly, to what extent does a significant increase in the price of gasoline affect investors' interest in creating domestically produced MTBE facilities, MTBE markets?

Mr. GUSHEE. Well, I would think that it would be a direct, but truncated, relationship because you would more than likely to use domestic natural gas butane rather the refinery C4s that you would have to produce from the more expensive gasoline or more expensive crude oil, I mean.

So I would say that to the extent that gas prices do not follow an oil price increase, you would increase the amount of fuel butanes used in MTBE production. But I do not know that it would

be a terribly large volume because the refinery would have to take the elephants out of his gasoline anyway.

So, therefore, I think there is a number of damping effects that would not have that much affect. I think it would be probably relatively small.

Senator DASCHLE. And what about natural gas prices? What if domestically-priced natural gas were to continue to go up as this chart indicates? What effect would that have on our ability to produce domestic MTBE?

Mr. GUSHEE. Well, I think it would make refineries interested in making more in their refineries because they have to buy it to put it in the gasoline anyway or make it. And the higher the gas price, then the higher the natural gas based MTBE price would be and the more attractive it would be to make more in the refineries. That would be two-thirds oil derived, so it would reduce the domestic content of the gasoline.

Senator DASCHLE. There is a study that I know you are familiar with—by Coopers and Lybrand. It was an August 1993 report that noted that there is a $2 per million BTU floor price for the national average annual price of natural gas. They are talking about prices as high as $3 per million BTU. Plans or studies to construct nearly 81,000 barrels per day of US MTBE capacity have been cancelled in the last year.

At the same time Saudi Arabia has recently announced that they will double their MTBE capacity in 1996. Do you believe, given these high natural gas prices, recent U.S. MTBE plant cancellations, and foreign MTBE plant construction plans, that there will be considerable new MTBE capacity built in the United States in the future?

Mr. GUSHEE. I believe you cannot answer that question until EPA writes the rules on the role of ethanol and RFG for one thing. Because if they direct the market in the direction of ETBE, that will have a dampening affect on domestic ethanol.

Senator DASCHLE. Does anybody else—Mr. Lewis?

Mr. LEWIS. Yes, Mr. Chairman, thank you.

You heard some statements earlier about imported MTBE, or more important what you heard was, there is going to be growth in foreign production of MTBE. I agree with that. You also heard Mr. Piel say it is going to go to the higher value markets.

The assumption is that that is the United States and that is where we disagree. The glowing market, new markets, recently reported in some of the trade presses that Asia is the fastest growing area for MTBE in the world. Europe is just beginning their reformulation. They are well into their lead phase-out, two other uses for it.

So the fact that it is being built in the Middle East does not mean that it is coming to the United States. In fact, the vast majority of it will not come to the United States. We are building here——

Senator DASCHLE. Let me just ask, based upon what Mr. Gushee just said though, if RFG regulations come out the way we hope they will, they are promulgated creating a tremendous reformulated demand, you do not think that is going to create a significant domestic demand that does not exist today?

Mr. LEWIS. I do think it is going to create a significant domestic demand and I think that domestic demand is going to be supplied domestically. The change which is rather radical in your chart here, if I can read it, Oxyfuel News quotes there, $2 is all that can be supported, I totally disagree with.

The difference in foreign price and U.S. price, $1.50 of that is made up in just freight, and working capital, and losses, and inspection fees, and terminal fees, and things like that, just to be even. And before you put in political risks or higher capital for foreign sources, for any of those other issues.

So we can clearly justify a higher price than that. The difference in $1.80 to $2.40, which is a radical rise in natural gas is 6 cents per gallon of methanol—6 cents versus 54 cents Federal subsidies for ethanol. So it is less than 10 percent of the subsidy difference that we are talking about.

So a small, small incentive for domestic production would totally overcome anything like this.

Senator DASCHLE. I get the clear impression that you as an organization have taken the position that domestically produced MTBE is clearly to be embraced and promoted to the greatest degree possible. Is that your position?

Mr. LEWIS. I think the market—our position is that will not be necessary. The market will take care of that because domestic producers will compete because of freight considerations, market stability, and other demand in the rest of the world. It is not necessary to put in tariffs. Now the one thing I am worried about——

Senator DASCHLE. That is not my question. Is it the position of your organization that domestically produced methanol or MTBE is to be favored in public policy as a matter of priority for your organization?

Mr. LEWIS. Clearly, we represent the domestic industry. We support the domestic industry and we do everything we can to get the domestic industry to grow and I support that.

The only caveat——

Senator DASCHLE. But do you only support the domestic industry or do you have foreign membership as well?

Mr. LEWIS. I clearly have foreign members. They do not have control of our Board or any other area such that we—we have told everyone and we continue to work with all of our members to say, we support the domestic industry growth. Our real position is one of saying, let us build a market and let the world compete for where it comes from.

And if we get into a we versus they we have to support and have always supported the domestic industry and we will continue to do that. Fortunately, the market takes care of that for us and we do not have to worry about it.

But the only thing I am worried about—I wanted to get this one in; I apologize for being a little pushy—the reason there might be a short-term growth in imports is because we have had very, very large cancellations of U.S. production of MTBE, deferrals of start-up of U.S. production of methanol. Not because the economics would not sustain it, but because the deferral in the EPA in getting the regulations out made it impossible for the banks and the producers to know how much was going to be needed.

Had we had a defined market, we would not have required those imports to go up. Once the market is defined, those imports will go away because those plans that were on the drawing board, have been engineered and have been developed will again go back into the construction and will be built.

So we are only talking about a year or two of a problem, if any exists at all.

Senator DASCHLE. Well, I guess I question that. I mean, you are in a difficult position in a sense. What is the proportional representation of foreign and domestic producers in your membership?

Mr. LEWIS. Producers we keep—we have domestic members. Some of the people——

Senator DASCHLE. You do not have any foreign members?

Mr. LEWIS. Some of them have both domestic and foreign production and we do have Canada and we do have people like Trinidad and producers like that.

Senator DASCHLE. Is it governments or private?

Mr. LEWIS. It is private. No, no, no. It is private.

Senator DASCHLE. That is what I understand.

Mr. LEWIS. Yes.

Senator DASCHLE. So, in terms of the private makeup of your organization, you have indicated there is a foreign representation and a domestic representation. What I am asking is, what is the percent of both, of each?

Mr. LEWIS. I do not have the calculation. But what I say is our issue——

Senator DASCHLE. You must have some general idea.

Mr. LEWIS. Well——

Senator DASCHLE. Is it 50/50?

Mr. LEWIS. Based on what?

Senator DASCHLE. Well, based upon just who are your members. I mean, is it——

Mr. LEWIS. It is the majority of——

Senator DASCHLE. I will get to the reason I am asking that in just a minute.

Mr. LEWIS. Probably 70 or 80 percent are domestic companies.

Senator DASCHLE. 70 or 80 percent are domestic and 20 percent are——

Mr. LEWIS. I beg your pardon?

Senator DASCHLE. Could you just submit that for the record? That would be very helpful.

Mr. LEWIS. All right.

[The information appears in the appendix.]

Senator DASCHLE. The reason I ask is because clearly you have members who see it as in their economic interests—and I do not blame them for having it—to create as much of a demand for imported product as possible. They would not be in business——

Mr. LEWIS. No, demand for product as possible.

Senator DASCHLE. I am sorry?

Mr. LEWIS. We have members that want to create demand for product.

Senator DASCHLE. Well, yes. But if you are not a U.S. company that means a demand for foreign product because you are not a U.S. company by definition. So clearly you have an organization

that represents both—people who want demand for domestic product, but also a significant number of people who want demand for foreign product.

Mr. LEWIS. I will give you a classic example. Hoechst Celanese is a member company of ours, a company I worked for for many years. They have production of United States, Canada, the Middle East, all three. The Middle East production goes to Europe and Japan. The Middle East production does not come to the United States.

Senator DASCHLE. But that is not relevant to this discussion because you have a significant number of your members who for good reason have created and want to maintain a dependency upon their product. I mean, that is why they are in business.

Mr. LEWIS. I agree with that, methanol is the product. That is correct.

Senator DASCHLE. Exactly. That is right.

So what I am saying is that you have the job of obviously advocating the need for domestic growth in the product, but you certainly have to acknowledge that your organization continues to represent, as it should, foreign producers of methanol and MTBE that would like very much to continue to have the right to market their products within the United States on a competitive basis. Correct?

Mr. LEWIS. Well, that is true.

Senator DASCHLE. Okay.

Mr. LEWIS. As an example, when issues of import duty came up I recused myself from that issue for that very reason.

Senator DASCHLE. Well, that is good. Let me move on here.

Mr. Piel?

Mr. PIEL. Could I followup on something?

Senator DASCHLE. Yes.

Mr. PIEL. There was some discussion about world markets of MTBE, and just to remind you, as I said in my testimony, we happen to be the world's largest producer of MTBE and we sell in all those markets. We currently produce MTBE in Europe and in the United States. Approximately 40 percent of our production is in Europe.

To let you know what the status of the markets are, is that currently we have been bringing some of our MTBE production in from Europe because the market in Europe has not been growing. There is currently no legislation on the book or anything that would require a need to use MTBE in Europe.

So I am suggesting that there is no market developing for all that capacity that is being built in the Middle East.

Senator DASCHLE. So what you are saying is you have production but no demand outside the United States?

Mr. PIEL. In Europe right now much of the MTBE capacity is running way below capacity because the market is not there. And a lot of the MTBE that is being produced in Europe is being brought into the United States. We are actually one of those companies. We have been one of the biggest MTBE importers into the United States and they have been bringing it in. Our plants are not running full in Europe currently either.

There is another reason. We are also the largest U.S. producer of MTBE and though we had many opportunities to expand our ca-

pacity in the United States we decided we could not because we could not compete with off-shore MTBE in the long run. I am just relaying the experience of the world's largest MTBE supplier who happens to sell in everyone of those markets and understands them just as good as anybody here or outside this room. We are actually doing it.

Senator DASCHLE. That is interesting. You are the world's largest MTBE supplier and you are the only oil company that currently produces ETBE.

Mr. PIEL. We are not the only oil company. Amoco also makes ETBE.

Senator DASCHLE. For blending with gasoline?

Mr. PIEL. In their refinery, right.

Senator DASCHLE. Okay.

Why have you chosen to produce ETBE as well as MTBE?

Mr. PIEL. Because we have, as any good supplier should be, responsive to what his customer needs are. And we believe ETBE is a more useful product for many of our customers. Not all of them, not all year long. Our intent is MTBE is going to probably be our major product as far as we can see in our plant. But we see ETBE has some unique advantages for certain times of the year, as mentioned earlier, summertime, possibly the southern part of the United States.

And for those of our customers that sell in those markets, we plan to offer ETBE because in those cases, with those customers, it has an advance over MTBE. So we are responding to what we believe are our customer needs in offering the best products available at the best time.

Senator DASCHLE. If you were not to consider cost advantages or disadvantages, would there be a preference among oil companies, in your view, between ETBE and MTBE?

Mr. PIEL. If the costs were the same between MTBE and ETBE, it would be obvious that ETBE would be a preferred product. It is the issue of cost that confuses the——

Senator DASCHLE. You say it would be obvious. I think for the record it is important for you to clarify that. It is not obvious to somebody just reading the record.

Mr. PIEL. All right. Because as I mentioned earlier in my testimony, we say about lower vapor pressure which is added valued, higher octane, which adds value, given a choice between the two at the same price most refiners would prefer ETBE because of its higher octane, lower vapor pressure, both which give added value to the product.

Senator DASCHLE. Where does ARCO expect to get most of its future supplies of ethers for blending with gasoline?

Mr. PIEL. Are you referring to ARCO Products Company on the West Coast?

Senator DASCHLE. That is right.

Mr. PIEL. I really cannot comment on that. We are a separate company from ARCO. ARCO Chemical is a separate company and we do not have access and knowledge to their future plans.

Senator DASCHLE. Do you expect that a strong domestic ether industry will be developed if current economic relationships remain as they are today?

Mr. PIEL. Under current relationships and current markets, all ether capacities will grow. We see off shore and imports as well as domestic will grow. You will see more ether units being built in refineries under current relationships, under current market conditions. So you will see growth of ether in domestic refineries.

There is no other domestic butane based MTBE plants scheduled beyond the ones that have already been committed and are in the process of being built. But there are a number of off shore plants that seem to be being built, driven more on favorable feedstock economics more so.

So there is only two more MTBE units that I know that are scheduled, world scale units to be built in the United States. There are a lot of other ones are being discussed about, but there is actually two that are being engineered.

Senator DASCHLE. Let me just ask one final question, Mr. Piel. We were talking about environmental qualities and the comparison of different oxygenates, but obviously the volatilization issue is one that this Subcommittee and I think EPA in particular are going to be examining with some interest in the months ahead.

Could you tell us whether MTBE suppresses benzene volatilization more than ETBE does and whether there are other benefits associated with ETBE or MTBE in terms of diluting toxic constituents in gasoline, replacing toxic constituents or suppressing the evaporation of toxic constituents?

Mr. PIEL. ARCO Chemical is one of the leaders on educating EPA and other parties on one of these advances of MTBE or ethers in general suppressing the volatility of benzene in evaporative emissions because we have seen it a lot in the past.

But our experience also suggests that all ethers, ETBE and TANE, are just as effective in suppressing the volatility of benzene evaporative emissions. We have done both laboratory tests and also computer modeling that verifies that it looks like all ethers at the same oxygen level in gasoline, but provide roughly the same reduction in benefits that reduce benzene vaporative or benzene volatility or benzene emissions in the evaporate emissions.

Mr. LEWIS. Using more of it. You said at the same oxygen.

Mr. PIEL. At the same oxygen level, they are all effective. Since you have to blend to give an oxygen level in gasoline, no one oxygenate would have an advantage, as long as there is an ether.

Senator DASCHLE. Well, I am out of questions and we are virtually out of time. I want to thank our panel for their contribution, their answers to our many questions, and their willingness to sit through a day of discussion about the oxygenates that again will be the subject of two additional hearings later on this fall.

We thank our witnesses and the hearing stands adjourned.

[Whereupon, at 4:50 p.m., the hearing was adjourned.]

APPENDIX

ADDITIONAL MATERIAL SUBMITTED

PREPARED STATEMENT OF ROGER K. CONWAY

Mr. Chairman and members of the subcommittee, we appreciate the opportunity to appear today to discuss the Department's (USDA) activities regarding the Federal reformulated gasoline program, renewable oxygenates, and the role ETBE might play in that program. My brief remarks will highlight the Department's role in the regulatory process.

USDA was actively involved in discussions that led to the reformulated gasoline regulatory proposal that allowed ethanol and other renewable oxygenates to participate in the reformulated gasoline program by relaxing volatility standards for fuels blended with renewable oxygenate and increasing volatility standards for all other fuels. The outline of that proposal was announced October 1, 1992, and the proposed regulation was published in the *Federal Register* on February 28, 1993.

The proposal called for providing reformulated fuels blended with ethanol and other renewable oxygenates, such as ETBE, up to a 30 percent market share in northern ozone nonattainment areas. Similar, but more restrictive provisions were granted for some southern ozone nonattainment areas. The Environmental Protection Agency (EPA) held public hearings on the February 28 proposal on April 14 and 15, 1993. Many of those testifying at that hearing stated their opposition to the proposed rule because they saw it as unworkable and unenforceable.

USDA supported the concept of a renewable oxygenates program in the reformulated gasoline regulation because we believe that such a program would provide ethanol, ETBE, and other renewable oxygenates increased opportunities in this highly regulated market. The Secretary believes that enhancing the use of renewable oxygenates would provide broad benefits for the U.S. agricultural sector. The expanded use of renewable oxygenates would boost the demand for corn and other domestic resources, expand employment opportunities in rural America and improve U.S. energy security.

We have estimated that an effective renewable oxygenate program as part of the reformulated gasoline regulation could increase ethanol production and use up to 2 billion gallons annually by the year 2000. Such use could expand employment opportunities by an estimated 28,000 jobs, 10,000 of which would be direct and indirect jobs in the ethanol processing industry.

Increased demand for ethanol as a fuel additive or an ether feedstock would provide incentives for new technological developments in ethanol processing. USDA estimates that near-term technology improvements could reduce the costs of ethanol production by 5–7 cents per gallon. In the longer term, technological innovations could save as much as 15 cents per gallon over current costs.

These benefits are some of the reasons why Secretary Espy supports a renewable oxygenates program. In his comments to EPA, the Secretary proposed a system of tradable credits to provide improved market opportunities for renewable oxygenates. All gasoline sold in a reformulated gasoline market area would be required to meet the performance standards specified in the regulation. Refiners or blenders who wish to use renewable oxygenates would earn credits. Refiners and blenders who do not wish to use renewable oxygenates in their reformulated fuels would be required to meet stricter performance standards or to purchase credits as a means of fulfilling their participation requirements.

I should add, however, that the views expressed here are those of the Department and do not necessarily reflect a final administration position. Final regulatory authority for the reformulated gasoline program rests with EPA. EPA is currently re-

viewing comments, including the Secretary's proposal. The deadline for publication of the final rule is December 15, 1993.

Mr. Chairman, this concludes my prepared remarks. I will address any questions you or other members of the subcommittee have at this time.

PREPARED STATEMENT OF SENATOR TOM DASCHLE

Good afternoon. I want to thank our witnesses for coming today. Many have been involved in the development of the nation's reformulated gasoline program, and I appreciate their willingness to discuss issues of mutual concern and interest.

As important as the free market is to the American economy, it does not address all our nation's needs; it does not achieve all the objectives of a thoughtful and progressive society. Important national objectives can be promoted by refining existing federal programs, by enacting new legislation, and through appropriate use of the tax code. These are the tools available to our democratic government to ensure that our children are educated, that our environment is protected, and that our citizens are housed, clothed, cared for, and employed.

Last week President Clinton announced his plan for providing every American access to health care, emphasizing the health and cost benefits of taking preventative measures. Efforts to control air pollution, such as the reformulated gasoline program, improve public health and thus contribute to reducing our nation's health cost burden.

The reformulated gasoline program, established in the 1990 Clean Air Act Amendments, represents an important step toward improving air quality and bringing some of our dirtiest cities into compliance with federal air pollution standards. I am hopeful that this effort, which will lower urban ozone levels and help control the release of toxic chemicals, will help reduce rates of respiratory disease and cancer.

The reformulated gasoline program will be implemented beginning in 1995 in the nine areas of the nation suffering the most from ozone pollution. Other areas can opt into the program if they so choose. Under the program, cleaner fuel, made by removing many of the toxic chemicals from base gasoline and replacing them with clean oxygenates, must be sold in participating areas.

Sadly, both the RFG program and the oxygenated fuels program have come under attack lately, and questions have been raised about when and how it will be implemented. The American Petroleum Institute has been trying to convince states not to opt into the program. Rather, API would have states choose a different route, one that would have fewer air quality benefits.

Just last week, the Senate accepted an amendment to the VA-HUD Appropriations bill that would allow states to opt out of the oxygenated fuels program, under certain conditions. This seemingly minor amendment, which was adopted with little debate, could have far-reaching ramifications, and I expect it will be revisited in conference.

The ceaseless bickering over the ultimate shape of the RFG program has also contributed to uncertainty and served to undermine support for this precedent-setting policy initiative. If this nation is truly intent on seriously addressing our air pollution problems, we must bridge existing differences and move ahead to implement a strong and workable RFG program.

If successfully implemented, the RFG program has the potential to reduce air pollution, reduce our dependence on foreign imports of petroleum, and create domestic jobs. The question that we as a nation must ask as we stand on the threshold of this exciting new opportunity is how to ensure that the full potential of this program is realized.

This hearing is the first in a series of three hearings designed to answer that question, as well as questions about the appropriate structure of tax incentives for an array of alternative fuels. Today, we intend to explore the advantages and disadvantages of using two oxygenates, ethyl tertiary butyl ether, known as ETBE, and methyl tertiary butyl ether, known as MTBE, and the roles that they could play in cleaning our nation's air, improving the health of our citizens and creating American jobs.

The second hearing in this series will be held later this fall and will examine the current tax provisions that relate to oxygenates. The third hearing will explore the tax treatment of gasoline or diesel fuel replacements, including neat ethanol and methanol, compressed natural gas, and biodiesel fuel.

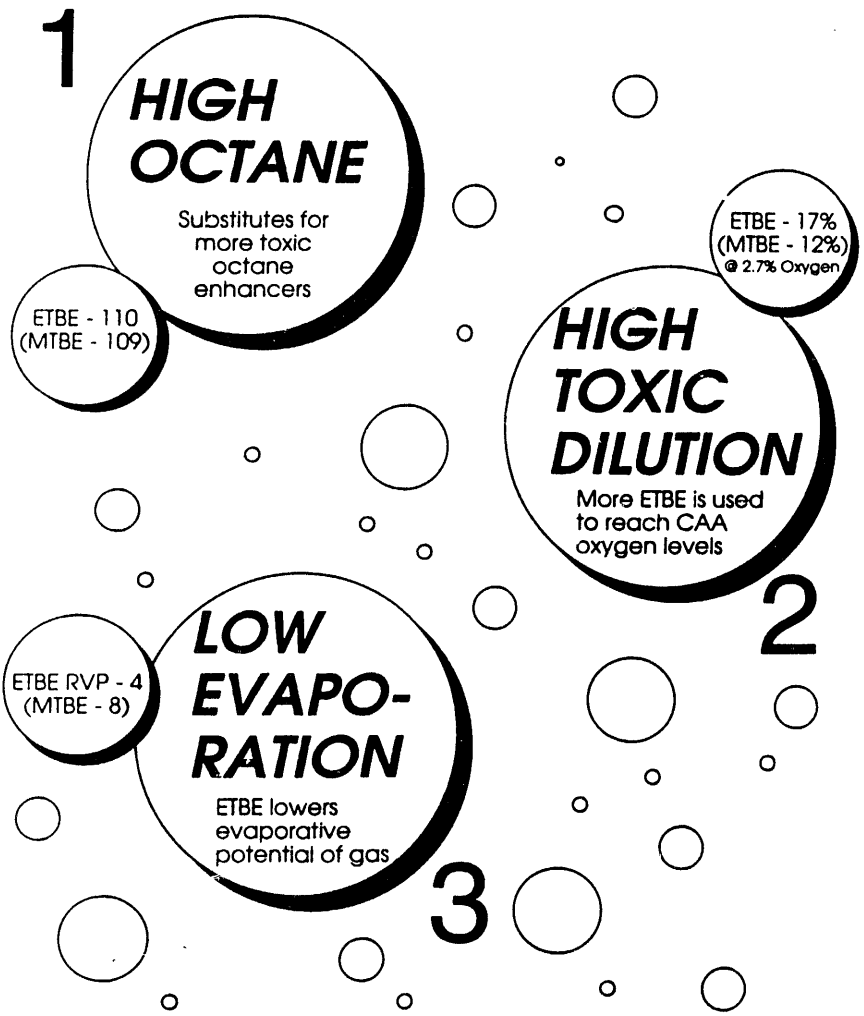
It is no secret that I have been a strong proponent of ETBE in this debate, and I would point out that at least one of our witnesses, Mr. Ray Lewis of the American Methanol Institute, was invited expressly to make any statements he wishes to about the merits of methanol and MTBE.

MTBE is a well-known and widely-used commodity. ETBE, on the other hand, is a relative new-comer with great potential. It is my hope that this hearing, among other things, will correct some misimpressions about this newer fuel.

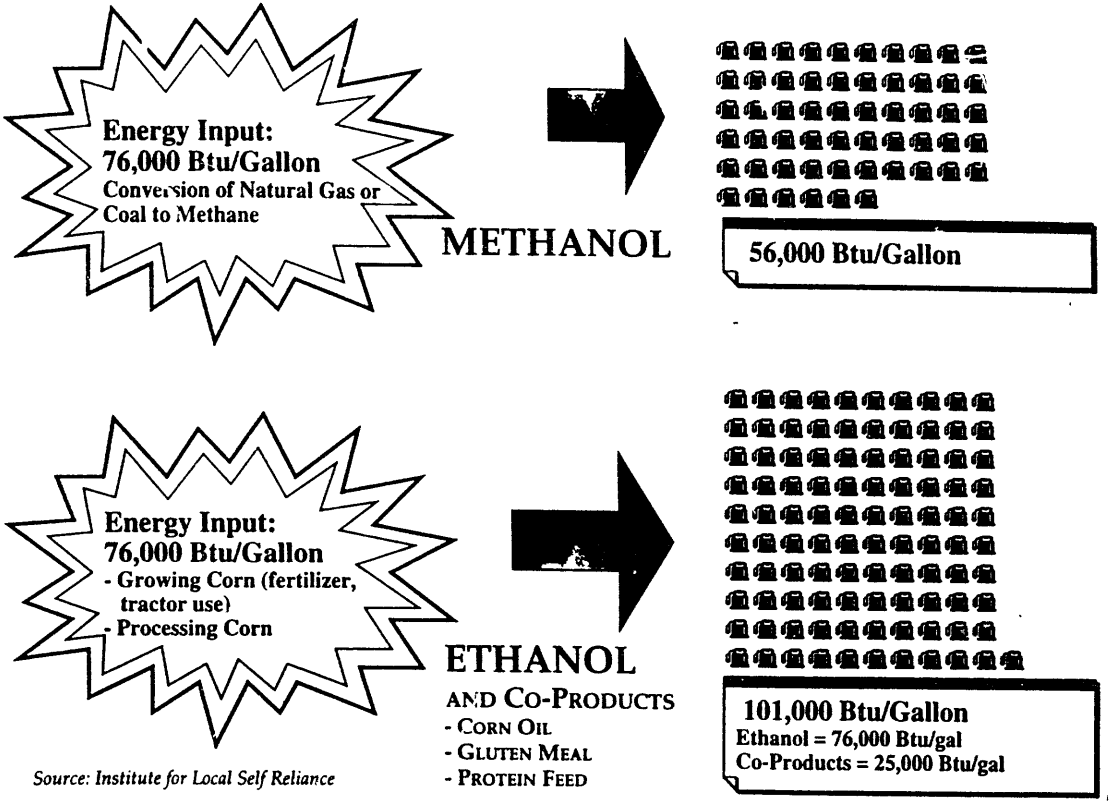
As the chart before you indicates, ETBE as a fuel additive results in fuel with high octane, substantial toxic dilution, and low evaporative characteristics. Second, ethanol, and hence ETBE, is an efficient fuel, both in terms of net energy balance and cost to the federal government. This point is further illustrated by two additional charts I have with me today.

Once again I would like to thank our witnesses for coming. I invite them to comment on these and any other points relevant to the topic under consideration today.

FACTORS AFFECTING RELEASE OF TOXIC AROMATICS

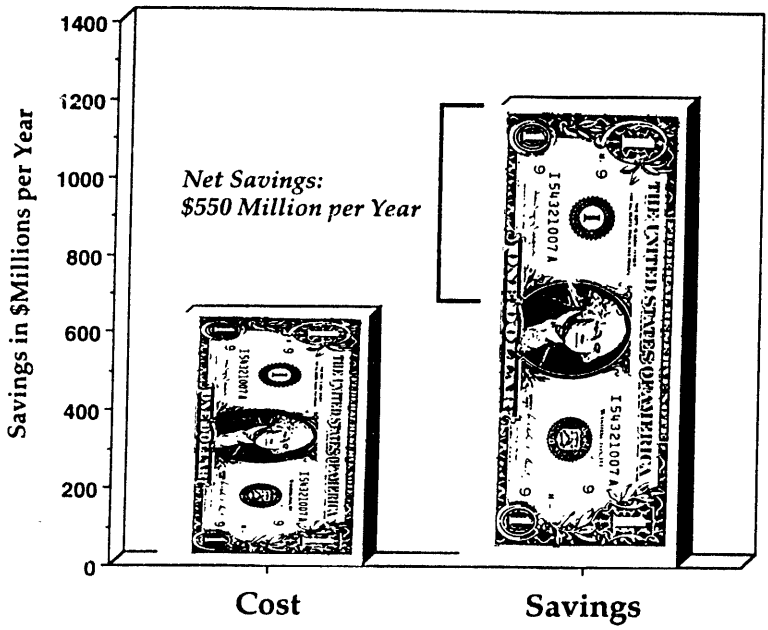


ENERGY BALANCE



Source: Institute for Local Self Reliance

THE ETHANOL TAX BENEFIT SAVES THE GOVERNMENT MONEY



Because the ethanol tax benefit increases the demand for corn, it decreases farm subsidies, resulting in a net savings of about $550 Million per year.

Source: GAO

Increasing market opportunities for ETBE would further reduce farm subsidies.

THOMAS DASCHLE
SOUTH DAKOTA

COMMITTEES
AGRICULTURE
ETHICS
FINANCE
INDIAN AFFAIRS
VETERANS AFFAIRS

(202) 224-2321
TOLL FREE 1-800-424-9084

United States Senate

WASHINGTON, DC 20510-4103

February 7, 1994

320 6TH AVENUE SW
SUITE B
P.O. BOX 1536
ABERDEEN, SD 57402-1536
(605) 225-8823

515 6TH STREET
P.O. BOX 6168
RAPID CITY, SD 57709
(605) 348-7551

810 SOUTH MINNESOTA AVENUE
P.O. BOX 1274
SIOUX FALLS, SD 57101
(605) 334-9596
TDD (605) 334-4632

Raymond A. Lewis
President
American Methanol Institute
800 Connecticut Ave, NW -- Suite 620
Washington, DC 20006

Dear Mr. Lewis:

I am writing regarding your testimony before the Senate Subcommittee on Energy and Agricultural Taxation on September 29, 1993.

At that hearing, you promised to provide a full list of the membership of the American Methanol Institute, indicating the percentage of foreign ownership of those members. In a followup letter of October 5, 1993, I requested that you provide information on "which AMI members have equity participations in non-North American oxygenate facilities, the types of oxygenate produced at those facilities, the estimated annual capacities of those facilities, and the amount of oxygenate from each facility that is exported for ultimate sale in the United States." A copy of that letter is attached.

To date, more than four months later, the Subcommittee has not received that information, despite repeated requests to you from the publications staff. Due to the importance of this information, I have asked that the hearing record remain open until the information is received. It is difficult to understand why this type of information should require so much time to assemble.

As you know, the purpose of the hearing was to collect and evaluate information on the various oxygenates available to be blended with gasoline. As such, the Finance Committee relies on the cooperation of all witnesses to establish a full and complete hearing record. Providing only that information which the American Methanol Institute wishes to make public damages the public interest by undermining the ability of Congress to make fully informed judgments. Should AMI continue to demonstrate its unwillingness to share information with the Committee -- information which it promised to provide at the hearing -- it would be difficult to justify inviting AMI to participate in future hearings on this subject.

I look forward to hearing from you.

Sincerely,

Tom Daschle
United States Senate

Enclosure

THOMAS DASCHLE
SOUTH DAKOTA

COMMITTEES
AGRICULTURE
FINANCE
INDIAN AFFAIRS
VETERANS' AFFAIRS

(202) 224-2321
TOLL FREE 1-800-424-9084

United States Senate

WASHINGTON, DC 20510-4103

October 5, 1993

515 SOUTH MAIN STREET
P.O. BOX 1536
ABERDEEN, SD 57401
(605) 225-8823

515 6TH STREET
P.O. BOX 8166
RAPID CITY, SD 57709
(605) 348-7551

510 SOUTH MINNESOTA AVENUE
P.O. BOX 1274
SIOUX FALLS, SD 57101
(605) 334-9596
TDD (605) 334-4632

Mr. Raymond A. Lewis
President
American Methanol Institute
800 Connecticut Avenue, N.W. -- Suite 620
Washington, DC 20096

Dear Mr. Lewis:

Thank you for providing testimony at the Finance Subcommittee on Energy and Agricultural Taxation hearing last week. I appreciated the time and effort you invested to help the Subcommittee explore important issues related to MTBE and ETBE, and am writing to request clarification of two issues that came up during the discussion.

For the purpose of completing the hearing record, I would appreciate additional information on 1) the degree of foreign methanol and foreign MTBE producer participation in your organization, and 2) the extent to which your members are involved in the advancement of commercial production of methanol from non-fossil fuel feedstocks.

The Subcommittee heard testimony from numerous witnesses who stated that, absent certain policy changes, a substantial amount of the oxygenates needed to supply the U.S. demand would come from foreign sources, such as those located in the Persian Gulf. Most of the witnesses also acknowledged that farsighted alternative fuels policy should be based on a number of factors in addition to strict "marketplace" considerations. These factors include job creation, energy security, the trade deficit, the federal budget deficit, renewability and environmental protection.

The testimony presented to the Subcommittee supported the contention that it would be preferable to meet domestic ether demand with domestic ether supplies. It is possible that the Subcommittee will want to consider how best to encourage the domestic ether industry to meet this demand, particularly in light of the fact that foreign ether producers are often enticed by host government raw material and financial concessions.

In weighing your testimony, it is important for the Subcommittee to have a clear sense of AMI's members' priorities and objectives. While the American Methanol Institute (AMI) describes itself as "the national trade association for the U.S. methanol industry," the Subcommittee notes that its membership includes many large multinational companies that have equity interests in large foreign methanol producers, and, in some cases, foreign MTBE facilities. AMI members like Fletcher Challenge, Nissho Iwai Corp, Sabic Marketing Americas, Mitsubishi Gas Chemicals, and Trinidad and Tobago Methanol appear to have interests that could be at odds with a policy designed to maximize U.S. oxygenate production.

Please describe which AMI members have equity participations in non-North American oxygenate facilities, the types of oxygenate produced at these facilities, the estimated annual capacities of these facilities, and the amount of oxygenate from each facility that is exported for ultimate sale in the U.S. market. In addition, it would be helpful if you could advise the Subcommittee whether each of these facilities has benefitted from, or currently enjoys, any type of host government assistance, whether it is in concessionary raw material pricing policies, tax forgiveness and/or moratoriums, or financing support, and whether equity- or debt-related. Please make this information as current as possible.

As you know, Congress established the alcohol fuel incentives in 1978 and 1980 to encourage the development of non-fossil-based alternative fuels. In response to these tax incentives, the private sector has invested hundreds of millions of dollars in plants to manufacture alcohols -- primarily ethanol up to this point -- from renewable feedstocks. While technological advances are occurring, producing alcohol fuels from renewable feedstocks is more costly than producing those same fuels from fossil fuels, such as natural gas and coal. Use of renewable feedstocks is also more capital- and labor-intensive, and offers more environmental benefits, particularly through reductions in emissions of the greenhouse gas, carbon dioxide.

Please advise the Subcommittee if any AMI members are involved in the commercialization of non-fossil fuel-based alcohol production technologies. Without divulging any proprietary information, please describe the general extent of their commitment to this work, in terms of funding levels, number of years involved in this work, and level of effort (i.e., pilot scale, demonstration scale, commercial scale). Finally, the Subcommittee would like to know if AMI's members believe that there are non-fossil fuel-based methanol production technologies that could be operating on a commercial scale in the near future.

Thanks again for your participation in the hearing. The Subcommittee is grateful for your help in providing it with the most up-to-date information on the alcohol fuels and ether industries. I look forward to hearing from you soon on these follow up questions.

With best wishes, I am

Sincerely,

Tom

Tom Daschle
United States Senate

TAD/ew

THOMAS DASCHLE
SOUTH DAKOTA

COMMITTEES
AGRICULTURE
ETHICS
FINANCE
INDIAN AFFAIRS
VETERANS AFFAIRS

(202) 224-2321
TOLL FREE 1-800-424-9094

United States Senate

WASHINGTON, DC 20510-4103

March 7, 1994

320 6TH AVENUE SW
SUITE B
P O BOX 1536
ABERDEEN, SD 57402-1536
(605) 225-8823

816 6TH STREET
P O BOX 8168
RAPID CITY, SD 57709
(605) 348-7551

810 SOUTH MINNESOTA AVENUE
P O BOX 1274
SIOUX FALLS, SD 57101
(605) 334-9596
TDD (605) 334-4632

Raymond A. Lewis
President
American Methanol Institute
800 Connecticut Avenue, N.W.
Suite 620
Washington, DC 20006

Dear Mr. Lewis:

My staff has briefed me on your recent meeting with them at which you provided your written response to questions raised during your testimony last September before the Finance Subcommittee on Energy and Agricultural Taxation. I appreciate your expressions of apology for the tardiness of your written submission and welcome your expressed interest in maintaining an open dialogue between us. I am always willing to discuss in any appropriate manner issues of relevance to the Subcommittee's jurisdiction, and I have asked my staff to follow this approach.

Since Felix Sanchez emphasized AMI's desire to keep the lines of communication open in his phone conversation with my tax counsel, Alex Deane, I thought I would take this opening to react to your record submission. Despite its length, I find in it very little information responsive to the questions posed at the hearing and further clarified in my letter to you several days thereafter. A copy of my subsequent letter is attached for your reference.

My interest is in ascertaining the general activities of the AMI membership, most specifically whether individual members are engaged primarily in domestic or foreign production. As I stated in my October 6, 1993 letter:

> "In weighing your testimony, it is important for the Subcommittee to have a clear sense of AMI's members' priorities and objectives. While the American Methanol Institute (AMI) describes itself as "the national trade association for the U.S. methanol industry," the Subcommittee notes that its membership includes many large multinational companies that have equity interests in large foreign methanol producers, and, in some cases, foreign MTBE facilities."

It seems to me that this request could be accommodated without divulging any truly "proprietary" information.

Your February 15, 1994, submission contains lengthy discussion of the methanol industry in general, as well as the tax treatment of methanol and ethanol and their respective ethers, but none of this information is responsive to the questions asked. Most of it is repetitive of AMI promotional materials we have seen numerous times in the past.

The only directly relevant information provided in the submission is a list of the members of AMI. It contains no indication as to whether or not the list is complete, the percentage of foreign ownership of these members, and the amounts of methanol and MTBE that each of these members import into the U.S. each year.

Finally, your submission totally ignores my request for information on the methanol facilities owned or controlled by these companies and the amount of methanol produced at each of those facilities. I find it difficult to believe that federal anti-trust guidelines would prevent AMI from collecting the information needed to comply with this request.

AMI frequently has argued, moreover, that the domestic ethanol industry should not be given encouragement through the provision of tax incentives, despite the billions of dollars in tax incentives that have been made available to the oil and natural gas industries as well as the subsidies provided by foreign governments to foreign producers of MTBE. Allegedly, these arguments have been made on behalf of the domestic methanol and MTBE industries.

Given those positions and considering the subcommittee's grant of AMI's request to testify at its hearing on September 29, 1993, it is my belief that the subcommittee and the public have a right to know the general activities and objectives of AMI's members. Such disclosure is a fundamental, reasonable and universally respected aspect of testifying.

In conclusion, while I have instructed my staff to accept your request for another meeting, I would strongly urge you to arrive at that meeting prepared to provide the information requested. Your good faith cooperation will reflect not only on the integrity of AMI, but also on its future opportunities to testify before this subcommittee.

With best wishes, I am

Sincerely,

Tom Daschle
United States Senate

PREPARED STATEMENT OF DAVID GUSHEE

My name is David Gushee. Until this past Monday, I have been a Senior Specialist in Environmental Policy at Congressional Research Service, Library of Congress. On that day, I retired. Yesterday, I became a contractor to CRS to provide over the next two years continuing expertise and analysis similar to that I have provided in the past.

CRS provides to Congress objective information and analysis without partisan bias, according to instructions in the Legislative Reorganization Act of 1970, which created CRS. Within that requirement, I have prepared a number of analyses for the Congress on issues associated with alternative fuels and clean gasoline as the Clean Air Act Amendments of 1990 and the Energy Policy Act of 1992 were debated in Congress. This testimony conforms to that same standard.

My assignment this afternoon is to review the Clean Air Act requirements for oxygenates in reformulated gasoline (RFG), to estimate the future demand for oxygenates as a result of these requirements, to describe the place of ethers among the oxygenates, to identify the properties which affect which oxygenate to select from among the options, and to rate the ethers relative to those properties.

My conclusion is that the oxygenate that would win the lion's share of the market if performance and cost were the primary criteria may not win because of socio-political forces which place higher values on other criteria. The issue is still in doubt.

CLEAN AIR ACT REQUIREMENT FOR RFG

The Clean Air Act requires that, beginning January 1, 1995, gasoline sold in the nine serious, severe, and extreme ozone nonattainment areas contain at least 2.0% oxygen and no more than 1.0% benzene. A number of other attributes are specified, among which are two of direct relevance to the choice of oxygenate—volatility and aromatics content. The precise limits on these two factors will be the result of EPA rulemaking (not yet complete) to set the parameters, followed by refiner choice which will reflect the individual characteristics of each refinery.

OXYGENATE DEMAND

The nine ozone nonattainment areas under the reformulated gasoline mandate consume about 20% of national gasoline demand. Other ozone nonattainment areas not under the RFG mandate may opt in. If all that could opt in do so, more than 60% of national gasoline demand would be affected. The share affected could go

higher, depending on whether States mandate RFG statewide rather than just within the nonattainment areas.

The Clean Air Act also mandates oxygenates in the winter months in carbon monoxide nonattainment areas. The winter oxygenate program involves about 10 billion gallons of gasoline at 2.7% oxygen. Further, some refiners voluntarily use oxygenates as sources of octane in gasoline sold in noncontrol areas. Thus, total demand for oxygenated gasoline will be somewhere between 35 billion and 75 billion gallons per year in the late 1990's, with the volumes tending toward the lower level in 1995 and increasing over time as areas opt in.

It is also possible that, as the proportion of oxygenated gasoline increases, the industry will decide to go all the way to 100% oxygenated gasoline so as to return to a system with fungible products, which cost less to distribute than a system with products which must be kept separate.

Assuming that 35 to 75 billion gallons of gasoline will contain 2.0% oxygen supplied by 11.0% methyl tertiary butyl ether (MTBE) in the gasoline, somewhere between 4 and 8 billion gallons per year of MTBE would be required. Of course, not all the oxygenate will be MTBE, and the oxygen content will not all be 2.0%, but this estimate provides a sense of the general magnitude of the gasoline oxygenate market.

THE ALTERNATIVE OXYGENATES

Potential sources of oxygen for oxygenated gasoline include alcohols such as methanol, ethanol, and higher alcohols such as tertiary butyl alcohol (TBA) and ethers such as MTBE, ethyl tertiary butyl ether (ETBE), tertiary amyl methyl ether (TAME), tertiary amyl ethyl ether (TAEE). Diisopropyl ether (DIPE) has been announced as a candidate oxygenate, but there appear to be no commercialization plans. These substances can be made from a wide variety of feedstocks, although currently they are made from biomass (ethanol), natural gas (methanol and isobutylene from natural gas liquids), petroleum (DIPE), or a combination of these (ethers produced by refiners).

At this time, MTBE and ethanol provide the lion's share of the oxygen. Last year, about 1 billion gallons of each were added to gasoline in three different markets—the gasohol market (all ethanol), the winter oxygenate market (about one third ethanol and two thirds MTBE), and the octane market (essentially all MTBE when the octane is provided by oxygenate).

Most early estimates of oxygenate use in RFG assumed that MTBE would be the oxygenate of choice, with a possible volume of 5, 6, 7, or even more billion gallons per year as the year 2000 approached. The role of TAME would increase but be limited by the volume of C5 olefins in refineries. The role of ethanol in RFG was expected to be minimal.

These early estimates of the dominance of MTBE in RFG are now in doubt. The EPA RFG rulemaking, where the role of ethanol hangs in the balance, is one factor. The health effects issue is another. A third is the emphasis on lower and lower volatility in RFG, particularly in later years, not only by EPA but also in California.

FACTORS AFFECTING OXYGENATE CHOICE

There are many factors bearing on the selection of which oxygenate or mixture of oxygenates to use. The primary technical ones are compatibility, cost, availability, blending volatility, blending octane, and oxygen content.

Compatibility. Alcohols have some compatibility problems, primarily their tendency to absorb water. Gasoline and other refinery products all contain water when they leave the refinery. The water doesn't affect the product quality because of its low solubility in the petroleum products. With alcohols in the products, however, pockets of water can cause problems, particularly in pipelines. This can be overcome but at a cost not required with ethers, which do not have the same affinity for water.

Volatility. Volatility is one of the key variables affecting the tendency of RFG to form ozone. The lower the volatility, the less fuel is evaporated. The less is evaporated, the less ozone is formed. EPA's first pass in rulemaking set a volatility limit of 8.1 psi (measured as Reid Vapor Pressure, or RVP) in northern tier cities and 7.2 in southern cities. These limits compared to limits of 9 and 7.8 respectively for nonreformulated gasoline.

Methanol's blending RVP is so high that it is disqualified as an oxygenate source except in some blends not currently being used. Ethanol has a blending RVP of 19 psi, which means that significant efforts are required in mixing and matching refinery streams in order to meet the RFG volatility limits. The difficulty is greater as the target RVP goes down.

MTBE has a blending volatility of about 8 psi. This makes MTBE convenient with respect to meeting the volatility specification for northern tier cities. ETBE, TAME, and TAEE have blending volatilities of about 4 psi. Whether this is an advantage in making gasoline for northern cities will depend on the specifics of the refinery in question, since volatility can be affected by the relative proportions of a number of different refinery blendstocks, and the issue is one of aggregate system cost.

For southern cities, the lower RVP limit removes some of the blending flexibility, thus reducing MTBE's relative advantage compared to ETBE and TAME or TAEE.

Octane. All of the oxygenates have blending octane values higher than the base blendstocks from which gasoline is made. Thus, they are all octane enhancers. ETBE and TAME have slightly higher blending octanes than MTBE. The differences are not great but in some cases, particularly when octane is short, can be the swing factor.

Dilution Factor. To produce an oxygen content of 2.0%, ethanol content is 5.7%. MTBE content is 11.0%. ETBE content is 12.7%, and TAME content 12.7%. TAEE content would be 14.5%. This factor can play a role when benzene content of the gasoline produced by mixing various refinery streams is very close to the upper limit of 1.0% and could be brought within specifications by an ether with a larger dilution ratio, thus avoiding an extra step in the refinery.

Cost. Ether cost depends on the cost of the alcohol, the cost of the olefin, and processing cost. ETBE and MTBE use isobutylene as the olefin, the alcohols being ethanol and methanol respectively. The isobutylene cost is common to both; it costs slightly more (a few pennies per gallon at the most) to make ETBE than MTBE. Ethanol is priced around $1.25 per gallon; after Federal subsidy, this is reduced to 71 cents per gallon. Methanol is priced at about 45 cents per gallon (both sell for less from time to time because of temporary market conditions). Thus, ETBE will cost net to the blender about 10 to 15 cents per gallon more than MTBE. TAME will cost a bit more than MTBE, because the C5 olefins are slightly more expensive than isobutylene. TAEE will be to TAME as ETBE is to MTBE.

According to a recent CRS estimate, the volatility, octane, and dilution advantages of ETBE will be of real value in making RFG for summertime use in southern tier cities and in California and will probably result in significant volumes of ETBE, probably in combination with MTBE, in the gasoline going to those markets. In northern tier cities, these values will not be of enough value to close the price gap if the relative alcohol prices do not change.[1]

CONCLUSION

When the Clean Air Act Amendments were passed in 1990, it was generally perceived by the petroleum industry and most other observers that the market for oxygenates would skyrocket into the billions of gallons per year, that ethanol and the ethers would share the winter oxygenate market, and that MTBE would capture most of the RFG market in the early years. Other oxygenates, probably ethers, would be developed and capture some of these markets as the years went by.

As the reformulated gasoline era draws nearer, the future for MTBE appears to be much less certain, in large part as the result of uncertainty about what the regulatory system will require but also because of uncertainties associated with potential adverse health effects and the increasing emphasis on lower and lower volatilities. Of these driving forces, only one—the apparent trend toward lower volatilities—is primarily a technical issue. The others are as much sociopolitical as they are technical.

PREPARED STATEMENT OF SENATOR ORRIN G. HATCH

Mr. Chairman, I want to thank you for holding this hearing today on the environmental and energy issues associated with ethanol and methanol. As I understand it, this is the first of three anticipated hearings on various aspects of alternative fuels, with the others focusing on the tax policy of alternative fuels and on substitute fuels.

I commend you, Mr. Chairman, for your leadership in scheduling these hearings. Too often, we in Congress tend to be reactive to crises rather than being proactive to opportunities. We wait until urgency demands our attention, often at the risk of ending up with less than the very best policy decisions. The issues before us today, dealing with our nation's energy policy, demonstrate a good example of where

[1] "Economics of MTBE vs. ETBE in Gasoline." CRS Memorandum. David E. Gushee. July 27, 1993.

thoughtful action now, before the next energy crisis erupts, could greatly benefit all Americans.

The Clean Air Act Amendments of 1990, which require the oxygenation of gasoline, present the nation with both challenges and opportunities. The importance to our economy of fuel additives, such as ethanol and methanol and their derivative ethers, will only grow as more and more fuel is reformulated.

Oxygenated gasoline burns more efficiently than regular gasoline, resulting in lower emissions of carbon monoxide and ozone, two elements of air pollution. However, Mr. Chairman, the benefits of oxygenation are less clear in the area of PM10 particulates. In fact, the State of Utah has asked the EPA for a waiver of the oxygenation requirement for the Salt Lake/Ogden Metropolitan Statistical Area because oxygenated fuels are expected to cause the state to violate PM10 air quality standards.

Because oxygenates are made from energy sources other than petroleum, their expanded use in gasoline offers an opportunity to displace some of the petroleum we now import with domestically produced additives. This should reduce our reliance on foreign oil and help bolster our energy industries. According to the Congressional Research Service, the demand for oxygenated gasoline will grow to as much as 75 billion gallons by the end of the decade. This represents a significant opportunity for domestic producers of additives.

I welcome our witnesses today and look forward to learning more about the problems and opportunities of gasoline additives in energy and agriculture producing states like Utah, as well as what kind of policy changes we should consider to ensure the best overall benefit to Americans from these changes.

PREPARED STATEMENT OF SENATOR J. ROBERT KERREY

Mr. Chairman, I would like to thank you for the opportunity to appear before your Subcommittee today to discuss the benefits of ethyl tertiary butyl ether (ETBE), a derivative of ethanol. As Nebraska is a large corn producing state, the continued widespread production of ETBE will have a very positive effect on the economy of our state. The broader issue, however, is that the positive effects of ethyl-based fuels are not limited to those midwestern states where corn is grown. The use of these fuels will make for a cleaner environment, less dependence on foreign oil, and less need for government farm support.

There are three reasons why ETBE is environmentally preferable to other traditional fuels and methyl tertiary butyl ethyl ether (MTBE). First is the additive's higher octane level, which reduces the amount of toxic chemicals in the fuel, thereby allowing it to bum cleaner and reduce harmful emissions. Second, when ETBE is blended with gasoline it actually lowers the evaporation rate and reduces ozone problems associated with a higher Reid Vapor Pressure (RVP) level. Third, ETBE is a renewable energy source, which reduces the output of carbon dioxide and reverses damaging global warming trends.

Another positive attribute of ETBE is that it can be produced domestically, thereby improving our economy, and reducing our dependence on foreign energy sources. Currently, domestic production of oil is at its lowest level in thirty years. Exploration efforts have decreased as well. The United States presently imports about fifty percent of its oil, a figure expected to rise to almost sixty percent by 2000. We cannot address this problem by simply opening the Arctic National Wildlife Refuge, and other environmentally sensitive areas, to drilling. For the sake of our own economic and energy security, we must continue to develop alternative fuel sources that are domestically produced and easily renewable.

In Nebraska alone, there are currently two ethanol plants in operation, one nearing completion, and two more that are under construction. There are nearly twenty-five nationwide. At the Nebraska plants, ten percent of the state's annual average corn crop, or 100 million bushels are converted into 240 million gallons of ethanol—one-fifth of the U.S. total—every year. The production of ethanol also produces jobs, and increased U.S. production could create 28,000–108,000 new jobs by 2000.

Finally, the U.S. Department of Agriculture estimates that ethanol production currently raises the price of corn by about 15 cents a bushel, and is expected to raise the price even more by 2000. Not only will this give vital financial help to our nations farmers, but it will also help to reduce federal farm outlays. For example, each one cent increase in the price of corn saves the taxpayers $55 million in lower corn program costs. Thus, the current benefits of ethanol production save about $825 million in annual USDA costs. Given these facts, it seems that the expanded production of ETBE is just smart fiscal policy.

In closing, I want to thank you again for giving me the opportunity to appear before the Subcommittee today. I firmly believe that ethanol and ETBE are viable keys to our energy future that should not be ignored. They provide a clean, secure, and fiscally responsible energy source, while also supporting an important part of our domestic economy. I appreciate your consideration.

PREPARED STATEMENT OF RAYMOND A. LEWIS

On behalf of the American Methanol Institute (AMI), the national trade association for the U.S. methanol industry, I am pleased to have the opportunity to appear today to present this testimony on the energy-security and environmental benefits of methanol fuel additives.

I understand that subsequent hearings will examine issues about the tax subsidies for alternative fuels and fuel additives and the effects of these subsidies and other programs on the competitiveness of the domestic methanol industry, as well as the economics of clean-fuel production. AMI looks forward to participating in those hearings.

In this connection, AMI commends the Chairman and the Subcommittee for taking this important first step in examining the tax treatment of gasoline additives and alternative motor fuels. This is an area greatly in need of legislative reexamination. Over the years, the taxation of motor fuels has developed in a piecemeal manner, resulting in an overall system that provides wide and unfair disparities in tax treatment between similar products. This pattern is highly prejudicial to methanol and MTBE, as is shown in the attached Exhibit I.

AMI believes that taxes applicable to competing products should not attempt to promote one product over another, particularly in the developing area of clean fuels. A product's merits should be demonstrated instead in the market. It is important in this context that the Internal Revenue Code not be used to make judgments about the relative merits of any particular gasoline additive or alternative fuel. While there may be a policy reason to provide all alternative fuels with some preferential tax status over gasoline, such as an initial period of tax exemption to establish market growth, any such policy should be as neutral as possible among all alternative fuels.

With this background in mind, I am pleased to address the more specific and limited topics of today's hearing.

Introduction

What Is Methanol? Methanol is a clear liquid alcohol. It is produced almost entirely in the U. S. from abundant supplies of domestic natural gas. When produced from natural gas, there is no other feedstock, so the production of methanol is a remarkably efficient and environmentally clean process. Methanol can be produced from a broad range of other domestic resources as well, from biomass to coal. Promising technology is being developed, for example, to produce methanol cleanly as part of the steelmaking process, which will provide major employment, environmental and energy benefits for the Nation and should greatly enhance the competitiveness of the U. S. steel industry. In addition, although funding has been very limited compared to other fuels, substantial progress has been demonstrated to produce methanol from a variety of domestic renewable or recycled products.

What Are Methanol Fuel Additives? Methanol and its derivatives can be added to gasoline to produce a fuel that is both cleaner burning and higher in octane. Methanol contains 50 percent oxygen by weight, a property that gives it enormous benefits in blending with gasoline to produce a fuel that burns both more cleanly and with better performance.

While methanol has been approved for blending directly with gasoline to produce these results, our industry has not sought any environmentally damaging volatility waiver that would have improved the economics of direct blending. Rather, it has become the practice to achieve these benefits by blending methanol ethers with gasoline. Using methanol to produce an ether retains all the benefits of methanol while providing a low-volatility blendstock that has low water solubility and therefore can be transported more efficiently through normal fuel-distribution pipelines. The most common ethers to date have been MTBE (methyl tertiary butyl ether) and TAME (tertiary amyl methyl ether).

MTBE has been providing benefits as a gasoline additive since 1979. Last year, approximately 2 billion gallons of MTBE were blended into gasoline.[1] More than one-third of the methanol currently marketed in the United States is used to manufacture MTBE and other methanol fuel products, which have become well-accepted and widely-used clean-fuel gasoline additives.

How Do Methanol and Ethanol Participate In The Gasoline Additive Market? The market for alcohol gasoline additives today consists of ethers such as MTBE and direct ethanol "gasohol" blends. Ethanol currently accounts for well over 50 percent of this market, with sales last year of some 1.1 billion gallons of ethanol compared to approximately 700 million gallons of methanol. Ethanol today is most often blended directly into gasoline in volumes of up to 10 percent ethanol, and the ability to produce ETBE with only minor modifications to MTBE plants has been demonstrated.

Energy-Security Benefits

Methanol And Its Derivative Fuel Additives Are Important Domestic Industries That Provide Major Energy-Security Benefits. It is important to recognize that both methanol and its derivatives such as MTBE are major domestic products. In recent years, the domestic methanol industry has expanded rapidly to meet the growing demand for clean fuels and fuel additives. The methanol industry is providing a key market for domestic natural gas and other domestic products. We estimate that by 1995, methanol production will provide a market for 500 bcf of domestic natural gas. This will represent the most significant opportunity available to implement the Clinton Administration's goal of displacing imported petroleum with clean domestic natural gas-derived products.

Currently, some 75 percent of the methanol consumed in the United States is produced domestically, with another 16 percent produced from secure natural gas supplies in Canada. An additional 5 percent comes from Latin America and the Caribbean Basin, with only 4 percent produced in other parts of the world.[2] MTBE and other methanol-derived fuel additives are similarly domestic in origin. Major domestic producers of MTBE and methanol include such well-known companies as Enron, Beaumont Methanol, Methanex, Valero, Lyondell, Ashland Chemical, Global, Arco Chemical, Texaco Chemical, Texas Petrochemical, Bellvue Environmental Fuels, and Amoco.

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[1] CRS Issue Brief: Alternative Transportation Fuels: Oil Import and Btu Tax Issues, Updated May 18, 1993, Congressional Research Service, The Library of Congress, p. CRS-6.

[2] Source: Petrochemical Consultants International, from U.S. Department of Commerce and International Trade Commission statistics.

Methanol and its derivatives provide real energy-security benefits to the Nation. Because methanol does not require any significant use of petroleum products in its production, the use of methanol and methanol derivatives is a powerful means of reducing oil imports and advancing important energy-security goals. In addition, by chemically reacting methanol with highly volatile butanes, the natural gas replacement for imported crude oil is leveraged 3 times. If these butanes were not currently combined with methanol to produce MTBE, they would be burned in the refinery, reducing the use of cleaner domestic natural gas.

If permitted to compete fairly, this pattern of strong domestic production and growth will continue. Methanol will be a major domestic product if the tax code and other public policies permit the methanol industry to compete fairly. The methanol industry has significant plans to maintain and increase domestic methanol production. However, these plans are dependent upon a balanced tax policy that does not undermine the ability of the methanol industry to compete. AMI welcomes the opportunity at the next hearing of this Subcommittee to present our views on the tax policies that would permit the Nation to continue to enjoy the energy-security benefits of clean-fuel methanol products in the future.

Environmental Benefits

Methanol And Its Derivatives Provide Major Environmental Benefits. Methanol products are key components in producing cleaner gasoline and in leading the way to an effective strategy for reducing air pollution. Methanol and its derivatives are effective in attacking all three of the major air-pollution problems addressed in the Clean Air Act -- carbon monoxide, ozone, and air toxics. Because of these benefits, major environmental organizations and state and local air-pollution regulators have consistently supported the use of ethers such as MTBE in oxygenated fuels and RFG programs and have supported substantial growth in these programs by encouraging additional states to opt in.

-- Carbon Monoxide Reduction. Adding methanol products to gasoline causes the fuel to burn more efficiently and completely, resulting in a significant decrease in the emission of carbon monoxide (CO). EPA studies indicate that the use of oxygenated fuels in CO nonattainment areas during the past winter, as called for by the Clean Air Act, was largely responsible for achieving a 95 percent reduction in the number of days exceeding the CO standard.[3] Moreover, methanol fuel additives achieve this benefit without any waivers of other environmental rules, including rules designed to prevent harmful evaporation of gasoline blends, while providing a higher octane, better performing fuel.

-- Ozone Reduction. Ozone in the lower atmosphere is a primary health concern from urban smog, and reducing ozone pollution is one of the major priorities of the Clean Air Act. Ozone is formed in a series of photochemical reactions involving volatile organic compounds (VOCs) and oxides of nitrogen (NOx). Methanol products used as gasoline additives reduce VOCs without increasing NOx and therefore are key components of any strategy to reduce urban smog.

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[3] Press Release, EPA, March 11, 1993.

-- Toxics Reduction. Even before the Clean Air Act began to require the use of oxygenated fuels in certain nonattainment areas, methanol products were performing a central role in removing lead from gasoline, thereby eliminating a major source of toxic pollution. The relatively high octane of methanol products has made these additives important and clean substitutes for tetraethyl lead. Moreover, methanol fuel additives enable gasoline refiners increasingly to reduce benzene -- a known carcinogen -- and to reduce other toxic hydrocarbons in gasoline blends.

-- Other Environmental Benefits. Methanol fuel additives provide additional environmental benefits that should become increasingly important as reformulated gasoline (RFG) requirements take effect and as attention is focused on emissions of greenhouse gases. Methanol derivatives are low in volatility and therefore will provide important clean-air benefits in producing cleaner gasoline with significantly reduced evaporative emissions. The production and use of methanol products also reduces emissions of greenhouse gases compared to emissions caused by gasoline that is not oxygenated, and therefore should be part of any strategy to reduce global warming.

Health Attributes

Methanol Additives Are Safe as Well As Effective In Producing Energy-Security And Environmental Benefits. In this concluding section of my testimony, I am pleased to be able to provide positive information to this Subcommittee on the safety as well as the effectiveness of the principal clean-air methanol derivative in use today, MTBE. MTBE is the only fuel-additive ether to have undergone rigorous and extensive testing.

Prior to the introduction of EPA's oxygenated gasoline program in the winter of 1992-93, MTBE had been subjected to a program of rigorous scrutiny and testing. This program involved 11 separate studies, including exposure studies at levels thousands of times greater than exposure levels during refueling and driving cars. The results of these studies, as well as over 30 other studies going as far back as 1969, did not show any adverse health effects at levels present in and around cars and at service stations.

MTBE and other ethers, including ETBE, have a distinct aroma, and this aroma is discernible when ethers are blended into gasoline. Perhaps because of this aroma, as well as publicity about the oxygenated fuels program and, in Alaska, a 15-cent increase in the retail price of gasoline, there have been complaints from a small number of consumers about headaches and dizziness from gasoline in which the characteristic ether aroma is present. While nothing in the extensive health studies indicated that there should be any causal relationship between the ether and such symptoms, EPA, CDC, and the industry determined to undertake an even more extensive and rigorous program of testing.

The results of this recent program of additional tests are coming in now, and as expected they are confirming the safety of MTBE. Researchers at Yale and at EPA, for example, conducted extensive human exposure tests using volunteers and found no adverse reactions. Researchers in New Jersey conducted studies comparing reactions to exposure in northern New Jersey, where MTBE was in use, and in southern New Jersey, where it was not, and they found absolutely no differences in symptoms or complaints between the two groups. EPA itself has raised six-fold the "reference concentration" of MTBE that can be

inhaled without adverse health effects, and an EPA official has recently termed MTBE "a safe, effective, and relatively inexpensive solution" to making gasoline cleaner and safer.[4] A recent article describing this testing program and its results, "Health Studies Indicate MTBE Is Safe Gasoline Additive," is attached as Exhibit II to this testimony.

Since 1979, over 100 billion gallons of gasoline containing MTBE have been used in the United States. MTBE and other methanol products can and will continue to help make our environment healthier and safer by removing harmful CO, benzene, and other pollutants from our gasoline.

Conclusion

Methanol Clean-Air Products Must Be Allowed To Compete Fairly. Methanol and its derivative products have a major role to perform in increasing America's energy security and achieving cleaner air. If methanol is permitted to compete fairly, it can provide these important benefits in an efficient and cost-effective manner.

Under current law, however, methanol and its derivative products have been required to face grossly unfair competition from a highly subsidized and protected ethanol industry. In addition, recent tax law changes have disadvantaged all combustible alternative fuels, including methanol and ethanol, relative to gasoline. I look forward to the opportunity to present our position on these significant public policy issues at the Subcommittee's next hearing on this subject.

On behalf of the American Methanol Institute, I would like to thank you for the opportunity to participate in these hearings.

Exhibit I

Fuel	Effective Rate of Tax Compared to Gasoline Based on Energy Content
Gasoline	18.4
Diesel	20.8
E-100	(54.10)
E-85	(44.05)
E-10	13.47
M-100	23.18
M-85	21.42
Propane Gas	25.07
CNG	5.89
MTBE	22.63
ETBE without credit	21.84
ETBE with credit	(5.72)

The calculation of the foregoing is shown on the following pages.

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[4] Statement by Jim McCormick, Director, Air and Toxics Division, EPA Region 10, quoted in "Health Studies Indicate MTBE Is Safe Gasoline Additive", Chemical & Engineering News, September 20, 1993, pp. 9, 17-18.

Fuel	Tax Ctns/Gal.	Btu Energy Content	Calculations	Effective Rate Compared to Gasoline Based on Energy Content
Gasoline	18.4	115,000		18.4
Diesel	24.4	135,000	115K/135K x 24.4	20.8
E-100	12.95[1]	75,670	115/75.67 x 12.95	19.68
Tax Credit	(48.55)		115/75.67 x 48.55	(73.78)
				(54.10)
E-85	12.95	81,570	.15 x 12.95	1.94
			.85 x 115/75.67 x 12.95	16.73
Subtotal				18.67
Tax Credit	(48.55)		.85 x 115/75.67 x 48.55	(62.72)
				(44.05)
E-10 (Gasohol)	13.0	111,000	115/111 x 13.0	13.47
M-100	11.4	56,560	115/56.56 x 11.4	23.18
M-85	11.4	65,323	.85 x 115/56.56 x 11.4	19.71
	11.4		.15 x 11.4	1.71
				21.42
Propane Gas	18.3	83,950	115/83.95 x 18.3	25.07
CNG	4.3[2]	Equivalent to Propane Gas	115/83.95 x 4.3	5.89
MTBE	18.4	93,500	115/93.5 x 18.4	22.63
ETBE w/o credit	18.4	96,900	115/96.9 x 18.4	21.84
ETBE[3] (w/credit)	18.4	96,900	115/96.9 x 18.4	21.84
Tax Credit			.43 x 115/96.9 x 54.0	27.56
				(5.72)

[1] Neat ethanol fuels are allowed a 5.45 cents/gallon reduction in excise tax. Section 4041(b)(2). This amount reduces the 54 cents/gallon subsidy under section 40(c). Therefore, the subsidy is the full 54 cents/gallon provided under section 40.

[2] CNG is taxed at a rate of 48.54 cents/mcf, which was intended to equate to the tax on propane gas on a Btu equivalent basis. Assuming that an mcf of natural gas contains one million Btus, the calculation would be 48.54 x 115/1000 = 5.58

[3] Under Treas. Reg. § 1.40-1, the portion of ETBE made through a chemical reaction with ethanol is also entitled to the 54 cents/gallon tax credit. This regulation is of questionable legal authority, and is the subject of litigation. ETBE is not presently in commercial production. If the credit were available for the ethanol used to make ETBE, the credit would be 43% of 54¢ or 23.22¢/gallon, because ETBE is composed of 43% ethanol and 57% isobutylene, a petroleum-based feedstock.

Health Studies Indicate MTBE Is Safe Gasoline Additive

Alaskan health complaints last winter spurred hastily organized test program, but official word on additive's safety still awaited

Earl V. Anderson, C&EN Northeast News Bureau

The complaints started in Fairbanks, Alaska, early last winter and jumped to Anchorage. Then they popped up in scattered spots around the lower 48 states.

Headaches, dizziness, irritated eyes, and nausea were the usual ailments. The suspected culprit: methyl *tert*-butyl ether (MTBE), by far the largest-volume oxygenate used in oxygenated gasoline.

Initial reports of the complaints, along with scare headlines in newspapers, sent shivers down the spines of MTBE producers and oil companies. And they gave the Environmental Protection Agency (EPA) a headache to match the ones that some Alaskans said they were getting from MTBE-blended gasoline.

> When you can live at 45 and 50 degrees below [zero] and carry on your normal life-style, people are not normally complainers
>
> —*Sen. Ted Stevens (R.-Alaska)*

Certainly the uproar took producers by surprise. MTBE has been used in premium gasoline as an octane enhancer since 1979 without any major complaints. And several cities, including Denver since 1988, have been using MTBE in oxygenated fuels programs of their own with no problems.

The reports are EPA's headache because it is the agency that oversees the oxygenated fuels program, a major weapon in the fight against polluted air. The program, part of the 1990 Clean Air Act amendments, requires areas that do not meet federal carbon monoxide standards to use oxygenated fuels during the winter months when carbon monoxide levels are the highest. Gasoline in these areas must contain at least 2.7% oxygen by weight and the areas must use it for at least four months (November through February). Adding oxygenates such as MTBE, other ethers, or ethanol to gasoline provides the required oxygen. The 2.7% oxygen requires 15% by volume of MTBE in gasoline.

Last year, the oxygenated fuels program's first, 39 metropolitan areas including Fairbanks and Anchorage had to use oxygenated fuel. The program got its baptism by fire only last November.

The complaints in Alaska surfaced almost immediately. Alaskan state and city governments introduced resolutions calling for an end to the program. By December, Alaska Gov. Walter J. Hickel suspended the oxygenated fuels program in Fairbanks, where most of the complaints arose, even though the program still had months to run. In Washington, D.C., Rep. Don Young (R.-Alaska) introduced a bill that would give EPA the authority to grant Alaska a waiver from the program.

Environmental groups, which support the oxygenated fuels program, have been uncharacteristically quiet about the MTBE health issue. David D. Doniger, until recently senior attorney for the Natural Resources Defense Council, says only that NRDC supports the oxygenated fuels program because it reduces carbon monoxide pollution. And Phyllis Salowe-Kaye, director of the New Jersey Citizen Action, says that Citizen Action, too, will continue to support the use of oxygenates in gasoline.

After a few scattered complaints in the lower 48 states followed hard on the heels of those in Alaska, the potential for serious problems became all too obvious. MTBE, the premier oxygenate used in the oxygenated fuels program, was tainted with suspicions. Without MTBE, the program itself could be in jeopardy. Other oxygenates are available, such as ethyl *tert*-butyl ether (ETBE), *tert*-amylmethyl ether (TAME), diisopropyl ether (DIPE), and ethanol; but there's not enough capacity for these products. Last year, about 1.8 billion gal of MTBE went into gasoline, almost 50% more than in 1991. In 1995, when the reformulated gasoline program to combat ozone depletion starts up, even more oxygenates will be needed.

At stake for MTBE producers are billions of dollars invested in plants already in operation or planned. If MTBE were ever proven to be a health threat, or even banned, those investment dollars would be in jeopardy. Refiners have had to at least start considering the complicated and expensive logistics involved in switching to other oxygenates if it becomes necessary.

Well aware of the potential consequences, in early 1993 EPA called in various industry trade groups such as the American Petroleum Institute (API) and the Oxygenated Fuels Association (OFA) to start planning an extensive test program to investigate the validity of the health claims. The testing was parceled out to various government and private laboratories. Trade associations and even companies funded

Many urban areas were required to use oxygenated fuels last winter

Alaska
Anchorage
Fairbanks

Arizona
Phoenix[a]
Tucson[a]

California
Chico
Fresno
Los Angeles-Anaheim-Riverside
Modesto
Sacramento
San Diego
San Francisco-Oakland-San Jose
Stockton

Colorado
Colorado Springs[a]
Denver-Boulder[a]
Fort Collins-Loveland[a]

Connecticut
Hartford-New Britain-Middletown

New York
New York metropolitan area, including northern New Jersey
Syracuse

North Carolina
Greensboro-Winston-Salem-High Point
Raleigh-Durham

Maryland
Baltimore

Minnesota-Wisconsin
Minneapolis-St. Paul

Montana
Missoula

Nevada
Las Vegas[a]
Reno[a]

New Mexico
Albuquerque[a]

Ohio
Cleveland-Akron-Lorain

Oregon-Washington
Grant's Pass
Klamath County
Medford
Portland-Vancouver
Seattle-Tacoma
Spokane

Philadelphia-Trenton-Wilmington metropolitan area

Texas
El Paso[a]

Utah
Provo-Orem

Washington, D.C., metropolitan area[b]

a Program began before 1992. b Includes Maryland and Virginia suburbs. Source: Environmental Protection Agency

many of the projects. But EPA orchestrated the entire test program.

In late July, EPA assembled most of the participants at a hastily convened conference in Falls Church, Va., to discuss the results of this research. The speakers had no time to prepare papers; they spoke off-the-cuff, most of them only with the help of slides.

The proceedings still haven't been published and may not be for some time. Opinions about what was presented at the conference aren't unanimous by a long shot. But many experts—in and out of industry—believe that the scientific data presented went a long way toward restoring MTBE's tarnished reputation.

A little tarnish may still remain, however. When complaints first started in Fairbanks in November, the Centers for Disease Control & Prevention (CDC) was one of the first agencies on the scene. In December, it studied 18 people who routinely spend a lot of time around cars. CDC measured MTBE levels in their blood, how much MTBE they were exposed to, and what symptoms of illnesses they experienced.

CDC has not specifically come out and said that MTBE is harmful. However, in a recent letter to the Alaska Department of Environmental Conservation, Ruth Etzel, chief of CDC's department of health and human services, summarized the results of CDC's research. Basically, CDC found that people in Fairbanks with high MTBE levels in their blood tended to complain more about such things as headaches and nausea. It later did a similar study in Stamford, Conn., and found the same relationship between blood levels and symptoms. "The consistency between the two study sites adds strength to these findings," Etzel writes.

CDC hasn't tagged MTBE as the culprit in Alaska's oxygenated fuels season last year. It does say, however, that questions about MTBE's safety remain until it is more fully evaluated.

More than a few MTBE supporters have criticized CDC's Alaskan study. They point out that it fails to mention other materials found in the air and blood; for instance, benzene, which can trigger similar symptoms and is a known carcinogen. And there is no baseline for comparison.

At the Falls Church meeting, however, MTBE advocates had to be happy with most of what they heard, including a report on studies of MTBE's health effects on animals initiated years before the complaints started piling up in Alaska.

With a 1987 test rule negotiated under the Toxic Substances Control Act, a task force of MTBE producers started a $3.5 million series of studies on animals to determine MTBE's potential chronic health effects. The studies, which began in 1988, were coordinated by OFA, but the Synthetic Organic Chemical Manufacturers Association (SOCMA) performed some of the work for OFA.

OFA exposed animals to very high levels of MTBE to check the oxygenate's toxicological potential. The inhalation tests included single exposures, repeated daily exposures, and lifetime exposures.

About the worst to come out of these studies is that the animals experienced drowsiness and lack of motor coordination. But they recovered completely in a very short time, even at extremely high levels. This reaction is consistent with data from metabolism studies. In these studies, MTBE absorbed into the body is rapidly converted to *tert*-butyl alcohol, which is safely eliminated from the body in urine.

Last year, OFA completed two lifetime exposure studies on animals to test for carcinogenicity and chronic effects. Rats and mice were exposed to 8000 ppm, 3000 ppm, and 400 ppm MTBE for six hours per day, five days per week for 24 months (rats) or 18 months (mice).

Researchers found an increased incidence of benign tumors in the livers of female mice at 8000 ppm. In rats, there was an increase in renal tubular cell tumors. But these occurred only in male rats and at 3000 ppm and 8000 ppm.

Larry Andrews, manager of toxics and regulatory affairs for Arco Chemical and head of the MTBE health task force, points out that, in toxicology studies, researchers use extremely high doses purposely to induce some effects in animals. And, he adds, the tumors seem to occur by mechanisms that aren't relevant to humans.

"These tests show that MTBE is not very toxic," says Andrews. In fact, he adds, there is a "large margin of safety."

Based on some of these chronic (long-term) exposure studies with animals, EPA reported at the Falls Church meeting that it had raised what it calls its inhalation "refer-

ence concentration (RfC)" for MTBE. Inhalation RfC is the airborne concentration that can be inhaled over a lifetime by people, including chemically sensitive people, without posing any appreciable health hazard. EPA increased the RfC level to 3.0 mg per cubic meter, a sixfold increase. One medical expert says this implies that EPA is even more certain than before that MTBE poses "minimal" health risks.

The Environmental & Occupational Health Sciences Institute (EOHSI), a cooperative venture of Rutgers University and Robert Wood Johnson Medical School, Piscataway, N.J., conducted an epidemiological study this year. This one, however, was in New Jersey to determine if MTBE plays any role in symptoms that state garage workers have reported. EOHSI surveyed 237 garage workers in state agencies, primarily mechanics, mechanics helpers, and refuelers. The self-reported symptoms included headaches, nausea, coughing, lightheadedness, and eye irritation—very similar to the ones that first surfaced in Alaska.

Brouwer: no comment on test results

The beauty of this EOHSI study is that the institute was able to compare workers in northern New Jersey, where oxygenated fuels were being used at the time of the study, with their counterparts in southern New Jersey, which does not use oxygenated fuels.

The results are particularly compelling, says OFA executive director John Murray. There were absolutely no differences in the responses given by southern and northern New Jersey workers. "[EOHSI] couldn't find any differences in symptoms or complaints, even though they tried hard to do so," he says.

Sandra Mohr concurs. An assistant professor at the Robert Wood Johnson Medical School, Mohr says the northern, high-exposure workers didn't report symptoms any more often than did the southern, low-exposure workers. "No untoward health effects were found in this cohort of 237 reasonably healthy working individuals," says Mohr.

Raymond A. Lewis, president of the American Methanol Institute, says the only thing wrong with MTBE is that it makes gasoline smell differently. Ethers, of course, have a distinctive odor—one that the typical motorist is not familiar with. But not much is known about how either adding an ether such as MTBE to gasoline may affect the characteristic odor of gasoline, or how motorists filling up at the pump may react psychologically to differences in odor.

To find some answers, earlier this year API and Arco Chemical commissioned an environmental consulting firm, TRC Environmental, Windsor, Conn., to determine odor threshold levels for gasoline, MTBE, other oxygenates, and gasoline-oxygenate blends. Not surprisingly, MTBE–gasoline blends have lower odor threshold levels than gasoline alone. In other words, people notice the odor of gasoline quicker when MTBE is in it.

For instance, the odor detection threshold for a reference gasoline is 0.58 ppm in air. For a blend of 15% MTBE in gasoline, it is only 0.26 ppm. An odor detection threshold is the level at which someone first becomes aware that there is an odor.

Odor recognition thresholds, on the other hand, are levels at which someone can recognize and describe a definite odor characteristic. In these studies, the odor recognition threshold was 0.80 ppm for the reference gasoline, but only 0.69 ppm for the 15% MTBE blend.

Despite the fact that the concentrations are low (a safe level of gasoline in the air is about 100 ppm), the tests indicate what everyone intuitively suspected—that motorists at a filling station will smell the blend easier and quicker than they will smell straight gasoline. Although it's difficult, if not impossible, to correlate the number of health complaints with the ability to smell MTBE, there's at least the suspicion among some observers that, psychologically, people may associate an unknown or unfamiliar smell with a sense of illness. Gerhard K. (Gerry) Raabe, director of epidemiology and medical information services for Mobil Oil, says, "When people get a whiff of something different, it sets them to thinking."

Researchers at EPA and Yale University used the numbers developed in the odor recognition threshold study as guides for two studies in which humans were exposed to MTBE and control substances in a chamber. Timothy Gerrity, chief of the clinical research branch in EPA's office of research and development at Research Triangle Park, N.C., says that even though CDC's epidemiological studies in Alaska suggest a possible association between MTBE exposure and symptomatic responses, there were no data that could demonstrate a "direct causal relationship" between the two.

Stevens: role of media disputed

To help resolve the issue, EPA studied the sensory, symptomatic, cellular, and ocular responses of healthy humans exposed to MTBE in a controlled exposure chamber at 24 °C. Researchers at Yale conducted a similar chamber study, funded by OFA and Arco Chemical, at its John B. Pierce Laboratory.

At Yale, William S. Cain, a fellow at the Pierce Laboratory, directed a group of researchers in a chamber study to see how exposing humans to 1.7 ppm MTBE for one hour would affect their selected behavioral and physiological

Oxygenates: what they are

Oxygenates are liquid organic compounds that can be blended into gasoline to increase its oxygen content. During combustion, the additional oxygen in the gasoline reduces output of carbon monoxide and may reduce emissions of ozone-forming materials.

The Environmental Protection Agency has determined that aliphatic alcohols and ethers, in specific volumes and combinations, are "substantially similar" to conventional gasoline and therefore able to provide the oxygen that gasoline will need under the Clean Air Act Amendments of 1990. It is in this context that compounds such as methyl *tert*-butyl ether (MTBE) are considered oxygenates, even though they may have other properties and uses.

Oxygenated gasolines are required in two programs outlined in the 1990 Clean Air Act Amendments. They are the oxygenated fuels program and the reformulated gasoline program.

The oxygenated fuels program started last Nov. 1. It requires gasoline sold in 39 metropolitan areas that did not meet federal air quality standards for carbon monoxide to contain 2.7% oxygen by weight. The program runs for at least four winter months, although areas can choose to extend it.

The reformulated gasoline program starts Jan. 1, 1995. After that date, all gasoline sold during the year in nine large metropolitan areas with the most serious ozone problems must contain 2.0% oxygen by weight. Other areas with ozone problems may choose to use the reformulation program.

reactions. They also exposed the 43 subjects to air and to a mixture of volatile organic compounds as controls. The chamber temperature was 24 °C.

Essentially, Yale researchers could detect no differences in how their subjects reacted when they were exposed to MTBE, to gasoline, or to air. Says Cain, "We conclude that one-hour exposures to levels of MTBE up to 1.7 ppm will, aside from odor, induce no reactions in normal, healthy young people." The participants ranged from 18 to 34 years old.

The EPA chamber study at Research Triangle Park was basically the same as the Yale study. The results were also similar, says Mary Smith, director of EPA's field operations and support division. The only differences were that Research Triangle Park researchers used air as its only control, their MTBE concentrations were 1.4 ppm instead of 1.7 ppm, and they used only 37 test subjects.

The results were, indeed, conclusively similar. EPA researchers found that the MTBE caused no increase in symptoms such as headaches, nasal irritation, coughing, or eye irritation, says Gerrity. Nor did exposure to MTBE have any effect on psychological performance or mood. In short, he says, MTBE at 1.4 ppm and room temperature doesn't trigger symptomatic responses from healthy individuals.

For MTBE producers, refiners, and EPA alike, these results were encouraging. The data are convincing, says Raabe, because humans were exposed for one hour, compared with the four minutes of exposure it usually takes for a refill of gasoline at the pump.

A corollary to these human exposure studies is a survey that EOSHI conducted among patient groups with unusual sensitivities to chemicals. EOSHI also surveyed New Jersey residents who registered complaints with the state's Department of Environmental Protection & Energy. It compared responses of 13 multiple chemical sensitivity (MCS) patients and five chronic fatigue subjects (CFS) with six normal control subjects.

As most MTBE observers would have expected, individuals with multiple physical complaints, including MCS and CFS patients, tended to report more MTBE symptoms than normal control subjects, even more than gas pump attendants who work with gasoline regularly. Apparently, chemically sensitive individuals or those who are ill may tend to become more symptomatic with MTBE. But, cautions EOHSI's Nancy Fiedler, an assistant professor at the Robert Wood Johnson Medical School, the symptoms may not even be associated with MTBE, but merely reflect the overall health of these individuals.

Because of the small number of people studied, the conclusions must be considered tentative, says Fiedler. Nevertheless, the study adds one more element to the pile of evidence that seems to dismiss MTBE as the cause of many health complaints.

In addition to farming out some of the tests, API made some surveys on its own earlier this year. A particularly revealing one was an occupational exposure study, designed to determine the amount of exposure for MTBE employees

Workers who handle MTBE are normally exposed to only low levels of the oxygenate

	Exposure to MTBE, ppm					
	Short term[a]			Workshift[b]		
	Minimum	Maximum	Median	Minimum	Maximum	Median
Manufacturing						
Routine	0.016	7.80	1.00	0.01	249	0.03
Maintenance/ turnaround	0.50	7.20	0.70	0.04	0.70	0.14
Blending						
Neat (100%)	0.01	97	2.30	0.04	88	2.60
Fuel mix	0.02	100	0.40	0.02	14	0.05
Transportation						
Neat (100%)	0.30	1050	9.70	0.02	712	0.21
Fuel mix	0.01	508	2.00	0.01	28	0.12
Distribution	0.01	14	0.85	0.01	2.20	0.11
Service station	0.16	136	2.80	0.09	34	0.59

a Less than 30 minutes. b Between six and nine hours (time-weighted average).
Source: American Petroleum Institute

who work with the material in the MTBE and fuels industries. The bottom line: not much, even among those who work regularly with MTBE.

Jack Hinton, industrial hygiene manager for Texaco, who directed the study, says the data typify industry operations in all five of the steps required to bring MTBE to market. These include:

- Manufacturing—producing MTBE at both chemical plants and refineries.
- Blending—blending MTBE into gasoline, which includes handling both neat (100%) MTBE and blended MTBE fuels.
- Transportation—moving MTBE or MTBE-blended fuels by barge, tanker, railcar, truck, or pipeline to their distribution points.
- Distribution—storing MTBE at and moving it from distribution terminals to service stations.
- Service stations—storing and dispensing MTBE-blended fuels to motorists.

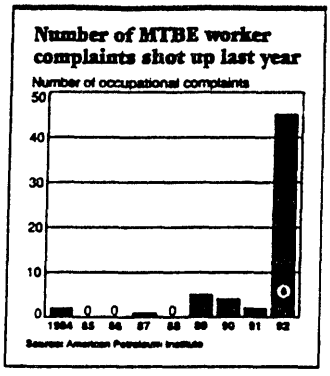
The 2038 exposure measurements the study uncovered span an 11-year period and represent all the major producers and users of MTBE. Most of the data (92%) are post-1990, with 50% of the data collected during the winter months, when oxygenated fuels normally would be used. The 1992-93 oxygenated fuel season accounts for 45% of the data.

According to Hinton, exposures to more than 100 ppm of MTBE during a normal six- to nine-hour workshift (time-weighted average) happen only infrequently and generally only when workers are performing nonroutine tasks. The same is true of short-term tasks (less than 30 minutes), when exposures may reach 300 ppm.

Among production workers, personal exposures are less than 10 ppm in both routine and maintenance operations. A quality control laboratory reported one single exposure of 249 ppm while bottles were being washed. But it was an unusual situation, says Hinton. The automated bottle-washing equipment usually is fitted with exhaust ventilation. This time it wasn't.

Personal exposures in blending operations are less than 100 ppm, but numbers of less than 10 ppm dominate the data. In the transportation sectors, the usual levels are less than 2 ppm for short-term activities associated with mixed fuel and less than 10 ppm for similar operations with neat MTBE. Distribution workers generally encounter exposures of less than 1 ppm of MTBE, whereas service station attendants experience exposures of less than 3 ppm. These service station levels, says Hinton, usually only crop up when workers are repairing vehicles or dispensing pumps.

In addition, other on-site exposure studies were made at service stations to check MTBE concentrations in air. After the initial health complaints started surfacing in Alaska, EPA began planning its series of clinical research studies to investigate the validity of the claims. To design the studies, EPA needed estimates of typical concentrations of MTBE in air that motorists and service station attendants may experience during refueling.



To get the data, API funded a field study to measure ambient MTBE concentrations at 10 service stations in the New York metropolitan area. The study, carried out by a consulting company, International Technology Corp. (IT), Durham, N.C., included both full-service and self-service stations as well as stations with and without advanced vapor recovery systems.

The results are hardly surprising. The mean and maximum four-hour MTBE concentrations in air were highest in the "breathing zone," where attendants or customers actually pump gasoline into the cars. They were lower at the pump island itself and lower still at the perimeter of the service station. This means, says Ted Johnson, IT office manager, that refueling activities are the principal source of MTBE in air at service stations.

More important are the actual MTBE levels that the company detected. Mean MTBE concentrations measured during four-hour periods were below 1 ppm at the breathing zone and pump islands and below 0.02 ppm at station perimeters. Even the maximum four-hour concentrations are below 2.6 ppm at the breathing zone and pump islands, and below 0.2 ppm at the perimeters.

Johnson says that measurements may underestimate breathing zone measurements by a factor of up to three. But even allowing for this, the numbers mean that the average driver encounters very low concentrations of MTBE, even in the breathing zone, while he or she is refueling. And considering that the average fillup takes only four minutes or less—not four hours as in the field tests, driver exposure to MTBE is very low.

It's impossible, however, to compare these data to exposure levels in Alaska during its abbreviated oxygenated fuels season. The reason is that data on Alaskan exposure studies aren't available. CDC did have some exposure data but they don't correlate well with what actually happens at a service station.

EOHSI took the exposure studies one step further. It launched an API-sponsored study to find out what happens inside the car during refueling and during typical suburban commutes in the New York metropolitan area. This study focused on Fairfield County in Connecticut, Westchester County in New York, and Middlesex County in New Jersey. Like IT's study, this one covered the ballpark of service stations—self- and full-service, with and without advanced vapor recovery systems, as well as a mix of new and older cars.

To OFA's Murray, the study shows that MTBE has no adverse effects on commuters—either while they are refueling or while they are driving the car. The numbers bear him out.

The highest MTBE levels occurred during refueling, says P. J. Lioy, director of EOHSI's exposure measurement and

assessment division. But those levels measured out in parts per billion, not million. During refueling, they ranged from 13 ppb to 4100 ppb. Inside the car, MTBE concentrations were even less during refueling. And, during a typical one-hour commute, the geometric mean concentration inside the car was only 8.2 ppb, with a range of 1.2 ppb to 160 ppb.

API also ran a questionnaire survey to find out if member companies were receiving many health complaints related to MTBE from their own workers. It didn't find many.

The 16 companies that responded reported 61 occupational complaints and nine consumer complaints. Most retail service stations are independently owned, and those owners do not have to maintain records of health complaints, which may explain the small number of consumer complaints. Because of the small number of complaints from consumers, API focused only on those from workers.

API sent its questionnaires to 18 U.S. refiners, which account for more than 60% of the gasoline used in the U.S. and an appreciably higher percentage of the fuels used in the oxygenated fuels program. Most of the complaints involved headaches, dizziness, and nausea. But there isn't any correlation between the number of complaints and a worker's exposure to MTBE.

"The study generated some interesting data," says Raabe. For instance, more than 70% of employee complaints came from California, New Jersey, and Pennsylvania. Raabe says it's only possible to speculate about the reasons. But he notes that the media in New Jersey and Pennsylvania gave the MTBE health issue heavy coverage, whereas California accounts for a significant percentage of gasoline consumption in the U.S.

The survey recorded worker complaints from 1984 to 1992, as well as complaints registered this year (through July 9). Over the nine-year period, more than 70% of the complaints surfaced in 1992. Prior to 1992, there were no more than five health-related MTBE complaints in any one year. In several years, there were none. And the amount of MTBE produced in 1992 was not significantly higher than in the 1989–91 time frame.

"What happened in 1992," Raabe asks, "that didn't happen in the previous few years?" The answer, of course, is the start of the oxygenated fuels program and the first reports of health complaints in Alaska. Says Raabe: "The number of [worker] complaints probably correlates better with the number of bad press articles than it does with the amount of MTBE produced or used in gasoline."

Another puzzle crops up when API analyzed the complaints by month. A significant majority of the complaints occurred in October and November—the start of the oxygenated fuels season. Raabe thinks that this is unusual for workers in the industry. Production and transportation workers would have been more exposed to MTBE months earlier than that, as they built up inventories for the start of the oxygenated fuels program. This suggests that factors other than actual MTBE exposure may have influenced the complaint rate, says Raabe.

In still another survey, API polled the states to determine how many complaints about adverse health effects they have received from consumers. It checked with state petroleum councils and state offices of health, environment, or transportation, which were most likely to receive such complaints.

API received responses from 14 of the 16 states it queried. Although some states received hundreds and, in one state, thousands of calls about the oxygenated fuels program, only one state received more than a few health complaints. That state, not surprisingly, was Alaska.

Of the 349 complaints about MTBE registered in Alaska, 100 were health related. The next largest number of health complaints—15—came in Montana.

The weak spot in these data is that some states may do a better job of recording complaints than others. Nevertheless, says Raabe, the study indicates that something is going on in Alaska that isn't going on in the lower 48 states. And there is nothing in the study to connect the health complaints to MTBE.

The results of all of the test programs launched since the Alaska incident has generated a huge sigh of relief in the MTBE and refining industries. Industry experts are unabashedly upbeat. The overwhelming consensus: MTBE has been given a clean bill of health—literally.

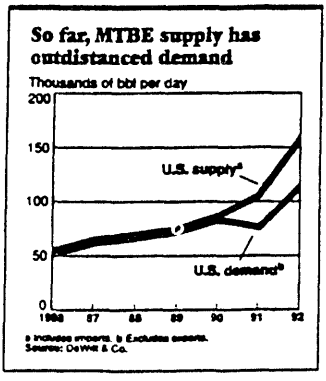
Lewis of the American Methanol Institute says that MTBE came out of the Falls Church meeting far better than some other components in gasoline. MTBE, says Lewis, isn't bad, it just smells different.

Bill Whitney, oxygenates business manager for Arco Chemical, says that what came out of the Falls Church symposium was very reassuring. "The consistency of the data from the toxicity work on lab animals, the human exposure studies, and the 'real world' studies involving consumers and the workplace give us a much higher level of confidence than we already had."

Mobil's Raabe says the weight of all the data is going in one direction—that MTBE is safe. "There's no magic bullet by itself," he adds. "It's the weight of the combined evidence."

As convincing as the test results may be, so far neither EPA Administrator Carol M. Browner nor anyone else at EPA's Washington, D.C., headquarters has revealed what EPA thinks about them. At press time, EPA was still trying to pull the data together.

Nevertheless, a statement released by EPA's Region 10 office last month may hint which way the agency is leaning. Referring to the test results unveiled at Fall



U.S. MTBE capacity tops 2.6 billion gal per year

Company/location	Annual capacity (millions of gal)
Amerada Hess	
Port Reading, N.J.	22
Amoco Chemical	
Whiting, Ind.	54
Amoco Oil	
Yorktown, Va.	11
Arco Chemical	
Channelview, Tex.	309
Carson, Calif.	31
Ashland Petroleum	
Catlettsburg, Ky.	49
Chevron Chemical	
El Segundo, Calif.	31
Chevron USA	
Pascagoula, Miss.	31
Citgo Petroleum	
Corpus Christi, Tex.	27
Lake Charles, La.	32
Coastal Chemical	
Cheyenne, Wyo.	63
Coastal Refining & Marketing	
Corpus Christi, Tex.	184
Conoco	
Lake Charles, La.	28
Ponca City, Okla.	15
Crown Central Petroleum	
Pasadena, Tex.	31
Diamond Shamrock	
Dumas, Tex.	31
EGP Fuels	
La Porte, Tex.	213
Exxon Chemical	
Baton Rouge, La.	54
Baytown, Tex.	41
Fina Oil & Chemical	
Big Spring, Tex.	7
Global Octanes	
Deer Park, Tex.	186
Lyondell Petrochemical	
Channelview, Tex.	198
Marathon Oil	
Detroit, Mich.	17
Robinson, Ill.	28
Mobil Oil	
Beaumont, Tex.	50
Occidental Petroleum	
Chocolate Bayou, Tex.	28
Phillips Petroleum	
Houston, Tex.	28
Krotz Springs, La.	16
Texas City, Tex.	20
Phillips Petroleum	
Sweeny, Tex.	46
Southwestern Refining	
Corpus Christi, Tex.	27
Star Enterprise	
Convent, La.	42
Sun Refining & Marketing	
Marcus Hook, Pa.	38
Texaco Chemical	
Port Neches, Tex.	122
Texas Petrochemicals	
Houston, Tex.	338
Valero Refining	
Corpus Christi, Tex.	200
TOTAL	2644

Sources: EPA International

Church. Jim McCormick, director of the air and toxics division, says that "the latest findings support the Congressional mandate" to use oxygenated fuels to reduce carbon monoxide emissions. McCormick notes that EPA is still reviewing what he calls "the encouraging results." But "in my judgment, MTBE gasoline remains, on balance, a safe, effective, and relatively inexpensive solution."

In addition to Idaho, Oregon, and Washington, EPA's Region 10 includes Alaska, where the problem started. And where the problem still remains.

The results of the massive test program may indeed be encouraging, but they do not do one thing. They don't put a scientific finger on what actually happened in Alaska during its abbreviated oxygenated fuels season. All of the tests were run under temperate conditions. That doesn't help explain what happens at the frigid temperatures Alaskans endure in the winter. It's not unusual for the temperature in Fairbanks to hit –60 °F.

Nor is it unusual for someone to make the point that the bevy of complaints in Alaska may have been inspired by the flood of adverse publicity about MTBE. Or that the complaints suddenly materialized at the start of the oxygenated fuels program, when the price of gasoline rose about 15 cents a gallon. Several cities in the lower 48 have had oxygenated fuels programs for years. Complaints were common during the first year, but virtually disappeared later.

Such observations don't sit well with Sen. Ted Stevens (R.-Alaska). "When you can live at 45 and 50 degrees below [zero] and carry on your normal life-style, people are not normally complainers," he says.

Until researchers are able to prove MTBE safe at sub-arctic temperatures, it will be difficult to get many Alaskans to embrace MTBE. But conducting studies at sub-arctic temperatures isn't easy to do because there aren't many labs that can go down that low. EPA's own lab at Research Triangle Park, for instance, can only go down to 0 °F. It's now being rigged to go to –20 °F.

Conditions in Alaska may be so much different from the lower 48 states that Alaska may have to have its own set of regulations, says OFA's Murray. That, of course, is Browner's call. But something along those lines could happen.

Two weeks ago, EPA received word from Alaska that the state would suspend the oxygenated fuel regulations again this year. Alaska told EPA that, once a joint decision is reached between the agency and the state, the state would give refiners 75 days' notice to get MTBE back into the distribution system. "These are Alaska's actions, not ours," says EPA's Smith.

Decisions will have to be made fast. The 1993–94 oxygenated fuels season is little more than a month away. EPA still is evaluating the test data discussed at Falls Church.

But, unless something startling happens, the oxygenated fuels program probably will go on in the lower 48 states as it did last year. The program has been successful. EPA says that oxygenated gasoline reduces carbon monoxide emissions 15 to 20%. The only difference may be that some cities that had to use oxygenated fuel last year may not have to this year because they have met carbon monoxide standards. Other cities that are not meeting the standards may be added to the program.

MTBE probably will be supplying most of the oxygen for the fuel. Alaska is a small market, so the big question is what impact the scare headlines may have had on consumers in the lower 48 states. MTBE marketers believe that it is slight to none. Besides, there's not enough of the other oxygenates available to satisfy demand. And these oxygenates haven't had nearly the amount of testing that MTBE has had. "What's been done for MTBE was well beyond what's normally done for most chemicals," says Smith.

To Mobil's Raabe, the moral that came out of the Falls Church meeting was that "good science" won. And, he adds, "it was one of the best focused examples of coordinated R&D that I can remember." □

AMERICAN METHANOL INSTITUTE

Telephone
(202) 467-5050
Fax
(202) 331-9055

February 15, 1994

The Honorable Thomas A. Daschle
United States Senate
Washington, D.C. 20510

Dear Senator Daschle:

This letter responds to your letter seeking supplemental information from the American Methanol Institute ("AMI") following the Finance Subcommittee on Energy and Agricultural Taxation Hearing of September 29, 1993. By this letter AMI is providing answers to your inquiries for the Hearing record.

Where are Methanol and MTBE Produced?

Your letter inquires as to where methanol and MTBE are produced. In 1992, 1,318,000,000 gallons of methanol were produced in the United States. As noted in AMI's testimony, 75 percent of the methanol consumed in the United States is produced here. Of the remaining 25 percent, 17 percent comes from Canada and other free-trade North America countries. Less than 4 percent comes from the Middle East for U.S. consumption. Moreover, the methanol industry continues to invest in U.S. production facilities. For example, a 200,000,000 gallon methanol production facility is now under construction in Louisiana, which will be on-line in 1994.

MTBE is similarly a domestic product. Currently, some 84 percent of MTBE consumed in the U.S. is produced domestically with over half of the remaining 16 percent coming from Canada. Moreover, investment in new domestic MTBE facilities is continuing and it is projected that North American MTBE production capacity will be sufficient to meet essentially all of the U.S. demand for MTBE within a short period after the start of EPA's reformulated gasoline program.

Methanol is commercially produced principally from natural gas. You have inquired in your letter as to whether AMI members are involved in the advancement of commercial production of methanol from non-fossil fuel feedstocks. The answer to date is no, however, the Department of Energy's National Renewable Energy Laboratory has been conducting research to produce both methanol and ethanol from such sources as landfill waste, wood chips, and biomass and AMI has supported NREL on these efforts. In addition, methanol can be made from off-gas produced as a by-product from a new steel production process called Corex. Nevertheless, currently commercial methanol is primarily produced from natural gas because this feedstock is the most economically viable today. It could be several years before this situation is likely to change.

The states in which natural gas is found in abundance, such as Texas, Louisiana, West Virginia, Oklahoma, Wyoming, Alaska, New Mexico, Colorado, Alabama and Utah, are natural sites for the production of methanol. Approximately 80% of all U.S. methanol plants are currently located in Texas and Louisiana. The widespread availability of domestic natural gas in these and other states explains why the domestic methanol and MTBE industries have developed into substantial industries and are expanding.

The facts are clear: methanol and MTBE are important domestic industries. The periodic efforts of the ethanol industry to ignore these facts and portray methanol and MTBE as other than domestic are not borne out by real-world production and investment statistics. Methanol and MTBE are, of course, sought-after products throughout the world as well as in the U.S., and worldwide production, like U.S. production, has been increasing to meet growing worldwide demand. In response to the inquiry in your letter whether foreign host countries provide financial concessions or other special benefits for the production of methanol, as are available for the production of ethanol in the United States, we do not have such information. Mindful of federal antitrust guidelines, our organization does not collect information on financial or production statistics for any member or non-member company. It is worth noting that while the natural gas feedstock may be in excess supply and, therefore, inexpensive in a particular country, that need not be a government subsidy. Moreover, the transportation, storage, handling, and other costs as well as possible import tariffs could add approximately $1.40 to $1.50 per million BTU's gas equivalent to the cost of the foreign natural gas. In addition, higher capital costs will normally be involved in methanol facilities in locations where the natural gas feedstock is inexpensive.

What is The American Methanol Institute?

Several of your questions, both at the Hearing and in your letter, relate to the identity of the membership of AMI. We are happy to supply this information. AMI is the trade industry association that represents virtually all companies involved in the production and sale of methanol in the United States. Our membership list is attached as Exhibit A. As is true of the petrochemical industry generally, our membership includes companies with multi-national operations and with methanol production in the U.S. and elsewhere. Our members account for the overwhelmingly domestic production of methanol in the U.S.

Your letter also listed several policy factors that you suggest were developed at the Hearing. AMI is happy to have the opportunity to comment on two of those factors: "renewability" and the Federal budget deficit.

Renewability

At the Hearing, some ethanol-industry representatives asserted that ethanol and ETBE are produced from "renewable" sources. Tax subsidies for "renewable" ethanol were first enacted in 1978. This policy arguably might make sense to foster the development of fledgling and truly renewable industries where the product is socially desirable but the costs of entry into the market are prohibitive. Now, over 15 years later, ethanol fuel has become a well-entrenched industry with annual sales of approximately $1.4 billion. Ethanol can no longer claim to be a start-up operation. Over one billion gallons of tax-subsidized ethanol are produced annually and this amount is growing. Thus, a re-thinking of the basic rationale for the ethanol tax subsidies can be anticipated in any legislative process focusing on increasing the tax subsidy for ETBE or ethanol.

Moreover, it is becoming increasingly clear that ethanol is not a "renewable" fuel. Ethanol production is a major consumer of hydrocarbon fuel and is highly energy inefficient. For every BTU of energy contained in finished ethanol, some 1.0 to 1.7 BTU's are consumed in the process of producing the ethanol.[1] Natural gas-based fertilizers are used to produce corn, and petroleum-

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[1] Ethanol Fuels: Energy Security, Economics, and the Environment, Cornell University, September 18, 1990; Oxy-Fuel News, December 21, 1992, page 3.

based and coal-based fuels are used to plant, harvest, dry and transport corn, and are consumed in the production of ethanol. ETBE is created by a chemical reaction of ethanol and a natural gas-based feedstock, isobutylene. Thus, the characterization of ethanol and ETBE as legally "renewable" is scientifically inaccurate. It may or may not be "renewable" in small part, but it is nowhere near 100 percent renewable.

Recognition is growing of the non-renewable nature of ethanol fuels. For example, Congressman Jim McDermott, a Democratic Member of the Ways & Means Committee, does not treat ethanol as a "renewable fuel" in H.R. 2026, the Renewables and Energy Efficiency Incentives Act of 1993, which he introduced last year. Indeed, not only is ethanol not entitled to the tax benefits provided in H.R. 2026 for true "renewable" fuels (wind, solar, geothermal and closed-loop biomass), but the cost of the legislation is paid for in part by reducing the tax subsidy for ethanol production from 54 cents per gallon to 35 cents per gallon. Thus, today it is increasingly and appropriately being questioned whether ethanol tax subsidies can be rationalized on the simplistic and inaccurate characterization of ethanol as a "renewable" fuel.

Federal Budget Deficit

To our knowledge, ETBE has been produced in test quantities, but is not in commercial production for use in the United States today. Any use of ETBE as a fuel additive will displace a quantity of MTBE. ETBE can be produced in existing MTBE plants with minor adjustments. The attempt to force widespread conversion of MTBE plants to ETBE, based solely on a change in the tax law, could threaten the viability of many U.S. methanol plants and would reduce significantly the U.S. consumption of domestic natural gas. There is no justification for a tax provision that would interfere with markets and adversely affect jobs and the economy in gas-producing states in order to benefit corn-producing states.

Moreover, the Federal deficit would be adversely affected. At present, MTBE is subject to the fuel excise tax of 18.4 cents per gallon. On the other hand, a Treasury Regulation provides that ETBE is entitled to a proportion of the ethanol tax subsidy, so that its effective tax rate is $18.4-23.22 cents or $ -4.82 cents per gallon of ETBE.[2] Thus for every gallon of MTBE that is displaced by ETBE, the Federal Treasury will lose 23.22 cents. Significant revenue costs will be associated with the expected replacement of MTBE with tax-subsidized ETBE even under current law. Any additional subsidy of ETBE which results in greater displacement of MTBE with ETBE will necessarily cost additional Treasury revenues. These costs to the Treasury will be scored by the Joint Committee on Taxation against any legislation, such as S. 1736, proposing to increase ETBE subsidies and will present a formidable and appropriate obstacle to any new ETBE tax subsidy proposal.

CONCLUSION

The Right Policy is Fuel Neutrality

AMI believes that a product's commercial and economic merits should be determined in the market, and that the Internal Revenue Code should not be used to make judgments about the relative merits of any particular gasoline additive or alternative fuel. While there clearly should be a policy to encourage all alternative fuels vis-a-vis gasoline, such as an initial period of tax exemption to establish market growth, any such policy should be as neutral as possible among all alternative fuels.

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[2] Under Treas. Reg. § 1.40-1, the portion of ETBE made through a chemical reaction of ethanol with isobutylene qualifies for the 54 cents per gallon tax credit. This regulation is of questionable legal authority, and is the subject of litigation. If the credit is available for the ethanol used to make ETBE, the credit would be 43 percent of 54 cents or 23.22 cents per gallon because ETBE is produced 43 percent from ethanol and 57 percent from isobutylene, a natural gas or petroleum-based feedstock.

Unfortunately our present Tax Code has a crazy-quilt pattern that is highly non-neutral, as illustrated in Exhibit B, and disadvantages methanol and propane compared to other alternative fuels and even compared to gasoline. AMI recommends that the Subcommittee concentrate its efforts on making the taxation of alternative motor fuels and fuel additives more fuel-neutral, rather than seeking to use the Tax Code to maximize the production of ETBE. An additional subsidy for another ethanol product cannot be justified under the false rubric of "renewability" at the expense of the American natural gas producer, the American methanol and MTBE producer, the American taxpayer and the American consumer.

It is my pleasure to work with you and the Subcommittee on these issues of enormous National importance.

Sincerely,

R. A. Lewis

Raymond A. Lewis
President

Attachment

AMERICAN METHANOL INSTITUTE
LIST OF MEMBERS

Exhibit A

Ashland Chemical, Inc.
Beaumont Methanol Company *
Borden Chemicals & Plastics
Enron Clean Fuels Company *
Ford Motor Company
Georgia Gulf Corporation
Haldor Topsoe, Inc.
Hoechst Celanese Chemical Group, Inc.
ICI Americas Inc. *
ICI Katalco
Itochu Corporation Ltd.
Lurgi Corporation
Lyondell Petrochemical Company *
The M. W. Kellogg Company
RNG Corporation *
Methanex Corporation *
Mitsubishi Gas Chemical Company, Inc.
Nissho Iwai Corporation
Sabic Marketing Americas, Inc.
Sumitomo Corporation
Terra Industries, Inc.
Trinidad and Tobago Methanol Company, Ltd.
United Catalysts, Inc.

* Represented on AMI Board of Directors

Exhibit B

Fuel	Tax Ctns/Gal.	Btu Energy Content	Calculations	Effective Rate Compared to Gasoline Based on Energy Content
Gasoline	18.4	115,000		18.4
Diesel	24.4	135,000	115K/135K x 24.4	20.8
E-100	12.95[1]	75,670	115/75.67 x 12.95	19.68
Tax Credit	(48.55)		115/75.67 x 48.55	(73.78)
				(54.10)
E-85	12.95	81,570	.15 x 12.95	1.94
			.85 x 115/75.67 x 12.95	16.73
Subtotal				18.67
Tax Credit	(48.55)		.85 x 115/75.67 x 48.55	(62.72)
				(44.05)
E-10 (Gasohol)	13.0	111,000	115/111 x 13.0	13.47
M-100	11.4	56,560	115/56.56 x 11.4	23.18
M-85	11.4	65,323	.85 x 115/56.56 x 11.4	19.71
	11.4		.15 x 11.4	1.71
				21.42
Propane Gas	18.3	83,950	115/83.95 x 18.3	25.07
CNG	4.3[2]	Equivalent to Propane Gas	115/83.95 x 4.3	5.89
MTBE	18.4	93,500	115/93.5 x 18.4	22.63
ETBE w/o credit	18.4	96,900	115/96.9 x 18.4	21.84
ETBE (w/credit)	18.4	96,900	115/96.9 x 18.4	21.84
Tax Credit			.43 x 115/96.9 x 54.0	27.56
				(5.72)

[1] Neat ethanol fuels are allowed a 5.45 cents/gallon reduction in excise tax. Section 4041(b)(2). This amount reduces the 54 cents/gallon subsidy under section 40(c). Therefore, the subsidy is the full 54 cents/gallon provided under section 40.

[2] CNG is taxed at a rate of 48.54 cents/mcf, which was intended to equate to the tax on propane gas on a Btu equivalent basis. Assuming that an mcf of natural gas contains one million Btus, the calculation would be 48.54 x 115/1000 = 5.58

PREPARED STATEMENT OF LT. GOVERNOR LEO MCCARTHY

Thank you, Mr. Chairman and members, for inviting me to speak today. Thank you, also, Senator Daschle, for the foresight you personally have shown in initiating discussions on linking federal energy policy and job creation goals.

I represent a state that would love to link every federal policy to job creation. We are three years into a bitter recession—a multi-dip plight other regions of America experienced in the early 1980s. The latest figures show California has 1.5 million people unemployed . . . at 9.9%, way above the national average. Since July 1990, California has lost approximately 600,000 jobs. The unemployment rates in Los Angeles, Riverside and San Bernardino Counties—home to 12 million people and hit hard by base closures—are 9.5%, 15.7% and 11.7%, respectively. Half of California's 58 counties face unemployment rates of 12% or more.

According to Governor Pete Wilson's Office of Planning and Research, California stands to lose 200,000 jobs and $7 billion in personal income because of the direct and indirect impact of base closures proposed and ratified under the Reagan, Bush and Clinton Administrations.

California has suffered a hemorrhage of high-skill, high-paying manufacturing jobs—jobs that helped shape and sustain an enormous middle class whose purchasing power drove this nation's economy for decades.

During these tough times, the leadership in California understands we must sweat for every job we can keep or create. In the just-ended legislative session in Sacramento, strong bipartisan cooperation brought about major improvements in the state's business climate: workers' compensation reform . . . unitary tax relief . . . creation of a 6% investment tax credit for manufacturing equipment purchases . . . a 50% capital gains tax credit for investments made in small business.

As Chairman of the California Commission for Economic Development, I try to look at every possible angle to create jobs by helping businesses and industries start and succeed.

I just took a group of California medical equipment and heavy machinery manufacturers to China to help them start or expand export opportunities in that market. I've led seminars to help businesses take advantage of the investment opportunities Congress included in the Immigration Act of 1990, and published guides to help small businesses cut through red tape and avoid common pitfalls. I've been working with local, state and federal officials and community economic development groups to facilitate the commercialization of military bases targeted in the 1988 round, 1991 round, and this year's round of closure announcements.

My job includes keeping an eye out for new industries that can be part of the mix of private, state and federal actions needed to bring California out of four years of deep recession.

An exciting prospect is the creation of a domestic oxygenated fuels industry.

One reason for our interest is, as some economists have suggested, funds invested in a domestic oxygenated fuels industry appear to have particularly high job-creation value, because they replace dollars that would otherwise be merely exported offshore and unavailable for investment here.

As you are aware, the reformulated gasoline program mandated under the Clean Air Act amendments of 1990 will establish a national demand for oxygenates that could exceed 7 billion gallons per year by the end of the decade.

The California Energy Commission estimates the California market for oxygenates will reach 1.7 billion gallons annually by the end of the decade.

The jobs generated by this huge American market for oxygenates should be filled by American workers.

Without delving into testimony covered by others, clean fuels make sense environmentally and economically. Also, we've seen in the past the perils of relying on imported fuel sources; though our hopes for increased stability in the Middle East are high, prudence suggests our energy security is best served by domestic production.

California would be one perfect home for the oxygenated fuels industry. We have a trained and talented workforce. We have a tremendous refining capability—one able to equal the more than 14 billion gallons of gasoline we consume per year. Many of the military bases to be closed are adjacent to the state's established refining centers and attendant infrastructure.

My office, with corroboration from the California Energy Commission, estimates it would take four facilities to produce 850 million gallons per year of oxygenates—a realistic target of 50% of our oxygenated fuels need in the year 2000. These four facilities would provide 4,000-8,000 construction jobs and 800–1,000 direct permanent jobs, 90% of which are skilled or highly skilled.

Because these are manufacturing jobs, they will, as Dean Baker and Thea Lee at the Economic Policy Institute argue, generate four times as many secondary jobs as retail or service equivalents.

In fact, using Department of Commerce economic multipliers, we estimate each facility would generate roughly $200 million annually in direct and indirect personal income in the community. The four facilities would also generate $28 million to $100 million annual tax on project income, $84 million in taxes on construction payroll, and $14 million in annual taxes on operating payroll. Over a 30-year project operation life, the four facilities, again, meeting a target of only half our oxygenate needs, would bring in $1.3 billion to $3.3 billion in tax revenue.

It is important to note that without these plants we will be importing oxygenated fuels to the tune of $850 million annually—money leaving California when it is desperately needed for investment in the state.

And it should also be noted that these jobs and revenues are in addition to those that would benefit our neighbors in states that produce the bulk of the raw material that is refined into ethanol-based oxygenates.

To meet the 850 million gallons-per-year goal, the four California facilities of my example would require 60 million bushels of feedstock annually—at least 30 million bushels of which we would import from grain producing states throughout the country. I believe at current prices 30 million bushels would translate to somewhere around $90 million per year for growers outside California.

Looking at these numbers, I do not think any Californian, particularly an unemployed Californian, or any American, particularly an unemployed American, would want the benefits of our oxygenated fuels demand to go to Venezuela or the Middle East.

I want to stress here that California's interest in oxygenated fuels facilities is far from academic. I have been contacted by a constituent in Bakersfield who is making progress toward establishing a facility that utilizes new technology to take grain and other forms of renewable biomass to produce ethanol, methanol, ETBE and MTBE within the same complex and requires only a minimal amount of natural gas.

This project shows that the oxygenated fuels industry is viable in California, and that the entrepreneurial spirit is there to be sparked if a domestic oxygenated fuels industry is made a priority in our national energy policy.

My interest in the oxygenated fuels industry has been heightened by my active involvement with a consortium of companies interested in building three plants that would use innovative, environmentally sound technologies to produce ethers for use in reformulated gasoline.

Through the California Economic Development Commission I chair, I've worked to bring together the state's Commerce Department, Energy Commission and Environmental Protection Agency to help advance this project, which is led by Sunthetic Energy of America, CMS Generation Company, John Brown Engineers and Constructors, and Kilborn Inc.

Again, signs of active federal support for a domestic oxygenated fuels industry will help us take projects such as this from hypothetical to feasible to functioning.

This is not only in California's interests but in the interests of each of your states and of the nation. In an economic recovery, California can be a sail or an anchor for the rest of the country.

Amory Lovins, whose prescience regarding economic and energy issues is widely hailed, writing recently in the pages of "Foreign Affairs," made a simple yet vital point: "the United States needs to adopt the same kind of comprehensive long-term strategy for creating high paying jobs as its major trading partners. The first step—a new energy policy."

A strong domestic oxygenated fuel industry is a clean industry that meets environmental standards and helps achieve environmental goals.

A strong domestic oxygenated fuel industry promotes near-term economic stimulus and long-term energy independence—it will prevent gas lines and reduce unemployment lines. A strong domestic oxygenated fuel industry keeps investment money at home, energizes our beleaguered national manufacturing base, boosts the economies of grain producing states and helps California pull our weight in the recovery.

Mr. Chairman and members of the Committee, I urge you to spur your colleagues and the Administration in this direction, and I pledge my strong support of your efforts.

LEO McCARTHY
LIEUTENANT GOVERNOR
CHAIRMAN

DEBORAH McCONVILLE
EXECUTIVE DIRECTOR

State of California
Commission for Economic Development

5777 WEST CENTURY BLVD.
SUITE 1650
LOS ANGELES, CA 90045-5631
(310) 412-5118
FAX (310) 412-5333

STATE CAPITOL
ROOM 1114
SACRAMENTO, CA 95814
(916) 445-5994
FAX (916) 323-4998

465 CALIFORNIA STREET
SUITE 280
SAN FRANCISCO, CA 94104
(415) 557-2662
FAX (415) 557-3530

February 14, 1994

The Honorable Tom Daschle
Chairman, Subcommittee on Energy and Agricultural Taxation
Senate Committee on Finance
United States Senate
217 Hart Office Building
Washington, D.C. 20510

Dear Mr. Chairman:

Thank you for your continued commitment to promoting domestically produced oxygenated fuels to meet the nation's clean air standards. Your leadership will help create desperately needed high-wage, high-skilled jobs in California and throughout the nation. The Renewable Fuels Incentives Act, S. 465, is important to building momentum for a strong clean fuels industry.

I am working closely with the private sector and state government agencies to help launch an oxygenated fuels industry in California. With over 1.5 million Californians unemployed, we must move aggressively to develop promising sectors in our economy. The oxygenated fuels industry presents su h an opportunity. California's Energy Commission estimates the state will require 1.7 billion gallons of oxygenates to meet federal and state clean air standards by the end of the decade. Under its current course, California will import nearly 90% of these oxygenates -- largely from foreign suppliers -- shipping billions of investment dollars overseas. Alternatively, California could manufacture at least 50% of our needs in-state, generating thousands of jobs and hundreds of millions of dollars in local investments and revenues.

Since I appeared before your Subcommittee on Energy and Agricultural Taxation, we have made significant headway in developing a clean fuels facility in Bakersfield. This project would create roughly 2,000 construction jobs and 250 high-skilled permanent jobs. I am increasingly optimistic we can site additional facilities on one or several of the many California military bases slated for closure.

While we are working hard at the state level to help launch this industry, it is crucial California investors, refiners and policy-makers receive a clear signal from the federal government indicating long-term support for domestically produced clean fuels. The Clinton Administration's recent announcement promoting oxygenates in the federal reformulated gasoline program is an important step. Your legislation, S. 465, clarifying certain tax incentives available to renewably derived alcohols, would give California investors and refiners the additional reassurance they are seeking.

The legislation's alternative minimum tax (AMT) blender credit provision is of particular importance. The AMT provision would allow California's larger refiners to qualify for the economic incentive created by the blenders' tax credit for renewable fuels. The blenders' credit policy has worked successfully for smaller operators. Unfortunately, larger blenders who are more likely to fall under the alternative minimum tax are unable to take the credit under the current provisions of the law. By providing uniform access to credits for all blenders, S. 465 would create strong incentives for California's refiners and blenders to purchase California-produced oxygenates derived from renewable alcohols.

Thank you for soliciting the comments of the California Commission for Economic Development and for your leadership on this important issue. Both our states and the nation stand to gain from your hard work. Please let me know if there is anything I can do to help win passage of the Renewable Fuels Incentives Act.

Warm regards,

Leo McCarthy

Leo McCarthy

LM:am

PREPARED STATEMENT OF WILLIAM PIEL

My name is William Piel, Manager of Business Development for Oxygenated Fuels in ARCO Chemical Company. As background, ARCO Chemical Company has been involved in the commercial production of alcohols for transportation fuels since 1969, and the production of ethers derived from alcohols since 1979. During that time period, almost all the oxygenates that we have produced and sold into the transportation fuel markets has been from non-petroleum energy sources. Besides the U.S. we also produce fuel oxygenates in Europe and have marketed our oxygenates in all major transportation fuel markets in the world. Though we do not produce methanol today, we have channeled more methanol into transportation fuels through our products than any other company, and will probably continue to do so through the rest of the decade. In order for us to have grown to be the world largest supplier of fuel oxygenates, we learned early in the business to adapt our products to meet the ever changing requirements of the fuel markets. Today, I would like to share some of our experience with this sub-committee on the oxygenates such as ethanol, methyl tertiary butyl ether (MTBE) and ethyl tertiary butyl ether (ETBE).

As you may already know, MTBE is made by combining methanol with a very active hydrocarbon compound called isobutylene. Methanol is generally made most economically from natural gas but can also be derived other carbon containing energy sources such as petroleum, coal or bio-mass. The non-alcohol part of the ether, known as isobutylene, is usually derived from either petroleum or from natural gas liquids such as butanes. ARCO Chemical Company happens to get most of its isobutylene from butanes via a proprietary conversion process. However, we currently acquire all our methanol from the market place.

An alternative to using methanol for ethers is to combine ethanol with the isobutylene to make ethyl tertiary butyl ether or ETBE. This switch from methanol to ethanol is relatively easy in existing ether units. As a demonstration of both the process and the product, we made two separate, large commercial production runs of ETBE near the beginning of this year which we then supplied to some of our refinery customers. The feedback from these customers is that the product performed above expectations. A few other companies have also commercially produced ETBE on a limited scale in both the U.S. and in Europe. Again, this was done by switching existing MTBE capacity over to ETBE. We are also not aware of any operating problems associated with these other ETBE productions runs.

From a technical stand point, ETBE has a number of advantages over both MTBE and ethanol in gasoline. In addition to ETBE having a slightly higher octane number than MTBE, its volatility or vapor pressure in gasoline is much lower, approximately half that of MTBE and one-quarter that of ethanol in gasoline. These properties become more important to the oil refiner as environmentally friendlier gasolines requires lower volatility and cleaner sources of octane.

The value of a blending component in gasoline is mostly determined by its vapor pressure and its octane. Included in this part of the written testimony is a short table that shows a simple comparison of the gasoline property changes associated with blending each of the oxygenates into summer grade reformulated gasoline.

	Gasoline Property Changes		
	Ethanol	MTBE	ETBE
Reid Vapor Pressure (psi @ 100F)	+1.0	0.0	−0.5
Octane (Avg of Research & Motor)	+1.5	+2.4	+3.1
Volume percent @ 2% oxygen	5.7	11.0	12.8

What the table illustrates is that ETBE provides the greatest beneficial changes in gasoline octane and vapor pressure when blended for two percent oxygen in gasoline.

ETBE's only disadvantage to MTBE and ethanol is its lower oxygen content. This only becomes a significant factor when blending gasoline for a high oxygen content such as in the Oxygenated Fuels programs used in winter time carbon monoxide non-attainment areas. In this situation, MTBE or ethanol blending is usually at an advantage to ETBE.

However, the lower oxygen content can actually work in ETBE's favor when blending for reformulated gasoline which must meet many other conditions besides oxygen content. A lower oxygen content allows more volume of the oxygenate to be blended into gasoline. The volume associated with the oxygenates helps dilute many

of the environmentally less desirable components found in conventional gasoline such as sulfur, benzene and high boiling aromatics. An example of this beneficial dilution effect is observed when blending two percent oxygen in reformulated gasoline. A refiner could use either 5.7 volume percent ethanol, 11 volume percent MTBE or approximately 13 volume percent ETBE. In this simple example, ETBE provides more dilution benefit and also more octane to the refiners gasoline pool because of its higher volume contribution than either ethanol or MTBE. This translates into more flexibility in producing reformulated gasoline and potentially reduces the refineries' investment capital necessary for producing reformulated gasoline. Under these conditions, ETBE is expected to have the highest value to the refinery industry

Because of these potential additional benefits for manufacturing reformulated gasoline, ARCO Chemical Company had decided last year to begin providing ETBE as an option for our current MTBE customers, and has been activity discussing the benefits of ETBE with them. We have also been advertising the commercial availability of ETBE in many of the industry journals. We would be disappointed if the refining industry overlooked the ETBE option in the development of their reformulation gasoline strategies and as a result end up investing more capital than necessary in their refineries.

The use of oxygenates in gasoline also involve some less tangible and less technical issues such as green-house gases and energy security. Reformulated gasoline generates about 2 to 3 percent less carbon dioxide emissions (a green-house gas) than conventional gasoline. This is a result of reducing the gasoline's aromatic content by replacing their octane with that from the oxygenates. Though aromatics are a major source of octane in conventional gasoline they also happen to be the gasoline components with the highest individual contribution of carbon dioxide emissions from vehicle tailpipes. Using ETBE instead of MTBE or ethanol in reformulated gasoline will likely replace more aromatics, and therefore lead to even lower carbon dioxide emissions associated with the use of gasoline.

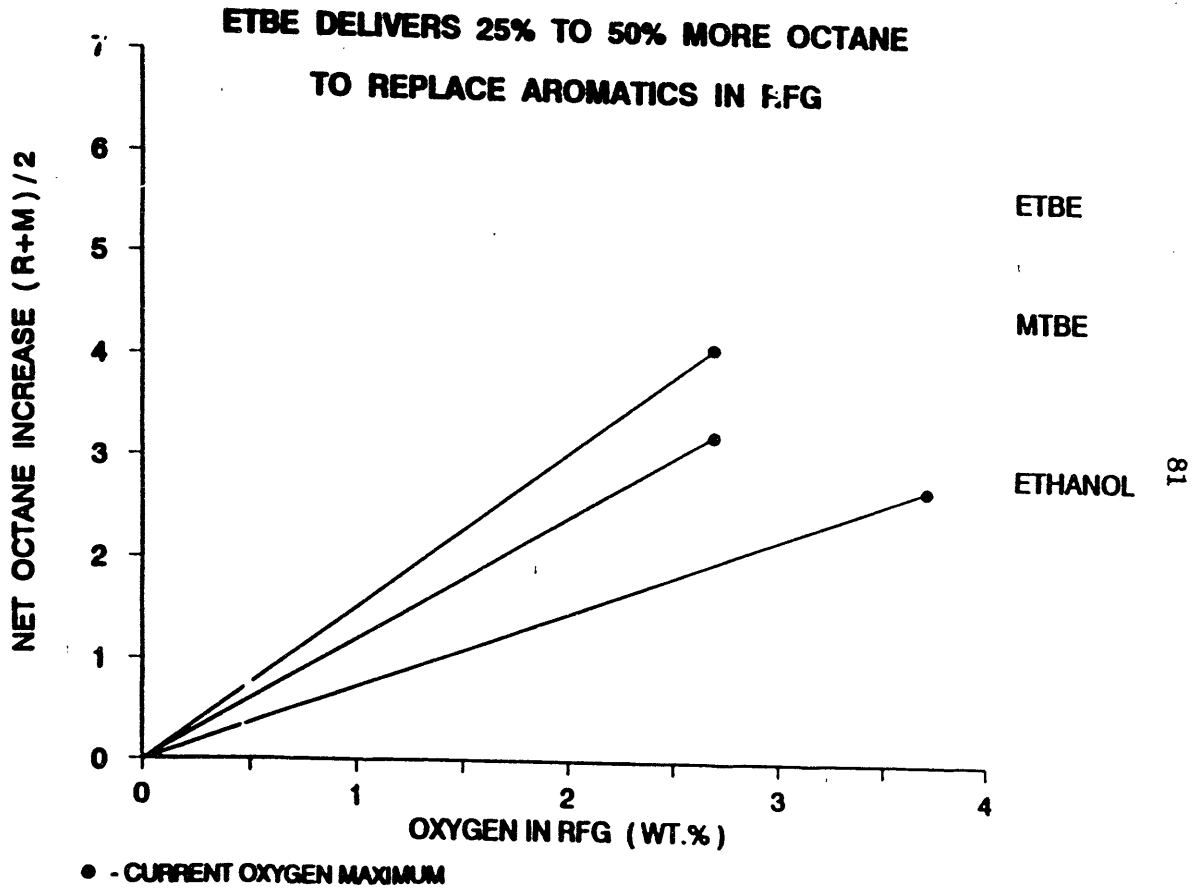
Separate from the effect of reducing aromatics is the beneficial use of renewable carbon in the form of ethanol contained in the ETBE. Since the carbon in ethanol is renewable, this will lead to a further reduction in carbon dioxide emissions by reducing the combustion of fossil fuels. Depending on the energy efficiency of growing the corn and converting it ethanol, blending ETBE at the two percent oxygen content can potentially reduce carbon dioxide emissions by additional two percent above that realized by reducing the aromatics content of gasoline. These two effects combined can potentially reduce carbon dioxide emissions from the gasoline-based vehicle fleet by a total of 4 to 5 percent.

Relative to energy security issues, oxygenates are generally made from non-petroleum energy sources. So their expanded use in U.S. gasoline will generally displace some gasoline derived from imported petroleum. As mentioned earlier, ETBE at two percent oxygen in gasoline will require more volume and therefore, displace more gasoline volume than either ethanol or MTBE.

Besides diversifying gasoline production away from petroleum, another issue for energy security is domestic versus foreign supplies for the non-petroleum energy. Methanol is a worldwide commodity and is most economically made from natural gas located near its source. The next wave of MTBE capacity expansions are expected to be mostly based on methanol and butanes as their energy raw materials, and much of this new MTBE capacity will likely be built outside the U.S. because of more favorable feedstocks economics. On the other hand, ethanol production for use in U.S. fuel is generally limited to domestic production because of the limitations on government economic incentives for ethanol. As a result, offshore MTBE units will not likely be able to competitively make ETBE because of inaccessibility to qualifying or economical ethanol. Therefore, any new ether capacity using ethanol will most likely have to be built in the U.S.

In summary, of the three oxygenates, ethanol, MTBE and ETBE, we would expect refiners to get the most benefit from ETBE, particularly in regard to making reformulated gasoline. It is for this reason that we have been actively promoting the product and educating our customers to the benefits of using ETBE. From our decades of experience of developing and marketing fuel oxygenates, we can say that one of the most environmentally beneficial and cost effective ways for ethanol to go into gasoline is in the form of an ether such as ETBE. Also, ETBE compared to the other oxygenates will likely provide some additional benefits relative to green-house gases and energy security.

I realize much of this discussion is of technical issues that is sometimes difficult to explain in simple terms. Therefore, I would be glad to address any questions that you may have.


ETBE DELIVERS 25% TO 50% MORE OCTANE
TO REPLACE AROMATICS IN RFG
NET OCTANE INCREASE (R+M)/2
7
6
5
4
3
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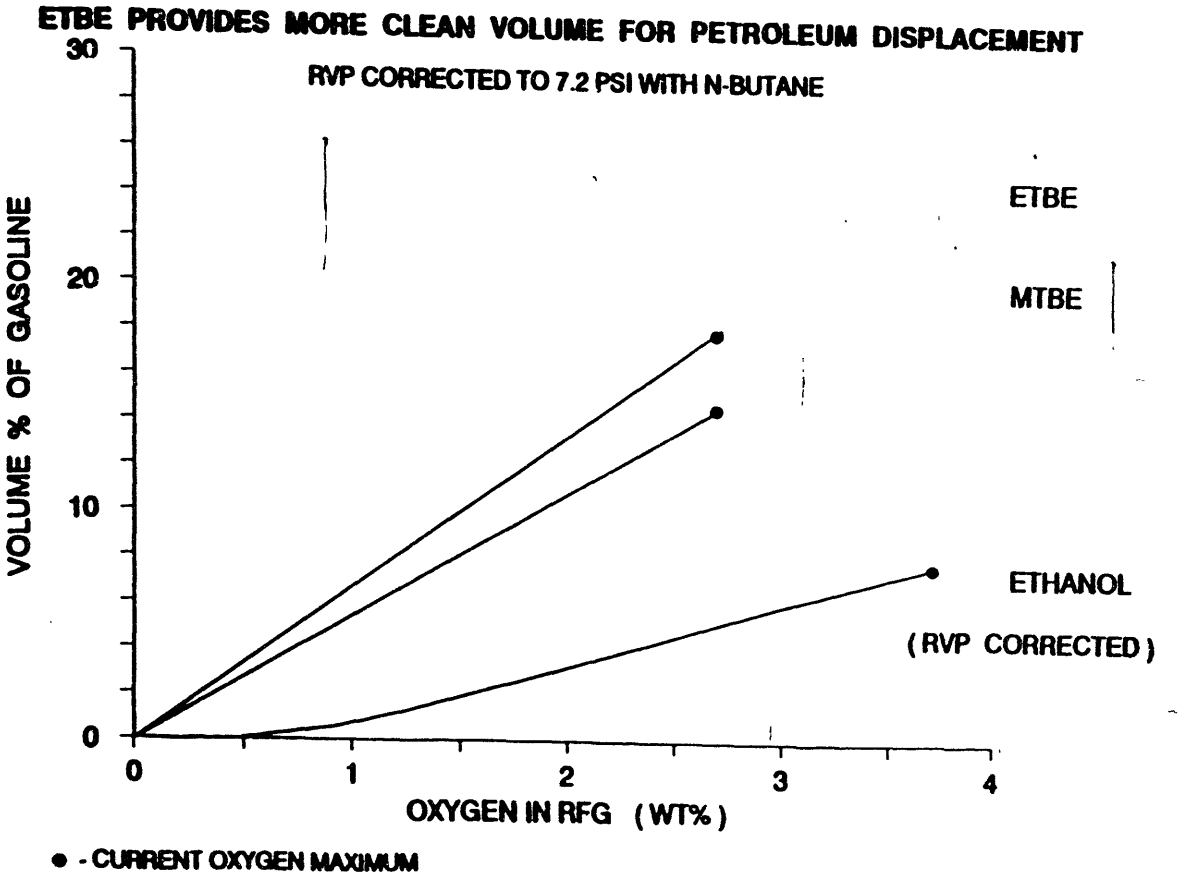
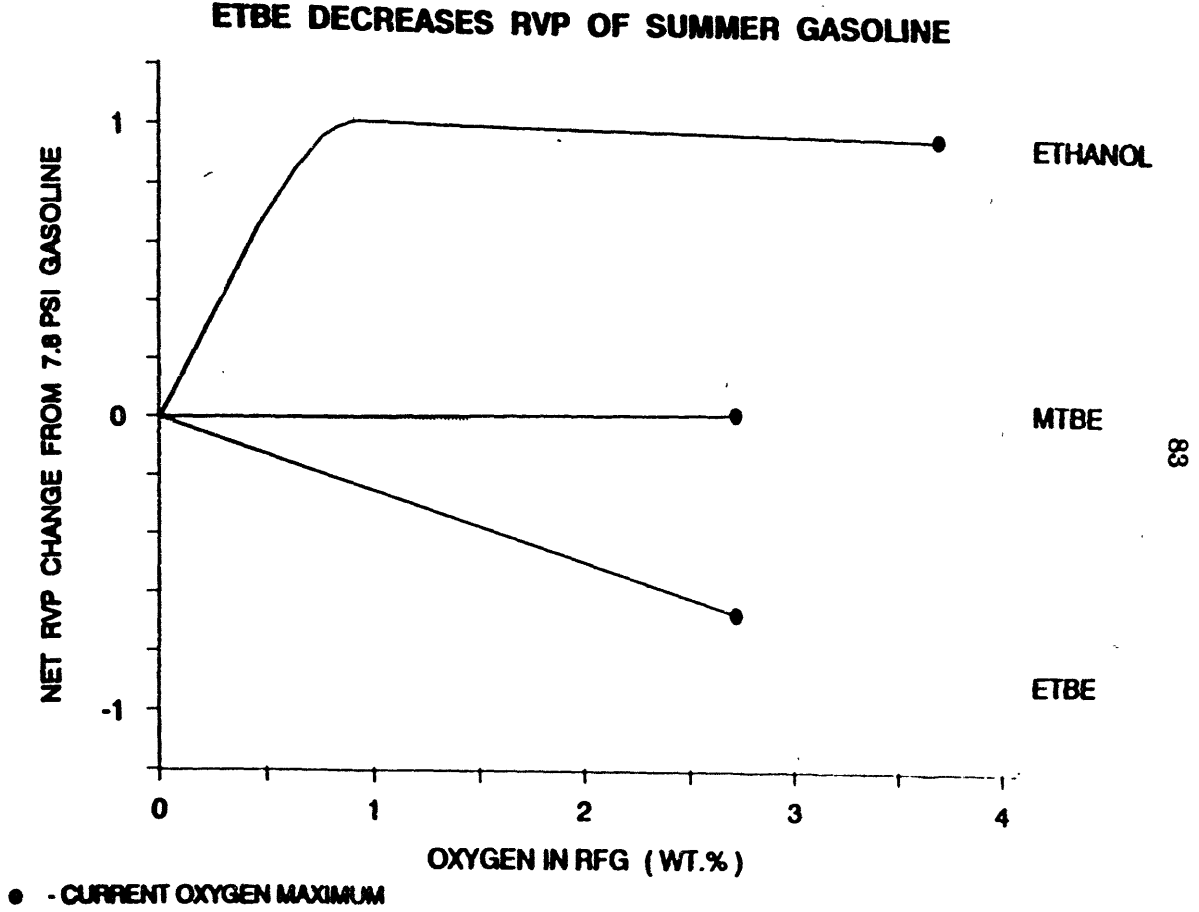
4
OXYGEN IN RFG (WT.%)
ETBE
MTBE
ETHANOL
● - CURRENT OXYGEN MAXIMUM


ETBE PROVIDES MORE CLEAN VOLUME FOR PETROLEUM DISPLACEMENT
RVP CORRECTED TO 7.2 PSI WITH N-BUTANE
VOLUME % OF GASOLINE
30
20
10
0
0
1
2
3
4
OXYGEN IN RFG (WT%)
ETBE
MTBE
ETHANOL
(RVP CORRECTED)
● - CURRENT OXYGEN MAXIMUM


ETBE DECREASES RVP OF SUMMER GASOLINE
NET RVP CHANGE FROM 7.8 PSI GASOLINE
1
0
-1
0
1
2
3
4
OXYGEN IN RFG (WT.%)
ETHANOL
MTBE
ETBE
● - CURRENT OXYGEN MAXIMUM

1995 RFG PRODUCTION EASIER WITH ETBE

	Gasoline Properties			
	OXYGEN	RVP	AROMATICS	BENZENE
1990 INDUSTRY AVG	--	7.8	33%	1.6%
+ 12.8 VOL% ETBE	2.0%	7.3	24%	1.4%
+ 17.2 VOL% ETBE	2.7%	7.0	22%	1.3%
1995 RFG TARGET	2.0%	7.2	25%	1.0%

- o ETBE blends meet most RFG specifications with capital
- o ETBE reduces "RFG" investment requirements for refiners
- o Allows refiners to focus strategy for 1997 Complex Model

PREPARED STATEMENT OF SENATOR MALCOLM WALLOP

Mr. Chairman, I am strongly opposed to this hearing because energy and environmental issues regarding alternative fuels should be addressed by the relevant committees of jurisdiction, and not the Finance Committee.

The Energy Committee has long been involved in alternative transportation fuels since the 1973 oil embargo. Most recently, the Energy Committee and the Congress spent considerable time fashioning a comprehensive national energy strategy which addressed issues involving alternative fuels, including the role of ethanol and methanol.

While recognizing the importance of alternative fuels to our national energy security, the legislation also made certain that no one fuel was favored over any other. Instead, the act relies on the marketplace to establish energy prices and energy uses related to environmental requirements. But every time we turn around it seems like someone wants to thwart this objective before it has even had time to be fully implemented.

This subcommittee is no exception. It wants to discuss energy-security and environmental issues when it has neither the expertise nor the experience to properly and adequately do so. Where are witnesses from the Department of Energy or the EPA—departments who have obvious jurisdiction over energy and environmental issues?

I understand that this subcommittee plans to hold further hearings to examine tax issues regarding subsidies for alternative fuels. This is certainly the proper role for this committee and I welcome the opportunity to review Federal tax policies to ensure that they do not conflict with the goals and objectives of the Energy Policy Act. But I certainly hope that it is not the intention of this committee to rely solely on the testimony given today, before a committee without jurisdiction over these issues, to justify changes in tax law.

COMMUNICATIONS

AMOCO OIL COMPANY,
Chicago, IL, September 29, 1993.

Hon. THOMAS DASCHLE,
U.S. Senate,
Washington, DC.

Dear Senator Daschle: Amoco Oil would like to offer comments to supplement the record for your September 29 hearing on ethyl tertiary butyl ether (ETBE). We appreciate and support your continuing efforts to ensure ETBE's competitiveness.

As you know, Amoco Oil was the first domestic oil company to produce ETBE in our MTBE plant as a commercial test run. We continue to manufacture and blend ETBE at our Yorktown, Virginia refinery. However, the industry's ability to increase its use of ETBE is constrained by the economic disadvantage created by the current tax treatment of ETBE. *S. 465* would remove that disadvantage and provide the proper economic incentive for ETBE production.

The winter oxygenated fuels and the reformulated gasoline (RFG) programs established by the Clean Air Act Amendments of 1990 will require oxygenate production to increase significantly. The question is not whether ether capacity will be developed, it is what feedstock (methanol or ethanol) will be used in producing ethers. At present, ETBE is not economic relative to MTBE. Adoption of *S. 465* would change this by ensuring that the full benefit of the blender tax credit is available to ETBE blenders on after-tax basis.

We have evaluated 1995 economics for RFG containing MTBE and RFG containing ETBE. The range of ethanol and methanol feedstock prices examined bracket the spread from current prices to the price necessary to cover investments in new methanol or ethanol plants. The comparison confirms that ETBE is uneconomic given its current tax treatment. However, *S. 465* would provide an additional tax incentive of about 20 cents per gallon of ethanol, thus reducing ETBE production costs significantly. The result is that at current ethanol prices of about $1.25 per gallon, ETBE becomes competitive with MTBE produced from methanol feedstock at current methanol prices. Thus, the tax incentive incorporated in *S.465* is the appropriate level needed to make ETBE competitive in reformulated gasoline.

There are a number of reasons why ETBE production should be encouraged:

Greater use of ETBE will increase the use of domestic renewables, namely ethanol.

For example, if *S. 465* were adopted and ETBE was used in all RFG in the 9 mandatory areas and Ozone Transport Commission opt-in areas in the Northeast, an additional 2.2 billion gallons per year of ethanol would be used. This is in addition to the 0.7 billion gallons of ethanol consumed in winter oxygenate programs in carbon monoxide areas and traditional Midwest gasohol markets. This would equate to a three-fold increase in current ethanol sales. Even if only 35% of the RFG market used ETBE, ethanol sales would increase to 1.5 billion gallons per year, a 50% increase over today's sales. Since ETBE relies primarily on a domestic feedstock, ethanol, its use also yields important energy security and trade benefits.

ETBE can make an important contribution to improving air quality.

Unless blended with a specially designed base gasoline, ethanol tends to increase the fuel's evaporative emissions resulting in a net increase in total volatile organic compound (VOC) emissions. This is because ethanol, when splash-blended into gasoline, increases the fuel's volatility as indicated by its Reid Vapor Pressure (RVP). However, ETBE has a low RVP and can help reduce VOC emissions and help reduce ozone formation. Thus, ETBE will be particularly useful in meeting summer VOC reductions (particularly in the South) and in complying with the RFG program once

the stricter year 2000 standards take effect and ETBE's low volatility becomes even more important in meeting the program's VOC reduction requirements.

ETBE enhances gasoline performance.

ETBE is a low volatility and high octane oxygenate. It has a more favorable impact on gasoline's distillation curve and on driveability than other oxygenates. The following table compares the octane and volatility of various oxygenates:

	ETBE	MTBE	Ethanol
Octane (RM/2)	109	108	113
RVP	4.9	9.0	19.0

Although ETBE's octane is only slightly higher than MTBE's, ETBE provides additional octane benefits because more of it must be used to meet a given oxygen level.

In summary, Amoco Oil continues to support your efforts to provide the tax incentives needed to encourage greater use of ETBE. ETBE can play an important role in the reformulated gasoline program due to its low volatility, high octane and good performance. It is one of the best ways to deliver a quality product to consumers that also makes a substantial contribution to improving air quality.

We look forward to working closely with you in exploring the potential role for ETBE in the reformulated gasoline program.

Sincerely,

WILLIAM D. FORD (DOUG), *President.*

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