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STAFF WHITE PAPER

Study of Unique Gasoline Fuel Blends ("Boutique Fuels"), Effects on Fuel Supply and Distribution and Potential Improvements

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Office of Transportation and Air Quality
U.S. Environmental Protection Agency

October 24, 2001

EXECUTIVE SUMMARY

Clean fuel programs have been an integral part of the nation's strategy to reduce air pollution. These programs provide significant, cost-effective, and timely reductions of VOC and NOx emissions. Seventy-five million people breathe cleaner air as a result of the federal reformulated program, and millions more benefit from different state or local fuel programs in fifteen states. An unintended consequence of these cost-effective air pollution control measures is the number of different fuel programs that exist throughout the country, which in times of gasoline production or distribution disruptions can lead to potential supply problems and short-term price spikes. As part of the President's National Energy Policy Report issued on May 17, 2001, included a directive to the EPA to

> ... study opportunities to maintain or improve the environmental benefits of state and local "boutique" clean fuel programs while exploring ways to increase the flexibility of the fuels distribution infrastructure, improve fungibility, and provide added gasoline market liquidity...

In response to this directive, EPA has undertaken a study of the State and local boutique fuel programs, looking at the various types of unique State and local fuels as well as Federal fuel programs, the motivation and causes for boutique fuels, assessing the impact, if any, of these fuels on the fuel production and distribution system, and analyzing potential ways to mitigate the impact of disruptions (i.e., refinery fires, pipeline shutdowns) by allowing for a more fungible system. This report focuses on issues related to the production and distribution of gasoline, but the appendix also includes a brief discussion about diesel fuel. Although there is no immediate concern about the proliferation of boutique diesel fuels, the Agency wants to be sure that such a problem does not arise in the future.

In preparing this report, we met with over forty stakeholder groups, including refiners, oxygenate producers, pipeline companies, terminal organizations, fuel marketer organizations, automobile manufacturers, environmental organizations and various states, to hear their concerns and viewpoints. We also consulted with the U.S. Department of Energy and U.S. Department of Agriculture.

As a result of this evaluation, EPA identified two issues that need to be addressed. The first is the need for greater flexibility in the process by which fuel marketers make the transition from winter to summer grade reformulated gasoline (RFG). In both 2000 and 2001, gasoline prices rose sharply during the transition period, particularly in the Midwest, and EPA believes that regulatory changes could help to moderate price spikes during future transition periods. EPA has released a report to the President outlining a set of regulatory and administrative options to ease seasonal fuel transitional issues. We are taking action this fall on the seasonal transition issues discussed in this report. The second issue is the growth in the number of state and local boutique fuels programs different from the federal RFG program and the challenges that this growth presents to the gasoline system. EPA has identified several reasons why states have adopted their own boutique fuel requirements, including reduced cost compared with the federal RFG program, local air pollution control needs, concerns about the oxygenate mandate in the RFG program, and concerns about increased use of MTBE, an oxygenated gasoline additive. A number of states want to avoid the use of MTBE in their gasoline because it has been found to contaminate water supplies.

Despite the number of state and local fuel programs, EPA has found that the current gasoline production and distribution system is able to provide adequate quantities of boutique fuels, as long as there are no disruptions in the supply chain. If there is a disruption, such as a pipeline break or refinery fire, it becomes difficult to move gasoline supplies around the country because of constraints created by these boutique fuel requirements. In addition, fuel providers are concerned that recently enacted state laws that ban the use of MTBE in future years may proliferate the number of boutique fuels and present new challenges to this country's fuel production and distribution system.

In response to this second issue, EPA staff have prepared this White Paper that explores a number of possible approaches for addressing the issue of boutique fuels in the longer term. EPA has developed a series of options that could reduce the total number of fuels. This menu concept served as a basis for EPA's initial analyses on long-term options. We conducted a preliminary analysis of four fuel program options, the choices being a three-fuel option, a two-fuel option, a 49-state Federal fuel, and California fuel available nationwide. This paper also discusses options for a regional fuel program, a case assuming State MTBE bans do not go into effect, and an option assuming no oxygenate or renewable fuels mandate. The guiding principles for our analyses are: 1) improve the fungibility and movement of gasoline across the country; 2) maintain or improve emission performance for each area of the country currently covered by Federal, State, or local fuel programs; 3) maintain or improve the ability of fuel producers to produce sufficient gasoline to meet demand, and 4) minimize the net cost when considering both production and distribution. This paper discusses the potential impact of each option on each of these principals. In appropriate cases where the option included a removal of the oxygen mandate in RFG, EPA included an alternative requirement for a national renewable fuels program. Additionally, given the importance of air toxics control to the states, we evaluated conventional gasolines in the appropriate options both with and without a 0.95 volume percent benzene averaging standard. The Agency is interested in comments on all these options. It is important to note that options in this white paper would require legislative action in order to implement and that more analysis is needed on these options before any such action could occur.

This study is the first step in a process that will necessarily require a great deal of additional analysis and study to determine the appropriate actions to pursue to address the directive in the President's National Energy Report. Nevertheless, it represents an important first step in this process to facilitate the gathering of public comment and help guide the actions that will follow to address the boutique fuel concerns.

APPENDICES

I. BACKGROUND AND INTRODUCTION

The Clean Air Act and Clean Fuels

In the Clean Air Act Amendments of 1990, Congress established a clean fuel program to reduce harmful emissions from our nation's vehicles. Cleaner fuels have been an integral component of the nations strategy to reduce smog forming emissions and other harmful pollutants, including air toxics from our nation's air. Specifically, the reformulated gasoline program (RFG), which began in 1995, has been cost effective and has provided significant and immediate reductions in air pollution levels throughout the nation. Seventy-five million Americans breathe cleaner air today due to this program. The Clean Air Act also allows states, under specified circumstances, to implement their own clean fuel programs. Fifteen states have done so, providing cleaner air to millions more.

The RFG program was designed to serve several goals. These include improving air quality and extending the gasoline supply through the use of oxygenates. Congress established the overall requirements of the RFG program by identifying the specific cities in which the fuel would be required, the specific performance standards, and the oxygenate requirement. Today, roughly 30 percent of this country's gasoline consumption is cleaner-burning RFG. Neither the Clean Air Act nor EPA requires the use of any specific oxygenate in RFG. Both ethanol and MTBE are used in the RFG program, with fuel providers choosing to use MTBE in about 87 percent of the RFG. Ethanol is used in 100 percent of RFG in Chicago and Milwaukee, which are closer to major ethanol production centers. Congress mandated the use of oxygenates in reformulated gasoline in the Clean Air Act Amendments (CAAA) of 1990 to promote the use of renewable fuels, enhance energy security, enhance agricultural markets and improve air quality.

The President's National Energy Policy Report

On May 17, 2001, the President's National Energy Policy Report was released which identified a comprehensive energy strategy to address a range of concerns. On the issue of fuel refinery and delivery infrastructure, the National Energy Policy Report directed:

> the Administrator of the EPA to study opportunities to maintain or improve the environmental benefits of state and local "boutique" clean fuel programs while exploring ways to increase the flexibility of the fuels distribution infrastructure, improve fungibility, and provide added gasoline market liquidity. In concluding this study, the Administrator shall consult with the Departments of Energy and Agriculture, and other agencies as needed.

In response to the President's National Energy Policy Report directive, EPA has undertaken a study, in consultation with the Departments of Energy and Agriculture, of so-called "boutique fuels", focusing on the various types of fuels, the motivation and causes for states to implement boutique fuels, the impact of these fuels on the fuel production and distribution system, and potential ways to mitigate the impact of disruptions (i.e., refinery fires, pipeline shutdowns) to allow for a more fungible gasoline fuel system. In addition, during the course of this study requirements concerning the "transition" from winter to summer fuels were identified as a concern. The Agency is taking action on methods that should provide more flexibility during the transition season in separate actions.

In examining the issue of "boutique" fuels under the President's Energy Policy directive, EPA reached out to affected stakeholders to understand their views and perspectives on what is a boutique fuel (Section II has a discussion on the types of fuels discussed in this paper), what are the reasons boutique fuels exist, what are the environmental benefits they provide, what problems – both current and potential – if any, do they cause, and what steps might be taken to improve the fungibility of the fuel distribution system while maintaining or improving the environmental benefits from federal and state fuel programs. Appendix A-1 contains a summary of stakeholder participation and perspectives. Further information regarding specific correspondence, studies, and analyses presented to EPA on this subject can also be found in EPA public docket A-2001-20.

What is the Problem?

In discussions with the various stakeholders, it became clear that the current fuel production and distribution/storage systems are capable of supplying sufficient volumes of the various types of fuels required today under normal operating conditions. Refiners, pipelines, terminals, and marketers have made the necessary investments to produce and distribute the suite of fuel types demanded of them today. The majority of stakeholders believe that as long as there are no disruptions the current system works well, both producing and delivering fuels which meet environmental needs in an efficient manner. This appears to be consistent with experience over the last couple years. Many of the stakeholders, especially the refinery industry, believe the current situation regarding the number of state or local clean fuels is not a problem. In fact, some refiners were willing partners in developing, for example, state emission control programs which require low RVP fuel. Many stakeholders noted that the impact of additional boutique fuels in the future, such as those resulting from State MTBE bans, is a concern.

The stakeholders also highlighted the fact that in many parts of the country the fuel production and distribution systems are now running near maximum capacity. In fact, reporting of refinery production capacity during the last several years indicates that they have reached unprecedented levels of production.[1] In addition, we were told that several pipelines frequently put refiners on what is referred to as "allocation" to allocate among the competing refiners the

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[1] Petroleum Supply Annual, US Department of Energy, Energy Information Agency

limited amount of capacity to distribute the fuel. Refiners would like to put a greater volume of fuel in the pipeline, but are unable to due to limited capacity. With these systems operating near capacity, when the market tightens for whatever reason (e.g., refinery shutdown, pipeline failure, winter-to-summer transition, or unusually high demand) they have limited ability to respond to overcome the disruption. These tight market conditions manifest themselves in increased fuel prices and price volatility for consumers.

During the spring months of the past two years, there has been public debate about the causes of spikes in the price of gasoline. This issue has been widely studied by both the Federal Trade Commission (FTC) and public advocacy groups (Consumer Federation of America and Public Citizen). The results of these studies indicate that many factors influence tight supply and resulting price spikes. Specifically, the FTC report states that the gasoline price spike that occurred in the Midwest during May and June of 2000 "appears to have been caused by a mixture of structural and operating decisions made previously (high capacity utilization, low inventory levels, the choice of ethanol as an oxygenate), unexpected disruptions (pipeline breaks, production difficulties), errors by refiners in forecasting industry supply (mis-estimating supply, slow reactions), and decisions by some firms to maximize their profits (curtailing production, keeping available supply off the market)."[2] According to a recent report by the Consumer Federation of America, "the price ratchet has resulted from a combination of inadequate capacity and inadequate competition in the industry. The underlying tight market condition is the result of both increasing demand and business decisions that slowed the growth of long-term capacity."[3] In testimony before the Federal Trade Commission at a recent public conference regarding increases in the cost of gasoline, representatives of the American Petroleum Institute (API) attributed recent gasoline price spikes to market forces. API's complete testimony and additional information regarding the oil industry's view of this issue can be found in EPA public docket A-2001-20.

While the entire fuel market is being stressed, the places where the problems (supply shortfalls and price volatility) tend to show up first and be most acute are with unique, geographically isolated fuel programs such as many of the State boutique fuel programs. These fuels typically have fewer fuel producers, are less fungible, and have fewer distribution system supply options. The magnitude of the problem varies with volumes, distance from supply sources, and the number of supply sources, which in turn, depend on the degree of product differentiation. Consequently not all boutique fuels have exhibited significant problems to date. For example, the 7.8 psi RVP fuel program in Texas has exhibited no known problems given the large number of refiners serving the area and the large number of fuel distribution options.

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2 Final Report of the Federal Trade Commission; " Midwest Gasoline Price Investigation"; March 29, 2001; Washington, DC

3 "Market Fundamentals for Consumer-friendly Policies to Stop the Wild Ride"; Consumer Federation of America; July, 2001; Washington, DC.

Conversely, Southeast Michigan, which also requires 7.8 psi RVP fuel, is served primarily by one pipeline and just a couple of refiners and has consistently experienced high prices and price volatility over the last couple years. Atlanta has an even more stringent fuel specification (higher product differentiation), but due to its proximity to two of the nations largest pipeline systems has not experienced supply shortfalls or price volatility to date. In the latter case, however, the pipelines and terminals invested significant capital in order to distribute this boutique fuel.

As the number of fuel types needed to be produced and distributed grows, it adds greater stress on the distribution system and the flexibility of supply is decreased. Fuel producers, both foreign and domestic face investment hurdles to stay in existing markets and may choose to avoid the investment and merely narrow their market. This results in fewer fuel producers for any given fuel type. Pipeline capacity is decreased as unique fuel types must be delivered to isolated areas and added constraints are put on delivery schedules leading to a greater likelihood of low product inventories or even outages. Terminals either have to invest to carry more products or chose which products they carry, leading to fewer terminals carrying any particular fuel and again a greater likelihood of supply shortfalls. Marketers are then faced with different fuel requirements for different areas with fewer and less stable supply sources for each fuel. Where they used to be able to go to another terminal for supply during a supply shortfall, that terminal may not be carrying the required type of fuel. In some cases the nearest alternative fuel supply may be hundreds of miles away. This ultimately is reflected in greater price volatility to the consumers. (See appendix A-2 for a more complete discussion of these issues). As long as there is excess capacity in the production and distribution systems, supply shortfalls can be corrected before they cause any noticeable impact. It is mainly when these systems are stressed that the impacts become noticeable.

As the problems to date have been rather limited in terms of geographical scope and duration, however, many of the stakeholders we spoke with did not express a large concern with the current situation. Most stakeholders were instead concerned with the potential for the continued proliferation of boutique fuels into the future and the added stress it would place on the fuel production and distribution systems. Over the last 10 years, States have been working with their fuel suppliers to make decisions to add their own unique fuel programs to the national mix for various reasons, including: the need for emission reductions to comply with Clean Air Act State implementation plan (SIP) requirements; the desire to avoid the oxygen mandate in the Federal RFG program and its associated cost; the desire to avoid MTBE for water quality reasons; and the desire to encourage the use of ethanol. (These motivations are discussed in more detail below). These motivations have led to a wide array of fuel programs across the country. As the MTBE bans are implemented over the next several years, many of the stakeholders we spoke to expressed serious concerns about the number of boutique fuels expanding and their inability to accommodate them. Furthermore, they expressed concern that in addition to the motivations above, there would be new motivations for boutique fuels in more parts of the country in the future, such as an increased need for emission reductions to comply with the new 8-hour ozone National Ambient Air Quality Standards (NAAQS). Before adopting any options the Agency would want to be sure that the environmental benefits and energy security impacts would be well understood in light of these motivations.

The fear is that the resulting growth in the number of boutique fuels and the number of areas with boutique fuels could change what is now an occasional and isolated supply problem into a much broader and frequent problem which will require significant investment on the part of the fuel production and distribution systems to address.

Many stakeholders suggested ways to reduce the current suite of fuels and to minimize the number of future fuels. The solution put forward by the majority of stakeholders is to remove the RFG oxygen mandate. Some stakeholders suggested replacing the mandate with a renewable fuels requirement. By eliminating the oxygen mandate in RFG, the stakeholders claimed the country can address both the issue of providing clean fuel at the lowest cost and the concerns about MTBE. Coupling that action with a renewable fuels requirement can, in the view of some stakeholders, also address the desire to develop and encourage the use of renewable fuels to enhance both energy security and agricultural markets.

Why do we have Boutique Fuels?

The Clean Air Act allows states, based on an air quality need, to adopt otherwise preempted unique clean fuel requirements. Fuel control for emission reductions is often one of the most cost effective control methods to help reduce air pollution and one of the more effective means of reducing emissions from the in-use fleet. Fifteen states have adopted their own clean fuel programs for part or all of their states (See Appendix B for a detailed listing). Most of these programs are in effect during the summer months when ozone air quality is of greatest concern. Most states which have fuel mandates other than RFG require gasoline with lower volatility than federal conventional gasoline standards. Sometimes states adopt these low RVP fuels because the Clean Air Act does not allow them to join the federal RFG program. In other cases where states could have opted-in to the federal RFG program, local fuel providers worked with states to develop an alternative fuel specification that can be produced at a lower cost and still meet the air quality need. What this has typically meant in practice is the avoidance of the oxygen mandate in the RFG program. Generally, the causes and motivations for these fuels can be attributed to the need for air quality improvements, the ability to get substantial improvements through gasoline modifications, and the desire to do so at the least cost. In contrast, Minnesota has a year-round program designed not only for clean air purposes, but also to promote the use of ethanol.[4]

Actions taken by a growing number of states to reduce or eliminate the use of MTBE is another factor that could lead to more boutique fuel programs around the country. Twelve states have passed legislation to significantly constrain or eliminate the use of MTBE beginning as early as the end of 2002 in states subject to the federal RFG requirements (See Appendix C).

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4 Minnesota expanded its approved wintertime oxygenate program statewide and extended it year round as a method to primarily enhance its agricultural markets.

These actions have been taken to reduce the risk of drinking water contamination by MTBE. At least a dozen more states are considering similar controls. These bans will increase the number of localities with unique fuel formulations. A ban on the use of MTBE in RFG markets will necessitate the use of alternative oxygenates (e.g., ethanol blends) which could further constrain the fuel formulation choices of fuel providers. The future use of MTBE is of concern to the Agency and has been the subject of federal review.[5]

Section III contains a discussion of the concerns that have motivated states to adopt boutique fuel requirements for summer gasolines.

Addressing Boutique Fuels

Overall, most stakeholders agreed that the current system generally works well in supplying sufficient environmentally-protective fuels. While having a range of opinions on the potential supply impact of boutique fuels, many stakeholders nevertheless saw merit in having fewer fuel specifications across the country as a way to improve fuel fungibility as long as it did not negatively impact supply, air quality benefits, and/or costs and as long as sufficient time was provided to allow for an orderly transition.

States support maintaining or enhancing a strong national program (federal RFG, low sulfur levels, toxics, etc.), while maintaining the ability to design their own fuel program to respond to air quality needs or other concerns (e.g., MTBE - due to groundwater contamination). A more stringent national program would minimize the need for unique state fuel programs. At the same time many refiners supported the current programs in place but expressed particular concern with trends toward greater proliferation of boutique fuels, especially as states adopt controls on the use of MTBE. In addressing these various perspectives, EPA asked stakeholders for recommendations which maintain or improve air quality benefits of current programs and have the potential to improve gasoline fungibility and therefore reduce the risk of supply disruptions. To meet these objectives, the menu approach was recommended by several stakeholders in which states and localities would choose from a menu of Federal fuel types that would allow states to maintain or improve air quality benefits over today's current fuel programs.

EPA is evaluating four base options that, based on feedback from the various stakeholders, are meant to capture a wide range of possible future fuel programs in terms of the various economic and environmental impacts and the degree to which they simplify the current fuel system. We analyzed these options both with and without the current oxygenate mandate. In those cases without the current RFG oxygen mandate we assumed it would be replaced with a

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5 In particular, in December 1998, EPA established a panel of independent experts to examine MTBE's performance in gasoline, its presence in water, and alternatives to its use. Panel recommendations made to EPA in July 1999 include: 1) ensure no loss of current air quality benefits from RFG, 2) reduce the use of MTBE, and seek Congressional action to remove the oxygen requirement in RFG, and 3) strengthen the nation's water protection programs, including the Underground Storage Tank, Safe Drinking Water, and private well protection programs.

renewable fuels requirement, although we also performed a qualitative analysis for the situation if just the RFG oxygen mandate were removed. In addition, states and others have clearly stated that an air toxics component must be part of the menu of fuels. Therefore, we also evaluated options with and without a benzene standard. The options evaluated would not be feasible before the 2006 or later timeframe as they would require new legislative authority and/or require extensive changes to existing regulations, with significant lead-time required for compliance. For the 2006 or later reference case for these options, we therefore assumed that existing federal regulations for gasoline sulfur and mobile source air toxics control were in place. We further assumed that all current proposed or final state MTBE bans were in place, although we also performed a qualitative analysis for the situation where no state MTBE bans went into effect. We also included a qualitative discussion of a regional fuels approach. Our preliminary analysis of the cost, production capacity, distribution and environmental impacts of these options is found in Section IV. We also discuss the need for additional analyses and data on the potential impacts of these options in that section.

Addressing the Future Use of MTBE as a Gasoline Additive

A related question that must be addressed is whether or not MTBE will be a component of our Nation's future gasoline supply. As mentioned previously, there is significant concern about contamination of drinking water in many areas of the country. Current data on MTBE in ground and surface waters indicate numerous detections of MTBE at low levels. Accordingly, EPA published last year an Advance Notice of Proposed Rulemaking requesting comments on a phase down or phase out of MTBE from gasoline under Section 6 of the Toxic Substances Control Act (TSCA). Although TSCA is the best regulatory process currently available to EPA for limiting or eliminating the use of MTBE, its use presents substantial legal and technical hurdles.

As discussed above, the issues surrounding the future use of MTBE, as well as the proliferation of boutique fuels, are both related to the statutory requirement that an oxygenate must be added to RFG. A number of refiners have stated that they can produce clean fuels without the use of oxygenates.[6] Thus, there may be other ways to achieve our national goal of clean air while also protecting our water. A majority of stakeholders have suggested federal and legislative action to reduce or eliminate the use of MTBE across the country. MTBE producers have suggested MTBE contamination should be addressed through improved fuel storage and containment to prevent leaks and spills.

Addressing Seasonal Transition of Fuels

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6 We are aware, however, that some have claimed that there are additional air quality benefits beyond those required by the RFG requirements (toxics overcompliance will be maintained by the recently promulgated Mobile Source Air Toxics regulation). EPA continues to evaluate these claims of additional benefits and will determine the merit in these views weighed against the goal of preserving our nation's water supply.

In addition to the concern related to boutique fuels and the potential for proliferation of unique fuel blends, a second, more isolated, issue was identified by some stakeholders. This issue deals with managing the annual transition from winter to summer fuels and is not a boutique fuel issue per se. The concern was expressed that there currently may not be enough flexibility during the season (April - June) to allow for an orderly transition.

In discussions with stakeholders EPA identified opportunities to improve fuel supply by providing more flexibility during the transition from winter to summer fuels. EPA is taking separate action on a set of administrative and regulatory actions in the near term to mitigate the concerns that were expressed. These changes are intended to better facilitate seasonal gasoline transition and reduce the incentive for low inventories. In summary, EPA will:

- <u>Allow 2% Testing Tolerance to turn tanks to summer specifications</u>. Allowing use of the testing tolerance for the first turn would benefit all refiners by providing additional flexibility. No costs associated with this action.

- <u>Allow Previously Certified Fuel to be reclassified</u>. Would help alleviate limited inventory in tight RFG markets. No costs associated with this action. May result in minimal cost savings as refiners are able to manage fuel stocks more efficiently.

- <u>Propose to Establish April 15 date for Receipt of Summer Fuel at Terminals</u> to encourage terminals to more gradually blend down RVP of their RFG stocks Should reduce the practice of drawing down tanks containing winter grade RFG to extremely low levels shortly before May 1, then refilling them with summer grade RFG. Estimated cost between $1.5 million and $2.3 million during the transition period due to the proposed requirement for some refiners to produce RFG two weeks earlier.

- <u>Propose Simplified Blendstock Accounting Requirements</u> to eliminate significant additional reporting for blendstock transfers. Will allow refiners more flexibility to sell gasoline blendstocks and improve refiners' overall ability to produce gasoline. This would remove a regulatory burden and would result in minimal cost savings.

EPA's action on these adjustments was announced on October 24, 2001. We intend to complete action on some of these transition improvements in advance of next year's ozone season.

II. WHAT FUELS WERE STUDIED?

The term "state and local boutique fuel" was used in the President's Energy Report to describe State and local fuel control programs that are different from federal fuel programs. At the same time, it has been used in the trade press and elsewhere more broadly, including certain Federal fuel programs. Stakeholders provided many different views regarding the appropriate definition of boutique fuels, with some stating that such fuels could include widely produced fuels such as RFG in addition to unique local fuels (See Appendix A-1). The Clean Air Act includes requirements for conventional gasoline, reformulated gasoline (RFG) and wintertime oxygenated gasoline. The requirements for these fuels are described in further detail in Appendix B. As discussed in Section III, the reasons for state and local areas going "outside" federal requirements are complex and cannot be attributed to any single external factor. EPA acknowledges that certain RFG formulations present challenges to the fuels industry to produce and distribute similar to state and local fuel control programs. The primary example is RFG blended with ethanol which is used in the Chicago and Milwaukee areas. Although it comprises 100 percent of the gasoline sold in these two areas, the use of ethanol in RFG in the summer months requires refiners to produce very low volatility RFG blendstock into which ethanol can be splash-blended at the terminals. This special blendstock is not fungible with other RFG formulations and must be segregated throughout the distribution and storage system. For the purposes of this report, therefore, we consider both state and local fuel control programs as well as Federal programs in the analysis of the current situation as well as potential options analyzed for the future. As we described above, localities covered by the Federal fuel programs appear to have prompted the development of many of the state and local fuel control programs, and since one part of the fuel system impacts other parts, the state and local fuel control programs cannot be viewed in isolation.

The requirements that make up the universe of fuels – both the federal requirements for gasoline as well as the state and local boutique fuel requirements – are discussed in Appendix B. We note that while the state winter oxygenated fuel programs described in Appendix B differ from federal requirements for conventional gasoline in the winter, discussions with stakeholders highlighted few concerns to date with the various wintertime fuel specifications in comparison to the summertime specifications. Consequently, this study of "boutique fuels" focused solely on summer requirements. In addition, some stakeholders expressed concern about the potential for diesel boutique fuels. Given that the focus of the President's Energy Report directive was on gasoline, we have so limited the scope of this report, but have included a brief discussion of the diesel fuel issue in Appendix B.

The following table lists all 12 of the various summer gasoline programs in the United

States and their respective volumes. (Note: there is both a federal CG and state 7.8 RVP fuel.) Appendix D describes these fuel program requirements and the number of fuels being produced across the country.

Table II-1: Summer Gasoline Types and their Volumes

Fuel Name	9.0 RVP CG	7.8 RVP CG and State*	Fed RFG (North)	Fed RFG (North) 100% ETOH	Fed RFG (South)	Fed/Cal RFG	7.2 RVP State	7.0 RVP State	7.0 RVP 150 Sulfur State	Cal CBG	Ethanol Blended CG in MN**
Percentage of U.S. Gasoline	49	13.3	7.8	3.2	9.5	7.5	0.2	1	2	4.5	2

* Includes Federal conventional fuel subject to 7.8 psi RVP limitation as well as State fuels that are subject to the same RVP limit under State rules or voluntary programs. The Federal CG portion represents 7 percent of the volume of gasoline in the U.S.; the state portion represents 6.3 percent.

**Minnesota has a program that requires ethanol in gasoline but it is not related primarily to air quality concerns. We include it here because it is a different fuel.

Figure II-1 shows the distribution of these various gasolines in the United States. In addition, stakeholders expressed concern with the anticipated additional boutique gasolines that would result from various state and local MTBE controls, both final (though not yet implemented) and proposed. These controls would add to the complexity of the current fuels system. Figure II-2 shows the current fuel programs across the U.S. with final and proposed gasolines MTBE restrictions. Those states imposing such restrictions are listed in Appendix C.

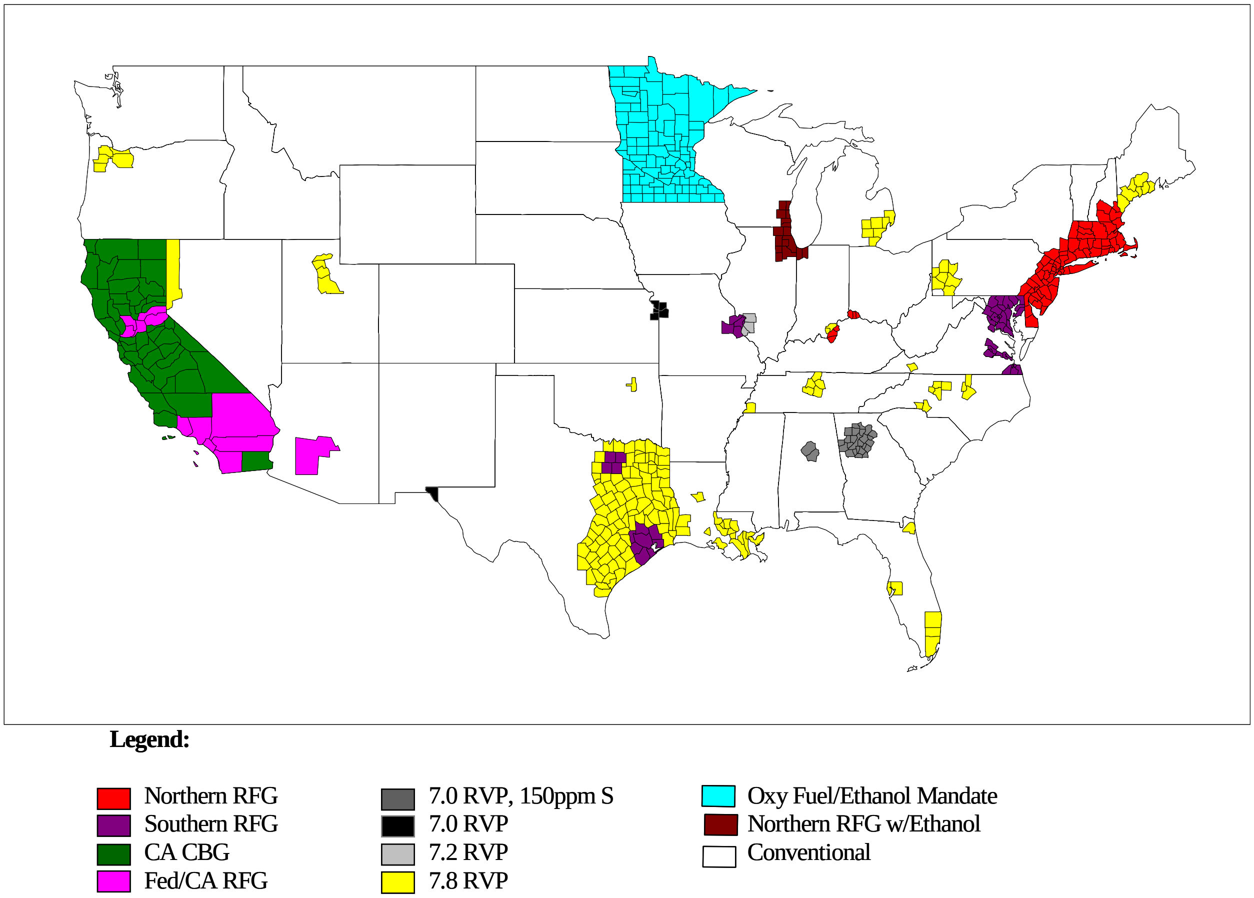
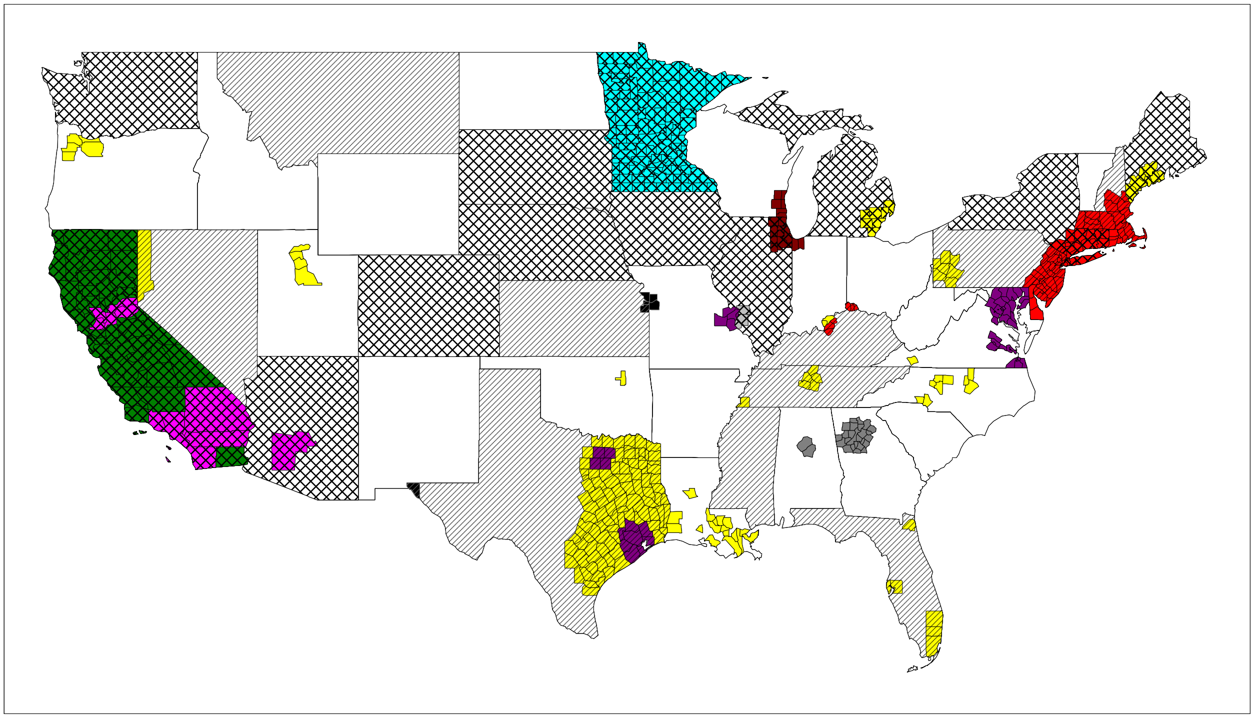


FIGURE II-1: Current Summer U.S. Gasoline Requirements



Legend:

- Northern RFG
- Southern RFG
- CA CBG
- Federal/CA RFG
- Northern RFG w/Ethanol
- 7.0 RVP, 150ppm S
- 7.0 RVP
- 7.2 RVP
- 7.8 RVP
- Conventional
- State MTBE Restriction
- Pending State MTBE Restriction
- Oxygenated Fuels/Ethanol Mandate

FIGURE II-2: Current Summer U.S. Gasoline Requirements with MTBE Controls

III. MOTIVATION AND CAUSES FOR STATE BOUTIQUE GASOLINE REQUIREMENTS

Section 211(c)(1) of the Clean Air Act allows EPA to regulate fuels for use in motor vehicles, motor vehicle engines, nonroad vehicles and nonroad engines for emission control purposes. Section 211(c)(4) of the Act restricts states from regulating fuels for motor vehicles and motor vehicle engines for emission control purposes. Specifically, section 211(c)(4)(A) prohibits states from prescribing or attempting to enforce controls respecting any characteristic or component of a fuel or fuel additive if EPA has already established controls under section 211(c)(1) for that fuel component or characteristic (unless the state control is identical to the federal control). States are preempted by federal law from regulating, for emission control purposes, aspects of motor vehicle fuels that EPA has already regulated.

There are some exceptions to this preemption. One is for California, which is not preempted under section 211(c)(4)(A) from establishing controls on motor vehicle fuels. Another exception to the preemption in section 211(c)(4)(A) is provided in section 211(c)(4)(C), which allows EPA to approve a state fuel control into a State Implementation Plan (SIP) if EPA finds the state fuel control is necessary to achieve the National Ambient Air Quality Standard (NAAQS) which the SIP implements. (NAAQS exist for each of the six "criteria" pollutants, i.e, ozone, nitrogen dioxide, carbon moNOxide, particulate matter, sulfur dioxide, and lead.) Such approvals must be based on a "necessity" showing that no other measures would bring about timely attainment of the NAAQS, or if other measures exist, they are unreasonable or impracticable.

This "necessity" requirement in section 211(c)(4)(C) has two major implications. First, before turning to state fuel measures, the state has to determine whether reasonable and practicable non-fuel control measures will bring about timely attainment. Second, state fuel measures can only be justified by the need to achieve a NAAQS, so state fuel measures directed at achieving public health or welfare benefits other than a NAAQS, e.g., toxic exposure from other pollutants, may not be approvable into a SIP.

Section 211(k) of the CAA requires EPA to implement the RFG program. Severe and extreme ozone nonattainment areas are covered by the RFG program. In addition, Section 211(k)(6) allows other ozone nonattainment areas to opt into the federal RFG program. Opting into the federal RFG program does not establish a state fuel control, so this action is not subject to section 211(c)(4)(A) preemption. By opting into federal RFG, the gasoline sold in the affected area becomes subject to federal RFG requirements.

During the years following adoption of the Clean Air Act Amendments of 1990, many states actively considered fuel controls, whether opting into federal RFG or adopting a state fuel program, as they tried to reduce motor vehicle emissions of VOCs or NOx in order to meet ozone

SIP obligations. Fuel controls can provide significant, cost effective emission reductions of VOCs and NOx. Further, such fuel controls can often be implemented quickly and, once implemented, produce benefits immediately, typically reducing emissions from each vehicle in the fleet with no need for vehicle fleet turnover. This fleet-wide impact distinguishes fuels control from most other mobile source emission control options available to state and local areas.

States considering such controls typically conducted a public advisory process to consult with stakeholders, including refiners and fuel suppliers who serve the affected region, and other members of the public. Refiners typically worked with the states to design fuel controls that met the region's air quality needs at the least possible cost. In many cases, states were primarily interested in VOC reductions and heard statements from refiners that opting into federal RFG was a more expensive way to obtain VOC reductions than adopting a low RVP state fuel control. Refiners said this cost difference is largely due to the oxygen content requirement for RFG. The cost of meeting the 2 percent oxygen mandate is approximately half the cost incurred by refiners in meeting the federal RFG requirements. Some refiners actively promoted a low RVP state fuel control as preferable to opting into the federal RFG program.

Discussions with refiners and marketers suggested that another possible reason refiners promoted state fuel programs over RFG related to the effect on competition. A state-specific program generally leads to the secondary effect of limiting competition for the gasoline supplied to the affected market since the market for a state fuel is often small compared to the market for federal RFG. As a result, the number of refiners likely to devote production to this small state fuel market is often limited. This has been perceived as a benefit to the refiners that produce the gasoline for a state fuel market.

Another factor that has affected a state's consideration of whether to opt into the federal RFG program or to adopt a state fuel measure is the interest in encouraging the use of a particular oxygenate. States wanting to encourage the use of ethanol in gasoline, especially states in the Midwest, were concerned that the 1 psi RVP "waiver" for ethanol blended conventional gasoline did not exist for federal RFG, but could be incorporated into a state low RVP program. (See Appendix B for a description of the 1 psi waiver and its application to federal and state RVP controls.) In Minnesota, although the state was not eligible to opt into federal RFG, the state decided to adopt a statewide oxygen mandate to provide an economic incentive for the use of ethanol, which is produced within the state. Although the oxygen mandate in Minnesota by itself would not preclude the use of MTBE, Minnesota has also adopted a statewide ban on the use of MTBE in gasoline.

As mentioned previously, the RFG used in Chicago and Milwaukee presents unique challenges to fuel providers. For a number of reasons, the markets in these two metropolitan areas have developed into ethanol-only RFG markets. These are the only two RFG cities that use ethanol exclusively. As was evident in the spring of 2000 when a major pipeline that supplies the upper Midwest broke, it was difficult for refiners to ship sufficient quantities of very low volatility RFG blendstock, necessary for ethanol blending, to the areas. This was a contributing factor, although not the only one, to the steep price rises that occurred at that time.

In the past few years, a number of states have banned or phased-down the use of MTBE in gasoline, based on groundwater contamination concerns. Legislation to ban or limit the use of MTBE in gasoline is pending in several more states. (See Appendix C for a list of adopted statewide bans of MTBE.) MTBE concerns could lead to increased interest in state fuel programs. For example, New Hampshire, although it has not banned MTBE, has notified EPA of its plan to opt out of federal RFG, based on MTBE concerns, and to adopt a state fuel program similar to RFG, but without the oxygen mandate. Avoiding the use of MTBE appears to be a growing motivation for states and localities to develop boutique fuels rather than opt into the federal RFG program with its oxygen mandate.

The result of these decisions is a patchwork of state fuel control programs which overlay the federal requirements for conventional gasoline. Most of these current state fuel programs focus on summer-only emissions of ozone precursors (VOC and NOx), but do not include other features of the federal RFG program such as minimum oxygen content or control of toxic air emissions. Appendix A-1 contains the feedback from the various stakeholders as to the causes of boutique fuels.

IV. ADDRESSING BOUTIQUE FUELS FOR THE LONG TERM

A. Stakeholder Comments

In conducting this study, EPA reached out to affected stakeholders to obtain their perspectives and recommendations. Most stakeholders believe that today's current suite of fuels are not causing much of a problem, citing temporary gasoline supply disruptions as the reason for problems to date. Stakeholders noted, however, that boutique fuels place constraints on the distribution system in times of a disruption. While no one produced data or analyses to support their comments, most stakeholders acknowledged that fewer fuel types would be directionally beneficial to simplify gasoline distribution and therefore ease the potential for local supply disruptions and resulting price volatility. Refiners, pipelines and terminals have all made investments to handle the current slate of fuel requirements and would not like to see those investments stranded by any changes in fuel requirements. Their main concern is less with the current situation and more with the potential for it to get much worse if additional boutique fuels are added (pending state MTBE bans, more areas choosing to adopt fuel controls to meet future air quality goals, and boutiques for fuels other than gasoline). States expressed satisfaction with the environmental performance of their programs, and above all do not want limits placed on their ability to set fuel specifications. If anything, states would like additional authority to avoid preemption issues surrounding fuel programs related to air toxics. A listing of stakeholder concerns regarding boutique fuels is contained in Appendix A-1. A fuller discussion of implications of boutique fuels on refiners, pipeline and terminal operators, and retailers is in Appendix A-2.

The majority of stakeholders, although not all in agreement on the magnitude of the problems caused by boutique fuels today or the need to make significant changes, saw merit in having fewer fuel specifications across the country as long as it did not negatively impact supply, air quality benefits, or cost, and as long as sufficient time was provided to allow for an orderly transition. States argued for a strong national program, including increased air toxics reductions, that would minimize the need for them to set their own unique fuel specifications while maintaining the ability to implement their own fuel program if necessary to respond to their air quality needs or other concerns (e.g., MTBE). At the same time many refiners argued, while not wanting to take away a state's ability to implement fuel controls, that without any restrictions on States, boutique fuels would continue to proliferate, particularly as long as the oxygen mandate in the RFG program remained in effect prompting states to avoid the federal fuel program as an option and to place bans on MTBE use. They wanted a strong federal program that would not cause states to adopt their own fuel programs but not so strong as to significantly impact refinery operations and costs of production.

In acknowledgment of this dilemma, several stakeholders put forward a menu approach to EPA which would give states and localities a menu of federal fuel programs to choose from. As long as the menu included choices sufficient to achieve the states air quality objectives these needs could be met while minimizing interest in developing unique state or local fuel programs. At the same time the use of clean fuel would be used in areas that want it, without impacting the entire national fuel supply. Different stakeholders came forward with different options with different numbers and types of fuels on the menu, but a number of them had similar themes (i.e., maintain air quality benefits, limit the menu to two to five fuel types, focus on RVP controls, remove the oxygen mandate, address air toxic concerns, and act within the 2006 or later timeframe.)

B. Principles for Assessing Future Options

In assessing possible future fuel program options, there were four key principles listed below that we identified.

1. Distribution System Complexity

- Improve the fungibility and movement of gasoline across the country which should reduce price instability by:
  - Providing more degrees of freedom in the event of fuel supply outages or disruptions
  - Reducing the limitations on the distribution system brought about by the large number of unique fuel specifications across the country

2. Air Quality:

- Maintain or achieve better emission performance for each area currently covered by Federal, State, or local fuel programs.

3. Production Capacity:

- Maintain or improve the ability of fuel producers to produce sufficient gasoline to meet demand.

4. Cost:

- Minimize the net cost when taking into consideration both production and distribution

C. Potential long-term solutions

For the purposes of analyzing the impacts of different fuel options, we have used a nationwide menu approach based upon the suggestions of a number of stakeholders. Given the scope of the options evaluated, however, all of these options are considered to be long term options in that they require changes in EPA's Clean Air Act authority and/or would require extensive changes to existing regulations with significant lead-time requirements. Some options evaluated would eliminate the oxygen requirement in reformulated gasoline and replace it with a national renewable oxygenate requirement as discussed below. However, we also include a more qualitative discussion on the impact if the RFG oxygen mandate were removed and not replaced. Some options have also been evaluated, given the states concerns for additional air toxics control, with and without a benzene standard. Given this, these options can only be considered viable in the 2006 or later time frame, after the federal gasoline sulfur and mobile source air toxics regulations are in effect. As a result, they would have no impact on the problems being attributed today to the presence of boutique fuels. They may be very beneficial in the future, however, as part of an overall approach to address gasoline supply and distribution in the country if gasoline demand continues to rise faster than production capacity. Since the options evaluated in this report are really for the 2006 or later time frame, we developed a 2006 reference case from which to evaluate these options. For this 2006 reference case we assumed that existing federal regulations for gasoline sulfur and mobile source air toxics control were in place. We further assumed that all current proposed or final state MTBE bans were in place. However, we did in addition perform more of a qualitative analysis for the situation where no state MTBE bans went into effect. In addition, we have included a qualitative discussion of two other options noted by some commenters. These options were a regional fuel program and a program that only removes the oxygen mandate from RFG.

Some might argue that to make the menu approach fully effective over the long run the authority of states to adopt their own fuel control programs would need to be constrained. We note that such constraint is not the approach taken here by EPA. The underlying assumption used in the analysis is that states retain the statutory right to obtain a waiver of preemption, under certain conditions, to regulate fuel characteristics. We also assume that states would not exercise this right but rather would limit their choices to the fuels contained in our fuel options and pick the option that would provide the same or better emission performance than the state is currently receiving under its fuel program. We acknowledge, however, that this is more likely to be the case if the RFG oxygen mandate were to be removed.

We performed a preliminary assessment of all of the options against the outlined principles, evaluating the impact of each option on distribution complexity, air quality, production capacity, and cost. In addition, it is important to note that for this preliminary analysis, we have not looked at how the options would impact refiners with special challenges such as unique refinery configuration or limited distribution channels. We request any analysis or data that identifies specific challenges faced by some refiners.

1. Five Basic Fuel Types

Examining the fuels listed in Table III-1, it quickly becomes evident that several of these fuels constitute a very small percentage of the total gasoline supply. If the fuels which make up a small percentage of the gasoline supply were to be consolidated with other fuels, the number of fuels which need to be produced and distributed can be reduced without a significant impact on the overall fuel market. For the options we have analyzed, we have therefore reduced the possible number of different fuel types from the twelve different fuel types to five as shown in Table IV-1. These five fuel types cover the range of environmental performance of the current suite of fuels and reflect the fuel types identified by the various stakeholders in their recommended solutions. These fuels focus on VOC and toxics emission performance since little can be done to improve gasoline NOx emission performance beyond the Tier 2 sulfur standards in place by 2006.

Table IV-1: Five Basic Fuels Types Comprising the Options

	RVP (psi)	Ethanol RVP Waiver	Volume % Bz (avg)	Sulfur (ppm)	VOC	Toxics	Oxygen Reqt.
Conventional	9.0	Yes	0.95*	30		MSAT**	NO***
Low RVP Conventional	7.8	No	0.95*	30		MSAT**	NO***
RFG	No reqmt	No	0.95	30	29.0%	21.5%/ MSAT	YES
Fed CBG	6.8 (or VOC)	No	0.95	30	29.0%	21.5%/ MSAT	NO***
Cal CBG	No reqmt	No	Meet emission performance of a specified fuel				

* Evaluated both with and without a benzene standard
** Refinery specific standards under the Mobile Source Air Toxics (MSAT) rule to prevent backsliding
*** Addressed through a nationwide renewable fuels requirement.

The first fuel would remain 9.0 psi RVP conventional gasoline which by 2006 will also be subject to the Tier 2 gasoline sulfur and mobile source air toxics (MSAT) standards.[7] The existing volatility waiver for splash blended ethanol would remain in effect. In addition, as discussed below we would consider adding to it a benzene standard. The second fuel would

[7] The Mobile Source Air Toxics (MSAT) program was established last year. This program, which goes into effect in the year 2002, requires that the overcompliance to the RFG toxics standard by refineries during the base years of 1998, 1999 and 2000 would be required starting in 2002. This requirement affects new volume of RFG as well which must meet the average toxics performance of non-California RFG during the base years, which is about a 26 percent reduction in air toxics. In our analysis we assume that this program is in place and that new volumes of RFG would have to meet on average a 26 percent reduction in toxics instead of the 21.5 percent reduction which was required in the RFG rule.

remain 7.8 psi low RVP conventional gasoline as required today in southern ozone nonattainment areas and a number of state programs where it provides moderate VOC control. Since this would be a fuel chosen for the purpose of reducing VOC emissions, we assumed for the purposes of this report that there would be no volatility waiver for ethanol blends as is currently the case in several state programs. Except for RVP, it would be identical to the 9.0 psi RVP conventional gasoline. The third fuel would be Federal RFG, providing an option for stringent VOC control. However, there are two different grades of Federal RFG today, a northern grade and a southern grade, with slightly different VOC performance standards due to different modeling conditions, but with essentially the same fuel quality. For the options below, these two grades would be consolidated into one consisting of the current southern grade specification. The fourth fuel would be a new Federal Clean Burning Gasoline (CBG) that would replace RFG. It would continue to meet all of the existing RFG emission performance requirements, but would not specify an oxygen content. The oxygen content requirement would be replaced with a nationwide average oxygen content requirement across all gasoline as discussed further below. While not analyzed separately, it may be possible in 2006 to simplify the requirements for CBG further to replace the VOC performance specification with a simple RVP standard of 6.8 psi RVP, since sulfur will already be controlled to 30 ppm average and other fuel properties have much smaller impacts on VOC emissions. We request comment on the relative merits of this simplified approach. The fifth and final fuel would be California CBG, providing the most stringent control of gasolines currently available. These five fuels are what constitute the fuel types in the following national program options. In reality each of these fuel types constitutes multiple fuels due to different octane ratings and depending on whether or not they contain oxygenates and of which type. Inherent in all 5 fuel types is the assumption that the various proposed and final State controls on the MTBE content of gasoline described in Section III and Appendix B are in effect by the 2006 timeframe (i.e., these are assumed to exist in the reference case in the analysis of the options). Given the potential impact of these bans on the fuel production and distribution system between now and 2006, however, we did perform more of a qualitative analysis to highlight the differences that would occur both in the 2006 reference case and under the various options were these State controls on MTBE use not to go into effect.

2. National Renewable Fuels Requirement

When Congress authorized the RFG program and it's mandated oxygen content requirement, they did so with the intent of enhancing agricultural markets through the demand for ethanol that would result, enhancing energy security and improving air quality. The oxygen requirement in RFG, as well as the winter oxygenated fuels program requirements also contained in the CAAA in 1990 have had the effect of increasing the demand for ethanol in the United States. At the time these Amendments were passed, ethanol consumption in the U.S. was approximately 0.8 billion gallons per year. By 1995 ethanol consumption rose to 1.3 billion gallons per year, and today stands at roughly 1.6 billion gallons per year -- double the pre-1990 levels.

Many of the stakeholders we talked to identified the oxygen mandate in RFG as one of the primary motivations for boutique fuels, suggesting that as long as it remained in effect there would be an incentive for both States and refiners to avoid the RFG program. Refiners stated they can meet the RFG standards with or without oxygenates. According to a National Research Council (NRC) study, the use of commonly available oxygenates in RFG has little impact on improving ozone air quality and may have some disadvantages. Therefore, many of the refiners question the need and desirability of maintaining the oxygen mandate. They stated that if they need to use oxygenates to meet the emission performance criteria, or need to do so for other reasons, they would much rather have it be their decision based on the economic factors facing them. At the same time, the support for the use of ethanol in gasoline to enhance agricultural markets and enhance energy security has remained since 1990. Consequently, it is our belief that any change to the CAA oxygen requirement in RFG, including the mandate's role in cleaner fuels, should be carefully studied and, if adopted, should be coupled with an alternative requirement for a national renewable fuel program. Such a program would accomplish the original objectives of enhancing agricultural markets, gasoline supply and air quality simultaneously in a manner that would not encourage states to adopt boutique fuel programs. A number of such concepts have already been put forward in Congress either as legislation or potential legislative proposals.

For the purposes of the primary options evaluated in this study we therefore assumed that any action to put in place a Federal CBG program (without the oxygen requirement of RFG today) would also put in place a national renewable fuel requirement. We did, nevertheless also perform more of a qualitative analysis to consider the impacts were the oxygen mandate to simply be removed with no renewable replacement as was recommended by several stakeholders. A renewable requirement would also help to reduce greenhouse gases, in addition to energy security and enhancing agricultural markets. While it is not clear that the use of ethanol would decline with the absence of the oxygen mandate in RFG, a nationwide renewable requirement would ensure that the use of renewables did not decline and, therefore, ensure that the Congressional objectives of the oxygen mandate are maintained. In developing a national renewable fuel program requirement one could begin at the level of today's nationwide ethanol consumption and increase over a period of 5 to 10 years and thus increase the amount a renewables over that time. With nationwide averaging and trading provisions it would provide the flexibility that refiners and fuel distributors would need to optimize around either ethanol blends or non-ethanol blends. For the purposes of the analysis contained in this study we assumed that the demand for ethanol in the timeframe these options would be able to be put into place and fully effective would be roughly twice the demand in 2000 or 2.4 percent of gasoline consumption. This level represents a considerable increase over the amount of ethanol used today, but nevertheless a level for which capacity could readily exist in the timeframe of the options under this study. This level is purely for illustrative purposes and is not meant to serve as a recommendation for what the level should be, but merely as a level for use in carrying out the analysis in this report. We welcome comments on what level of renewable mandate should be contemplated if such a mandate were pursued as part of an overall fuels strategy. In addition, we welcome information and analysis that would further inform such issues as renewable production capacity and impacts on transportation of renewables.

3. Benzene Standard

When we established the MSAT rule, we committed to evaluating additional air toxics reductions in the future. Additional federal controls on air toxics, particularly benzene emissions, have been very important to the States, since under current CAA authority they cannot obtain a waiver of preemption to control air toxics emissions unrelated to achieving a NAAQS. Benzene, given its known carcinogenicity and presence in gasoline tends to be the focus of the most attention, both overseas and in the U.S. for air toxics controls. For this analysis, we therefore evaluated conventional gasolines both with and without a 0.95 volume percent benzene averaging standard. We request comment on the appropriate level and approach for reduction of toxics in a future fuel program.

4. Options for Addressing the Boutique Fuels

While there are a large number of possible options, based on the feedback we received from the stakeholders, our initial analysis in this paper includes four main options that are meant to capture a wide range of possible future fuel programs in terms of the various economic and environmental impacts and the degree to which they simplify the current fuel system. The first two options have different menus of fuel types from which states could choose. Due to the desire to evaluate options with RFG versus Federal CBG and a renewable oxygenate requirement, and with and without a benzene standard for conventional gasoline, some of the options contain a number of sub-options for analysis purposes. In addition to these primary options, in response to some commenters' input, we also performed more of a qualitative analysis and include discussion in the report to highlight how the results would change were two different fundamental assumptions to be made. The first is a scenario where the RFG oxygen mandate is simply removed and not replaced with a nationwide renewable requirement. The second of these impacts not only the options but also the 2006 reference case and is a scenario where no MTBE bans (State or Federal) would go into effect. Performing a complete analysis and including a complete discussion of all the options under these different assumptions as well would complicate even further an already complex set of options. As a result, we focused this report on what we considered to be the most worthwhile options to evaluate, but include some discussion of these alternative scenarios is sections IV.E. and IV.F. We request comment on the appropriateness of the options presented here or ideas on other options that are consistent with the President's National Energy Policy Report directive.

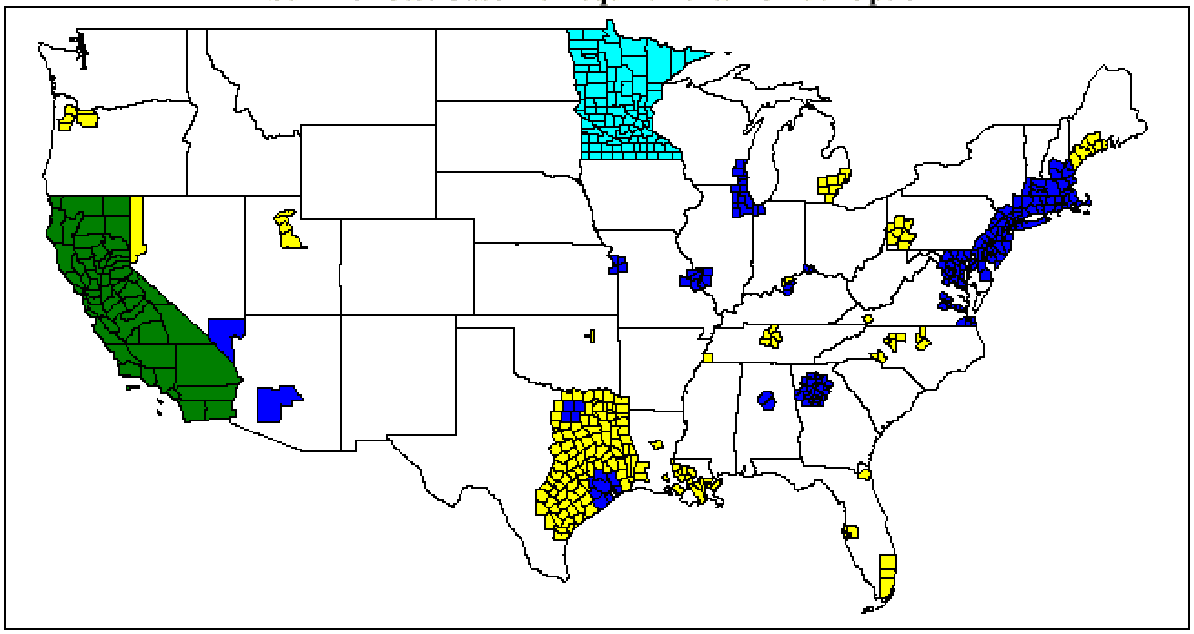
a. Three-Fuel Option for 49 State Program

The first option which we have identified would consist of a menu for States and localities to choose from of 9.0 psi RVP conventional gasoline, 7.8 psi RVP conventional gasoline, and either RFG or Federal CBG. As this would only be a 49 State program, California

CBG would remain an option for California.[8] We would also not preclude fuel programs that are put in place for reasons other than air quality, and as a result programs like the oxygenated fuel/ethanol requirement in Minnesota would remain options as well. Under this option, in order to ensure no emission backsliding, it was assumed that States and localities would choose a fuel type from the menu with the same or better emission performance compared to the fuel they receive today. Consequently, the 7.2 and 7.0 RVP areas would be consolidated into RFG or CBG as applicable. Setting aside a possible benzene standard for conventional gasoline, less than 4 percent of gasoline production would be impacted by these changes. Figure IV-1 shows a map of the country showing the location of the different fuel types remaining under this option. As is readily apparent in comparing Figure II-1 with this map, the number of different fuels is significantly reduced. It is important to note, however, as shown in Appendix D. that while we refer to this option as the 3-fuel option due to its 3 basic fuel requirements for the 49 states, due to variations in oxygenate requirements and use there are still as many as 8 different fuel program requirements and 12 different fuel grades distributed nationwide even under this option. Of course, not all regions will see all of these fuels, and it still represents a large reduction in the number of fuel grades nationwide compared to the 2006 reference case.

8 California has its own waiver of preemption for fuel controls under the CAA, and further has its own refining system which is mostly separate from the rest of the U.S.

Summer U.S. Gasoline Requirements – 3 Fuel Option



Legend:

Conventional   CA CBG   7.8 RVP   FED CBG   Oxygenated Fuels/Ethanol Mandate

Figure IV-1

b. Two-Fuel Option

The second option which we have identified would reduce the menu for States and localities to just conventional gasoline and either RFG or CBG. As with the 3-fuel option, this would only be a 49 State program and California CBG would remain an option for California and programs like the oxygenated fuel/ethanol requirement in Minnesota would remain options for States as well. Consistent with the environmental goals outlined above, all current RVP control areas were assumed to be consolidated into RFG or CBG as applicable. Setting aside a possible benzene standard for conventional gasoline, less than 13 percent of the gasoline pool would be impacted by these changes. Figure IV-2 shows a map of the United States indicating the location of the different fuel types remaining under this option. Again, it is important to note as shown in Appendix D. that while we refer to this as the 2-fuel option, due to differences in oxygenate requirements and use nationwide there are still as many as 6 different fuel program requirements with 9 different fuel grades distributed nationwide.

Summer U.S. Gasoline Requirements – 2 Fuel Option

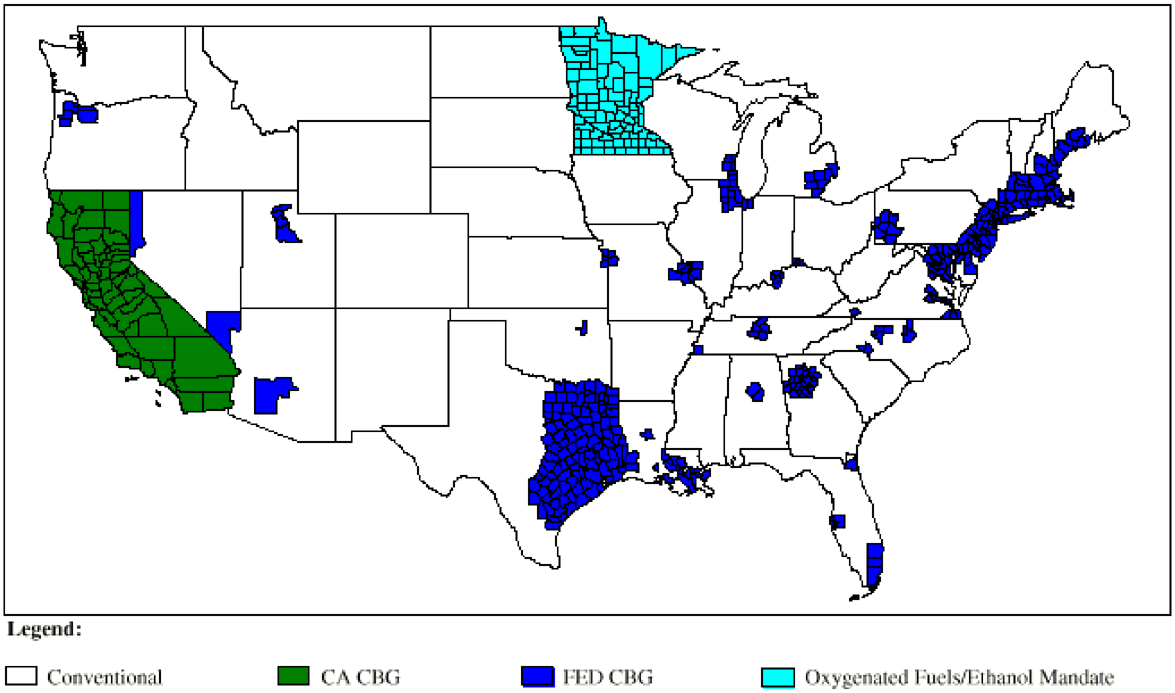


Figure IV-2

c. 49 State Federal CBG

The third option would require Federal CBG across all 49 States. All conventional gasoline as well as State RVP control programs would be replaced with Federal CBG. California CBG would remain in place in California. This option would impact in excess of 70 percent of the gasoline pool. To simplify the analysis necessary, this option was not evaluated with RFG and its oxygen requirement. Such a large increase in the amount of oxygenate required across the country would be difficult to analyze in the timeframe of this study with much confidence.

d. 50 State California CBG

The fourth option would require California CBG Nationwide. As there is no oxygen requirement as part of the California CBG program, this option assumed that a renewable fuel requirement would be put in place as part of a national program. This option would impact approximately 89 percent of the gasoline pool.

Table IV-2 provides a summary of the four long-term options discussed.

Table IV-2: Matrix of Cases Analyzed

	Case #	**RFG Oxy Mandate**	**Renewable Oxy Mandate**	**Benzene Standard for Conventional Gasoline**
2000 Base Case*		Yes	No	No
2006 Reference Case**		Yes	No	No
3-Fuel Options				
	1	Yes	No	No
	2	Yes	No	Yes
	3	No	Yes	No
	4	No	Yes	Yes
2-Fuel Option; 9.0 RVP CG				
	5	Yes	No	No
	6	Yes	No	Yes
	7	No	Yes	No
	8	No	Yes	Yes
49-State Fed CBG	9	No	Yes	NA
50 State Cal CBG	10	No	Yes	NA

* Year 2000 with all current Federal, State, and Local fuel programs in place

** Year 2006 with Tier 2 Sulfur Control, Mobile Source Air Toxics Rule, and proposed and final State MTBE controls in place in addition to current Federal, State, and Local fuel programs

e. Other options

The 3-fuel and 2-fuel options described above assume a continuation of the current geographic boundaries between fuel quality (i.e., the local fuel islands stay the same). The differences in fuel quality between these islands would be diminished through a reduction in the total number of fuels marketed in the U.S., but the islands themselves would not change. Some have suggested that another approach would be to reduce the number of islands by combining certain ones, along with the area in-between them. The result would be fewer and larger regions of cleaner fuels and has been termed the “regional fuel” approach.

Practically, the number of options which could be developed under this approach is endless, given the flexibility in both the number of distinct fuels in any particular region and the number of regional islands of each fuel type. For example, the Northeast could be broken down into two regions, one contiguous region with RFG and the remainder with 9 RVP conventional fuel. The boundaries of the RFG region could be varied in many ways. Or, there could be two contiguous regions of RFG and one conventional fuel, again, with varying regional boundaries. Or, there could be one or two RFG regions and two or more conventional fuel regions (e.g., 7.8 RVP and 9.0 RVP).

Despite the large number of options possible in the Northeast, it is probably the simplest region, given the preponderance of RFG use and the semi-contiguous nature of urbanization along the eastern seaboard. It is much more difficult to conceive of how the large urban areas of the Midwest could be combined without including large rural areas not now needing additional fuel-related air quality benefits. If air quality were the primary criterion and backsliding was to be avoided, many urban areas and wide swaths of rural area would require Federal RFG or CBG. This option would begin to approach the single fuel, Federal CBG option. The same is true for the Southeast and Southwest.

Also, the distribution system crosses regional boundaries, so major pipelines would still have to carry a number of fuels, even if different regions each had a single fuel.

Given these difficulties, we did not attempt to develop such regional fuel programs in any detail in this report. Still, we are interested in whether interested parties perceive benefits associated with such options. We request comments on whether such regional approaches would be preferable to the options which were evaluated. In particular we request comment on whether the further simplifications in fuel distribution which such regional programs might provide would outweigh the additional cost and gasoline production capacity impacts which would likely accompany the production of cleaner fuels for broader geographic areas. We also request comment on the appropriate basis for defining such regions (e.g., air quality need, distribution system network, etc.) and specific regions which would result from these criteria.

D. Analysis of Options

In assessing the options described above, we focused on analyzing the options according to the four principles described in Section IV.B: gasoline production capacity, cost, distribution, and air quality. All options presented in this paper are intended to maintain or enhance environmental benefits compared to today's fuels, maintain state choices, and significantly reduce the number of fuels, improving the fungibility of the gasoline and production system. We desired to develop quantitative estimates of the impacts of each fuel option on the above principal factors. However, in most cases, the lack of available quantitative models, or the extensive time needed to apply them, prevented us from developing more than first order estimates of most of the relevant impacts. Some modeling work is continuing, particularly with respect to gasoline production capacity and costs.

In assessing the options, assumptions needed to be made regarding states' choices when a menu of fuels are offered, as under the 2-fuel and 3-fuel options. The underlying assumption is that states retain the statutory right to receive a waiver of preemption, under certain conditions, to regulate fuel characteristics. In conducting our assessment, we assumed that states would not exercise this right, but rather would limit their choices to the fuels contained in our fuel options. In particular, we assumed that, if possible, each state would select a fuel for each of their relevant local areas which would provide the same emission performance that it is currently receiving. When that was not possible (i.e., that fuel option did not include their current fuel), then we assumed that the state would select a fuel providing the next greatest degree of additional emission reduction. For example, a local area with a 7.0 RVP program today would select Federal RFG under the 3-fuel cases with the RFG oxygen mandate and Federal CBG under the 3-fuel cases without the RFG oxygen mandate.

As discussed above, a number of states designed their own fuel program instead of opting into the Federal RFG program, because of the RFG oxygen mandate. Thus, for the 2-fuel and 3-fuel cases without the RFG oxygen mandate, it is quite conceivable that states would opt into the Federal CBG program. To the extent that they do so, the fuel distribution benefits projected here would occur. However, to the extent that they retain their current fuel programs, the benefits projected here would be diminished.

If the RFG oxygen mandate is maintained, then states' choices are really no different in the future than today. If they have currently selected a fuel that is not included in either the 2-fuel or 3-fuel options, then they could retain this fuel program. To the extent that they do so, the 2-fuel and 3-fuel cases with the RFG oxygen mandate look more like the 2006 reference case and do not match the assumptions made in this report.

Also, for the 3-fuel cases without the RFG oxygen mandate, states which have selected 7.8 RVP as their fuel program might select Federal CBG and obtain even greater emission reductions than they are achieving today. This would make these cases look more like those of the single fuel, Federal CBG option, with the additional emission reductions occurring in areas with air quality problems. We did not attempt to predict the number of states which might do this.

1. Overview of the Impacts of the Fuel Options

Our analysis of the fuel options indicates that there are trade-offs involved in attempting to simplify gasoline distribution and reduce market volatility. Those fuel options providing the greatest benefits in these areas also entail the greatest production costs and reductions in gasoline production capacity[9] at today's refineries.

The California CBG option achieves the greatest reduction in the number of fuels which have to be distributed nationally, and thus, provides the greatest degree of simplification to fuel distribution. All domestic refineries producing gasoline would produce this fuel and could potentially make up lost production if another refinery experiences an unexpected shutdown. Fuel could also be moved from anywhere in the U.S. to counter a local shortfall due to a disruption in the distribution system.   This option is also the only option which would provide additional NOx emission reductions in areas now receiving Federal RFG or a boutique fuel and as much VOC emission reduction as any other option. However, this option also raises the greatest concern with respect to cost and gasoline production capacity. The California CBG option is estimated to increase production costs by at least 5 to 15 cents per gallon and reduce gasoline production capacity of current refineries by 10 to 13 percent.

The Federal CBG option could essentially achieve the same reduction in the number of fuels which have to be distributed as the California CBG option, since the only additional fuel would be California CBG in California. California's distribution system is fairly isolated from that for the rest of the U.S. All domestic refineries outside of California producing gasoline would produce this fuel. Thus, this option could again provide essentially the same flexibility for increased refining and distribution during a disruption. While this option would not provide any additional NOx emission reductions in areas now receiving Federal RFG or a boutique fuel, it would provide as much VOC emission reduction as any other option. This option also raises fewer concerns with respect to cost and gasoline production capacity when compared to the California CBG option. The Federal CBG option is estimated to increase production costs by as much as the current cost of producing Federal RFG (4 to 7 cents per gallon) despite the absence of the oxygen mandate. At the full phase-in of the renewable requirement (2.4 percent of gasoline consumption) gasoline production capacity would be reduced by 3 to 6 percent. However, the impact could be less if adequate time is provided for the market to adjust to avoid the reduction.

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9 Gasoline production capacity in this report refers to the volume of gasoline which current domestic refineries can produce given relatively minor investments (e.g., distillation capacity to reduce RVP) plus the volume of MTBE and ethanol projected to be economic or mandated under various fuel options.

The 2-fuel cases would require a few additional fuels to be distributed relative to the single-fuel options. However, these cases would still reduce the total number of fuel programs by 60 percent in 2006 (See Appendix D). They would also provide the same VOC and NOx emission reductions as the Federal CBG option in areas now receiving Federal RFG or a boutique fuel, if all of these areas opted into the Federal RFG or CBG program. The likelihood of this would be much greater under the 2-fuel case without the RFG oxygen mandate, as this mandate has been a factor in discouraging states from opting into the Federal RFG program in the past. If the Federal RFG oxygen mandate is retained, it may be much less likely that states would decide on their own to opt into the Federal RFG program in lieu of their own fuel programs, thereby negating much of the gasoline distribution benefits projected under the 2-fuel option. These 2-fuel cases would cost significantly less than the Federal CBG option and based on our preliminary analysis actually increase gasoline production capacity slightly.

The 3-fuel option would reduce the total number of fuel programs by nearly half in 2006. Although preliminary analysis indicates that it may provide equivalent or greater environmental benefits relative to the 2006 reference case in all areas of the country, it would provide less VOC and the same NOx emission reduction as the Federal CBG and 2-fuel options in areas now receiving Federal RFG or a boutique fuel, again if all of the current boutique fuel areas opted into the Federal RFG or CBG program. As with the 2-fuel option, this is more likely to occur with the renewable fuel mandate than with the RFG oxygen mandate. The 3-fuel cases are the least costly of all of the options, would cost significantly less than the Federal CBG option, and would increase gasoline production capacity slightly.

Each option analyzed as part of this study has beneficial impact on at least two of the four principal factors we looked at. It is difficult to estimate the case which provides the greatest net benefit. Nevertheless, it is clear that the response to the directive from the National Energy Policy Report is in the affirmative - there are indeed alternative options for the future which can maintain or improve the environmental benefits of clean fuel programs while at the same time increasing the flexibility of the fuels distribution infrastructure, improve fungibility, and provide added gasoline market liquidity. Our analysis further indicates that there are options that could accomplish this without negatively impacting gasoline production capacity and with little impact on the long-term costs of nationwide fuel programs. Further analysis will be required to more accurately assess the magnitude of the air quality and distribution system benefits of these alternatives, as well as their cost and fuel supply impacts. Furthermore, there are expected to be variations in some regions of the country that are not obvious in this nationwide view. As a result, some regions would be expected to see greater impacts and others less. For example, the air quality and distribution system benefits could be very large in some local regions where the fuel is being changed, but with little impact on other parts of the country.

The following sections describe our analysis of the impact of the four fuel options on gasoline production capacity, cost, distribution, and air quality, as well as a preliminary assessment of the overall impact of the fuel options on gasoline supply and market volatility.

2. Impact of Fuel Options on Gasoline Production Capacity

Gasoline production capacity means the volume of finished gasoline which can be produced from current refineries. As used here, it includes the impact of modest investments, such as related to RVP control, but does not include more significant investment, such as that necessary to crack heavy gasoline or distillate components into gasoline. Gasoline production capacity also includes the capacity to produce and use the various oxygenates, primarily MTBE and ethanol. New investment in ethanol production is assumed to the degree necessary to fulfill RFG oxygen or renewable fuel mandates. Investments to convert MTBE plants to the production of other gasoline components are discussed in more detail below.

Gasoline production capacity is relevant to the issue of boutique fuels, because one of the causes of current market volatility is the fact that domestic refineries are operating at a very high percentage of their design capacity. Under this situation, it is more difficult for other refineries to make up the lost production at a specific refinery if it shuts downs or reduces production unexpectedly. Therefore, options which expand current refineries' gasoline production capacity are expected to improve refineries ability to respond to problems, while those options which reduce capacity are expected to exacerbate refiners current difficulties in responding.

A thorough assessment of the impact of the fuel options on gasoline production capacity requires a detailed study of refining technology and economics, which was not possible here. Nevertheless, we have conducted an initial engineering analysis to develop first order estimates of the directional impacts of the most important factors on gasoline production from domestic refineries. We have not conducted an analysis of the impact of the fuel options on the ability of overseas refiners to maintain or increase their exports to the U.S. Several key importers view the U.S. market (e.g., refineries on the Canadian Atlantic Coast, the Virgin Islands and Venezuela) as their primary market and are likely to respond to the fuel options in a manner similar to domestic refiners. However, there are other significant sources of imported gasoline and further analysis is needed to confirm the response of these key importers to the fuel options considered herein. This study, associated public comments, and other information will be used to help guide and direct more detailed assessments in the future, including the development of the modeling tools necessary to perform these future assessments. In addition to our ongoing efforts, more detailed refinery modeling will likely be conducted over the next few months by a number of parties, including the Department of Energy and the Energy Information Agency.

Based on this assessment, the impacts of the various fuel options on gasoline production fall into two broad categories: 1) changes in the amount of gasoline which can be refined from crude oil (e.g., the hydrocarbon portion of gasoline) and 2) changes in the amount of oxygenate, either MTBE or ethanol, which is added to gasoline. The production capacity of hydrocarbons depends primarily on the overall level of RVP control required and the degree to which MTBE plants are converted to iso-octane or alkylate. The stringency of other fuel quality standards associated with the various fuel options can also be important, particularly for California CBG.

The oxygenate effects depend primarily on legislation or regulations mandating or prohibiting their use.

Overall, the 3-fuel and 2-fuel options should not cause a reduction in gasoline production capacity relative to the 2006 reference case. In fact, they are expected to have very small, positive impacts on gasoline production capacity, with or without a benzene standard. The same is true under a renewable fuel mandate in lieu of the RFG oxygen mandate. In all cases, ethanol use increases. While MTBE use decreases under some cases and increases under others, production capacity of hydrocarbons tends to compensate for any change in MTBE use. This increase in hydrocarbon capacity is contingent on the conversion of otherwise idled MTBE plants converting to the production of iso-octane or alkylate high octane gasoline blending components.[10] This conversion is itself contingent on the availability of capital. While MTBE conversion cost are significantly lower than other capital costs facing refiners over the next several years for desulfurizing gasoline and diesel fuel, they are nevertheless substantial and would come in roughly the same timeframe.

The two single fuel options would begin to reduce gasoline production capacity due to their RVP and other limits on gasoline quality. Based on our assessment of the first order impacts, the Federal CBG option could reduce gasoline production capacity on the order of 3-6%, while the California CBG option could cause a 10 to 13 percent reduction.

A more detailed description of the analysis performed for this study can be found in a technical memorandum in the docket.[11] Comments are requested on all of these projections, particularly the use of MTBE under the state MTBE limits, the fate of domestic MTBE plants should MTBE use decrease, and the impact of RVP and other gasoline quality specifications on gasoline production capacity.

Table IV-3 summarizes the projected impacts of the various fuel options on domestic gasoline production capacity in comparison to a 2006 reference case that assumes the EPA Tier 2 sulfur and MSAT programs and state MTBE controls are in place.[12] The total impact on gasoline production capacity is shown, along with a breakdown of this impact into three components: ethanol, MTBE and all other sources, which is primarily hydrocarbons derived directly from

10 Information relevant to this issue can be found in the docket for this paper in " Draft Economic Analysis of U.S. MTBE Production Under an MTBE Ban", Pace Consultants Inc., May 2001.

11 "Gasoline Production Capacity Impacts of Fuel Control Options," Memorandum from Richard A. Rykowski and Lester Wyborny to the Record, October, 2001

12 It is important to note that there is uncertainty about the analysis of the 3-fuel and 2-fuel options with the RFG oxygen mandate. They show an increase in overall MTBE volume as states that currently have low RVP programs switch to Federal RFG. It is possible that some states would not want an increase in MTBE use and will limit or ban MTBE. As a result, this would alter the figures in Table IV-4 by increasing the ethanol volume estimated for these cases and decreasing the MTBE and hydrocarbon volumes.

petroleum or natural gas liquids. As this analysis takes into account only first order impacts and is not based on a thorough study of refining technology and economics, variations of a few tenths of a percent should not be viewed as significant, but only indicative on the likely direction that any changes would take. Furthermore, as discussed above, there may be variations in some regions of the country that are not reflected in this analysis to date. Two primary regional impacts that could occur under some of the options in this report are impacts on imports into the Northeast and a potential shift of considerable ethanol volumes to or from the Midwest. We request comment on these and any other potential regional impacts that could occur as a result of the options evaluated in this study and which warrant further evaluation in the future. We have not shown any of the cases involving a 0.95 volume percent benzene limit, as the processes associated with benzene control.

Table IV-3 Estimated Impact of Fuel Options on Gasoline Production Capacity Relative to the 2006 Reference Case *

Option	RFG Oxygen Mandate	2.4% Renewable Requirement	% Volume Change (Positive number indicates increase)**			
			Ethanol	MTBE***	Hydro-carbons	Total
3-Fuel	Yes	No	0.1	0	0	0
	No	Yes	0.3	-0.7	0.7	0.3
2-Fuel	Yes	No	0.4	0.4	-0.4	0.4
	No	Yes	0.3	-0.6	0.6	0.3
Federal CBG	No	Yes	0.3	-0.6	-3.1 to -5.6	-3.5 to -6.0
California CBG	No	Yes	0.3	-0.6	-10.1 to -12.6	-10.5 to -12.9

* Assumes implementation of the state MTBE bans. Does not include impact of MSAT toxics standards, nor octane impacts.

** Expressed as a percentage change in the volume of the entire gasoline pool.

*** The projections for MTBE are highly uncertain because of potential actions by states to limit or ban its use. State action on MTBE will also have significant effects on projected ethanol volumes for cases that retain the oxygenate mandate.

The following sections describe the impact of the various fuel options in somewhat more detail. The Agency requests comments on all the projected impacts of the options included in this White Paper.

a. 2006 reference case

The most significant changes affecting gasoline production capacity between now and 2006 will be limits placed on MTBE use by many states. These limits effectively remove MTBE from RFG and conventional gasoline sold in the Northeast and California and several other states and were described in greater detail in Section II above.

As can be seen in Table IV-3, however, the overall projected change in production capacity is very small and positive. However, the changes in the three components (MTBE, ethanol, and hydrocarbons) are larger and more significant. We project that some, but not all of the MTBE currently sold in these areas will shift to conventional gasoline in states which have not banned MTBE, based on octane blending economics, provided, however, that more states do not ban MTBE to prevent an increase in its use. Despite this shift, MTBE use is projected to decrease by about 50 percent overall. We expect that MTBE plants which no longer produce MTBE will be converted to iso-octane, compensating for 70 percent of the lost MTBE volume. Also, ethanol will be used (at 5.7 volume percent) in lieu of MTBE in RFG in order to continue to meet the 2.1 percent oxygen annual average. Some of this ethanol will be shifted from conventional gasoline, but much would have to be produced from new plants. Together, the volume of the new ethanol and iso-octane will exceed that of the lost MTBE and their octane will essentially match that of the lost MTBE. The key assumption for this to be the case is the conversion of idled MTBE plants to iso-octane. Should these plants simply shutdown, or produce MTBE for export, both volume and octane will be lost due to the state and local MTBE limits. Should some convert to alkylate production instead of iso-octane, however, volume would increase even more.

b. 3-Fuel Option

As shown in Table IV-3, the 3-fuel case with the RFG oxygen mandate should produce a very minor increase in gasoline production capacity. The overall effect of this case will be small, due to the very low volume of gasoline affected.

The addition of a renewable fuel mandate in lieu of the RFG oxygen mandate has the potential to increase production capacity slightly, due primarily to the additional ethanol production required. MTBE production decreases further because it is no longer needed to meet the RFG oxygen mandate, but is still used for octane blending in states allowing its use. Additional MTBE plants are expected to convert to iso-octane production. Also, ethanol can be used in either CBG or conventional gasoline. When used in 9 psi RVP conventional gasoline (or any winter fuel), ethanol can simply be added without adjusting for its RVP increase. This reduces the need to remove butane from gasoline, expanding the hydrocarbon portion of gasoline production capacity.

c. 2-Fuel Option

The 2-fuel case with retention of the RFG oxygen mandate shows a small increase in production capacity relative to the analogous 3-fuel case. This is due to the assumption that current areas with 7.8 or 8.0 psi RVP programs will switch to RFG. Many, if not all, of these areas are expected to fulfill the RFG oxygen mandate with ethanol from new plants rather than accept increased use of MTBE.

Substituting a renewable fuel mandate for the oxygen mandate in RFG has much less effect under the 2-fuel option than the 3-fuel option, because in this analysis ethanol use is assumed to be slightly higher with the RFG oxygen mandate then with the renewables mandate due to the expanded number of RFG areas. As mentioned above, these small changes in overall gasoline production capacity are first-order estimates and only indicative that positive impacts on gasoline production capacity are expected. It should be noted, however, that these projections are highly dependent on the conversion of MTBE plants to production of iso-octane and future state actions in regard to MTBE.

d. Single Fuel Options: Federal CBG or California CBG

Due to its deep nationwide volatility control, requiring Federal CBG outside of California begins to cause losses in gasoline production capacity. This is compounded in this option by the need to produce additional sub-RVP blendstock volumes for blending ethanol into this Federal CBG. Many refiners may need to begin removing pentanes from their gasoline pool under this case, as they will have removed essentially all the butane contained in summer gasoline. The result is an estimated reduction in gasoline production capacity of three to six percent.

Requiring California CBG reduces gasoline production capacity even more than the Federal CBG case. California CBG would have roughly the same RVP as Federal CBG, with the same loss of production capacity. The additional California CBG specifications, however, (particularly its restrictive T90 limit), would likely cause a significant shift of gasoline to diesel fuel, causing a larger loss in overall gasoline production capacity.

3. Impact of Fuel Options on Cost

The assessment of the impact of fuel options on the cost of producing gasoline, like that of production capacity, also requires a very thorough study of refining technology and economics which was not possible in the timeframe of this study. For the purpose of this study, we have therefore relied upon previous refining modeling studies coupled with more recent updates and other available information to perform a preliminary analysis of production cost changes. This analysis sufficiently captures the most significant impacts on production costs and should be adequate for the purposes of this initial report. However, there are no distribution system cost models available to model the changes in distribution costs that would occur under the various options. Section IV.D.4. contains a qualitative discussion of the impacts of the various options on the distribution system, but these impacts could not be quantified for this report.

As can be seen in Table IV-4 the overall costs of the 3-fuel and 2-fuel cases tend to be low on a nationwide average basis (i.e., less than one cent per gallon) in comparison to the 2006 reference case, and much of this cost is for nationwide benzene control for conventional gasoline. The renewable fuel mandate in lieu of the RFG oxygen mandate will increase the cost of conventional gasoline but should reduce the cost of complying with the RFG program, resulting in an overall neutral to beneficial impact on production cost.

The cost of requiring all non-California gasoline to meet Federal CBG specifications are estimated to be considerably higher (several cents per gallon), due to the stringent RVP and toxics controls on the entire nationwide gasoline pool (all conventional gasoline converted to CBG). The cost of requiring all U.S. gasoline to meet the California CBG specifications would be even higher due to the even more stringent constraints on gasoline properties for the entire national gasoline pool.

A summary of the derivation of these results is contained below and a more detailed explanation can be found in a technical memorandum in the docket.[13] The values in Table IV-4 should be viewed as approximate until such time as more sophisticated analyses can be performed using refinery models. However, the costs are unlikely to change dramatically. It should be noted that these are nationwide average costs. Those regions most impacted by the changes in the fuel program options would likely bear the majority of the cost increase. It should also be noted that the values in this table reflect only production costs and do not reflect reductions in distribution system costs that would result from the various options. Comments are requested on all the projected costs presented here.

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13 "Cost estimates of long-term options for addressing boutique fuels," Memorandum from Lester Wyborny to the Record, October, 2001.

Table IV-4 Estimated Impact of Fuel Options on Gasoline Production Costs Relative to the 2006 Reference Case*

Option	RFG Oxygen Mandate	2.4% Renewable Requirement	Nationwide Benzene Std	Cost for Highest Cost Area Impacted (c/gal)	Nationwide Average Production Cost** (c/gal)
3-Fuel	Yes	No	No	3.4	0.1
	Yes	No	Yes	3.4	0.4
	No	Yes	No	1-2	0.1
	No	Yes	Yes	1-2	0.4
2-Fuel	Yes	No	No	3.6	0.6
	Yes	No	Yes	3.6	0.8
	No	Yes	No	1-2	0.3
	No	Yes	Yes	1-2	0.5
Federal CBG	No	Yes	N/A	4-7	3-5
California CBG	No	Yes	N/A	5-15	5-14

* Tier 2 sulfur, MSAT toxics, and State and Local MTBE bans are in place

** Includes production cost changes with the options only, not distribution cost changes associated with the options (other than changes in ethanol distribution costs)

a. Main Cost Components

For the 3-fuel and 2-fuel options the most significant impacts on fuel production cost among the options evaluated fall into three main components. These include RVP control costs, oxygenate costs, and benzene control costs. RVP control costs depend on the base RVP to begin with for the boutique fuel area, the control level (which for this analysis is to meet Phase II RFG or CBG), and in the case of RFG, the oxygenate type. As a result, as shown in Table IV-5, RVP control costs can range from as little as essentially zero to as much as 1.75 cents per gallon depending on the control option. Oxygenate costs vary depending on whether it is MTBE or ethanol, and in the case of ethanol will also depend among the options on the geographic region where the blending occurs due to differing distribution costs. As shown in Table IV-6. oxygenate costs can range from 2.2 to 3.9 cents per gallon. Benzene control costs will vary as well depending on the level of control necessary as shown in Table IV-7. The costs of the various options (discussed below) can be determined by applying these various fuel component costs to the differing portions of the fuel supply impacted by the provisions in the options. In addition to these three main cost components, for the 49-state Federal CBG option, the cost of air toxics control becomes important. For the 50 state California CBG option, compliance with the many other fuel specifications, including the T90 and olefin limits become very important.

Table IV-5 RVP Control Costs to Produce Phase II RFG (c/gal)

Starting RVP (psi)	9.0		7.8		7.2		7.0	
Oxygenate type*	MTBE	Ethanol	MTBE	Ethanol	MTBE	Ethanol	MTBE	Ethanol
Cost (c/gal)	0.56	1.75	0.4	1.5	0.1	1.3	0	1.2

* RVP control costs for the CBG options would be similar the RFG options with MTBE

Table IV-6 Oxygenate Costs to Produce Phase II RFG (c/gal)

	MTBE	Ethanol*	
Region	National Avg	Midwest	California and NE
Cost** (c/gal)	2.2	2.9	3.9

* Assuming 2.0 wt% oxygen. For ethanol blends at 3.5 wt% oxygen, cost could be roughly determined by multiplying by 1.75

** Includes oxygenate cost differential and a correction for energy density to account for fuel economy changes that would result

Table IV-7 Benzene Control Costs (c/gal)

Control Case	Cost (c/gal)
Conventional Gasoline to 0.95 vol% avg	0.41
New RFG to 0.7 vol% avg to meet MSAT	0.42
New Federal CBG to 0.3 vol% avg to meet MSAT*	0.67

* Assuming no oxygenate blended

b. 3-Fuel Option

The average nationwide cost of the 3-fuel cases tend to be very low in large part due to the fact that only roughly 4 percent of non-California gasoline would be converted to RFG or Federal CBG. Furthermore, since the fuels controlled under this option are already at 7.0 and 7.2 psi RVP, RVP control costs are minimal. Consequently the cost of modifying 7.0 and 7.2 psi RVP gasoline to meet the RFG specifications consists primarily of adding oxygenate (presumed to be met by moving MTBE from conventional gasoline and by producing ethanol from new plants) and a moderate degree of benzene control. The volume of RFG is sufficiently small that oxygenate prices would not increase substantially.

Replacing the RFG oxygen mandate with a renewable fuel mandate will result in a shift of ethanol use from RFG to conventional gasoline. As ethanol use is shifted from RFG to conventional gasoline, the cost of CG will increase, but the cost of RFG will decrease compared to the 2006 reference case. At a renewable requirement of 2.4% of gasoline supply, these two effects offset each other on a nationwide average basis. The distribution costs associated with transporting ethanol to both East and West Coasts could decrease substantially relative to the 2006 reference case. Ethanol use could once again be focused on areas where its blending is most economical. Historically this has been the Mid-west where distribution costs are low and the infrastructure to transport and store ethanol exists. Refining costs associated with blending ethanol should also decrease substantially with the RFG oxygen mandate replaced with a nationwide renewable mandate. There is an increase in refining cost to produce a sub-RVP blendstock for ethanol blending into RFG that would be avoided by blending ethanol into 9 psi RVP conventional gasoline with a 1.0 psi waiver for ethanol blends. While ethanol distribution costs and blending costs should decrease, however, this will be offset to some extent by an increase in ethanol production costs. For the purposes of this study we have assumed based on previous analyses as discussed in the cost memorandum in the docket that ethanol production costs would increase by 15 cents per gallon relative to today's ethanol prices.[14] However, a recent study by a professor at Iowa State University would suggest that the cost increase could be as little as 5 cents per gallon.[15] This will be an important issue for further study in the context of any nationwide renewable fuel program, but fortunately it will not dramatically impact the results of this analysis.

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14 As with most commodities, an increase in price is typically necessary to induce an increase in supply. Likewise, an increase in price normally leads to a reduction in demand. In this case, demand is artificially set by the renewable fuels mandate. However, while this provides ethanol producers with a certain demand, it does not change their cost of production, which has been established in previous studies. Basically, additional ethanol plants were not built in the past because they could not economically compete with existing plants, particularly given the depressing effect of increased supply on price. New ethanol plants are now being designed to supply the California market, given the expectation of increased demand there and the willingness to pay a higher than historical price which will provide a reasonable rate of return on newly invested capital.

15 "The Effects of MTBE Bans on Ethanol Production, Feed Markets, and the Iowa Economy," Draft report, by Paul Gallagher, Guyenter Schamel, Hosein Shapouri, Jeff Price, Daniel Otto, and Heather Brubacker, Iowa State University of Science and Technology, August 10, 2001.

While ethanol use would increase under a renewable requirement, MTBE use would further decrease. Some MTBE will likely continue to be used in conventional gasoline where its use is not banned. Additional MTBE will continue to be used in RFG even without the RFG oxygen mandate as an economical means of meeting the existing MSAT standards.[16] For this analysis we have assumed that as MTBE use declines, iso-octane use would increase. As discussed in the cost memorandum in the docket, many MTBE plants are likely to covert to either iso-octane or alkylate with widespread MTBE bans. Given the current scope of the State MTBE bans, we have assumed the majority of those that convert would be to iso-octane for this study.

Much of the cost under some of the 3-fuel option cases is the cost of the nationwide benzene standard. While its cost per gallon is relatively low (approximately 0.4 cents per gallon), it affects nearly two-thirds of U.S. gasoline consumption outside of California under this option. As a result, it actually has a larger impact on the overall cost of the 3-fuel option than the other changes.

c. 2-Fuel Option

The significant difference between the cost of the 3-fuel and 2-fuel option cases is in the volume of gasoline impacted by the various fuel component control costs. The 2-fuel option is projected to increase RFG/CBG use to roughly 45 percent of non-California gasoline (15 percent more than under the 3-fuel cases). As the increased volume is starting at 7.8 psi RVP rather than 7.0 or 7.2 under the 3-fuel option, the per gallon costs for RVP control are also somewhat higher. For RFG cases, the substantial increase in oxygenate volume required will also tend to drive up oxygenate costs. Ethanol use would increase to just above 2.4 percent of gasoline, or slightly more than the level assumed in this study for the renewable fuel standard. Under this option replacing the RFG oxygen mandate with a renewable mandate results in a small overall reduction in nationwide average costs.

d. Federal CBG Option

This option would extend the Federal RFG VOC and toxics performance standards to all non-California gasoline and replace the oxygen mandate with a nationwide renewable requirement. As a result both the percent of the nationwide fuel pool impacted and the per gallon costs for control are significantly greater than under the 3-fuel and 2-fuel options. RVP control costs will increase as the starting point for much of the fuel will be 9.0 psi conventional gasoline.

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16 Complying with the MSAT standard is more difficult without oxygenates, particularly for those refineries which did not produce RFG during 1998-2000. The MSAT toxics standard for RFG is refinery specific. For its average annual production volume during 1998-2000, the standard is equal to the toxics emission performance of that refiner's RFG producing during 1998-2000. If a refinery increases RFG production, the toxics standard for the incremental volume is 21.5 percent. However, if a refinery never produced RFG, its standard is 26.7 percent for whatever volume it produces, which is the national average toxic performance of RFG during this time frame. Thus, under fuel options which substantially increase RFG consumption, the toxics performance standard for the new RFG will be between 21.5 percent and 26.7 percent.

The benzene and aromatics control associated with meeting the toxics standard would also be substantial. Finally, unlike for the 3-fuel and 2-fuel options, the renewable fuel standard would increase production costs relative to the 2006 reference case. Since ethanol could only be blended into CBG under this option, the blendstock refining cost savings under the 3-fuel and 2-fuel options would not occur, and in fact would increase. Ultra-low RVP blendstock for ethanol blending (like that currently produced for use in Chicago and Milwaukee RFG) would be needed to meet the VOC performance standard wherever ethanol was blended. Furthermore, since all gasoline nationwide will now be held to stringent RVP limits, there would be little ability to re-blend the butanes and pentanes removed into other summer products, further increasing costs.

Given the extent of the changes under this option, it is especially difficult to project overall production costs with a reasonable degree of confidence without more extensive analysis. At the same time the cost for this option would still likely be less than our most recent cost estimate for Federal Phase II RFG, which is 4 to 7 cents per gallon. The cost for Phase II RFG includes roughly one cent per gallon for sulfur control, which would already have occurred due to the Tier 2 sulfur standards. Furthermore, refiners would have the option of meeting the CBG performance standards either with or without oxygenate, which should reduce costs. At the same time, the MSAT standards will effectively make the toxics performance standard of new CBG volume more stringent. In addition, the lowest cost producers are those likely to be the ones currently producing RFG. Expanding the requirements nationwide would also impact higher cost producers. For the purposes of this report we have assumed the same range as for Phase II RFG would apply.

e. California CBG Option

California has estimated that their Phase 2 CBG with oxygen costs range from 5 to 15 cents per gallon, with an additional 4 to 5 cents per gallon cost for their recent Phase 3 modifications. The vast majority of the Phase 3 CBG cost is associated with removing MTBE, adding ethanol and compensating for the accompanying changes in emission performance.

Extrapolating these costs to the rest of the country is difficult absent detailed refinery modeling. Numerous factors argue that the costs of extending these specifications throughout the U.S. would be more or less than the Phase 2 CBG costs, possibly as much as the Phase 3 CBG costs. At this time, it appears reasonable to project that the cost of this option would be at least 5 to 15 cents per gallon on average, with both higher and lower costs in specific areas.

4. Impact of Fuel Options on Gasoline Distribution

The assessment of the impact of the fuel options on gasoline distribution is one of the primary foci of the long-term analysis. No accepted models of the gasoline distribution system are available with which to conduct such an assessment. Therefore, by necessity, this assessment must be qualitative in nature.

In general, gasoline distribution is made simpler by reducing the number of fuels which must be delivered. This is particularly true during disruptions, as the ability to shift fuel short distances to compensate for pipeline or local terminal problems will clearly reduce the severity of any disruption and shorten the length of time it exists. At the same time, the current distribution system has proven that it can deliver a number of distinct fuels consistently. Therefore, the goal is not necessarily to reduce the number of gasolines to a single fuel, but to assess the relative benefits of one, versus two, versus three fuels, to see which may provide important benefits, particularly in those areas which have experienced price spikes in the recent past. As discussed above, the current distribution system appears to work reasonably when both refineries and pipelines are fully operational. As price spikes typically occur today when a refinery or pipeline is shutdown unexpectedly, the primary focus of this assessment will be the ability of the distribution system to deliver fuel during upsets.

Overall, the 2-fuel and 3-fuel cases with the RFG oxygen mandate would have generally positive impacts on distribution. A renewable fuel mandate with these options would generally simplify distribution by not requiring ethanol to be transported and used in areas that have not used ethanol in the past. It should also be noted that two types of RFG might be sold in some RFG areas, one with ethanol and one without. However, this should be within the capability of the distribution system and would only occur to the extent economics warrant it. Production and distribution along these lines occurs today. The removal of the oxygen mandate from the RFG requirements would also help to reduce the need for future state boutique fuel programs since states would no longer have the incentive to develop their own non-oxygenated fuel programs. It is recognized that under the 3-fuel option, a number of 7.8 RVP areas requiring a low RVP blendstock for ethanol blending could increase. However, substantial amounts of 9 RVP would likely be available for splash blending, so there may be little incentive to blend ethanol into 7.8 RVP gasoline, except in the Midwest. Also, a special low RVP blendstock to meet the 7.8 RVP limit can also be low in octane, reducing the cost. Thus, a low RVP blendstock might be the dominant or sole fuel supplied to 7.8 RVP areas in the Midwest, for example. Thus, the added complexity is not expected to be a significant problem. Adding a benzene standard would not affect distribution.

The two single fuel options would clearly simplify gasoline distribution. However, it is still likely that two types of CBG (one with ethanol and one without) would be distributed to some areas.

Table IV-8 presents the number of distinct environmental fuel programs and fuel grades under the various options. A more detailed listing is presented in Appendix D. As this discussion highlights, the actual degree of simplification to the distribution system brought about by the various options will vary by geographical area. As Table IV-8 indicates, on a nationwide basis, these options can significantly reduce the number of fuel types and grades. This can be of significant benefit to refiners, pipelines, and terminals that are currently producing and shipping many of these different fuel types. However, most areas of the country only have a subset of these fuels today, so the impact of the options on the refiners, pipelines, and terminals serving individual areas will differ. An analysis which looks at impacts on the distribution system for different regions of the country was not possible in the timeframe of this report, but will be important in future study of the boutique fuels issue. Such an analysis, will not be simple, however. It will require detailed information of which fuels are currently being produced and distributed by essentially all producers and distributers serving different regions. Furthermore, since future decisions of which fuels to produce and distribute will be made by many different independent entities on the basis of many different factors, projections for the future for the various options will always be somewhat tenuous.

Table IV-8: Impact of Fuel Options on the Number of Fuels in Distributed Nationwide in the Summer

Option	RFG Oxygen Mandate	2.4 Percent Renewable Requirement	No. of Fuel Programs including California	No. of Fuel Grades in U.S.*
2000 Base Case	Yes	No	12	15
2006 Reference Case	Yes	No	15	17
3 Fuel	Yes	No	8	11
	No	Yes	8	12
2 Fuel	Yes	No	6	8
	No	Yes	6	9
Federal CBG	No	Yes	4	6
CA CBG	No	Yes	3	3

* The actual number of fuel grades which are distributed would likely be twice the numbers shown (a regular, premium, and sometimes a midgrade of each fuel). This also assumes ethanol is blended at terminals and the need to segregate blendstocks for ethanol blending, except in 9 RVP areas.

The following sections describe the distribution impacts of the various options in more detail. Comments are requested on all the projected distribution impacts presented below.

a. 3-Fuel Option

Overall, the net impact on fuel distribution of the 3-fuel case with the RFG oxygen mandate is small and generally positive. A few pockets of 7.0, 7.2 and 8.0 psi RVP fuel would be replaced by RFG, which should ease distribution for these areas both during normal and disrupted operations. While none of the areas which would switch to RFG have experienced unusual market volatility recently, switching to a more common fuel would reduce the potential for problems in the future. This case would also remove the possibility that new areas would adopt unique fuel programs below 7.8 psi RVP. There would be some simplification of local distribution in the St. Louis area which currently has two different fuel specifications (RFG in Missouri and 7.2 psi RVP in Illinois) and provide it with the same fuel specification as other areas such as Kansas City and Chicago.

In general, the fact that the 7.0, 7.2 and 8.0 psi RVP areas are receiving a more common fuel will not likely help in the case of a supply shortage in another RFG or 7.8 psi RVP area. The primary exception could be the use of RFG in Atlanta and Birmingham. This would increase RFG supplies moved on the Colonial and Plantation pipelines and make it easier to mitigate a potential shortfall further north in Washington, D.C. Similarly, there would be more refiners producing southern RFG, making it easier to compensate for the shutdown of a refinery making this fuel.

Replacing the RFG oxygen mandate with a renewable mandate generally simplifies distribution by not forcing the use of ethanol in areas that historically do not use it. However, while not required, some ethanol could still be used in CBG in states on the coasts that have limited the use of MTBE. This would mean that two CBGs would be distributed to these areas, one with ethanol and one without, since the two cannot be mixed without hurting their VOC emission performance. Two RFGs are provided today in St. Louis and areas of Kentucky with no apparent difficulty. RFG areas today, particularly those on the two coasts, are quite large and populous and are served by numerous terminals. They are also served by large pipelines or have refineries nearby. If it was difficult to distribute two CBGs to a particular area, the refiners supplying fuel to that area could decide which one to provide, avoiding the cost of distributing two distinct types of CBG. Therefore, while an additional complication, the distribution of two CBGs in these areas is probably within the capability of the system to handle, particularly given the overall reduction in the number of different fuel grades under this case (see Table IV-8). Comments are requested on this issue.

We have analyzed this option assuming that there would not be a 1 psi RVP waiver for ethanol blends in 7.8 RVP areas. This may directionally increase the number of grades of gasoline needing to be distributed to the Midwestern 7.8 psi RVP areas. As discussed in Appendix B, some areas currently allow a 1.0 psi waiver for their 7.8 psi gasoline, and others do not. Areas with a waiver need only receive one gasoline which can be used with and without ethanol. Areas without a waiver either have two blendstocks or do not utilize ethanol. Without the waiver under this option, a low-RVP blendstock would be needed to utilize ethanol in any of the 7.8 psi RVP areas. The number of areas receiving two types of 7.8 psi RVP fuel would be determined by economics, as would be the case for RFG. One advantage of a low-RVP blendstock is that it can also be low in octane, reducing refining costs. Today, much of the gasoline shipped to Minnesota is sub-octane material, since all gasoline there must contain ethanol. Given the large amount of 9 psi RVP gasoline sold under this option, and the relatively low number of 7.8 psi RVP areas in the Midwest, the issue of a low-RVP and octane blendstock in 7.8 psi RVP areas should not have a major impact on distribution.

Adding a benzene standard to either 3-fuel case (or the 2-fuel cases) should not affect distribution, since compliance with this standard would be determined at the refinery gate and would not affect the fungibility of fuels in the distribution system.

b. 2-Fuel Option

The primary difference between the 3-fuel and 2-fuel options are the shift of 7.8 psi RVP areas to Federal RFG or CBG. With the retention of the RFG oxygen mandate, gasoline distribution is simplified for both 7.8 psi RVP and RFG areas, as these areas can now receive common gasoline. Terminals and pipelines which now deliver boutique fuels in addition to conventional gasoline and RFG can now simplify to two fuels. As a result, instead of increasing the amount of tankage necessary for gasoline, it may be possible to consolidate and reduce the number of different storage tanks needed to distribute gasoline. Perhaps more importantly, most of the current 7.8 psi RVP areas are in isolated pockets. While this means that RFG must now be delivered to these pockets, overall the RFG pockets are now closer to each other making it much easier to bring in alternate fuel supplies from other areas and other producers in the event of supply disruptions. This change may have only a marginal benefit in areas such as Detroit and Pittsburgh which are at the end of pipelines, but even here it should directionally help since sizeable amounts of RFG should be available in nearby areas (e.g., Kentucky and Chicago).

Replacing the RFG oxygen mandate with a renewable mandate would generally simplify distribution. Due to the larger number of CBG areas, it is more likely that many of the CBG areas would receive just one type of CBG (either with ethanol or without it). If supply and distribution economics were such that it was economic to ship both fuels to the same area, then they could be. No area would be required to receive both types of CBG, however. In the case of a disruption, either fuel could be used, giving CBG areas a wider source of supply.

c. Single Fuel Options: Federal CBG or California CBG

The two single fuel options would clearly simplify gasoline distribution. Nevertheless, it is still likely that three types of CBG (one with ethanol, one with MTBE and one without either oxygenate) would be distributed to some areas. Areas not allowing MTBE to be used would receive CBG with ethanol or neither oxygenate. Areas allowing MTBE to be used would receive CBG with ethanol or a combination of CBG with MTBE or neither oxygenate. The latter two types of CBG are fungible. Thus, many areas would likely receive two of the three fuels, as opposed to one, based on economic optimization and not on inflexible requirements. The largest impact of these options would be the removal of all the fuel "islands" that result from the boutique fuel requirements. Not only would the reduction in the number of fuel types simplify distribution dramatically, but the lack of distinct fuel islands would also address the gasoline marketers' competitive concerns with boutique fuels.

5. Impact of Fuel Options on Air Quality

We used a variety of emission models to project the emission impacts of the various fuel options on VOC, NOx and toxics emissions. The draft MOBILE6 motor vehicle emission model (MOBILE6) was used to estimate in-use emissions from vehicles in 2006 when operating on 9 RVP, 30 ppm sulfur conventional gasoline. It was also used to estimate the effect of gasoline RVP on evaporative VOC emissions. The average of several recently developed exhaust VOC and NOx emissions models were used to estimate the impact of the various fuel options on these emissions. These models were developed in support of the recent EPA evaluation of California's request for a waiver of the RFG oxygen mandate. A detailed explanation of the methodology and results of the emission inventory impact analysis is contained in a technical memorandum in the docket.[17]

A number of potentially relevant factors were not included in this emission analysis. These factors include the effect of potential commingling of ethanol and non-ethanol containing fuels in RFG, CBG and 7.8 RVP areas. Except for those cases where oxygen is required in RFG, it is difficult to predict the relative fractions of fuels which will and will not contain ethanol in the various local areas. This analysis also does not factor in the CO emission reductions, nor increased VOC permeation emissions which can accompany ethanol blends. The auto industry has raised concerns about the effect of increased distillation temperatures on exhaust emissions, particularly from late model vehicles. Except to utilize the latest emission models for exhaust VOC and NOx emissions, this analysis does not address the issues raised by the automakers.

The concern that has been raised among automobile manufacturers is that the various program options in this report might increase the use of low RVP fuels. According to analyses that were presented in their 1999 petition[18], low RVP fuels can be correlated with higher distillation index (DI) which can lead to higher emissions of exhaust hydrocarbons.

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17 "Emission inventory impact analysis of long-term fuel control options to address boutique fuels," Memorandum from Richard A. Rykowski to the Record, October, 2001.

18 "Petition to Regulate Gasoline Distillation Properties," submitted to the U.S. EPA by DaimlerChrysler Corporation, Ford Motor Company, General Motors Corporation, and the Association of International Automobile Manufacturers, January 27, 1999.

Of the four program options presented in this report, only one - the Three Fuels Option - would permit states to choose a 7.8 psi CG program. Other low RVP programs for CG were not considered as part of the program options evaluated in this report. In addition, the choice of a 7.8 psi CG program under the Three Fuels Option is no different than the option that states have today. In fact, since most low RVP programs under all options are being consolidated under federal RFG or CBG, there are some cases in which the number of low RVP programs could actually decrease. However, this may not always be true for cases with federal CBG since it is a low-RVP fuel without any required oxygenate content.

The impact that low RVP fuels may have on DI and, thus, on exhaust emissions is one that we did not evaluate directly in the context of this report other than to use the latest emission models to evaluate exhaust VOC and NOx emissions. Although the quantification of the emission impacts of higher DI remains a matter of some debate, we believe that the issue of low RVP impacts on DI and the subsequent impact of DI on emissions warrants further investigation. We welcome comment on the degree to which the program options presented in this report could increase the use of low RVP fuels, as well as on the relationship between DI and exhaust emissions.

Finally, some stakeholders have raised concerns that removing MTBE from gasoline (or eliminating the RFG oxygen mandate) would increase ambient PM levels. Their rationale is that oxygen in gasoline reduces direct emissions of PM. Oxygenate use also reduces aromatic levels in gasoline, which in turn reduces emissions of aromatics. Aromatics have been shown to be a significant source of atmospherically produced PM emissions. Some data exist which does indicate that oxygen in gasoline reduces PM emissions. However, the vehicles tested had very low levels of PM emissions. If PM emissions from gasoline vehicles are a significant part of the PM emission inventory, it is the high PM emitting vehicle that is the problem, not the low emitting vehicle. The effect of oxygen on PM emissions from high emitting vehicles has not been demonstrated. Also, it is questionable whether removing oxygen from RFG would result in higher levels of aromatics. Certainly, from a purely economic point of view, aromatics are among the least expensive sources of higher octane levels in gasoline. However, the existence of the RFG toxics performance standards and the MSAT standards appear to limit, if not practically eliminate any significant increase in aromatic levels of RFG. Thus, the effect of MTBE and oxygenate use may not be a significant factor in the level of atmospherically formed PM. We request comment on these PM-related issues, as well as the other emissions effects which could not be addressed in this study.

The VOC and NOx emission benefits of the current mix of fuels and the various fuel options relative to a 9 psi RVP, 30 ppm sulfur conventional gasoline are shown in Table IV-9. The emission factors used to project these annual emission reductions represent summer conditions (i.e., RVP controlled). Summertime emission reductions were assumed to occur year-round, in order to be comparable to other VOC and NOx control programs, most of which are annual. Toxic emission reductions also occur, though these have not been quantified for this analysis.

Table IV-9 VOC and NOx Emission Reductions in Federal RFG and Low RVP Fuel Areas in 2006 Relative to 9 RVP, 30 ppm Sulfur Conventional Gasoline (tons/year)

Option	RFG Oxygen Mandate	Renewable Requirements	VOC	NOx
2006 Reference Case		No	287,000	6,800
3-Fuel	Yes	No	291,000	6,800
	No	Yes	291,000	6,800
2-Fuel	Yes	No	349,000	6,800
	No	Yes	349,000	6,800
Federal CBG	No	Yes	349,000	6,800
California CBG	No	Yes	339,000	53,000

As indicated in Table IV-9, the current mix of Federal and state fuel programs by 2006 will be reducing VOC emissions by about 287,000 tons per year, annualized. The fuel options all provide greater VOC emission reductions and fall into two categories. The first category includes the 3-fuel option. This option provides a small VOC emission reduction (about 4,000 tons per year) due to the use of Federal RFG or CBG in areas now receiving 7.0 and 7.2 RVP fuel. This change affects only 4 percent of non-California fuel consumption.

The second category includes the 2-fuel option and the two single fuel options. These options provide the VOC emission reductions obtained by the 3-fuel option, plus those from converting current 7.8 RVP areas to Federal RFG or CBG. This change affects an additional 15 percent of non-California gasoline and the RVP reduction is larger. Thus, the incremental VOC emission reductions are much greater. Not reflected in Table IV-9 are the emission reductions that occur with the single-fuel options in areas currently receiving conventional gasoline. Were all nationwide emission benefits to be reflected, these options would obviously result in far greater emission reductions than the 2-fuel option.

The presence of the RFG oxygen mandate or a renewable fuel mandate does not affect VOC emissions in clean fuel areas in this analysis. All the clean fuels in these areas must meet the same VOC or RVP standards with or without ethanol. As discussed above, certain unique impacts on emissions of ethanol blending were not analyzed here. Due to the RVP waiver for ethanol in conventional gasoline, however, as the amount of ethanol blending increases or decreases in the various options in conventional gasoline, its impact on emissions in these regions will also increase or decrease. Emission changes in conventional gasoline areas were not the focus of this analysis, however, as they tend to primarily be ozone attainment areas.

The current mix of Federal and state fuel programs will be reducing NOx emissions by about 7,000 tons per year, annualized, in 2006. None of the fuel options provide greater NOx emission reductions, except for the California CBG option. This is because all of the areas included in this emission analysis all will be receiving fuel with 30 ppm sulfur and at most 7.8 RVP. The California CBG option would reduce NOx emissions by an additional 53,000 tons per year.

As mentioned above, toxics emissions have not been quantified in this analysis. However, based on EPA's RFG compliance model (the Complex Model), a 0.95 volume percent benzene standard would reduce the benzene content of exhaust and evaporative VOC emissions by 2 and 14 percent, respectively. These reductions would apply to the areas receiving conventional gasoline under these fuel options.

6. Overall Impact of Fuel Options on Gasoline Supply and Market Volatility

The assessment of the impact of the fuel options on the system's ability to consistently supply gasoline under normal conditions and to respond to disruptions depends on all of the factors discussed above. As no models exist with which to combine the various factors into a single assessment, the approach taken here is to simply point out the key impacts of and differences between the fuel options which are likely to affect gasoline supply and market volatility. As some of the impacts of the options are felt more on a regional or local basis (e.g., emission benefits and local distribution impacts), whereas others may have more of a nationwide impact (e.g., production capacity), it is particularly difficult to combine the various factors.

Reducing the number of fuels also simplifies gasoline production and supply. Many of the more environmentally stringent fuels require capital investment to produce. If a refinery producing one of these fuels shuts down unexpectedly, only certain refineries can respond by increasing capacity. The fewer the number of fuels which must be produced, the greater the number of refineries producing each fuel and the greater the number which can respond to a shortfall.

Similarly, the more environmentally stringent fuel options (the two single fuel options) reduce the gasoline production capacity of existing refineries. In the long run, we expect that refiners would invest in additional production capacity or imports would compensate. In the short term, however, reduced production capacity could at least increase the potential for tight supplies and market volatility.

Finally, due to the fact that domestic refineries are currently operating near maximum capacity, we expect that gasoline prices under each option will at least reflect the long-term costs associated with that option or case. While this aspect does not directly relate to market volatility, it is relevant to long term prices. For the 2-fuel and 3-fuel options, these long-term costs are low and can generally be ignored for the purpose of assessing gasoline supply and market volatility in the context of this study. The costs of either nationwide Federal or California CBG are much greater and by themselves represent a significant increase (e.g., 4 to 15 cents per gallon) in the long-term price of gasoline.

a. 3-Fuel Option

Under the 3-fuel case with the RFG oxygen mandate retained, we project a small improvement in gasoline supply and market volatility. This is primarily because the volume of fuel affected would be less than 5 percent of national supply. As discussed previously, there should be a very slight overall increase in gasoline production capacity. Much of this increase in supply will originate in the Midwest. However, it will be ethanol destined for use on the East Coast. Thus, there should be little impact in the Midwest where supply is currently tight.

In the local areas where 7.0 or 7.2 psi RVP areas would switch to RFG, they should be able to obtain alternate supplies of their new fuel just as easily as their previous fuel, if not more easily. There would be some simplification of local distribution in the St. Louis and Louisville areas which currently have two different fuel specifications (RFG on one side of the river and low RVP fuel on the other side) and provide it with the same RFG specification as other areas such as Kansas City and Chicago.

Finally, the fact that these areas are receiving a more common fuel will likely have a small, positive impact in the case of a supply shortage in another RFG or current 7.8 psi RVP area. The only exception could be the use of RFG in Atlanta and Birmingham. This would increase RFG supplies moved on the Colonial and Plantation pipelines and make it easier to mitigate a potential shortfall further north in Washington, D.C. Similarly, there would be more refiners producing southern RFG, making it easier to compensate for the shutdown of a refinery making this fuel. Overall, these effects are expected to be quite minor, however.

As mentioned above, the primary concern with this case is that the continuation of the RFG oxygen mandate would discourage states from opting into RFG. If so, this case reverts back to the status quo, or the 2006 reference case.

The presence or absence of a benzene standard under the 3-fuel option would not have a significant impact gasoline supply and market volatility. As mentioned above, the benzene standard should not affect gasoline distribution, nor production. Being an annual average standard, even unexpected problems with refinery equipment should not impact fuel production in the short run.

Exchanging the oxygen mandate for a renewable mandate under the 3-fuel option, as described earlier, is expected to generally simplify gasoline distribution, even though it would result in both oxygenated and non-oxygenated RFG in the system. Overall, the effect on the distribution system appears to be slightly positive.

Total gasoline production capacity increases slightly under this case. Also, the production of a combination of oxygen-free RFG and sub-RVP RBOB (approx. 5.5 psi) for the Northeast should be easier than the production of just sub-RVP RBOB. Thus, there could be more refiners in a position to mitigate shortages.

The greatest advantage of the renewable fuel mandate is its encouragement to states to opt into the Federal CBG program in lieu of their own state programs. Thus, overall, this case appears to be slightly more advantageous relative to the 3-fuel case with the RFG oxygen mandate.

b. 2-Fuel Option

The primary difference between the 3-fuel cases and the analogous 2-fuel cases would be the shift of 7.8 psi RVP areas to Federal RFG or CBG. This reduces VOC emissions in these areas. With the retention of the RFG oxygen mandate, gasoline distribution is simplified for both 7.8 psi RVP and RFG areas and overall gasoline production capacity increases slightly. However, the cost of expanding RFG production would likely be passed on to 7.8 psi RVP areas (and existing RFG areas, since the overall cost of RFG is likely to increase as its volume is expanded). The long term, nationwide average cost would be higher than those of the 3-fuel option. Overall, the benefits of this case are quite close to those of the 3-fuel case with a renewable fuel mandate, but probably less. Again, there is the strong possibility that states would continue to design their own fuel programs with a continuation of the RFG oxygen mandate.

As under the 3-fuel option, exchanging the oxygen mandate for a renewable mandate under the 2-fuel option would generally simplify gasoline distribution. It should not affect overall gasoline production capacity, but would likely lower long-term costs slightly. Again, it would encourage states to opt into the Federal CBG program in lieu of their own state programs Overall, the benefits of this case are quite close to those of the 3-fuel case with a renewable fuel mandate and somewhat higher than the 2-fuel case with the RFG oxygen mandate.

c. Federal CBG Option

The Federal CBG option results in slightly more total fuels being distributed nationwide than the California CBG option. However, practically, it would achieve essentially the same distribution-related benefits as the California CBG option, since California's distribution system is fairly isolated from that for the rest of the U.S. All domestic refineries outside of California producing gasoline would produce this fuel. Thus, this option would again provide essentially the same flexibility for increased refining and distribution during a disruption. While this option would not provide any additional NOx emission reductions in areas now receiving Federal RFG or a boutique fuel, it would provide as much VOC emission reduction as any other option. This option also raises less concerns with respect to cost and gasoline production capacity than the California CBG option. However, the Federal CBG option could increase production costs by as much as the current cost of producing Federal RFG (4 to 7 cents per gallon) despite the absence of the oxygen mandate. With a renewable requirement estimated at 2.4 percent of nationwide gasoline consumption, gasoline production capacity would be reduced by 3 to 6 percent. The decrease in production capacity and uniqueness of this fuel on the global market would be likely to increase market volatility on a regional or national basis. However, the ease in distribution associated with this option should reduce local market volatility.

d. California CBG Option

The California CBG option achieves the greatest reduction in the number of fuels which have to be distributed nationally, and thus, provides the greatest degree of simplification to fuel distribution. All domestic refineries producing gasoline would produce this fuel and could potentially increase supply if another refinery experiences an unexpected shutdown. Fuel could also be moved from anywhere in the U.S. to counter a local shortfall due to a disruption in the distribution system. All islands of unique fuel grades would be eliminated, avoiding local competitive concerns by gasoline marketers. This option is also the only option which would provide additional NOx emission reductions in areas now receiving Federal RFG or a boutique fuel and as much VOC emission reduction as any other option. However, this option also raises the greatest concern with respect to cost and gasoline production capacity. The California CBG option is estimated to increase production costs by at least 5 to 15 cents per gallon and reduce gasoline production capacity of current refineries by 10 to 13 percent.

The ease in distribution should reduce local market volatility. However, the decrease in production capacity and uniqueness of this fuel on the global market would be likely to increase market volatility on a regional or national basis. Thus, the overall impact of this option appear to be more significant and negative.

E. Effect if the RFG Oxygen Mandate Were Not Replaced with a Renewable Requirement

The options evaluated in section IV.D. only considered the potential for the RFG oxygen mandate to remain in place, or if removed, to be replaced with a nationwide renewable requirement. The rationale for this is discussed above under IV.C.2. At the same time, a number of stakeholders suggested that one simple solution to address many of the boutique fuel concerns would be to simply remove the RFG oxygen mandate. Thus, while we have not conducted a technical analysis of this scenario, a qualitative analysis follows.

By far the most significant change from the description of the options above would be that the increase in ethanol production capacity and use associated with either the Federal RFG oxygen mandate or a renewable fuel mandate would not be certain. We believe that ethanol production capacity and use would still increase over today's levels even in the absence of either the Federal RFG oxygen mandate or a renewable fuel mandate. However, the level of this increase would likely be less than that if the Federal RFG oxygen mandate continued. Without a much more thorough analysis, it is not possible to accurately project the absolute level of this increase. Impacts on cost, distribution, and air quality change to a much lesser degree.

1. Impact on Production Capacity

Were the RFG oxygen mandate to simply be removed with no nationwide renewable requirement to replace it, the most dramatic impact would be on the amount of ethanol blended nationwide. The level of this impact depends on the timing of this decision vis-a-vis the state MTBE bans. The state MTBE bans (at least in those states with significant consumption of MTBE blended gasoline) are scheduled to occur between January 1, 2003 and January 1, 2004. Should the removal of the RFG oxygen mandate occur well after this, the increased ethanol capacity associated with the state MTBE bans would already have been constructed to comply with the RFG oxygen mandate and gasoline production capacity without either the RFG oxygen or renewable fuel mandates would be very similar to that without the RFG oxygen mandate, but with the renewable fuel mandate.

However, if the decision to remove the RFG oxygen mandate occurred soon and was effective by January 1, 2003, then it is more difficult to project the volume of ethanol which would be blended into gasoline. Ethanol use (and, thus, production capacity) is still likely to increase relative to today's levels, but is likely to be less than that with the RFG oxygen mandate. For example, refining analyses performed for EPA in assessing California's request for a waiver of the RFG oxygen mandate showed that California refiners were still likely to use ethanol in the majority of their fuel even in the absence of a mandate. Ethanol use in Federal RFG in the absence of an oxygen mandate is likely to be less than in California, due the less restrictive nature of the Federal RFG performance requirements. However, it is still likely to be substantial. Without a specific mandate, either in the form of an RFG oxygen mandate or a renewable fuel mandate, it is difficult to accurately predict the amount of new ethanol production capacity without much further study. Ethanol would compete with other "clean", high octane blendstocks for use in RFG. Ethanol's use in conventional gasoline could also increase if other "clean" high octane blendstocks, such as alkylate, were shifted from conventional gasoline to RFG to facilitate compliance with RFG toxics and MSAT performance standards. However, as the cost of new ethanol production capacity is significant and its level uncertain, it is not appropriate to include this potential new capacity under the definition of gasoline production capacity which we are using in this study.

Of the two options described above regarding the timing of a decision to remove the RFG oxygen mandate, it appears more reasonable to assume that this decision would occur prior to the implementation of the MTBE bans. Otherwise, the new ethanol plants built to meet the RFG oxygen mandate in states banning MTBE would be put in some degree of economic jeopardy.

Thus, presuming that a decision to remove the RFG oxygen mandate occurred prior to the state MTBE bans, it is appropriate under the premises of this study to exclude any new ethanol capacity from our estimation of gasoline production capacity. This would reduce gasoline production capacity by about 0.6 percent, relative to those cases which presume the RFG oxygen mandate.

Other important impacts of removing the oxygen mandate were already reflected in the cases where it was replaced by a renewable mandate. This includes reductions in MTBE volume, reductions in gasoline hydrocarbon to reduce RVP for increased volume of CBG, and the increase in gasoline hydrocarbon production resulting from no longer having to produce a sub-RVP blendstock for blending ethanol into RFG. As a result, for option cases with no RFG oxygen mandate and no renewable mandate, the relative impacts on production capacity would look very similar to those in Table IV-3 except that ethanol volumes would decrease to year 2000 base case levels. The net result would be an overall decrease in gasoline production capacity compared to the 2006 reference case. With such large reductions in ethanol and MTBE volume, however, a more detailed analysis would be warranted in subsequent work to ensure sufficient gasoline pool octane.

2. Impact on Cost

Not replacing the RFG oxygen mandate with a renewable mandate would impact the costs little in comparison to the options where it was replaced. The main impact would be that demand for ethanol would be unlikely to increase significantly beyond today's levels, causing its cost per gallon to remain unchanged (as opposed to the 15 cent per gallon increase projected in section IV. D.). With the exception of this change in ethanol costs the discussion of the options in section IV.D. would reflect the significant impacts. One important issue, however, would be that between now and 2006 with State MTBE bans taking effect, a considerable increase in ethanol plant investment is expected to take place. With no RFG oxygen mandate and no renewable mandate, these investments may be difficult to recoup.

3. Impact on Distribution

Not replacing the RFG oxygen mandate with a renewable mandate would impact distribution little in comparison to options where it was replaced. Fewer parts of the country would be likely to carry both ethanol blended CG and non-oxygenated CG, but few other changes would result. This could have some important localized impacts, however, it would not change the number of fuel types and grades distributed nationwide.

4. Impact on Air Quality

Not replacing the RFG oxygen mandate with a renewable mandate would not impact the air quality discussion contained in section IV.D. RFG must meet the same emission performance standards regardless of whether they contain oxygenate or not. The RFG performance requirements are the most relevant in this case, as the air quality discussion in this report is focused on impacts in the clean fuel areas. As mentioned in section IV.D., however, there are differences in the emissions between oxygenated and non-oxygenated RFG which are beyond the scope of this analysis. These include CO emissions, permeation emissions from vehicle's fuel systems and evaporative VOC emissions related to commingling. Some stakeholders have also raised the possibility that oxygenates reduce tailpipe PM emissions and reduce ambient PM levels by reducing emissions of aromatic compounds. We request comments on all of these potential air quality impacts should the RFG oxygen mandate be removed in the absence of a renewable fuel mandate.

F. Effect if State MTBE Bans Do Not Take Effect

The analysis in section IV.D. is based on the assumption that State MTBE bans which have been proposed or finalized to date will go into effect. At least one state may be delaying it's ban, but we have no reason at this time to believe that other State bans which have been finalized will not be implemented on schedule. It also appears reasonable to assume that the proposed bans will be finalized and implemented according to their proposed schedules. However, several stakeholders have requested that we evaluate how our analysis would be affected if these state MTBE bans were rescinded and never went into effect. While we have not conducted a detailed analysis of this possibility, a qualitative analysis follows for the situation assuming no MTBE bans take effect.

Were no MTBE bans to go into effect (State or Federal)**,** by far the biggest impact on the analysis in this report is that the primary factor that could change the fuel supply and distribution system between now and 2006 would disappear. Gasoline production capacity in the reference case would look very similar to today's situation and the number of different fuel grades distributed would not have to increase. Consequently, the absence of the state MTBE bans should generally improve gasoline supply and reduce market volatility in the 2006 reference case. The need to segregate MTBE and non-MTBE fuels in the distribution system would be avoided and ethanol use would not be forced into the East and West Coasts.

These benefits occur in the one, two and three fuel options, as well as in the 2006 reference case. Thus, in general the impacts described in section IV.D. of the one, two and three fuel options relative to their reference case would also apply for these options when these bans are not implemented. The main differences would be small additional production capacity and cost benefits in options where the RFG oxygen mandate remains in effect. As a result only these cases are discussed further below in addition to the impact on the reference case.

1. Production Capacity

Should the State MTBE restrictions not take effect, the primary factor for change between now and 2006 would disappear. Gasoline production capacity in the reference case would look very similar to today's situation. The primary factors would become EPA regulations which will be taking effect during this time frame and VMT growth.

The net effect of gasoline and diesel fuel sulfur control should have a negligible impact on gasoline production capacity. Any small gasoline yield loss associated with some gasoline desulfurization technologies would basically be offset by a slight production of naphtha when diesel fuel is desulfurized. Likewise, without the state MTBE bans, and even with fuel consumption growth, the recently promulgated MSAT standards should have no impact on gasoline production capacity, since they do not require any toxics control beyond that already in place in 1998-2000 and the Tier 2 sulfur controls will reduce toxics relative to refiners' historic baselines.

Vehicle miles traveled and gasoline consumption are expected to continue to grow. We also expect that refining capacity creep will continue, as refiners continue to announce and complete expansions of domestic refineries. Over the past few years, this capacity creep has occurred at a slower rate than gasoline consumption. Should this continue in the future, the need for gasoline imports might need to rise slowly to compensate. However, the improved refining margins of the past two years could increase refiners' incentive to increase domestic capacity at a faster rate than has occurred of late. EIA projects that total imports of all refined petroleum products will increase by 280,000 bbl/day between 1998 and 2005 (2% of total consumption). However, this may change given recent economic changes. Also, ethanol production capacity has been increasing the past few years and some project it to grow even more rapidly over the next five years. However, much of this future growth is probably tied to the State MTBE bans due to take effect between now and 2005. Some growth in ethanol production capacity is likely to occur even in the absence of these MTBE bans. However, the level of this growth is likely to be less than that currently anticipated.

As a result, we would project very little change for the 2006 reference case relative to today were MTBE bans not to go into effect. The difference between a the reference case with and without MTBE bans compared to the 2000 base case is shown in Table IV-10.

Table IV-10 Estimated Impact on Gasoline Production Capacity of State MTBE Bans in 2006 Relative to the 2000 Base Case

Option	RFG Oxygen Mandate	2.4% Renewable Requirement	% Volume Change (Positive number indicates increase)*			
			Ethanol	MTBE	Hydro-carbons	Total
2006 Reference Case with State MTBE Bans	Yes	No	0.6	-1.7	1.2	0.1
2006 Reference Case with No MTBE Bans	Yes	No	0	0	0	0

* Expressed as a percentage change in the volume of the entire gasoline pool.

While the main impact of removing the MTBE bans is on the 2006 reference case, there are some additional changes that occur for the options as well when the RFG oxygen mandate remains in place. These changes have to do with the ability to meet the increased RFG volume needs of the the options with MTBE instead of ethanol. Since the 3-fuel option impacts such a small percentage of the gasoline pool, these impacts would be insignificant. However, the ability to blend MTBE and at the same time avoid the need to produce a sub-RVP blendstock for ethanol blending in RFG will directionally help overall production capacity. Refiners will no longer have to back out as much butane and pentane as assumed in the analysis in section IV.D. This benefit in comparison to the analysis in section IV. D. would be noticeable under the 2-fuel option.

2. Impact on Cost

Without the state MTBE bans and with a continuation of the RFG oxygen mandate, the cost of both the 2-fuel and 3-fuel options with the RFG oxygen mandate in place could be slightly lower than those described in section IV.D. The reason for this is that refiners would be able to choose between MTBE and ethanol in producing the new RFG volume. RVP control costs for increased RFG production volume would decline due to the fact that sub-RVP blendstocks for blending ethanol into RFG are no longer required. Added distribution costs associated with moving ethanol to other RFG markets could also be avoided by blending incremental RFG with MTBE.

3. Impact on Distribution

The absence of the state MTBE bans reduces the number of fuel types in the 2006 reference case slightly, as conventional gasoline without MTBE is not a distinct fuel which must be kept segregated from conventional gasoline with MTBE. It would also reduce the need to transport ethanol long distances to the East and West Coasts. These relative impacts remain for both the 3-fuel and 2-fuel options with the RFG oxygen mandate in place. Thus, the effect of the state MTBE bans not being implemented eases distribution to about the same degree in the reference case and the 2-fuel and 3-fuel options. Thus, the impacts of the 3-fuel and 2-fuel options relative to the reference case would be basically the same with or without the state MTBE bans.

4. Impact on Emissions

We generally project the same emission impacts of the various fuel options with or without the state MTBE bans. This is not to say that emissions do not differ between MTBE, ethanol and non-oxygenated blends. It simply means that the emission effects between these blends in the context of applicable state and Federal regulations do not reveal themselves at the level of detail applicable to this analysis. As mentioned earlier, CO emission effects have not been addressed here. Ethanol blends with 3.5 weight percent oxygen reduce CO emissions more than MTBE blends at 2 percent oxygen. Likewise, MTBE blends reduce CO emissions relative to non-oxygenated fuels. The commingling of ethanol and non-ethanol blends can cause in-use RVP levels to increase, and ethanol can increase permeation rates through elastomeric fuel system components. Finally, there are the potential differences between oxygenated and non-oxygenated fuels regarding PM emissions and atmospherically formed PM. A more detailed analysis of the emission effects would be needed to quantify these emission effects under the various fuel options.

G. Additional analyses

This study is in essence a "proof of concept" in response to the directive from the President's National Energy Policy Report, concluding that there may be other fuel program approaches that could maintain or even improve air quality while at the same time improving fuel fungibility. It is the first step in a process that will necessarily require a great deal of additional analysis and study to determine the appropriate actions to pursue to address the directive in the National Energy Policy Report. Nevertheless, it represents an important first step in this process to facilitate the gathering of public comment and help guide the actions that will follow to address the boutique fuel concerns.

To support the conclusions in this report we met with many stakeholders and performed a preliminary analysis of the air quality, fuel distribution system, production capacity, and cost impacts of various options that could replace the current patchwork of fuel programs across the country. The options and analysis in this draft study and the public comments received on it can serve as a springboard to guide additional evaluation of the boutique fuels problem and potential regulatory or legislative initiatives. As these initiatives unfold, more rigorous and detailed analysis would have to be conducted to support them. Some of this additional analysis may be needed early on in the decision making processes. Other aspects would need to be conducted in support of subsequent implementing regulations. Example of such additional analysis include:

- More detailed study of the current limitations in the fuel production and distribution systems, particularly as they relate to supplying unique fuels to individual areas
- The study of additional limitations expected in the future as current programs such as State MTBE bans take effect
- Refinement of the future options to carry forward for further consideration, including options developed from public comment
- Evaluation of the appropriate timing for implementation of any such options
- More detailed evaluation of the impact of options on fuel production capacity and cost (both domestic and imports)
- A study of the impact among different fuel suppliers (size, region, etc.)
- A more detailed analysis of air quality impact of future options and their environmental need
- A more detailed analysis on the impact of future options on the distribution system nationally and regionally

While a great deal of detailed analysis and study remains to be done prior to decisions on appropriate actions to address boutique fuels, this draft report's bottom line conclusions are not likely to change:

- Today's boutique fuels constrain distribution mainly during times of disruption.
- There are a number of factors that contribute to the proliferation of boutique fuels.
- In the future with State MTBE bans and a potential need for clean fuels in more locations the system is likely to be further constrained.
- Fewer fuel types will improve fungibility.
- There are options that could reduce the number of fuel types and improve fungibility while maintaining or improving air quality.
- It may be possible to do this without impacting State authority if they have the incentive to choose from a limited menu of environmental fuels.

APPENDICES

APPENDIX A-1: OVERVIEW OF STAKEHOLDER MEETINGS

A. Overview of Stakeholder Outreach

The President's National Energy Policy Report directs EPA to study opportunities to maintain or improve the environmental benefits of state and local "boutique" clean fuel programs while exploring ways to increase the flexibility of the fuels distribution infrastructure, improve fungibility, and provide added gasoline market liquidity. As a first step, EPA staff held meetings and discussions with numerous stakeholder groups to ascertain what perceived problems may be associated with boutique blends. Attendance lists of the stakeholder meetings are on file in Docket A-2001-20, Section II.E. During the course of those meetings stakeholders shared their perspectives on a range of issues from definition of boutique fuels, any problems they have seen with boutique fuels, and potential solutions or methods to mitigate stated problems. The feedback we heard is reflected throughout the body of the report. Below is a summary of what we heard in the various meetings. Appendix A-2 contains a more extensive discussion and evaluation, based on the stakeholder feedback, of the problems boutique fuels cause in the refining, distribution, and retail systems.

The stakeholders we met with were:

1. Refiners (API/NPRA, Chevron, Citgo, Marathon, Exxon, BP, Phillips, Equillon/Equiva)
2. Oxygenate Producers (National Corn Growers Assoc., Renewable Fuels Association., Clean Fuels Development Coalition, Nebraska Ethanol Board, Lyondell/Equistar, Lyondell Chemical, Oxygenated Fuel Assoc., Tier Associates)
3. Pipeline and Terminals (Colonial, Williams, Buckeye, Plantation, Independent Liquid Terminals Assoc.)
4. Marketers and Retailers (Petroleum Marketers Assoc., Sigma, National Assoc of Convenience Stores, Service Station Dealers of America)
5. States (STAPPA, NESCAUM, Arizona, Maine, New Hampshire, Pennsylvania, Georgia, Alabama, Illinois, Indiana, Texas, Kansas, Missouri)
6. Environmental Organizations (American Lung Association, Natural Resources Defense Council)
7. Automakers (Association of International Automobile Manufacturers, Alliance of Automobile Manufacturers)
8. American Trucking Association

B. Stakeholder Definitions of Boutique Fuels

Many different definitions of the term "boutique fuels" were put forward during the discussions with the various stakeholders. In large part people's definitions appeared to be driven by the particular concerns they were having in their place of business. The list below reflects the cross-section of what we heard from the various stakeholders.

- Anything other than 9.0 psi RVP conventional gasoline as a result of either Federal or State actions
- Not just environmental - some others boutiques as well such as different State octane minimums
- Something other than conventional, RFG, or CARB CBG
- Anything but 9.0 psi conventional gasoline
- Atlanta/Birmingham gasoline
- Chicago gasoline
- Boutique is what a State requires
- Something that does not have widespread distribution and serves specialty markets; not RFG
- Specialized small volume fuels or large volumes for small markets; RFG is not really a boutique concern as originally conceived
- Something that departs from Federal or California specifications for RFG and conventional gasoline
- Any fuel when a State is acting differently from Part 80
- Fuels for unique markets; small islands, including RFG in St Louis or Louisville
- Anytime there are islands with unique fuel requirements

C. Stakeholder Identified Motivations for Boutique Fuels

Stakeholders identified a large number of motivations for the creation of boutique fuels as shown below. The main recurring theme throughout these comments appears to be the need for air quality improvements, the ability to get substantial improvements through gasoline modifications, and the desire to do so at the least cost, which in most cases has meant avoiding the oxygen mandate of the RFG program. More recently, avoiding the groundwater contamination concerns of MTBE is also serving as a motivation.

Stakeholder 1:

- States avoiding the higher cost of RFG caused by oxygenate, benzene, and toxics requirements
- States avoiding RFG due to MTBE concerns
- States putting the cost and burden of environmental controls on businesses outside their States
- Refiners pushing the States to adopt boutique fuels often to avoid the costs (oxygenate, benzene, and toxics requirements) of RFG

- Whenever an industry member has a large part of a particular market, it is always in their best interest to have a unique fuel specified

Stakeholder 2:

- Refiners supporting States desires for boutique fuels as long as they could produce it and distribute it
- State needed NOx reductions and got it sooner with only a summertime program than they could have otherwise

Stakeholder 3:

- Environmental need is the primary motivation for boutique fuels; States looking for summertime VOC/NOx controls for SIPs at the lowest cost; the lowest cost option is summertime only and with no oxygen mandate
- Reluctance by the States to pursue other emission control options than the “low hurdle” of fuel controls
- Refiners working with States to create boutiques in lieu of RFG

Stakeholder 4:

- RVP controls are effective at reducing emissions
- Fuel Changes are easy; EPA approves them too easily
- Complex model gives States the tool to quantify the benefits
- Avoid the oxygenate and toxics requirements of the RFG program
- Avoid MTBE
- Avoid ethanol blending in RFG
- In short, avoid all the problems of the RFG program but attempt to achieve the same emission benefits

Stakeholder 5:

- Refiners working with States to get them fuels that meet their air quality needs at the least cost
- Refiner opposition to the oxygen mandate of RFG, so whenever an area considered RFG, they encouraged them to do RVP control instead

Stakeholder 6:

- States and refiners avoiding the RFG oxygen mandate
- Refiners telling States they can get all the benefits of RFG without the problems caused by the oxygen mandate

Stakeholder 7:

- CAAA requirements and government mandates for air quality

Stakeholder 8:

- Ultimately it derives from the ozone NAAQS; States have to show attainment

- One of the biggest bangs for the buck is RVP control
- They could opt into RFG, but for various reasons (avoiding or promoting ethanol, avoiding MTBE, cost, oxygen mandate) they have avoided it
- New areas are reluctant to adopt RFG because of MTBE concerns
- Fuel controls have been thought to be transparent to the consumer
- Refiners pushed boutiques in many markets

Stakeholder 9:
- CAA requirements for State SIPs with every state having different needs and different requirements
- Local governments are permitted to have their own unique fuel

Stakeholder 10:
- Result of oil companies persuading individual states that various boutique fuels, rather than RFG, were sufficient to meet their air quality needs at less cost.

Stakeholder 11:
- State concern over MTBE contamination in drinking water

Stakeholder 12:
- State looking for additional NOx emission reductions

D. Stakeholder Concerns Expressed with Boutique Fuels

There were a large number of concerns with boutique fuels expressed by the stakeholders. Their concerns are listed below individually so as to highlight that different entities have different concerns, but yet many of the concerns are common. In order to keep the feedback we received confidential, we have not identified any particular entity with any particular comment and where necessary to maintain confidentiality have grouped feedback together. In general, as can be seen by the comments below, the majority of the concerns are with the distribution of boutique fuels. States and environmental organizations expressed few concerns with the current boutique fuels; they are working well to provide the air quality benefits they are seeking. Some States observed that prices in areas with boutique fuels are often cheaper than in other parts of the State which use conventional gasoline.

1. Refiners:

Stakeholder A:
- Current system working - just some hot spots - be careful not to make things worse
- Transition from winter to summer, limited tankage
- Limited fungibility and keeping track of multiple grades
- Ethanol RFGs difficult to blend and know you will hit the specification

- With MTBE bans and MSAT rule in place, RFG supply will go down

Stakeholder B:
- Concerned more about the future with 8-hour ozone and MTBE bans
- Price differentials caused by boutiques shift demand from one place to another
- Not enough suppliers and shippers for boutique fuels; especially if boutiques occur at the end of pipelines
- MTBE bans make RFG very difficult, particularly if done by states and not all at once with some lead time
- Impacts of boutique fuels on other areas are not taken into account when a state adopts boutique requirements
- Problems/mistakes/disruptions are harder to fix

Stakeholder C:
- Not just boutiques, but pipeline capacity is really beginning to constrain flexibility, particularly in the mid-west
- MTBE bans forcing a shift to ethanol in RFG will result in a loss of ~13% of supply
- Boutiques cause smaller batch sizes and more interface losses/downgrade, reducing supply
- With MTBE bans, many terminals will not be equipped to handle ethanol - no rail access...

Stakeholder D:
- Boutiques are not the real problem, the fundamental problems are
    - Limited refinery capacity
    - Limited ability to produce clean fuels
    - Limited pipeline capacity
    - Summer transition
- Difficulty in blending around the Unocal patent on RFG
- Adaptive learning in moving to new fuel requirements always takes time
- Alone multiple fuels is not the problem, but when you look across 49 states, if you reduce the number of fuel types it will help whenever there is a disruption

Stakeholder E:
- Don't have a problem complying today, it just costs money
- Upsets are the real issue - boutiques make the impact of upsets worse
- Inability to move one fuel to another area when there is a shortfall. Particularly bad when the shortfall is in an area with the clean fuel - you cannot even downgrade product from other places
- Distribution system is limited in its ability to move fuel to places that may have a shortfall from areas with surpluses
- Winter to summer transition

Stakeholder F:
- Boutique fuel areas have greater problems if any supply disruptions

- For boutique markets, most refiners enter into exchange agreements with the few actual producers of the fuel, resulting in fewer sources of supply
- Ethanol shipments are not always reliable - esp. outside the Midwest
- Ethanol boutiques are difficult to blend
- Winter to summer transition
- Blending around the Unocal patent
- Enforcement discretion granted to competitors when there is a problem
- Distribution system constraints limit bringing fuel in when a shortage - Jones Act limits shipments from the Gulf to California.

Stakeholder G:
- Winter to summer transition
- Potential future shortage of ethanol supply with MTBE bans
- The problem is supply, boutiques are just one more challenge in providing supply
- Only when there are disruptions do boutique fuels make it more difficult to bring in sufficient supply
- You can't truck in fuel like you could before

2. Pipelines and Terminals:

Stakeholder H:
- Delivery of Atlanta's boutique fuel requires the pipeline to be shut down; situation occurs at any location where there is a fuel that is not shipped farther down the pipeline
- Boutiques cut down on the size of large fungible batches, causing many more smaller batches
  - More pipeline shutdowns
  - More interface loses
  - Less efficient - less fungible operation
- If the pipelines can't handle enough volume, the refineries will have to slow down production
- Potential for even one or two more grades of fuel in 2003-4 are of great concern
- The more fuel types the more possibility for errors
- Difficulty keeping fuels segregated
- Difficulty keeping fuels from mixing in storage tanks - transitions to boutiques

Stakeholder I:
- Insufficient tankage to handle boutiques
- Need new/separate loading racks
- Scheduling more boutique fuels in the pipeline would be difficult
- Problems depend on where the boutique fuel is and what terminal facility capabilities exist at those locations
- Mistakes in blending ethanol - driver errors
- Winter- Summer transition creates difficulties

Stakeholder J:

- End of line for any unique fuel always creates a problem - have to “stop” flow
- Inability to pull off fuel at enough terminal locations simultaneously to keep pipeline capacity up
- Any more boutiques downstream of Atlanta with a different fuel may not be able to be handled
- State fuels are always a problem; difficult to handle, difficult to adjust to with short lead times
- Large cost to handle any new boutiques in terms of terminal tankage, pumps, lines, etc.
- Problems are a function of the volumes and where they are going
- Boutiques can result in significant underutilization of tankage
- Batch sizes go down and downgrade volume goes up with each boutique
- Winter to summer transition causes a tankage problem
- State by State MTBE bans would be the biggest problem

Stakeholder K:

- Tankage issues
  - Insufficient tankage at terminals
  - Insufficient pipeline breakout tankage
  - Winter to summer transition
- Pipeline problems
  - Boutique fuels reduce pipeline capacity
  - Terminals not equipped to handle enough flow to keep capacity high
- Boutique fuels are not the only reason for problems, but certainly contributing

Stakeholder L:

- Boutiques make contamination prevention difficult
- Insufficient tankage
- Inability to take fuel from multiple suppliers and put in the same tank
- Ethanol blends require a whole separate system
- Problems depend on where you are located
- Winter to summer transition

3. Marketers:

- Boutiques cause tremendous price differences in the same vicinity; cause significant competitive issues on the edges of the “islands”
- Fewer suppliers of the fuel they need - either the boutique or the non-boutique
- Fewer suppliers leave independents out in the cold when there are any supply shortfalls
- Boutiques carve up the available storage making it inadequate
- Increased likelihood for supply glitches - makes it more difficult to sequence deliveries though the pipeline to terminals with available tankage...

- The probability of a stock out goes up and the ability to bring in supply from elsewhere goes down
- Can't downgrade to a boutique
- Leads to price volatility which puts independents at greater competitive disadvantages
- Whenever there is a supply shortfall, it is very difficult to bring in new supply - truck from hundreds of miles away instead of tens of miles
- Inefficient - requires multiple trips to the rack to deliver different fuels to different stations in the same vicinity
- Confusing for consumers
- Stations on boundaries suffer and/or go out of business due to competitive pressures
- Boutiques create a tracking problem to ensure the right fuel goes to the right station
- Limits the number of suppliers and increases the distance to suppliers

4. Oxygenate Producers:

- Boutiques do play a role in limiting supply, but its overblown
- Tight refinery capacity and just-in-time fuel delivery are the real problems
- Boutiques exacerbate but do not cause problems
- The real problems are little spare refining capacity and low gasoline inventories particularly during winter to summer transition
- Boutique fuels lead to a less fungible system

5. States:

- Fewer fuel suppliers are available to provide boutique fuels
- Boutique fuels create competitive problems near the borders
- Independent retailers seem to have more supply problems than "branded" retailers
- Fuel distribution system limits the areas that can have a boutique
- Concerned about ability to expand their boutique fuel program
  - Few suppliers - insufficient volume
  - Terminal limitations, trucking costly
- Authority not broad enough - needs to include more than just criteria pollutants
- Current authority limits implementation to nonattainment areas, which may be inconsistent with gasoline distribution within the state

E. Stakeholder Recommendations to Improve Upon the Current System

A few stakeholders we spoke with did not believe any meaningful changes were warranted to the current system. A few others recognized that some change may be necessary, but did not have any recommendations to give to the Agency. Most, however, did have recommendations for improving upon the current system, many of which were along the lines of reducing the number of available fuel choices States and Localities had to a limited menu. The listing below summarizes what we heard individually from the various Stakeholders that chose to make recommendations to the Agency so as to highlight the differences and similarities between their recommendations. The list below contains recommendations from all the various stakeholders, listed confidentially. There is no correlation between the stakeholder listing in the previous sections and this one.

Stakeholder 1:

- Menu of 4 fuels
  - Conventional 9.0
  - Conventional 7.8
  - One national RFG (Same northern and southern)
  - California CBG for California
- No oxygen Mandate
- Ethanol RVP waiver for Conventional 9.0 and maybe 7.8
- No earlier than 2006

Stakeholder 2:

- Menu of 4 fuels
  - Conventional 9.0
  - Conventional 7.8
  - One national CBG or 7.0 RVP - refiner's choice
  - California CBG for California
- No oxygen Mandate - replace with national pool average renewable requirement
- No Ethanol RVP waiver
- No earlier than 2006
- Nationwide benzene standard of 0.95 avg in 2010 or later

Stakeholder 3:

- No oxygenate mandate
- Remove oxygenate minimum
- Don't go <7.5 psi for conventional gasoline

Stakeholder 4:

- Menu of 3 fuels
  - Conventional 9.0
  - Conventional 7.8
  - RFG - no oxygen
  - California was not mentioned
- No oxygen Mandate
- No oxygen minimum

Stakeholder 5:

- Menu of fuel options

  - Conventional gasoline with one set of specs; perhaps different RVPs by different regions of the country
  - Something akin to Federal RFG
  - California CBG for California
- No oxygen mandate
- Perhaps one national benzene spec

Stakeholder 6:
- No recommendation, but..
- Without oxy mandate and sulfur control by 2006 things would simplify
- Essentially left with
  - 9.0 conventional
  - 7.8 conventional
  - ~7.0 RVP fuels

Stakeholder 7:
- No more fuel types than today

Stakeholder 8:
- 2 or 3 choices for States
  - One clean fuel option similar to RFG that serves a broad set of purposes
  - Conventional gasoline
- Limit State/Local flexibility to those choices

Stakeholder 9:
- Reduce the number of fuels to standardized options

Stakeholder 10:
- No oxygen mandate
- Moratorium on new boutiques
- Reduce the number of boutiques
- Planned nationwide phase-out of MTBE

Stakeholder 11:
- Three fuels
  - One National preemptive RFG
  - One national preemptive conventional
  - One Cal CBG for Cal
- No oxygenate mandate

Stakeholder 12:
- 3 Fuels
  - Conventional Gasoline

    - One Federal RFG (not separate north and south)
    - California RFG
- Curb power of states to adopt separate standards

Stakeholder 13:
- Replace boutiques with MTBE or ETBE blended RFG

Stakeholder 14:
- The long-term goal should be to simplify to a larger regional market for non-RFG low-RVP fuel without the oxygenate
- No oxygen mandate

Stakeholder 15:
- Strong national benzene control program

Stakeholder 16:
- Do not allow boutique diesel fuels

Stakeholder 17:
- Strong national fuel program that is protective of vehicle driveability

Stakeholder 18: States

- To the extent EPA develops a menu of fuel options from which states can choose, the menu should be based on the highest common denominator or most stringent that maximize emission reductions and public health benefits as well as flexibility for fuel formulation. This would limit the need for states to want more stringent "boutique" fuels.

- Under no circumstances should states' authority under section 211(c) to adopt unique clean fuel programs after showing necessity to achieve a NAAQS be weakened.

- States' authority to adopt unique clean fuel programs, or to opt into RFG, should not be limited by need to achieve a NAAQS or by non-attainment status but should be extended to any area that could benefit from such a program for any public health or environmental reason.

- Some states are prohibited from adopting restrictions which are more stringent than federal requirements, so some states might not be able to choose any but the least stringent of a menu of options.

APPENDIX A-2: Discussion of the Problems with Boutique Fuels Experienced in the Gasoline Production, Distribution, and Retail System.

As was strongly expressed during EPA's discussions with stakeholders, it is not clear to what extent boutique fuels are actually responsible for the localized fuel shortages and price spikes that have been experienced as of late and which have been much of the impetus behind the desire to look at the issue of boutique fuels. For the most part, when the system is working properly, there have not been supply shortages or price spikes. Problems mostly arise just when there are disruptions in the system such as unexpected refinery shutdowns, pipeline breaks or during the winter to summer transition. In these cases the added stress on the system caused by the presence of boutique fuel requirements may exacerbate the problems, particularly if the disruption impacts a boutique fuel area directly, but it is not the cause. This prompted many of our stakeholders to highlight that the fundamental problem is not the boutique fuel programs in and of themselves, but rather that domestic capacity has not kept pace with the growing economy, causing problems to surface now that did not in the past.

Many stakeholders state their belief that domestic refining capacity is fully utilized with no room to respond to changes that would negatively impact production or significantly increase demand. Many also identify what are viewed as obstacles in the way of producing clean fuels such as the oxygen mandate in RFG and the need to produce sub-RVP blendstocks for ethanol blending. Finally, many also assert that parts of the domestic fuel distribution system, particularly a number of pipelines and terminals do not have any excess capacity to respond to supply imbalances, and especially any more boutique fuel requirements. As a result, concerns from many of the stakeholders were not with the boutique fuels of today for which they have already made investments to handle, but with the potential impacts of more fuel requirements in the future.

1. Refiners

Boutique fuels have both positive and negative effects on refiners. By focusing the fuel controls only on those areas that need it, rather than applying it more broadly, the impacts on refinery operation and investment are minimized. Furthermore, in most cases of State or Local fuel control programs the refiners worked with State environmental agencies to develop boutique fuel alternatives to existing fuel programs that would have required greater refinery modifications and capital investments. Refiners see the boutique fuel programs as being preferable to other alternatives. Boutique fuels by their very nature may also provide advantages to those refiners that produce them. Gasoline is for the most part a fungible commodity with a large number of producers competing in the marketplace on price. Any product differentiation (e.g., additive packages) is a way for a refiner to move away from the commodity market and demand higher prices. Boutique fuels in some cases provide similar opportunities.

The primary concerns with respect to boutique fuels are not with the production of the fuels at refineries themselves, but rather with their distribution to the various fuel markets.

Consequently, much of the discussion with refiners also tended to center around distribution system impacts. Nevertheless, there are a number of impacts that boutique fuels have on refiners that warrant mentioning.

a. Narrowing Markets

While for individual refiners serving local communities, boutique fuels may be particularly advantageous, for other refiners boutique fuels reduce their available markets. Due to constraints on available tankage and processing units to produce the range of potential petroleum blendstocks, no single refinery produces every product manufactured by the industry as a whole. Dozens of different products are manufactured that include motor fuels and highway paving oils, as well as feedstocks to a variety of other industries and petrochemical plants. A refiner chooses which products to manufacture based in large part on the availability of crude, the units available for processing the crude, and the volume and number of available storage tanks for crude, blendstocks, and finished products. Each boutique fuel would require tankage for at least two grades of gasoline, premium and regular, as well as other possible blendstock tanks. Other important considerations include the refiner's customers and their proximity, and what product pipelines are nearby and whether they have excess capacity that the refiner could utilize. As a result, the number of refineries producing fuels for some of the boutique fuel markets is small. Other refiners may enter into what is known as exchange agreements to obtain fuel for sale in those markets, but in general the boutique fuels tend to exclude more remote refiners from competing in the local boutique markets since they need to also produce different fuels for other markets.

b. Investments for Current Boutique Fuels

Obviously, boutique fuels require investment on the part of refiners. In some instances, the investments have been fairly modest, especially in comparison to other fuel control program options. In many cases, the refiners have had to act very quickly given the short lead-time associated with some of the State fuel programs. For those refiners that have made the investment to produce the boutique fuels, however, the main concern is now with the ability to recover those investments. As such there is a reluctance to revise the requirements for the current boutique fuel programs now that they are in place and investments have been sunk.

c. Investments for Future Boutique Fuels

The main concern by refiners with respect to boutique fuels is not with the past investments, but the possible future investments. They will be faced with the need to make considerable investments over the next several years to comply with recently finalized Federal and State fuel control actions (e.g., Tier 2 gasoline sulfur control, MSAT, State MTBE controls, and highway diesel sulfur control), as well as to respond to the growing demand for gasoline. Furthermore, after years of excess production capacity in the U.S., most refineries in the U.S. are now operating at or very near their maximum capacity. As demand continues to rise refiners will begin to make additional investments to expand capacity. How best to make these investments while at the same time preparing themselves to address potential impacts of future fuel specifications is a key question facing many refiners today.

d. Responding to Disruptions

Disruptions in the supply of gasoline are inevitable. Historically the market was able to respond to disruptions in the production system (e.g., refineries going down for various unforeseen reasons) by increasing the production at other refiners, or by shifting fuel from one area to another. This was a relatively easy thing to do since, with the exception of leaded and unleaded gasolines, up until the 1990's there were essentially only two grades of gasoline produced in the United States, northern and southern RVP fuels to address vehicle driveability needs. In addition, as discussed above, there was excess domestic refining capacity, and room to debottleneck existing refineries to increase production. Since then the development of boutique fuel programs has reduced the fungibility of the system, and its ability to move fuel from another area to satisfy the shortfall. This is particularly pronounced in boutique fuel areas where the number of fuel producers capable of making the fuel required also tends to be further constrained as discussed above.

When disruptions do occur gasoline stocks in a local area fall, resulting in short-term price spikes until the disruption passes or alternative supplies can be obtained from other sources. These disruptions can mean higher costs to consumers. However, they do not necessarily translate into investment by refiners. As unplanned disruptions are typically a short-term nature, refiners will continue to respond with boutique fuels in just the same way they have in the past, by shifting excess fuel stocks to the extent possible from other areas. A few may make modest adjustments in crude choices, operating conditions, or processing capability. However, we do not expect refiners to invest in more costly, long-term solutions to increase capacity until overall demand exceeds production capacity and they can be assured of long-term returns on their investments.

e. Oxygen Mandate of RFG

The Clean Air Act contains a requirement that federal RFG contain 2 percent oxygen. The two sources for this oxygenate have been MTBE and ethanol. Given the growing concerns associated with MTBE and the added cost of shipping and using ethanol, many stakeholders, particularly refiners, in our discussions have questioned the necessity of maintaining the oxygen mandate to produce cleaner burning fuels, particularly since the oxygen is not necessary to meet the emission performance requirements of RFG.

The oxygen mandate of RFG was highlighted by refiners as being particularly problematic. Their concerns, however, appear to be tied in large part to the impact this mandate may have in the future rather than the impact today. First, they consider the oxygen mandate to be the cause of many of the boutique fuels in existence today and are concerned about their future proliferation as States try to avoid the use of MTBE. Secondly, however, they are concerned about the cost and impact of blending additional ethanol into RFG as State and Local controls on MTBE use begin to take effect. Ethanol blending in RFG requires a very low, approximately 5.5 psi RVP, gasoline blendstock. In order to produce this refiners have to remove considerable volumes of butane and even pentane from their gasoline blendstock for the final blend to meet the RFG standards. This is not only costly, but in addition can have a negative impact on their refinery yield if they cannot re-blend the butanes and pentanes back into other gasoline products. To make matters worse for them, while they are removing the petroleum based components which they produce, they must in turn add components purchased from other sources (ethanol producers) to make up for it. Furthermore, in the case of ethanol blends, they are faced with unique challenges of getting the ethanol blends to market as it cannot be shipped through the common carrier system. At present, the majority of ethanol is blended near the mid-west where investments to overcome these distribution system challenges have already been put in place. As the MTBE controls go into effect, however, the oxygen mandate in RFG will force ethanol's use in other parts of the country much further from supply sources for ethanol and where the infrastructure to handle it has not yet been developed.

2. Pipelines and Terminals

A central part of our directive from the National Energy Policy Report was to look for ways to improve the ability of the fuel distribution infrastructure to distribute fuel in the United States. Our discussions with stakeholders served to highlight that the majority of the concerns with boutique fuels appear to be centered around the ability of the distribution system to handle them. There were a large number of concerns raised in discussions, the main concerns of which are discussed below.

a. Tankage

Boutique fuel batches are typically smaller than normal, especially if the service area in a specific state is small and localized around a city. Regardless of the volume of a fuel in the distribution system, segregated storage tanks and facilities must be devoted to its transport. All the refinery and terminal operators interviewed indicated that the availability of adequate storage tanks is a major factor in supplying boutique fuel. They indicated that while there is adequate tankage to handle the existing slate of boutique fuels, devoting tankage to a greater number of fuels has consumed nearly all available tankage. Thus, most concerns regarding tankage were associated with the ability to meet the demand for additional tankage from the proliferation of new boutique fuel grades.

b. Reduced Pipeline Flow

When a boutique fuel is not marketable past a given point in a fungible products pipeline, it is often necessary to interrupt the flow of product through the pipeline downstream of the point where the boutique fuel is drawn off the line to a terminal. This is necessary because the stub-lines at terminals which draw product off of a pipeline typically do not have as high a flow capacity as the pipeline itself.[19] Such interruptions are avoided by pipeline operators when possible because they reduce the overall volume of product can carried. For fungible products, product is typically "stripped-off" a batch in the pipeline as it flows by a given terminal. The terminal takes what it needs of the batch, and the remainder flows down the line to other markets. Thus, the need to transport unique fuels to isolated islands can constrain total pipeline capacity. This occurs today whenever a product is not delivered to any point further down the pipeline (e.g., jet fuel to an airport). Boutique fuels merely add to the frequency and volume of such occurrences. Pipeline operators are coping with this situation at present, but several expressed concern regarding their ability to ship adequate fuel volume if pipeline capacity is further impacted through the addition of new boutique fuels.

c. Responding to Disruptions

i.) Limitations on Pipeline Capacity

Because of the distribution system's heavy reliance on shipment by pipeline, most problems associated with the distribution system providing an adequate supply of gasoline involve the product pipeline segment of the distribution system. If distribution by pipeline is disrupted, it is difficult to find ready alternatives to transport the large fuel volume over the long distances normally traversed by pipelines. In a number of geographic areas, service is provided by only a single pipeline. Even when multiple pipelines serve the same area, the alternate pipeline may not possess sufficient excess capacity to make up the shortfall.

Since many pipelines are typically running near full capacity, after service is resumed by a pipeline that has had its service interrupted, it can take a substantial amount of time for the terminals that the pipeline serves to recover from a supply shortfall. Pipeline(s) that serve a given area may not have sufficient excess capacity with which to meet current demand as well to replenish previously lost volume. The time intensive nature of shipping petroleum products by pipeline can also make recovering from a supply shortfall by pipeline shipment a lengthy process. Petroleum product shipped by pipeline from Houston Texas will arrive in New York City in 14 to 22 days. Thus, it can take a considerable amount of time for product to reach market when shipped by pipeline, particularly at the end of the pipeline. Under normal situations, this time delay is factored into production and shipping schedules. However, this is not possible when unforeseen disruptions occur.

The ability of the pipeline system to compensate for supply shortfalls in a timely way is also limited by the fact that the range of fuels shipped by pipeline are shipped back-to-back in a

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[19] One example of this is Atlanta, Georgia which has the same boutique fuel as Birmingham, Alabama. The boutique fuel is shipped to the Birmingham market where it is "stripped-off-the-line" without shutting down or reducing flow, since Atlanta is downstream of Birmingham and the same fuel will be delivered there. However, because no other state or area downstream of Atlanta uses the same fuel, the line must be shutdown north of Atlanta during the delivery. The stub-line into Atlanta is smaller than the main pipeline which results in a reduced flow rate on the main pipeline.

set sequence. The cycle during which the sequence of fuels shipped is repeated is typically 5 to 10 days depending on the capacity of the pipeline, scheduling of refinery operations, and market demand.[20] It is difficult to interrupt this sequence to provide priority shipment of a given fuel because product shipments are arranged in advance with product staging storage tanks devoted to a given fuel. Delaying the shipment of one fuel to speed up delivery of another fuel might lead to a downstream shortage both fuels.

ii.) Limited Alternatives to Pipelines

Transport by barge/tanker is an alternative to pipeline shipment only in certain geographic areas and can be limited during spring and winter months when ice interferes with navigation (e.g. on the Mississippi river and Great Lakes). Rail transport also has geographic limitations, because many product terminals are not equipped to receive petroleum products by rail. In addition, arranging for marine and rail transport can be time intensive and therefore may not be suited to respond quickly to compensate for an interruption of pipeline shipments. Also, if adequate tankage wasn't already devoted to transport the specific fuel, there would be costs and concerns associated with limiting contamination in readying the tanks to transport the fuel. Regardless of whether tankage was devoted to the fuel, stakeholders relate that a sufficient excess in marine and rail transport assets are often not be available to compensate for the large distribution shortfall which typically results from an interruption in pipeline service.

The distribution system operates most efficiently and flexibly when fuel fungibility is maximized. Due to their flexibility, tank trucks are best suited to respond quickly to compensate for distribution shortfalls. The volume a single truck can carry is limited, however (e.g., 8,000 to 10,000 gallons in a single load), and the cost of shipping large volumes over long distances by tank truck can be high. Discussions with marketers indicate that gasoline delivery by tank truck is usually limited to a maximum distance of 200 to 250 miles from the product terminal, after which the cost can become prohibitive because of the need for the driver to make an overnight trip. Gasoline is sometimes carried over longer distances by tank truck when the price differential is sufficiently high between the point of supply and delivery to justify the additional cost. In Texas, typical transport distances by tanker truck from the terminal to retailer can be as long as 50 to 80 miles. Typical truck transport distances are shorter in most other areas that have a higher population density such as the Northeast. Stakeholders stated that in some cases, depending on the volume of gasoline involved, there may not be enough trucks available to deliver the fuel to a given area.

Because alternate sources are often not available and boutique fuel volumes are characteristically small, reductions in local supply are usually more serious and can result in price spikes. With boutique fuels, additional supplies may have to come from distant sources. It is often not possible to bring in additional supplies of boutique fuels from neighboring areas. For

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[20] Petroleum Storage and Transportation, Volume V, Petroleum Liquids Transportation, National Petroleum Council, April 1989.

example, marketers stated that during the supply shortfall in the Detroit area in the summer of 2000 that was associated with the a pipeline interruption, some marketers were forced to ship fuel by tank truck from Pittsburgh to fulfill their contracts. The non-fungibility of boutique fuels is a substantial obstacle to the industry's ability to respond in a timely way to shortfalls in supply. Supply disruptions of any type can cause price spikes. The further a boutique area is from supply, the higher the likely spike.

iii.) Reduced Inventories

Similar to other industries there is a trend in the fuel distribution industry to minimize inventory (i.e. the volume of fuel stored at various points in the system), thus implementing a "just in time" fuel delivery process. This reduces the cost of holding excess inventory and the tank capacity that must be maintained at various points in the distribution system. Substantial advances in information technology allow fuels to be more closely managed in real-time as they are routed through the distribution system to meet market demands and facilitate the "just in time" approach. The trend toward minimizing storage capacity in the distribution system was also encouraged by heightened regulatory requirements to prevent spills from storage tanks and otherwise improve tank safety, as well as stationary source emissions requirements for tank farms. With boutique fuels, because storage tanks must be devoted to an increasing number of fuels, the volume of any given fuel stored at the facilities in the distribution chain necessarily tends to be reduced. This also acts to limit the volume of a specific fuel in storage at a given facility (which might be shifted to make up a shortfall in supply).

The inventory of fuels in the distribution system needed to keep it functioning efficiently is referred to as the "minimum operating inventory". Most of this inventory is normally not available for consumption and consists of pipeline fill, tank bottoms, and working inventory to ensure the ready availability of fuels to market. Over the period of 1986 through 1995 there was a steady decrease in the level of gasoline inventory at terminals of 2 to 2.5 million barrels per year in PADDs 1 through 4 and 0.3 million barrels per year in PADD 5.[21] In 1986 the gasoline inventory at terminals was approximately 235 million barrels compared to 215 million barrels in 1995, while over the same time period gasoline supply increased from 2,567 barrels to 2,843 million barrels per year.[22] Terminal gasoline inventory represented 9.2 percent of annual gasoline volume supplied in 1986, and 7.6 percent in 1995. This downward trend has continued and was accelerated by the post 1995 events described previously.

When the fuel production and distribution system is functioning properly, the application of a just in time fuel delivery process helps to keep the cost of delivering fuel to market low. The

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21 U.S. Petroleum Product Supply - Inventory Dynamics, National Petroleum Council, December 1998. The U.S. is divided into PADDs (Petroleum Administration for Defense Districts. PADD 5 includes the following states: Washington, Oregon, California, Nevada, Arizona, Alaska, and Hawaii.

22 Petroleum Supply Annual, 1999, Energy Information Administration, U.S. Department of Energy.

accompanying reduction in the amount of fuel stored throughout the distribution system, however, has made the system less able to compensate for what once might have been considered a relatively insignificant interruption in product flow through the system by drawing upon stock stored in the various points in the system.

iv.) Fewer Suppliers

Although the supply of gasoline continues to keep pace with demand, it is coming from fewer refineries that are located far from those they service. These refineries also tend to be clustered in a few specific locations, such as the Pacific and Gulf coasts. Due to refinery closings in the Midwest and upper Midwest, an increasing volume of fuel must now be imported from the Gulf coast to meet demand. These changes make it much more difficult to compensate for shortfalls in the supply of boutique fuels, because alternate sources of boutique fuels are often difficult to locate and far distant (resulting in long transport times and/or high shipping costs).

d. Investments for Current Boutique Fuels

Pipeline and terminal operators indicated they are not currently troubled by serious problems related to boutique fuels (other than the transition from winter to summer RVP seasons; see Section II). Their primary concerns pertain to the feasibility of handling additional boutique fuels. Investments have typically already been made by terminal and pipeline operators to handle the existing slate of fuels. Sufficient facilities to handle multiple fuel grades has been provided. A number of terminal and pipeline operators have met the need to segregate additional fuel grades by dividing their existing storage tanks between a greater number of fuels rather than increasing the total number of tanks they have (and their overall capacity). This was made possible in part by improved fuel management practices associated with advances in information technology. Dividing existing tankage avoids much of the space and permitting concerns associated with putting in new tanks and reduces overall storage costs (in keeping with the trend to a “just in time” delivery process). The accompanying reduction in the volume of any given fuel in storage, however, makes the system more vulnerable to interruptions in the steady flow of product into storage facilities.

Stakeholders state that there is little if any additional opportunity to further subdivide the existing number of tanks to handle new boutique fuels. Where necessary, pipeline operators have increased the flow rate on stub lines that draw fuel off of the main line to a terminal to limit the duration of interruptions in pipeline flow associated with delivery of a boutique fuel to an isolated boutique fuel island. Such has been the case in supplying the current boutique fuels to Atlanta and Pittsburgh. As is the case with refiners, terminal and pipeline operators wish to recoup the investments they have already made to handle the existing slate of boutique fuels.

e. Investments for New Boutiques

A number of terminal and pipeline operators state that adding even one or at most two new blends to the slate of fuels they carry could result in a reduction in the total volume of fuel they can deliver. Tankage concerns are obviously a central concern to terminal operators, since their business is centered on storing large volumes of fuel prior to delivery by tank truck to the retailer or end-user. Available tankage is a vital concern to pipeline operators because storage tank farms at the beginning of their system and at locations where a stub line branches off from a the main pipeline are essential for routing fuel through the pipeline system. As in the past, if economics are such that installing additional tankage can be justified in lieu of refiners producing a greater volume of a cleaner or more expensive fuel and downgrading it for the local market, then the tankage will tend to be constructed and terminals lines and pumps upgraded. However, many terminal and pipeline operators are concerned that they may not be able to construct the additional storage tanks required to handle new boutique fuels because of limitations on available space, limited capital, or difficulty in securing a permit to put in additional storage tanks. In such cases, the pipeline or terminal might be forced to refuse to handle the additional boutique fuel or discontinue supplying one of the grades that they currently handle.

f. Ethanol Blending

Input from stakeholders indicates that the inability to ship ethanol by pipeline results in concerns regarding the ability of the distribution system to supply adequate volumes of ethanol in a timely fashion. Stakeholders relate that one of the primary means of transporting ethanol to terminals – rail transportation – can experience serious scheduling and timing problems. Some fuel suppliers stated that it is not unusual for rail delays of one, two, or even several days due to various routing difficulties. Reportedly, it is not unusual for rail shipments to be delayed for days or even weeks at the Mississippi River during times of flooding. Delivery delays of this magnitude can result in serious supply shortfalls. Other limitations on shipment by barge also apply: many areas are not accessible by barge, barge traffic can be seasonally limited and is also subject to disruption from severe weather conditions. Transport of ethanol over long distances by tank truck can also be expensive and result in substantial logistical problems.

If the number of boutique fuels proliferates and the use of ethanol is required, terminal operators whose facilities are not currently set up for ethanol blending would need to put in additional storage tanks and blending facilities (with all of the concerns related to construction of new tanks noted previously). A number of terminals also do not have the facilities to accept fuel shipments by rail or barge. Such facilities would need to be constructed if the use of ethanol was required. The construction of rail or barge terminaling facilities would be subject to the considerations of cost, space limitations, and permitting that were noted earlier regarding the construction of new storage tanks. In addition, all terminals may not have ready access to a rail line or navigable waterway.

3. Retailers

The concerns with boutique fuels expressed by retailers focused on their ability to secure adequate fuel supplies and the potential adverse impacts on competitiveness. The price of boutique fuel at the pump is typically higher than for conventional gasoline. The boundaries of a "boutique fuel island"often follow a city or county line that many times follows a well-traveled road or street. Stakeholders relate that fuel retailers inside the boundary of a boutique fuel island are put at a competitive disadvantage because a retailer just outside the island can sell conventional gasoline at a lower price. Anecdotal reports from stakeholders indicate that some drivers will travel several miles to purchase conventional gasoline in a nearby city or county because it is less expensive. Stakeholders related that retailers on the periphery of boutique fuel areas suffer a loss in the volume of fuel they sell because of this phenomenon. This phenomenon would also result in a negative impact on the air quality benefits of using a boutique fuel.

Independent retailers are also concerned that the presence of boutique fuels makes them more vulnerable to shortfalls in supply than retailers associated with major oil refiners because their suppliers are more likely to interrupt the independents' supply of fuel before that of the major refiners' retailers. Thus, supply shortfalls would have a more frequent and greater economic impact on independent retailers. Since there is a greater chance that there may be a shortfall in supply of boutique fuels, independent retailers argue that the presence of boutique fuels can jeopardize their ability to remain in business. They state that the fewer number of suppliers of boutique fuels increases the likelihood of a supply shortfall.

APPENDIX B: SUMMARY OF FEDERAL, STATE AND LOCAL FUEL REQUIREMENTS

A. Federal gasoline requirements

The Clean Air Act authorizes EPA to regulate fuels (gasoline or diesel) for certain purposes. It sets out requirements for federal reformulated gasoline (RFG) and conventional gasoline (CG). This section describes each of these programs. Federal CG, as defined in the Clean Air Act, refers to any gasoline other than RFG.

1. Federal reformulated gasoline (RFG)

The purpose of the RFG program is to improve air quality in certain specified areas of the country by requiring reductions in emissions of ozone forming volatile organic compounds (VOCs), NOx, and emissions of toxic air pollutants through the reformulation of gasoline, pursuant to section 211(k) of the Clean Air Act (CAA or the Act), as amended. Therefore, RFG must meet performance standard requirements in order to be distributed and sold in an area subject to RFG requirements. There are separate requirements for summertime gasoline under the RFG program; also, within the summertime requirements, the standards for VOC differ for gasoline in southern and northern states. The RFG performance standards are expressed in terms of percent reduction from an emissions baseline. Baseline emissions are the emissions of 1990 model year vehicles operated on a specified baseline gasoline typical of gasoline in 1990. The standards are summarized in Table B-1 below:

Table B-1: Summary of RFG performance standards

Pollutant	Region[23]	Season[24]	Standard
VOC[25]	Northern	VOC control[26]	≥27.4 %
	Southern	VOC control	≥29.0 %
Toxics	All	All	≥21.5 %
NOx	All	VOC control	≥6.8 %
	All	Non-VOC control[27]	≥1.5 %

Section 211(k)(2) includes compositional specifications for reformulated gasoline including a 2.0 weight percent oxygen minimum, a 1.0 volume percent benzene maximum, and a prohibition on heavy metal content. This section also requires emissions from RFG to contain no more oxides of nitrogen (NOx) than baseline gasoline emissions.

Section 211(k)(10)(D) of the Act mandates that RFG be sold in the nine largest metropolitan areas with the most severe summertime ozone levels, as well as areas that are reclassified to "Severe". When the Sacramento Metropolitan Air Quality Management District was reclassified to "Severe", the number of mandated areas became 10. In addition to the

23 The regions are defined in terms of "VOC Control Regions" in 40 CFR 80.71. VOC Control Region 1 represents southern states and contains: Alabama, Arizona, Arkansas, California, Colorado, District of Columbia, Florida, Georgia, Kansas, Louisiana, Maryland, Mississippi, Missouri, Nevada, New Mexico, North Carolina, Oklahoma, Oregon, South Carolina, Tennessee, Texas, Utah, and Virginia. VOC Control Region 2 represents the northern states and contains: Connecticut, Delaware, Idaho, Illinois, Indiana, Iowa, Kentucky, Maine, Massachusetts, Michigan, Minnesota, Montana, Nebraska, New Hampshire, New Jersey, New York, North Dakota, Ohio, Pennsylvania, Rhode Island, South Dakota, Vermont, Washington, West Virginia, Wisconsin, and Wyoming.

24 Summertime refers to the ozone season and is from May 1 through September 15.

25 A recently promulgated regulation (66 FR 37156; July 17, 2001) allows a slight adjustment to the VOC performance standard in the RFG areas of Chicago and Milwaukee for RFG blends that contain 10 percent by volume of ethanol. The VOC performance standard for such complying RFG is 2.0 percentage points lower than the standard that would otherwise apply. Thus, in areas outside of Chicago and Milwaukee (in northern states), the VOC performance standard is a 27.4 percent reduction from baseline fuel. For complying RFG in Chicago and Milwaukee, the adjusted standard is 25.4 percent.

26 VOC control season refers to "High ozone season" as defined in 40 CFR 80.27(a)(1) and is the period from June 1 to September 15 for retail outlets and wholesale purchaser-consumers.

27 This season is outside the "high ozone season" and therefore includes the period from September 16 to May 30.

mandatory areas, RFG may also be required to be sold in ozone nonattainment areas that opt into the program.[28]

The regulations provide a method of certification through the complex model, based on fuel characteristics such as oxygen, benzene, aromatics, RVP, sulfur, olefins and the percent of fuel evaporated at 200 and 300 degrees Fahrenheit (E200 and E300, respectively).

In addition to the above requirements, RFG will also be subject to the recently promulgated Tier 2/low sulfur gasoline regulations (40 CFR 80 Subpart H). This regulation will ultimately result in all gasoline exceeding the NOx performance standard for RFG. Also, the recent air toxics regulations (40 CFR Subpart J) will generally supersede the toxic air pollution performance standard of the RFG regulations, since it is a refinery-specific standard based on the air toxics performance achieved by each refinery during the time period from 1998 through 2000. RFG is also subject to the federal volatility requirements (as described in more detail in A.2 below), but RFG formulations meeting the VOC performance standard for RFG will satisfy those requirements.

2. Conventional gasoline

Section 211(k)(10)(F) defines conventional gasoline (CG) as any gasoline which does not meet specifications set by a certification under the RFG provisions of the Clean Air Act. All gasoline, whether CG or RFG, must meet fuel volatility requirements under Section 211(h) of the Act, which limits the RVP of gasoline to a maximum of 9.0 psi throughout the 48 contiguous states during the summer ozone season. Section 211(h) also authorizes EPA to set more stringent RVP limits for nonattainment areas, which EPA promulgated at 40 CFR 80.27. These regulations limit the RVP of gasoline in “designated volatility non-attainment areas” to a maximum of 7.8 psi during the “high ozone season”, from June 1 to September 15 of each year.

Many areas, regardless whether they are subject to the 9.0 psi or the 7.8 psi federal volatility limit, are also subject to more stringent volatility standards through other requirements under federal or state law. Those states with areas participating in the federal RFG program are subject to a VOC performance standard (described in section A.1 above) which results in fuels with RVP levels much lower than the relevant federal volatility limit . Some states (as described in section B. below) have adopted state volatility requirements which are more stringent than the relevant federal volatility limit . The major cities within “designated volatility non-attainment areas” which are subject to the federal 7.8 psi volatility limit, but are not subject to any other more stringent volatility standard (either due to federal RFG requirements or state RVP limits) are listed in Table B-2.

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[28] Mandatory areas: Los Angeles, CA, San Diego, CA, Hartford, CT, New York City (NY-NJ-CT), Philadelphia (PA-NJ-DE-MD), Baltimore, MD, Houston, TX, Chicago (IL-IN-WI), Milwaukee, WI, and Sacramento, CA. Opt-in areas: Part or all of CT, DE, DC, KY, MD, MA, MO, NH, NJ, NY, RI, TX, and VA.

Table B-2: Fuel volatility requirements for conventional gasoline in designated volatility non-attainment areas not subject to more stringent volatility standard

Fuel Volatility Requirement	**Locations**
RVP of 7.8 psi	Florida: Jacksonville, Miami, Tampa
	Louisiana: Baton Rouge, Houma, Lafayette, Lake Charles, and New Orleans
	Nevada: Reno
	North Carolina: Charlotte, Greensboro, Raleigh
	Oregon: Portland
	Tennessee: Memphis, Nashville
	Texas: Beaumont, Port Arthur
	Utah: Ogden, Salt Lake City

An exception to the RVP requirement is made for gasoline which contains 10 percent by volume of ethanol. Section 211(h)(4) of the Act allows such blends to be 1.0 psi greater than the applicable RVP limitations. This provision of the Act is referred to as the “one pound waiver” for ethanol.

In addition to the fuel volatility requirements, CG is also subject to anti-dumping requirements, as authorized in Section 211(k)(8) of the Act. This provision limits for each individual refiner the average per gallon emissions of VOC, NOx, CO and toxic air pollutants to those levels introduced by that refiner in the baseline year of 1990. EPA promulgated anti-dumping regulations for refiners which are contained in 40 CFR 80, Subpart E. As is the case with RFG, CG will be subject to the Tier 2/low sulfur gasoline regulations (40 CFR 80 Subpart H). Also, the recently promulgated air toxics regulations (40 CFR Subpart J) will generally supersede the toxic air pollution performance standard of the anti-dumping requirement, since it is a refinery-specific standard based on the air toxics performance achieved by each refinery during the 1998-2000 time period.

Fuel volatility, therefore, represents a geographic-based requirement for CG. That is, these limits apply for gasoline distributed or sold in areas in which specific federal CG requirements apply. Thus, a refiner that produces CG with an RVP of 9.0 may not distribute or sell such gasoline in a federal CG area that requires an RVP limit of 7.8 psi. The anti-dumping and air toxics requirements, on the other hand, are not geographically based – the performance requirement for VOC, NOx, CO, and air toxics are refiner-specific since they are dependent on each refiner's baseline. For example, Refinery A and Refinery B, may have completely different performance standards but as long as they meet the anti-dumping and air toxics requirements, both may distribute and sell CG in the same area.

3. Winter fuels

Although there are winter and summer requirements for CG and RFG as discussed above, there are separate requirements for oxygenated fuels for certain areas which have been classified non-attainment for carbon moNOxide (CO). As discussed above, we are not including wintertime requirements in our definition of "boutique fuels" for this study.

a. Oxygenated fuels program

The Clean Air Act Amendments of 1990 required states with areas exceeding the National Ambient Air Quality Standard (NAAQS) for carbon moNOxide (CO) at certain levels to establish winter oxygenated fuels programs. Under section 211(m), gasoline supplied to these areas (by MSA or CMSA) during the winter must contain no less than 2.7 % oxygen by weight. The duration of the program must be at least four months, and typically runs from November 1 through February 29, although the duration varies, depending on the state.

CO pollution from motor vehicles is caused by incomplete burning of fuels used in internal combustion engines, and is generally more severe during cold winter temperatures. Oxygenates such as MTBE or ethanol are added to gasoline to help decrease exhaust emissions of CO and some toxic air pollutants such as benzene.

In 1992, when the oxygenated fuels program began, there were 36 areas implementing the program. Many of those areas have attained the NAAQS for CO since that time, and have demonstrated they can maintain the standard without the oxygenated fuels program. Today, there are sixteen areas implementing the program, as listed by major city within those areas in Table B-3 below.

b. Other winter gasoline controls

Three of the sixteen areas implementing the oxygenated fuels program, as described above, have also adopted other controls on gasoline during the winter: Los Angeles (as described in E.3 below) Phoenix (as described in E.4 below) and Las Vegas. The Las Vegas controls are intended to mimic California RFG specifications for sulfur and aromatic hydrocarbons for the winter months, for the purpose of reducing CO emissions. See discussion in section E.3 below for a description of the California RFG Phase 2 requirements.

Table B-3: Areas that require oxygenated fuels for attaining or maintaining the CO NAAQS

FOR ATTAINMENT PURPOSES	FOR MAINTENANCE PURPOSES
El Paso, TX	Albuquerque, NM
Denver/Boulder, CO	Tucson, AZ
Ft. Collins, CO	Portland, OR
Missoula, MT	
Provo/Orem, UT	
Las Vegas, NV	
Phoenix, AZ	
Los Angeles, CA	
Reno, NV	
Klamath Co., OR	
Medford, OR	
Anchorage, AK	
Spokane, WA	

4. Diesel fuel requirements

Current EPA requirements for on-road diesel fuel nationwide restrict sulfur levels to a maximum of 500 ppm by weight, and either a minimum cetane index of 40 or a maximum aromatics content of 35 percent by volume. See Clean Air Act Section 211(i) and regulations promulgated thereunder at 40 CFR 80.29. There is no similar federal regulation of these properties in non-road diesel fuel. Beginning June 1, 2006, EPA requirements for on-road diesel fuel will change the maximum sulfur content to 15 ppm by weight, subject to exceptions for phase-in and for small refiners. See final rule at 66 FR 5002 (1/18/01).

Except for California, which has regulated diesel fuel statewide since 1993, no state had regulated diesel fuel until last year, when Texas adopted its Low Emission Diesel rule for certain parts of the state. Although currently adopted to be implemented in 2002, the Texas rule has been proposed to be revised to delay implementation until 2005 in accordance with recently adopted legislation. Both California and Texas regulate on-road and non-road diesel fuel and both states include requirements for cetane and aromatics content that are more stringent than current federal requirements. These states are interested in reducing emissions from diesel engines, including NOx, particulate matter, and SOx.

Although some other states have considered regulating diesel fuel in aspects which would differ from federal requirements, no other state has done so. From discussion with representatives of the trucking industry and other stakeholders, we know there is serious concern that state diesel fuel requirements may begin to proliferate, following the pattern of gasoline. That issue is not the focus of this report, which, in accordance with the directive from the President's National Energy Policy Report, is concerned with impacts of multiple fuel requirements on the supply and distribution of gasoline.

B. State and local fuel requirements

1. Low RVP gasolines

Reid Vapor Pressure (RVP) is an indication of a gasoline's volatility at a certain temperature, and is a measurement of the rate at which gasoline evaporates and emits VOCs; a lower RVP means a lower rate of evaporation. Lowering RVP in the summer can help offset the effect of higher summer temperatures on the volatility of gasoline which, in turn, lowers emissions of VOCs. This is primarily through reducing evaporative losses from vehicle fuel tanks, lines, and carburetors as well as losses from gasoline storage and transfer facilities. To a lesser degree, there is also a reduction in the VOCs in vehicle exhaust.

If the state RVP limits described in this section did not exist, the areas subject to the state fuel RVP limits would be subject to the federal RVP limit, as described in Section IV.B.2, during the summer ozone season. The federal RVP limit is either a maximum of 9.0 psi or a maximum of 7.8 psi, depending on the month, the geographic location, and the ozone non-attainment status of the area at the time the federal RVP limit became effective.

Nine states have adopted low RVP requirements for areas within the states as the only "boutique" fuel requirement that differs from the federal requirements for conventional gasoline. Two local metropolitan areas have entered into agreements with fuel suppliers for the past several summers to voluntarily supply lower RVP fuel than would otherwise be required under the federal volatility regulations. Table B-4 summarizes these eleven state and local programs.

Table B-4. State and local low RVP fuel programs with no other state/local fuel control

Area and State	RVP level	Compliance period	1 psi ethanol waiver?
Tulsa, Oklahoma (voluntary local program)	7.8 psi	June 1- Sept. 15, 2001	No
Weber and Utah Counties, Utah (voluntary local program)	7.8 psi	June 1- Sept. 15, 2001	
Southern Maine	7.8 psi	May 1- Sept. 15	No
Pittsburgh, Pennsylvania	7.8 psi	June 1- Sept. 15	No
Clark & Floyd Counties, Indiana	7.8 psi	June 1- Sept. 15	Yes
Detroit, Michigan	7.8 psi	June 1- Sept. 15	Yes
Central and eastern Texas	7.8 psi	June 1- Oct. 1	No
E. St. Louis, Illinois	7.2 psi	June 1- Sept. 15	Yes
El Paso, Texas	7.0 psi	June1- Sept. 15	No
Kansas City, Kansas	7.0 psi	June 1- Sept. 15	Yes
Kansas City, Missouri	7.0 psi	June 1- Sept. 15	Yes

The state RVP limit applies during the summer ozone season, with a transition period which is usually similar to the transition period for the federal RVP limit. By May 1 of each year, all parties in the gasoline distribution chain except for retailers and wholesale purchaser-consumers must supply gasoline with an RVP no greater than 9.0 psi; by June 1 and until September 15 of each year, all parties in the gasoline distribution chain must supply gasoline with an RVP no greater than the limit specified in the state law, i.e., 7.8 psi, 7.2 psi, or 7.0 psi. (Note the slight difference in compliance periods for the Southern Maine and Central/eastern Texas programs in Table B-4 above.)

As described in Section A.2 above, the federal RVP limit includes a 1.0 psi "waiver" for gasoline blends which contain at least 10 percent by volume of ethanol. This means that conventional gasoline with 10 percent ethanol can have an RVP which is 1.0 psi greater than the RVP that would otherwise apply. States which have adopted boutique RVP limits have in many cases adopted the same 1 psi waiver, but some states, i.e., Maine, Pennsylvania, and Texas, have not.

The local 7.8 RVP programs in Tulsa and Utah plus the five state 7.8 RVP requirements described here make up an estimated 6.3% by volume of the daily summer gasoline supply in the

U.S. The state 7.2 RVP requirement in E. St. Louis makes up an estimated 0.2% by volume of the daily summer gasoline supply in the U.S. The three state 7.0 RVP requirements described here make up an estimated 1.0% by volume of the daily summer gasoline supply in the U.S.[29]

2. Low RVP, low sulfur gasolines

Two states have adopted low sulfur requirements for summer gasoline in addition to low RVP requirements. These programs are in Birmingham, Alabama, and Atlanta, Georgia. Georgia has also adopted a more stringent sulfur requirement beginning April, 2003, when it will apply year-round.

Lowering the sulfur content of gasoline helps reduce emissions from vehicles equipped with emission control devices known as catalytic converters. Light duty vehicles use these emission control devices to reduce emissions of hydrocarbons (HC), carbon moNOxide (CO), and NOx. Sulfur in gasoline can reduce the ability of the catalytic converter to control these emissions, especially NOx. Thus, lowering sulfur in gasoline can result in significant NOx emission reductions from existing vehicles. For this reason, EPA required control of sulfur to a 30 ppm average level for all gasoline nationwide beginning January 1, 2004, subject to some exceptions for phase-in and for small refiners.

Alabama and Georgia decided to control both RVP (at 7.0 psi) and sulfur (at 150 ppm) levels in gasoline in order to reduce emissions of both VOC and NOx. Both states chose to control these levels during the summer ozone season, although Georgia has chosen to control sulfur at a more stringent level (30 ppm) year-round beginning in 2003. (See discussion in section E.1 above regarding the time periods for summer RVP controls.)

Both Alabama and Georgia have adopted a 1.0 psi “waiver” for gasoline blends which contain at least 10 percent by volume of ethanol. This means that gasoline with 10 volume percent ethanol can have an RVP of 8.0, which is 1.0 psi greater than the 7.0 RVP that would otherwise apply.

The two state fuel requirements described here (low RVP, low sulfur) constitute an estimated 2.2 percent by volume of the daily summer gasoline supply in the U.S. (See footnote 7 for source citation.)

3. California Cleaner-Burning Gasoline (CBG)

Since 1996, California has required sale of gasoline statewide which meets the standards of its Phase 2 Cleaner-Burning Gasoline, a type of reformulated gasoline which has more stringent emissions control requirements than federal RFG, especially for NOx, air toxics, and benzene.

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[29] This estimate is based on the EIA/ Petroleum Marketing Annual 2000, Table 48: Prime Supplier Sales Volumes of Motor Gasoline by Grade, Formulation, PAD District, and State.

(Beginning December 31, 2002, California will change to Phase 3 CBG requirements, which are even more stringent in some respects.) Much of the gasoline sold in California, however, is also subject to federal RFG requirements, in accordance with the Clean Air Act requirements. (See Section B.1 above for explanation of CAA requirement that federal RFG be sold in areas with the most severe summertime ozone problems. This mandatory participation in federal RFG applies to the Los Angeles, San Diego, and Sacramento areas in California.)

California CBG regulatory standards apply to eight fuel parameters, with an option for refiners to supply alternative formulations which, in accordance with California's predictive model, provide equivalent emission reductions, subject to certain parameter caps. Federal RFG regulatory standards are primarily in the form of performance standards for VOC, air toxics, and NOx emissions reduction (by comparison to 1990 conventional gasoline), plus an oxygen content mandate and benzene standard. Table B-5 below is an attempt to compare the typical fuels which meet these two sets of standards (based on the averaging standard, rather than the "flat" or "cap" limit in each case.)

Table B-5: Typical Fuels and Standards

Fuel Parameter	**Conventional Gasoline pre-RFG**	**Federal Phase II RFG Averaging Standard**	**California CBG Phase 2 Averaging Standard**
RVP (psi)	8.7/7.8	(6.7)	(6.8)
Sulfur (ppm)	339	(150)	30
Oxygen (wt%)	<0.5	2.1 min	(2.0)
Aromatics (vol%)	32	(25)	22
Olefins (vol%)	13	(11)	4
E200 (%)	41	(49)	(49)
E300 (%)	83	(87)	(91)
Benzene (vol%)	1.5	0.95 max	0.8

Phase II complex model performance (% reduction from 1990 baseline) of these fuels:

VOC performance	n/a	29.8	29.6
NOx performance	n/a	6.8	14.7
Toxics performance	n/a	28.4	34.4

Note: Properties listed under the federal RFG "standards" column in parentheses are not standards *per se*, but indicate the average properties a summer fuel must have to meet the emissions performance standards. The "/" indicates "North/South" specific values. Southern (VOC Control Region 1) values were used in performance comparisons.

California Governor Gray Davis issued an Executive Order (E.O. D-5-99) on March 25, 1999, calling for a phaseout of MTBE in gasoline by December 31, 2002. The California Legislature adopted legislation (SB 989) later that year incorporating the same phaseout date, and Governor Davis signed the legislation on October 9, 1999. This phaseout is reflected in California CBG Phase 3 requirements.

The California CBG subject to federal RFG requirements is an estimated 6.7% by volume of the daily summer gasoline supply in the U.S. The remaining California CBG constitutes an estimated 4.3% by volume of the daily summer gasoline supply in the U.S. (See footnote 7 for source citation.)

4. Arizona Cleaner Burning Gasoline

Arizona has adopted several requirements for gasoline supplied to the Phoenix, Arizona, area. This program, known as Arizona Cleaner Burning Gasoline (CBG), incorporates requirements for low RVP (7.0 psi) in the summer and minimum oxygen content (3.5 percent by weight) in the winter, as well as other parameter controls or performance standards which apply year-round, as described below.

These remaining CBG controls are categorized in one of two types of gasoline; Type 1 CBG is a federal Phase II RFG "look-alike," and Type 2 CBG is a California Phase 2 CBG "look-alike." Refiners can supply either type.

Type 1 CBG incorporates all the features of federal RFG, except for the benzene content limit and the toxics performance standard. Thus, Type 1 CBG must contain 2 percent oxygen by weight, and must meet the NOx and VOC performance standards for federal RFG in Control Region 1 ("southern" federal RFG.) Type 2 CBG incorporates all the features of California Phase 2 CBG, except for the benzene content standard, and allows refiners the option of providing alternative formulations which, under California's predictive model, provide equivalent emissions reductions.

The Arizona Legislature recently adopted laws requiring a phaseout of MTBE in gasoline in Arizona within six months of the phaseout of MTBE in California, and removing the 2 percent by weight oxygen requirement from the Arizona CBG program. See SB 1504, now Chapter 405, signed by the Governor on April 28, 2000.

The state fuel requirements of the Arizona CBG program comprise an estimated 1.0 % by volume of the daily summer gasoline supply in the U.S. (See footnote 7 for source citation.) For this report, the volume has been equally divided between Federal RFG (Southern) and Federal RFG (California) because refiners have compliance options to supply either of these fuels in meeting Arizona CBG requirements.

5. Minnesota minimum oxygen content requirement

Minnesota has adopted a year-round minimum oxygen (2.7% by weight) content requirement for gasoline supplied throughout the state. Minnesota has also adopted a ban on the use of MTBE, ETBE, or TAME (all of which are oxygenates) in gasoline, effective July 2, 2005. This legislation also bans the use of these oxygenates in gasoline at more than one third of one percent, effective July 1, 2000.

As a result of the state's ban on the use of other oxygenates, the minimum oxygen content requirement can only be met through the use of ethanol. In effect, the minimum oxygen content requirement is a statewide ethanol mandate.

The Minnesota minimum oxygen content requirement for gasoline used statewide constitutes an estimated 1.9 % by volume of the daily summer gasoline supply in the U.S. (See footnote 7 for source citation.)

6. Three grade levels of each type of gasoline

For each state fuel requirement mentioned above, refiners typically supply three grades of gasoline: regular, mid-grade, and premium. Although these grade levels of gasoline are not regulatory requirements, they do result in yet further "types" of gasoline which in some cases are segregated during the distribution process. For example, many refiners segregate regular and premium grades of gasoline during the distribution process but produce their mid-grade blend by combining regular and premium grades after the gasoline has been shipped by pipeline or other channel from the refinery to the terminal.

APPENDIX C: STATE ACTIONS CONTROLLING MTBE (STATEWIDE)

State (Region)	**Phaseout date** (chron. order)	**Extent of ban**	**Oxygenates to which ban applies**	**Date of adoption**
IA (7)	2/1/00	Partial: no more than 2% (vol.) MTBE in motor vehicle fuel.	MTBE only	5/23/00
MN (5)	7/2/00 (p) 7/2/05 (c)	Partial/then complete: no more than 1/3 of 1% oxygenate as of 7/2/00; complete ban as of 7/2/05.	MTBE, ETBE, and TAME	Early '00
NE (7)	7/13/00	Partial: no more than 1% (vol.) MTBE in any petroleum product.	MTBE only	4/11/00
SD (8)	2/28/01 No date specified.	Partial: no more than trace amounts (less than 0.5% vol.) resulting from commingling during storage or transfer.	MTBE only	2/28/01 Replaced previous limit of 2% (vol.)
CO (8)	4/30/02	Complete ban by 4/30/02.	MTBE only	5/23/00
CA (9)	12/31/02	Complete ban by 12/31/02.	MTBE only	10/9/99 (E.O. signed 3/25/99)
MI (5)	6/1/03	Complete ban by 6/1/03; can be extended if determined by 6/1/02 that phaseout date is not achievable.	MTBE only	6/26/00
AZ (9)	6/30/03	Complete ban ASAP but not later than 6 months after CA phaseout.	MTBE only	4/28/00
CT (1)	10/1/03	Complete ban by 10/1/03, planned in conjunction with NESCAUM regional fuels task force.	MTBE only	6/1/00

NY (2)	1/1/04	Complete ban as of 1/1/04.	MTBE only	5/24/00
WA (10)	1/1/04	Partial: may not be intentionally added to fuel, or knowingly mixed in gasoline above 0.6% (vol.)	MTBE only	5/10/01
IL (5)	7/24/04	Complete ban as of 7/24/04	MTBE only	7/24/01

NOTES:
(1) **MO** Gov. signed Exec. Order, 4/5/00, requiring DNR to phaseout MTBE once Congress and EPA waive MO's participation in RFG and clarify state's authority to ban MTBE.
(2) **ME** Gov. signed legislation, 4/14/00, setting goal of eliminating MTBE in gasoline by 1/1/03.
(3) Oxygenated Fuels Ass'n (OFA) has challenged **NY** and **CA** bans in court. On May 18, 2001, the U.S. District Court for the Northern District of NY denied OFA's motion for summary judgment in the lawsuit challenging the NY ban, which results in the case having to be tried. A summary judgment in favor of OFA would have been a ruling against the ban.

Various Fuel Program Requirements

Fuel Program Requirements	**Current**	**2006 Ref.**	**3-Fuel Option**		**2-Fuel Option**		**Fed CBG**	**Cal CBG**
			RFG	CBG	RFG	CBG		
Northern RFG	X	X						
Chicago Northern RFG w/Ethanol	X	X						
Northern RFG, no MTBE		X						
Southern RFG	X	X	X	X	X	X	X	
Southern RFG, no MTBE			X	X	X	X	X	
California CBG	X	X						X
California CBG with oxygen	X							
California CBG w/o MTBE		X	X	X	X	X	X	X
9.0 Fed CG w/ethanol waiver	X	X	X	X	X	X		
Ethanol requirement in Minnesota	X	X	X	X	X	X	X	X
9.0 Fed CG, No MTBE		X	X	X	X	X		
7.8 Fed CG w/ethanol waiver	X	X						
7.8 RVP, w/o ethanol waiver	X	X	X	X				
7.8 Fed CG, No MTBE		X	X	X				
7.2 RVP	X	X						
7.0 RVP	X	X						
7.0 RVP, w/Sulfur control	X	X						
Total	12	15	8	8	6	6	4	3

Fuel Grades Resulting from the Various Program Requirements

Fuel Grades*	Current	2006 Ref.	3-Fuel Option		2-Fuel Option		Fed CBG	Cal CBG
			RFG	CBG	RFG	CBG		
Northern RFG w/ethanol	X	X						
Chicago Northern RFG w/Ethanol	X	X						
Northern RFG w/MTBE	X	X						
Southern RFG w/ethanol	X	X	X	X	X	X	X	
Southern RFG, with MTBE or w/o oxygenate	X	X	X	X	X	X	X	
Southern RFG w/o oxygenate				X		X	X	
California CBG w/ethanol	X	X	X	X	X	X	X	X
California CBG w/ MTBE or w/o oxygenate	X							
California CBG w/o oxygenate		X	X	X	X	X	X	X
9.0 Fed CG w/ethanol	X	X	X	X	X	X		
9.0 Fed CG w/MTBE or w/o oxygenate	X	X	X	X	X	X		
9.0 RVP w/o oxygenate		X	X	X	X	X		
Ethanol requirement in Minnesota	X	X	X	X	X	X	X	X
7.8 RVP w/ethanol	X	X	X	X				
7.8 RVP w/MTBE or w/o oxygenate	X	X	X	X				
7.8 RVP w/o oxygenate		X	X	X				
7.2 RVP	X	X						
7.0 RVP	X	X						
7.0 RVP, w/Sulfur control	X	X						
Total*	15	17	11	12	8	9	6	3

* At least regular and premium grades of each. Some fuel types may also have midgrade while others may not have all three