

Timing for Startup of the Renewable Fuel Standard

September 2002

Contacts

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On June 17, 2002, Senator Jeff Bingaman, Chairman of the Senate Committee on Energy and Natural Resources, requested that the Energy Information Administration (EIA) provide analysis of eight factors related to the Senate-passed fuels provisions of H.R. 4, the Energy Policy Act of 2002 (Appendix A). In response, EIA has prepared a series of analyses discussing the market impacts of each of these factors.

Because of the rapid delivery time requested by Sen. Bingaman, each requested factor related to the Senate-passed bill was analyzed separately, that is, without analyzing the interactions among the various provisions. In addition, assumptions about State actions, such as their implementation and timing of MTBE bans, influence the results. Discussions about some of these interactions have been included in order to explain the interconnected nature of such issues.

EIA's projections are not statements of what will happen but what might happen, given known technologies, technological and demographic trends, and current laws and regulations. The *Annual Energy Outlook 2002 (AEO2002)* is used in these analyses to provide a policy-neutral Reference Case that can be used to analyze energy policy initiatives. EIA does not propose, advocate or speculate on future legislative or regulatory changes. Laws and regulations are assumed to remain as currently enacted or in force in the Reference Case; however, the impacts of emerging regulatory changes, when clearly defined, are reflected.

The analyses involve simplified representations of reality because of the complexity of both the issues examined and the environment in which they would occur. Projections are highly dependent on the data, methodologies, and assumptions used to develop them. Because many of the events that shape energy markets (including severe weather, technological breakthroughs, and geopolitical disruptions) are random and cannot be anticipated, energy market projections are subject to significant uncertainty. Further, future developments in technologies, demographics, and resources cannot be foreseen with any degree of certainty. These uncertainties are addressed through analysis of alternative cases in the *AEO2002*.

Introduction

This paper responds to Senator Bingaman's inquiry on whether or not moving the start date of the Renewable Fuel Standard (RFS) from its currently proposed January 2004 to October 2004 would improve the chances of a smooth transition. The question recognizes that January is during the middle of the winter gasoline season and several months prior to when refiners have to begin producing summer gasoline, which is more difficult to make – particularly when using ethanol.¹ October is closer to the transition

¹ Summer gasoline requires a lower Reid Vapor Pressure (RVP) than winter gasoline and summer is the time of highest demand. RVP measures the tendency of a material to evaporate, and thus, in the case of

between summer and winter gasoline, and provides an entire winter season to adjust to the RFS. Concern over seasonal timing of transitions is understandable in light of the price volatility experienced in spring 2000 and 2001.

For this discussion, fuel regulatory timing issues can be considered as falling into three categories:

1) *Setting implementation dates within an annual calendar.* For example, should the date be set at a time when refiners are making a normal seasonal product change or during a low demand season (winter for gasoline)? The goal is to try to minimize the potential for supply problems and price surges while making the transition.

2) *Synchronizing a regulatory change that has a logical connection with other regulatory changes affecting product quality requirements.* An illustrative example is timing between potential MTBE bans and a waiver to the oxygenate requirement² in reformulated gasoline (RFG). The oxygenate waiver gives refiners more flexibility to meet RFG requirements. When the use of MTBE is restricted, refiners will have to make some significant changes, and providing suppliers with as much flexibility as possible during such changes can help smooth the transition. Thus, even though most MTBE-banned RFG is expected to be made with ethanol initially, there is a rationale to having an oxygenate waiver precede or coincide with MTBE ban dates, in order to allow as much supply flexibility as possible to minimize chances of product shortfalls.

3) *Timing where large changes are needed by the industry, such as large capital investment requirements.* There are three dimensions to this timing area. First, adequate time must be allowed to promulgate the regulations. The time required in this case will vary with the complexity of the changes required by the legislation. Second is that adequate advance notification be provided to refiners so that they have time to plan and make the necessary investments. Third, the timing needs to be adequate for the construction and engineering sector to produce and install the equipment needed to comply with the regulations without adding excessive burden to refiners.

This particular issue deals with aspects of all three timing issues, as described below. The next subsection of the paper covers the basic elements of the RFS that could affect the timing for beginning the program. The Findings subsection discusses the issues affecting the first timing dimension, i.e., a need to start the program during a different seasonal period than mid-winter, and then discusses factors associated with the third

gasoline, its tendency to produce volatile organic compounds (VOC's). It is measured in pounds per square inch (psi), sometimes just referred to as "pounds." Adding ethanol to gasoline increases the RVP and requires that further refining adjustments be made, particularly when producing RFG and low-RVP conventional gasolines. The low-RVP requirement in the summer adds more complications to using ethanol during this season than during the winter, in addition to summer being the period of highest demand.

² Currently, RFG is required to contain at least 2 percent oxygen by weight. Oxygenates are materials with high oxygen content, such as ethers or alcohols. MTBE, which is an ether, generally has been the most economic oxygenate to use. Ethanol, an alcohol, has been used widely in the Midwest, where fuel ethanol is produced.

timing issue, i.e., adequate time to implement and respond to the legislation, in order to explore if a delay beyond January 2004 might be needed. The Conclusion section then summarizes the findings.

Background on RFS and Ethanol Use

The RFS currently being proposed requires minimum volumes of renewable fuel to be used in each year beginning in 2004, as described in Appendix B. The proposed legislation directs the Environmental Protection Agency (EPA) to assign every gasoline supplier a renewable fuel volume requirement based on an estimate of the supplier's share of the gasoline demand in the upcoming year. The proposal also allows for credit trading among suppliers, with the details to be developed in associated regulations. Due to its availability and economics, ethanol will be the renewable fuel used to meet this standard initially. (Appendix C discusses the use of ethanol in gasoline.)

The RFS requires that 2.3 billion gallons, or 150,000 barrels per day, of renewable fuels be used in 2004. In 2001, the United States used 1.7 billion gallons (113,000 barrels per day) of ethanol, which is 74 percent of the 2004 RFS requirement. During the first few years of the RFS program, volumes of ethanol used may already meet or exceed RFS requirements, as a result of increased ethanol production capacity currently under construction, partially in anticipation of State MTBE bans that are scheduled to be in place in 2004.³ (Further detail is provided in EIA's response to the Senator's question regarding "Renewable Motor Fuel Production Capacity Under H.R. 4.") Regardless of the RFS, the MTBE volumes lost as a result of bans in States using reformulated gasoline⁴ (e.g., California and New York) will be replaced by ethanol, alkylate, and other materials as discussed in the response to Committee's question on the volume impact of an MTBE ban.

Findings

Moving the start date of the RFS program from January to October has two effects. The first is to shift the date to a different part of the gasoline season from mid-winter to the transition period from summer to winter. The second effect is to delay the program 9 months from January to October.

³ MTBE restrictions are currently scheduled in the following States: Arizona, California, Colorado, Connecticut, Illinois, Indiana, Iowa, Kansas, Kentucky, Michigan, Minnesota, Missouri, Nebraska, New York, Ohio, South Dakota, Washington. Maine has not banned MTBE, but set a State goal to do so.

⁴ States with regions using or planning to use RFG are: Arizona (requires very clean burning gasoline, which is frequently satisfied with California RFG referred to as CaRFG), California (which uses CaRFG that is cleaner burning than Federal RFG), Connecticut, Delaware, District of Columbia, Illinois, Indiana, Kentucky, Louisiana (Baton Rouge will soon be using RFG), Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Texas, Virginia, Wisconsin.

Seasonal Startup Timing

There is not a major difference between starting the RFS program during the summer-winter transition (October) or during the middle of winter (January). A January startup separates the RFS transition from seasonal changes in gasoline specifications and allows refiners several months to adjust and prepare for the summer gasoline season. While some refiners might prefer an October startup, finding it advantageous to deal with the RFS transition at the same time as the normal seasonal summer-to-winter transition, which allows them to draw down summer-grade gasoline and replace it with winter-grade and to change gasoline types at the same time, others would prefer a mid-season transition in January. The difference in perspective between suppliers would likely depend on the types of gasoline currently marketed (conventional or RFG, and RVP specifications) and existing use of ethanol.

The seasonal choice between January or October is also not expected to be significant since the industry is not expected to have to change physical production and distribution much to meet the RFS, beyond what they would otherwise be doing. As we indicated in the response to the question on availability of ethanol (Question 2), projected ethanol production, based on added capacity of plants already under construction, will likely provide more ethanol in 2004 than required by the RFS. Thus, there would be no need for refinery or terminal changes beyond those already taking place.

The increase in ethanol production capacity has been partially driven by State MTBE bans, and it is likely that California's ban on MTBE will result in the additional ethanol demand needed to meet the RFS target in 2004. The RFS requires that 0.6 billion gallons (39,000 barrels per day) more be used in 2004 over that used in 2001 (2.3 billion gallons RFS target minus 1.7 billion gallons used in 2001). California will likely need at least 45 thousand barrels per day, or 0.7 billion gallons, of ethanol for gasoline in 2004, to satisfy requirements given its MTBE ban.⁵ California suppliers are already beginning to remove MTBE and use ethanol. California's consumption alone, added to current ethanol use, would meet the RFS requirement in 2004. If more California RFG than anticipated is produced without ethanol, the shortfall from the RFS is likely to be very small, and easily accommodated by Midwest gasoline suppliers that currently use ethanol.

While there may not be an immediate problem in meeting the RFS due to the impending MTBE ban in California, further compliance may be contingent on the implementation of the credit-trading program. The proposed legislation indicates that EPA will assign each supplier a renewable volume quota to meet based on the supplier's share of the gasoline market. Some companies are likely to produce more than their quota and to have credits to sell to those companies that find it less economical to use ethanol. If the credit system does not work, gasoline suppliers that were not planning on using ethanol but on purchasing credits could be caught short of meeting their quota, even if the total RFS target is being met. The effective functioning of the credit trading system will depend on

⁵ California gasoline consumption in 2001 was 791 thousand barrels per day. If all of this were blended with 5.8% ethanol, over 46 thousand barrels per day or 0.7 billion gallons of ethanol per year would be needed. More than that may be needed by 2004, taking into consideration gasoline demand growth.

the regulations that are developed and on the eventual ability of the credit trading market to function smoothly, including the presence of an adequate number of players and volume of credits being traded in the market.

Delayed Startup

The assumption about the workings of the credit-trading program relates to the third timing issue or the potential need for a delay beyond January 2004. Senator Bingaman's question raised an option that would add 9 months to the current proposed startup date. If the RFS legislation is passed this year, January 2004 allows about 12 months for promulgating the regulations, including a 60-day comment period, OMB review, and industry implementation. While not comparable in many dimensions, it should be noted that 3 years passed between passage of the Clean Air Act Amendments in 1990 and when the sulfur dioxide (SO₂) trading allowance rules were finalized. It then took EPA another year to finish the computer system needed to track the SO₂ allowances.⁶

While the RFS program is different than the SO₂ program, there are still complexities and uncertainties that need to be worked out. For example, EPA historically has focused fuel-quality enforcement at the refinery level of the gasoline production and distribution chain. Ethanol additions most often take place at terminals, not refineries. If EPA chooses to keep enforcement at the refinery level, for a refinery to generate RFS credits, it would need to keep records to account for each batch of gasoline that indicates those volumes must be blended with some specific amount of ethanol. If that "ethanol-tagged" gasoline is sold before blending, the buyer would be responsible for adding the appropriate ethanol volumes. While this approach should work, it will encourage production and distribution of unfinished gasolines to which ethanol is to be added at the terminal, not for normal market reasons, but because of a regulation. This is a change from today where ethanol is added to finished conventional gasoline in many cases. Since this process would not be tracked under current reporting practices, it could discourage some ethanol blending decisions being made today at the terminal. For example, in some cases, marketers determine how much mid-grade gasoline to make on an as-needed basis at the terminal, and they add ethanol to regular gasoline to produce the higher octane midgrade. Such blending would not be "counted" towards the RFS program under an enforcement process directed at the refineries, even though ethanol is being used. It is not known if these examples would make a large difference in the marketplace. They illustrate why EPA will need time to determine the role of blenders in the credit-trading program, and how best to establish the program both from an enforcement perspective as well as from a market perspective to avoid inadvertently introducing any significant market barriers or inefficiencies. On the industry side, once the players and basic rules of the credit trading system are known, companies must set up their supply/trading strategies and computer systems to comply.

⁶ McLean, Brian J., "Evolution of Marketable Permits: The U.S. Experience With Sulfur Dioxide Allowance Trading," Environmental Protection Agency, <http://www.epa.gov/airmarkets/articles/mclean/index.html>.

If the RFS is delayed, the second timing issue of synchronizing with other regulations will be important to consider. The oxygenate waiver is currently tied to the RFS. If that remains the case, a delay in the RFS means there will be a delay in the oxygenate waiver, and that will mean some States may begin their MTBE bans before refiners are allowed to produce RFG without oxygenates. RFG can be produced without oxygenates by adding clean-burning, high-octane materials such as alkylate or iso-octane. Since even ethanol-blended RFG will require more alkylate than is being used today, there could be insufficient economic supply of such materials initially to produce much, if any, non-oxygenated RFG. While EIA expects that most volumes of RFG will be made with ethanol when MTBE is banned, some refiners may find it beneficial to include some RFG without oxygenates. The oxygenate waiver provides production flexibility, and flexibility is needed the most during major fuel-change transitions such as MTBE bans.

Conclusion

A shift of the RFS startup date from the currently proposed mid-winter date (January) to the time when the seasonal change in gasoline from summer to winter occurs (October) will probably not matter to the transition, mainly because the State MTBE bans that are planned to go into effect in 2004 would result in sufficient ethanol use to meet the RFS target in that year. Construction is already underway on enough additional ethanol capacity to meet 2004 and 2005 requirements. However, it is important to ensure that the administrative aspects of the program can be developed with sufficient time between promulgation and implementation to give companies adequate time to respond.

Appendix A. Request from Committee

JEFF BINGAMAN, New Mexico, Chairman

DANIEL K. AKAKA, Hawaii	FRANK R. LUTZ, Alaska
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United States Senate

COMMITTEE ON
ENERGY AND NATURAL RESOURCES

WASHINGTON, DC 20510-6150

ENERGY.SENATE.GOV

June 17, 2002

Dr. Mary Hutzler
Acting Administrator
Energy Information Administration
1000 Independence Avenue SW
Washington, DC 20585

Dear Acting Administrator Hutzler:

The Senate passed version of H.R.4 contains a number of provisions affecting fuels markets that require additional analysis prior to final conference decisions. First, the oxygenate requirement for RFG would be eliminated and the states would be allowed to ban the use of MTBE beginning in 2004, a national phase out would follow. Also beginning in 2004, a certain portion of all gasoline sold in the U.S. will have to be from "renewable fuels", this requirement will affect all refiners and gasoline markets. The combination of these two factors alone has the potential to significantly impact US motor fuels markets.

As we all know too well, every previous significant change to fuel formulations has resulted in severe price volatility in various US motor fuels markets. Each time, the Committee on Energy & Natural Resources has held hearings to review the problems in an effort to avoid or at least mitigate future recurrence of such dislocations. The Energy Information Administration (EIA) has also investigated and reported on these various transitions. We should be able to apply what we have learned from these past market transition experiences to ease the implementation of these various changes that will start to take effect in 2004.

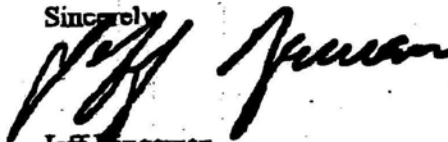
Therefore, I am requesting that the EIA analyze the potential market implications of the Senate-passed fuels provisions in H.R.4 combined with known and anticipated regulatory changes. This should include specific analysis of the following factors:

1. The expected volumetric shortfall in fuels supplies with an effective MTBE ban in 2004;
2. Actual renewable fuels production capacity, supply, and constraints and the effect on price;
3. Inter-regional transportation issues and associated costs for renewable fuels;

4. The potential effect of operating the mandate on a fiscal year, (i.e. beginning in October) vs. calendar year basis;
5. The environmental impact of the simultaneous implementation of the low sulfur and Mobile Source Air Toxic (MSAT) gasoline regulations and a national ethanol mandate;
6. The impact on gasoline price and supply when many additional ozone non-attainment areas come under the new 8-hour ozone standard;
7. The potential cost and supply impacts associated with individual states seeking to protect air quality through the removal of the one-pound vapor pressure waiver for gasoline blended with ethanol;
8. The potential effect/role of implementation of a national menu of fuels to address the proliferation of boutique fuels.

As earlier requests have noted, it would be helpful to have this study completed as soon as possible. Should you have any questions, regarding this request, please contact Jennifer Michael at the Committee, at (202)224-7143. I thank you in advance for your assistance.

Sincerely,



Jeff Bingaman
Chairman, Senate Committee on
Energy & Natural Resources

cc: file

Appendix B. Selected RFS Requirements

From Section 820 of H.R. 4 (Public Print Version)

Applicable volume of renewable fuel

Calendar year:

(In billions of gallons)

2004--2.3

2005--2.6

2006--2.9

2007--3.2

2008--3.5

2009--3.9

2010--4.3

2011--4.7

2012--5.0.

“(ii) CALENDAR YEAR 2013 AND THEREAFTER- For the purpose of subparagraph (A), the applicable volume for calendar year 2013 and each calendar year thereafter shall be equal to the product obtained by multiplying--

“(I) the number of gallons of gasoline that the Administrator estimates will be sold or introduced into commerce in the calendar year; and

“(II) the ratio that--

“(aa) 5.0 billion gallons of renewable fuels; bears to

“(bb) the number of gallons of gasoline sold or introduced into commerce in calendar year 2012.

3) APPLICABLE PERCENTAGES- Not later than October 31 of each calendar year, through 2011, the Administrator of the Energy Information Administration shall provide the Administrator an estimate of the volumes of gasoline sales in the United States for the coming calendar year. Based on such estimates, the Administrator shall by November 30 of each calendar year, through 2011, determine and publish in the Federal Register, the renewable fuel obligation, on a volume percentage of gasoline basis, applicable to refiners, blenders, distributors and importers, as appropriate, for the coming calendar year, to ensure that the requirements of paragraph (2) are met. For each calendar year, the Administrator shall establish a single applicable percentage that applies to all parties, and make provision to avoid redundant obligations. In determining the applicable percentages, the Administrator shall make adjustments to account for the use of renewable fuels by exempt small refineries during the previous year.

Appendix C. Using Ethanol in Gasoline

Ethanol, or gasoline containing ethanol, cannot be moved practically through today's pipeline system, because it tends to get pulled into the water that usually exists in petroleum pipelines and tanks. Instead, ethanol is blended into gasoline at terminals near the end users. Splash blending, in which ethanol is added directly to a tanker truck along with the base gasoline, is commonly used. Ethanol-blended product must be kept separate from product not containing ethanol, necessitating separate handling all the way to the gasoline pump. The separation is needed because movement of a small amount of ethanol (from the ethanol-blended mixture) to gasoline without ethanol can increase the vapor pressure of that gasoline mixture substantially, potentially pushing it above required VOC limits. Thus, ethanol must be moved through an independent distribution system until it is close to the end user, where it then is added before being delivered to retail stations.

Ethanol's high blending RVP affects gasoline production as well as distribution and storage. Most summer conventional gasoline has an RVP of 9.0 psi. Adding 10 percent ethanol to 9.0-psi conventional gasoline increases the RVP by about 1 pound. However, a Federal waiver of 1 psi RVP (sometimes called the "1-pound waiver") exists for conventional gasoline that is blended with ethanol. The waiver allows terminal operators to add 10 percent ethanol to finished 9.0-psi conventional gasoline with no penalty for the RVP increase. However, lower-RVP conventional gasolines will experience a larger RVP increase than 1 pound when 10 percent ethanol is added. For example, 7.8-psi gasoline might see a 1.3-psi increase. Because this RVP gain exceeds the 1-pound waiver, refiners cannot add 10 percent ethanol to a finished 7.8-psi gasoline. They must produce an unfinished blend with RVP of 7.3 psi that, when combined with 10 percent ethanol, creates a finished gasoline with RVP of 8.8 psi (7.8 psi plus the 1 psi waiver). This unfinished conventional gasoline base is sometimes called a conventional gasoline blendstock for oxygenate blending, or CBOB.

Producing reformulated gasoline using ethanol to replace MTBE presents a larger problem for refiners. Ethanol affects nitrogen oxides (NO_x) and toxics emissions as well as VOC's. In order for RFG to meet its VOC requirements, the finished blend must be at a fairly low RVP, generally less than 7.0 psi during the summer. To create a base unfinished reformulated gasoline mixture to which the ethanol will be added (referred to as reformulated gasoline blendstock for oxygenate blending, or RBOB), the RVP must be reduced to very low levels (6.0 psi or less). Light molecular weight, high RVP components must be removed to reduce the base mixture's RVP. When these light components are removed, RFG's distillation characteristics are changed, which may require removing some heavy molecular weight, high boiling point components as well. (The distillation characteristics, as measured by how much material evaporates at different temperatures, affect driveability.⁷) Ethanol also increases NO_x emissions, and

⁷ Chevron has a website primer on gasoline characteristics that affect volatility, including the distillation profile and driveability index: <http://www.chevron.com/prodserv/fuels/bulletin/motorgas/ch1a.shtml>

in the case of California reformulated gasoline, which has more stringent emission requirements than Federal reformulated gasoline, the NOx limitations will likely prevent refiners from being able to use much more than 6 percent ethanol. Ethanol, while clean on a relative basis, has a higher toxic impact than MTBE. Thus, refiners with very low Mobil Source Air Toxics baselines based on MTBE usage may have great difficulty switching from MTBE to ethanol.

When CBOB's or RBOB's are produced, these unfinished products travel through the petroleum distribution system to terminals where ethanol is added to create the finished gasoline. The ethanol will have traveled through a separate distribution system to the terminals.