



# EPAct Section 1541(c) Boutique Fuels Report to Congress



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Office of Policy and International Affairs  
U.S. Department of Energy

and

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

# EPACT SECTION 1541 (C) BOUTIQUE FUELS REPORT TO CONGRESS

SUBMITTED TO THE COMMITTEE ON ENERGY AND COMMERCE OF THE UNITED STATES HOUSE OF REPRESENTATIVES AND THE COMMITTEES ON ENERGY AND NATURAL RESOURCES AND ON ENVIRONMENT AND PUBLIC WORKS OF THE UNITED STATES SENATE

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## EXECUTIVE SUMMARY

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In compliance with Section 1541(c) of the Energy Policy Act of 2005 (EPAct), the Environmental Protection Agency (EPA) and the Department of Energy (DOE) are submitting to Congress this report regarding the impact of state fuel programs (approved under the Clean Air Act Amendments (CAAA) Section 211(c)(4)(c)) on air quality, the number of fuel blends, fuel availability, and on fuel costs. This report fulfills one part of a broader EPAct requirement for EPA and DOE to analyze the affects of boutique fuels, in addition to other unique fuels, on the nation's fuel system. Because of the potential importance of these distinct fuel requirements on the nation's fuel supplies, in the spring of 2006 President Bush established the Boutique Fuels Task Force to gather information from numerous stakeholders including state officials, refiners, public health officials and automakers. The Task Force issued a report in June 2006. This Report builds upon the Task Force findings. It provides an overview of the status of state boutique fuel programs, describes important regulatory and legislative changes that have or will soon change the landscape of the broader transportation fuels market, summarizes other critical market factors that have had a significant influence on the U.S. transportation fuels sector, revisits the Task Force recommendations from affected parties, and provides a plan that EPA and DOE will follow for a more comprehensive assessment of the impacts of boutique fuels and other varying transportation fuels programs, as outlined in EPAct Section 1509 (the Fuel Harmonization Study).

Significant changes have occurred in the last five years that have affected the refining industry's ability to make and distribute boutique and other distinct fuels. While some legislative and regulatory changes were specifically directed at boutique fuels, others had important indirect effects on the boutique fuels. Legislative and regulatory changes have also occurred that have an effect on fuel supply and emissions beyond the boutique fuels authorized by CAAA Section 211 programs, such as the emergence of state renewable fuel requirements. These changes have occurred during a period in which increases in demand have outpaced increases in U.S. refining, distribution and storage capacity. These changes make it very difficult to rely on past experience with boutique fuels to predict what the impacts on fuel supply and price might be in the future from the continued use of boutique and other distinct fuels.

Within the context of this changed environment, the Boutique Fuels Task Force revisited stakeholder concerns. The key findings of the Task Force were:

- The U.S. 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 a disruption occurs (for example, due to unexpected refinery or distribution problems), it becomes more difficult to move gasoline supplies around the country because of the limitations imposed by the boutique fuel requirements. Existing authorities have been used to temporarily waive boutique fuel requirements during times of supply disruption.

- The Energy Policy Act of 2005 includes provisions that will limit the future growth of new boutique fuels allowable under CAAA Section 211(c) and provides additional authority to EPA to waive boutique fuel requirements when necessary to help alleviate unexpected supply disruptions.
- State boutique fuel programs have provided significant, cost-effective air quality improvements. Any additional policies affecting boutique fuels should be done in a manner that at least maintains these air quality benefits and avoids restricting state's authorities.
- Future analyses of potential changes to the number and types of fuels should utilize the most up-to-date data and analytical tools. The joint EPA – DOE Fuel Harmonization Study required under Section 1509 of EPAct should ensure that all aspects, including the impacts of fuel requirement modifications on air quality, vehicle components and performance, fuel fungibility, fuel supply and fuel cost, are appropriately addressed.
- As part of the analyses of future fuel options, careful consideration should be given to the possibility of new legislative authority that would allow for the adoption of regional clean fuel programs. A mechanism to require the same boutique fuel in geographic areas that cross state boundaries merits further study.
- Renewable fuels are an important part of the nation's plan to reduce our dependence on foreign oil. States are undertaking a number of actions to promote the use of such renewable fuels and the federal government is implementing programs, notably the Renewable Fuels Program established by EPAct, to do the same. Additional study would be beneficial to ensure these programs are working together and will not create undue impacts on air quality, fuel fungibility, fuel supply and/or fuel cost.

DOE and EPA have concluded that further evaluation is required to determine whether additional legislative changes affecting boutique fuels beyond those already provided in EPAct are desirable. Accordingly, DOE and EPA propose to coordinate the EPAct Section 1541 boutique fuels report with the EPAct Section 1509 Fuel Harmonization Study. The Fuel Harmonization Study will require significant analysis and substantial resources in order to update existing models and fill in major data gaps. This includes, for example: a multi-year program to generate and analyze the impacts of numerous fuel properties on emissions from engines and vehicles; and the collection and analysis of data from the pipeline and terminal industries regarding how different fuel types impact fuel distribution. Additional stakeholder involvement, particularly from the states, will also be critical. In the course of the Fuel Harmonization Study, EPA and DOE will continue to actively engage and seek input from state participants, industry stakeholders and others.

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## I. INTRODUCTION

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Over the past few decades, the number of distinct petroleum fuels produced and distributed has increased, largely due to the environmental benefits such fuels provide. This growth in both the number and location of different fuel specifications has caused changes to fuel production and distribution. To improve the understanding of the effects of these changes and provide guidance for future policy and legislation, Congress directed the Environmental Protection Agency (EPA) and the Department of Energy (DOE) to analyze the supply and environmental implications of a subset of these distinct fuels, referred to as boutique fuels. Boutique fuels are motor fuels that are a part of any clean fuel program designed and enforced under state authority to reduce motor vehicle emissions and improve air quality; approved by the EPA under the authority of Section 211 (c)(4)(c) of Clean Air Act Amendments (CAAA) of 1990; and included in an EPA-approved State Implementation Plan (SIP).

In particular, Section 1541(c) of the Energy Policy Act of 2005 (EPAct or Act) directs EPA and DOE to jointly undertake a study regarding the impact of state fuel programs (approved under the CAAA Section 211(c)(4)(c)) on air quality, the number of fuel blends, fuel availability, and on fuel costs. Congress directed EPA and DOE to determine how to develop a Federal fuels system that addresses air quality requirements, maximizes motor fuel fungibility and supply, reduces motor fuel price volatility, including that which has resulted from the increase in boutique fuels, and to recommend to Congress such regulatory and legislative changes necessary to implement such a system. Furthermore, Section 1541(c) directs EPA and DOE to consider the impacts on overall energy supply, distribution and use due to any recommended legislative changes. It also directs EPA and DOE to coordinate the report required by this section with other studies required by the Act. In developing the report, EPA and DOE are to use sound science and objective science practices, consider the best available science, use data collected by accepted means, and consider and include a description of the weight of the scientific evidence.

As this report will highlight, the impact that the various state fuel programs have on the transportation fuels market is complex. EPA and DOE have completed several boutique fuels reports in the past five years that address many of the issues identified in Section 1541(c) of the Act. The most recent report, published in June of this year, provides important information and insights on the relevant issues under Section 1541(c), however, it also illustrates that boutique fuel issues are only a part of the broader issue of distinct fuel types, including additional renewable, diesel, and heating oil fuels. In order to develop appropriate legislative recommendations, the impacts on air quality, fuel fungibility, availability and supply, cost, price, and other factors have to be fully evaluated, taking into consideration supply and environmental issues beyond the boutique fuel subset. Given the conclusions of the past boutique fuel studies, a broader evaluation, as described in Section 1509 of the Act (the Fuel Harmonization Study), is required to develop recommendations for a Federal fuels system or legislative changes. This Report will address the requirements of the narrower in scope Section 1541(c) by providing an overview of the status of state boutique fuel programs. Specifically, this report describes important regulatory and legislative changes that have or will soon change the landscape of the broader transportation fuels market and summarizes other critical market factors that have had a significant influence on the United States (U.S.) transportation

fuels sector. Furthermore, it provides a plan that EPA and DOE will follow to conduct a more comprehensive assessment of the impacts of varying transportation fuels programs.

## **BACKGROUND**

Most of the increase in the variation of petroleum fuel types has been with gasoline, the major light-duty (i.e., passenger cars and trucks) transportation fuel used in the United States. Prior to the CAAA of 1990, types of gasoline differed primarily by octane grade. Gasoline grades were generally the same nationwide and through the seasons with only gasoline volatility differing by region and by season.

During the late 1980s and the 1990s, Congress, EPA, states and other stakeholders realized the strong impact certain motor vehicle fuel properties have on air pollution. Furthermore, controlling various fuel properties was considered a very cost-effective way to reduce vehicle emissions that contribute to air pollution, while providing widespread and immediate benefits. In response to the serious air quality problems, which were occurring across the U.S., Congress, EPA, and many states took a number of actions, which have both resulted in large emission reductions as well as an increase in the number of distinct motor fuels.

The gradual increase in the number of unique fuel types first began in the late 1980s, with the emergence of both new federal and state standards. Beyond the phasing down of lead in gasoline, which began in the mid 1970s, quality controls on gasoline at the federal level remained constant until new volatility controls were first implemented beginning in 1989. In addition, some states began to require oxygenated gasoline in the winter months to reduce carbon monoxide (CO) pollution.

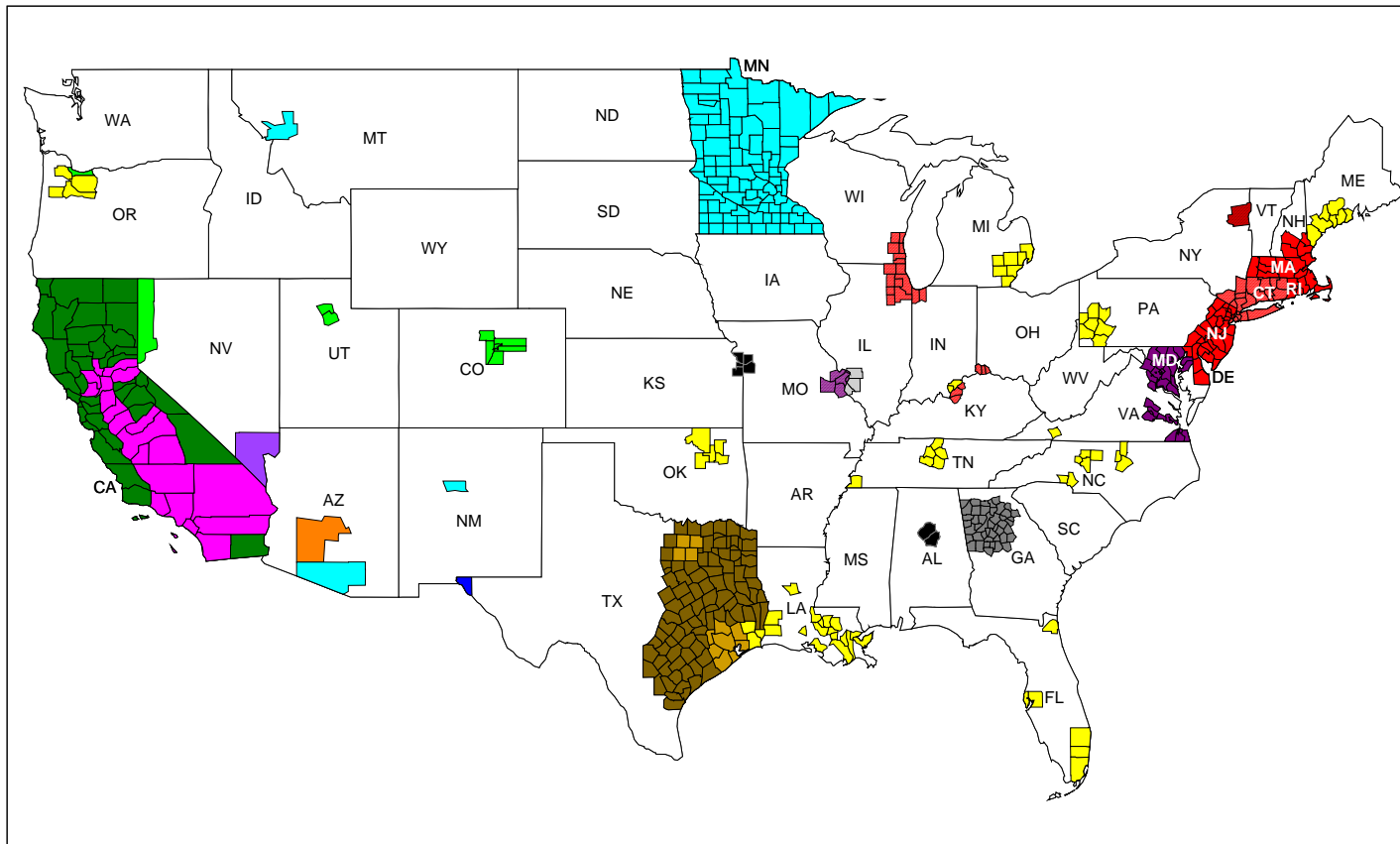
Congress included new federal and state programs in the CAAA of 1990 specifically designed to address our nation's serious air quality issues and the contribution from the mobile source sector. EPA was tasked with developing and implementing new gasoline and diesel programs that would provide significant air quality benefits and support progress in attaining the National Ambient Air Quality Standards (NAAQS). Over a 5-year period from 1990 to 1995, in accordance with the directives in the CAAA, EPA set standards for diesel fuel and gasoline including a requirement for states to introduce wintertime oxygenated fuel in 1992 in certain areas exceeding the CO standards. In 1993, the nationwide low sulfur (500 parts per million) highway diesel fuel program began, which was designed to reduce the emissions from the on-highway sector of the heavy-duty diesel truck and bus fleet. In 1995, phase 1 of the federal reformulated gasoline (RFG) program went into effect, which was designed to reduce ozone-forming emissions and control harmful air toxics in the nine worst ozone non-attainment areas.

States, with support of stakeholders including the oil industry, began to investigate and consider controls on fuels as a way to support attainment of the NAAQS. States began to evaluate both the existing menu of fuels, including federal RFG, and other potential fuel options. While the CAAA allowed states having ozone non-attainment areas that were not required to use RFG to opt-in to the program, many states selected their own cleaner-burning fuels tailored to meet their emission reduction targets, with most selecting low Reid vapor pressure (RVP) gasoline standards, stopping short of requiring cleaner burning Federal RFG. These are the so-called boutique fuels.

Figure 1, below, illustrates the different types of gasoline present in the marketplace today, including both boutique fuels as well as other available gasoline fuel types. For example, several RFG types are shown. California's RFG is required to meet a more stringent standard than federal RFG and is therefore a unique blend. Ethanol blends are distinct and have properties that vary compared to non-oxygenated or MTBE-blended RFG and therefore require different distribution methods.

Figure 2, below, illustrates the seven distinct fuels included in State Implementation Plans and defined as boutique fuels which are used in 15 different areas.

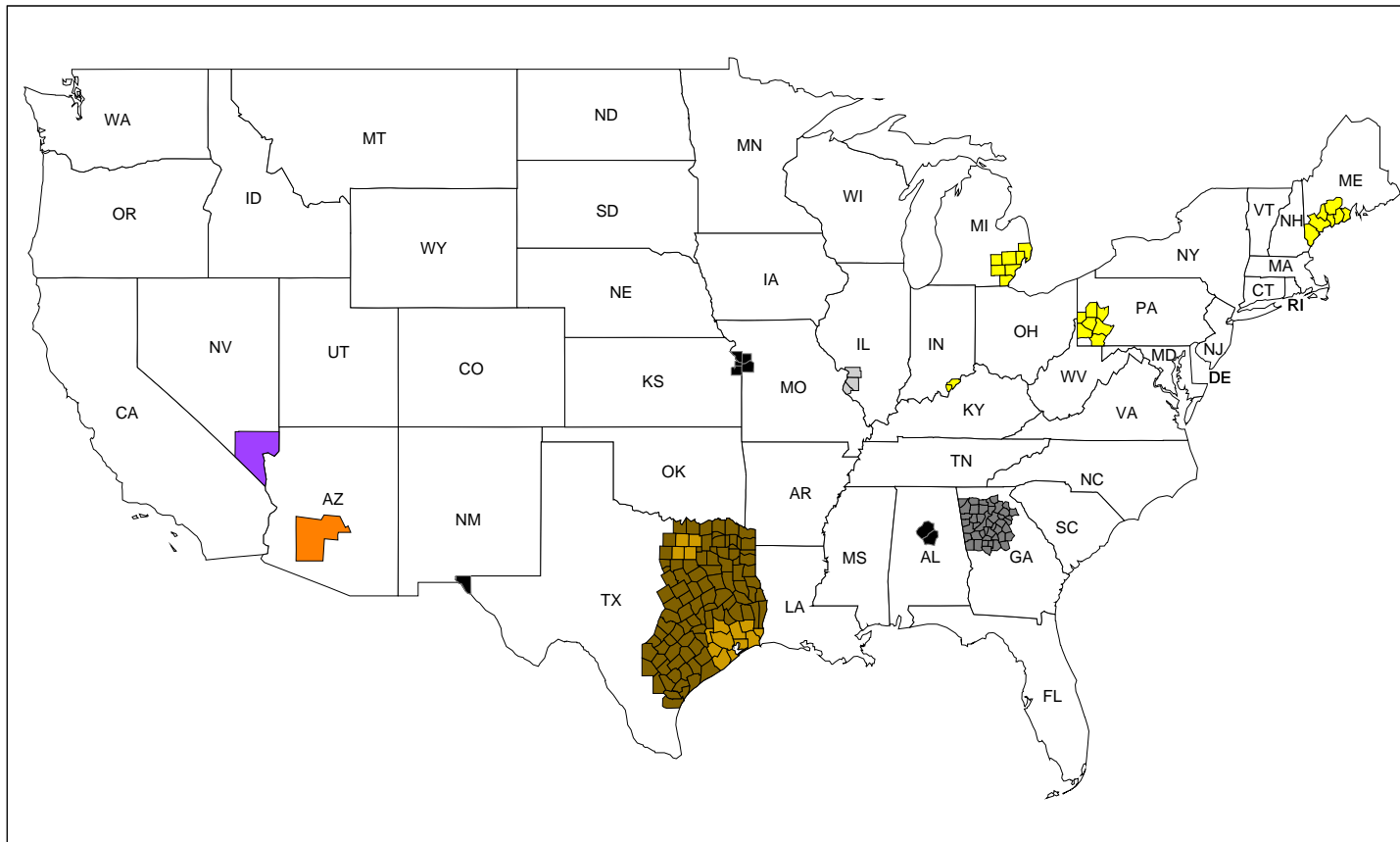




**Legend:**

- |   |   |   |
|---|---|---|
| <ul style="list-style-type: none"> <li>□ Conventional</li> <li>■ Northern RFG</li> <li>■ Southern RFG</li> <li>■ CA Cleaner Burning Gasoline</li> <li>■ Fed/CA RFG</li> <li>■ Northern RFG w/Ethanol</li> <li>■ Southern RFG w/Ethanol</li> </ul> | <ul style="list-style-type: none"> <li>■ RVP of 7.0psi w/Sulfur Content</li> <li>■ RVP of 7.0psi</li> <li>■ RVP of 7.2psi</li> <li>■ RVP of 7.8psi</li> <li>■ Oxy Fuel/Ethanol Mandate</li> <li>■ Oxy Fuel/7.0 RVP</li> <li>■ Oxy Fuel/7.8 RVP</li> </ul> | <ul style="list-style-type: none"> <li>■ AZ Cleaner Burning Gasoline</li> <li>■ NV Cleaner Burning Gasoline Winter Gasoline</li> <li>■ Texas Low Emission Diesel Fuel &amp; State RVP Controls of 7.8psi</li> <li>■ Texas Low Emission Diesel and Federal RFG or RVP Control</li> </ul> |
|---|---|---|

Figure 1. U.S. Gasoline Requirements



**Legend:**

- |                                  |   |
|----------------------------------|---|
| ■ RVP of 7.0psi w/Sulfur Content | ■ Cleaner Burning Gasoline                                      |
| ■ RVP of 7.0psi                  | ■ Winter Gasoline   |
| ■ RVP of 7.2psi                  | ■ Texas Low Emission Diesel Fuel & State RVP Controls of 7.8psi |
| ■ RVP of 7.8psi                  | ■ Texas Low Emission Diesel and Federal RFG or RVP Control      |

Figure 2. State Boutique Fuel Programs as of May 2006

Some fuels are easier to produce and distribute than others. Consequently, boutique fuel requirements can affect the decisions of individual companies to produce, distribute, and market them and affect the sources of fuel for particular areas. In some situations one fuel producer may choose to optimize their operations around the production of one fuel type (e.g., low-RVP gasoline), while others optimize their operations to produce another fuel type (e.g., conventional gasoline). In other situations, the addition of new fuel grades may require the delivery and storage system to make adjustments to accommodate more fuels. Most petroleum-based transportation fuels travel from refineries through pipelines to local distribution terminals, where tanker trucks move the products to nearby retail outlets. Pipelines ship different products sequentially in batches. For example, a pipeline might ship gasoline, diesel fuel, kerosene, jet fuel, kerosene and heating oil. Each grade of each type of fuel must be shipped in separate batches. As more fuel types evolve, smaller batches result, which may require changes to pipeline operations. Each fuel type must also be stored in separate tanks. Terminal operators must either build more tanks or hold less volume of each product to accommodate the increasing number of fuel types.

As Figure 1 illustrates, fuel types are distributed in geographic regions of various sizes. In some cases, such as portions of the Midwest and the East Coast, product must travel several weeks from refineries on the Gulf Coast. If a region runs short of its special fuel or there is a supply disruption (e.g. pipeline rupture), it cannot borrow from its surrounding areas without a special waiver. Thus, the speed with which new supplies can be brought into such an area can be affected by its use of a special fuel.

## **REPORT ORGANIZATION**

This report begins in Section II with a summary of the boutique fuel-related studies done in 2001. Much has changed since then. Section III provides an overview of the relevant legislative, regulatory, and petroleum market changes that have occurred since the 2001 studies, setting the stage for a discussion of boutique fuel issues today. Section IV focuses on the current boutique fuel perspectives, including a summary of a recent Presidential task force report on boutique fuels. This chapter illustrates the complex nature of the issues, and provides the rationale for the work planned in the integrated fuel harmonization study required under Section 1509 of EPAct 2005. Section V summarizes a coordinated plan to determine how to develop a federal fuels system, provided the necessary resources are available, and to prepare the Fuel Harmonization Study as required by Section 1509 of EPAct.

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## II. PAST EPA BOUTIQUE FUEL STUDIES (OCTOBER 2001)

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The Environmental Protection Agency wrote two studies in 2001 that contain direct and indirect analyses of boutique fuels.<sup>1</sup> The first study was performed in response to a directive of the President's 2001 National Energy Policy Report. The second study EPA performed focused on improving the transition from the winter grade to summer grade standard for RFG volatility. These studies are no longer fully representative of today's market situation given the implementation of new federal and state legislation and regulations over the past five years. However, many of the major issues highlighted in those reports are still applicable today.

In response to the President's directive, EPA issued a "Study of Unique Gasoline Fuel Blends ("Boutique Fuels"), Effects on Fuel Supply and Distribution and Potential Improvements" on October 23, 2001.<sup>2</sup> This study examined the motivation and causes for state boutique fuels, assessed the impact of these fuels on the fuel production and distribution systems, and analyzed potential ways to mitigate the impact of disruptions (due to, for example, natural disasters or other unforeseen circumstances) by allowing for a more fungible system. In preparing this study, the Agency sought input from the U.S. Departments of Energy and Agriculture, and more than 40 stakeholders.<sup>3</sup> Figure 3, below, illustrates the U.S. gasoline requirements that were in place in the summer of 2001.

The report concluded that despite the number of state and local fuel programs, the gasoline production and distribution system would be able to continue providing adequate quantities of boutique fuels, as long as there were no disruptions in the supply chain. If a disruption were to occur, it would become difficult to move gasoline supplies around the country because of constraints caused by the boutique fuel requirements. In addition, at the time, fuel providers were concerned that recently enacted state laws to ban the use of MTBE would increase the number of boutique fuels and present new challenges to the country's fuel production and distribution system.

The underlying assumptions for the analysis done in the 2001 study (costs, legislation and regulations, emergence of renewable fuels, and so forth) have changed considerably, requiring a new assessment of the fuels situation. As discussed in Section IV of this report, EPA and DOE believe it is appropriate that a new, comprehensive analysis be performed to fully assess today's situation, as part of the Fuel Harmonization Study.

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<sup>1</sup> While this section focuses on the 2001 EPA study, the Energy Information Administration provided a Service Report on the topic: *Gasoline Type Proliferation and Price Volatility*, September 2002, <http://www.eia.doe.gov/oiaf/servicerpt/fuel/gasoline.html>

<sup>2</sup> *Study of Gasoline Fuel Blends ("Boutique Fuels"). Effects on Supply and Distribution and Potential Improvements*, October 2001.

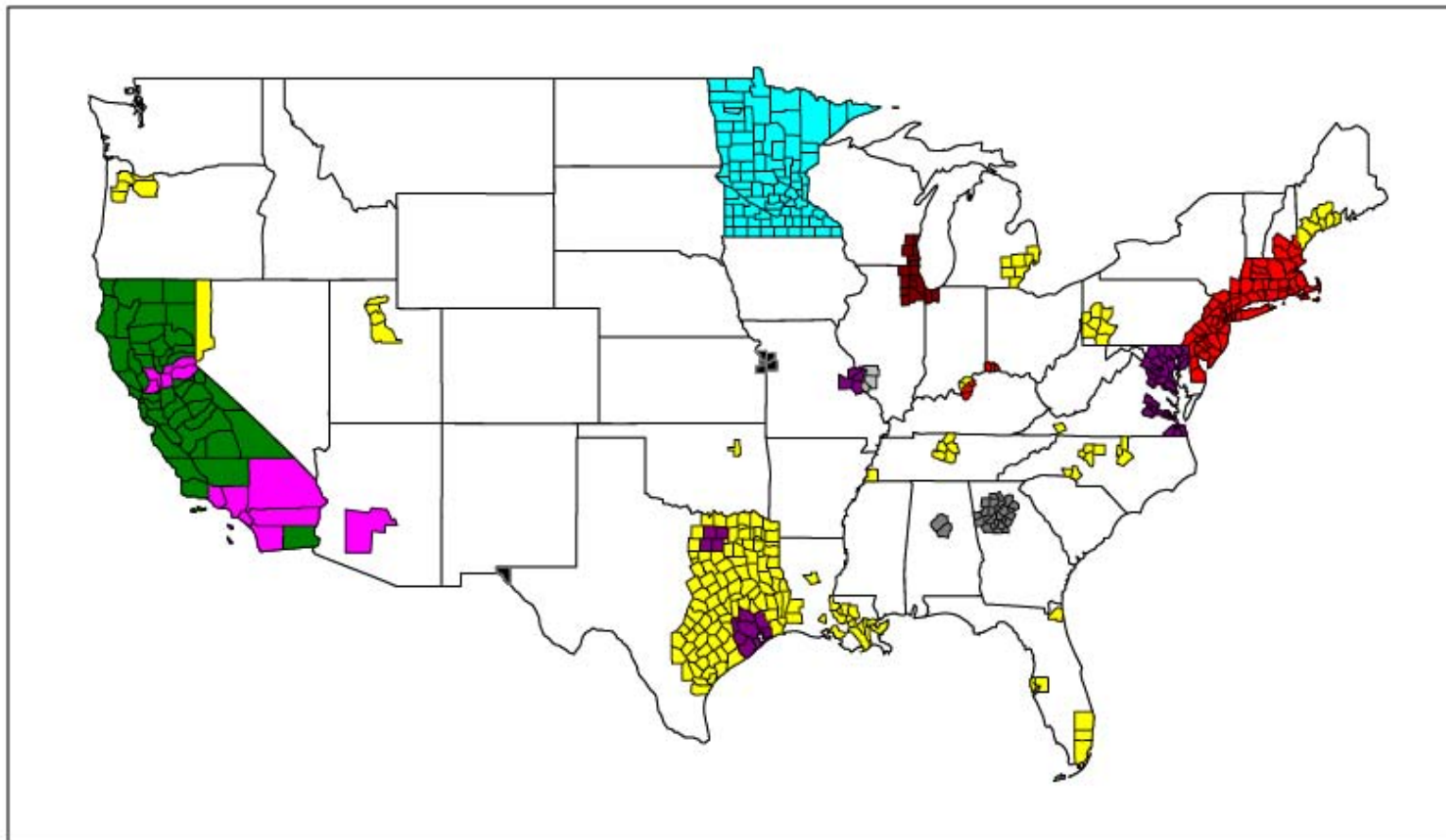
<sup>3</sup> Stakeholder comments on the 2001 study are available for review in the EPA docket (EPA-HQ-OAR-2002-0003).

In the second boutique fuels related report released by the Agency in 2001, EPA investigated seasonal transition concerns that arise when summer grade gasoline replaces winter grade gasoline.<sup>4</sup> In the 2001 fuel transition study, EPA identified a set of administrative and regulatory options as near term actions that could better facilitate seasonal gasoline transition and reduce the incentives for low inventories. Some of the options discussed in the 2001 study have since been implemented to address these transitional issues.<sup>5</sup> While these actions have not resulted in a reduction of the number of boutique fuels, they have served to allow for greater flexibility in the supply and distribution of these fuels, ultimately relieving some of the transitional issues that affected these localized market areas.

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<sup>4</sup> It is important to note that industry would make this seasonal transition at some level to support vehicle performance and operational issues, regardless of whether any environmental regulations are in place. However, the RVP specifications established by industry for vehicle performance reasons are not as stringent as those established by regulation for environmental protection purposes.

<sup>5</sup> *Study of Boutique Fuels and Issues Relating to Transition from Winter to Summer Gasoline*, October 2001, <http://www.epa.gov/otaq/regs/fuels/r01051.pdf>.



**Legend:**

- |  |   |   |
|--|---|---|
| <span style="color: red;">■</span> Northern RFG    | <span style="color: gray;">■</span> 7.0 RVP, 150ppm S | <span style="color: cyan;">■</span> Oxy Fuel/Ethanol Mandate  |
| <span style="color: purple;">■</span> Southern RFG | <span style="color: black;">■</span> 7.0 RVP          | <span style="color: darkred;">■</span> Northern RFG w/Ethanol |
| <span style="color: green;">■</span> CA CBG        | <span style="color: lightgray;">■</span> 7.2 RVP      | <span style="color: white;">■</span> Conventional             |
| <span style="color: magenta;">■</span> Fed/CA RFG  | <span style="color: yellow;">■</span> 7.8 RVP         |   |

*Figure 3. Summer U.S. Gasoline Requirements in 2001*

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### III. RELEVANT FUEL CHANGES THAT HAVE OCCURRED SINCE 2001

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Since the release of the first EPA boutique fuel study in 2001, several significant regulatory, legislative, and market changes have occurred that have influenced the U.S. fuels market situation. These factors have resulted in a significantly different fuels market today than at the time the first 2001 study was released. These changes are important to take into consideration because they can influence decisions of states interested in boutique fuels as well as the relative costs and benefits of those boutique fuels. This section summarizes the most significant regulatory and legislative changes that have occurred since 2001 and provides a brief overview of how these changes have impacted both the boutique fuels situation and more broadly, the U.S. fuels market. The legislative and regulatory factors coupled with the various market factors, further demonstrate the need and rationale for conducting a more comprehensive evaluation prior to proposing any legislative or regulatory recommendations.

#### REGULATORY CHANGES

**Tier 2 Vehicle and Gasoline Sulfur Standards and Toxics Reduction:** The Tier 2 vehicle and low sulfur gasoline program (65 FR 6698, February 10, 2000), went into effect in 2004. This program includes more stringent emission standards for light-duty vehicles enabled by low sulfur gasoline. This comprehensive program reduces smog-forming emissions from motor vehicles by up to 95 percent. The Tier 2 program began to phase-in in 2004 and ultimately requires all gasoline to average 30 parts per million (ppm) sulfur (fully phased in by January 1, 2011), whereas previously only RFG required additional sulfur control in order to meet the emission performance standards for RFG.

EPA recently proposed making additional changes to national gasoline requirements in order to reduce mobile source air toxics. The proposed Mobile Source Air Toxics (MSAT2) Rulemaking (71 FR 15804, March 29, 2006) proposes standards to significantly lower benzene emissions. With respect to gasoline properties, the EPA proposal would lower the benzene content in gasoline. If implemented as proposed in 2011, this MSAT2 benzene content standard will replace the separate air toxics performance standards currently in place for RFG and conventional gasoline, resulting in the same gasoline air toxics standards nationwide, with the exception of California.

To the extent the MSAT2 program is finalized as proposed, then the combination of the Tier 2 and MSAT2 programs will have addressed two of the fuel parameters (sulfur and benzene) states might otherwise have been interested in controlling in their own fuel programs.

**Clean Diesel Programs:** EPA's clean diesel programs require diesel fuel to meet a per-gallon cap of 15 ppm sulfur (ULSD) beginning in 2006 for highway diesel fuel (66 FR 5002, January 18, 2001), in 2010 for nonroad diesel fuel (69 FR38958, June 29, 2004) and 2012 for locomotive and marine diesel fuel. The new emissions standards established in these programs, coupled with new cleaner diesel fuel, provide for significant reductions across both the on-highway and nonroad diesel sectors. The phased introduction of these new diesel engines and fuels is intended to provide for a smooth market transition. Specific flexibilities were included in the regulations to support and ease any production and distribution issues that might arise. During the phase-in period for ULSD, some

parts of the distribution system are choosing to accommodate two grades of on-road diesel fuel; other parts of the distribution system are choosing to simply switch to ULSD. Ultimately, when these programs are fully phased in, the entire transportation sector nationwide will be using one diesel fuel. As with the Tier 2 and MSAT2 programs for gasoline, the federal action on diesel fuel sulfur addresses a fuel parameter that states might otherwise have considered for control.

**8-hour Ozone NAAQS:** In 2004, EPA established a new 8-hour ozone NAAQS. These new standards require states with areas that are not in attainment with the standard to submit a State Implementation Plan to bring the ozone non-attainment areas into attainment. In some instances, the geographic size of the new non-attainment areas may encompass only a few counties. As in the past, some states may consider boutique fuels as a cost-effective solution to reduce air pollution and help them to quickly come into attainment with the new ozone standard. The number of unique fuels being used cannot increase due to the limitations on boutique fuels prescribed by EPAct 2005 and described below under Legislative Changes. However, the existing fuel programs may increase in size or expand to new areas. The impact that the 8-hour ozone standard may have on states' interests in boutique fuels and how this may affect the fuels market should be further explored and understood prior to making any recommendations.

## LEGISLATIVE CHANGES

**EPAct Boutique Fuels List:** The Energy Policy Act of 2005 included several provisions, which specifically address boutique fuels. EPAct established a fixed limit on the number of boutique fuels that EPA can approve. Specifically, Section 1541(b) required EPA to publish a boutique fuels list based on fuels approved into SIPs as of September 1, 2004. On June 6, 2006, EPA published a draft listing of boutique fuels for public comment (71 FR 32532). In EPA's proposed approach, seven different fuel types used in 15 areas in 12 states were identified that have been implemented in an EPA-approved boutique fuel program to support cost-effective attainment of the air quality standards. Charts indicating the fuels contained under both interpretations of the statute are included in the Appendices.

By publishing this list, the number and type of fuels, and to some extent geographical application (by Petroleum Administration for Defense Districts (PADDs)) of these fuels in the U.S. market is explicitly limited. EPA is permitted to approve state requests for fuel standards (waive the preemption set for in CAAA Section 211(c)(4)(c)) only for fuels already on this list or by replacing fuels on the list. Therefore, states seeking approval of new fuel programs generally would be limited to fuel types already in existence within the PADD in which the state is located. The PADD restrictions are a powerful constraint on the expansion of state fuel programs. It is important to note that these restrictions apply in addition to the requirements set forth in CAAA Section 211(c)(4)(c), under which states must request approval for a program that is otherwise preempted under the CAAA.

**Removal Of The RFG Oxygen Content Standard:** The CAAA required that RFG contain a minimum content of oxygen. Refiners initially met this requirement primarily through the addition of MTBE, a clean-burning fuel component. Until recently, MTBE was also used to increase octane, and to reduce air toxic emissions. MTBE made up a significant amount of volume of the RFG gasoline pool. In the late 1990s, concerns over the use of MTBE began to increase because of its



potential for contaminating drinking water. Beginning in 2003, state MTBE bans resulted in a substantial reduction in the use of MTBE and a subsequent increase in ethanol use to replace this product.

In 2005, the enactment of EPAct subsequently removed the oxygen requirement for RFG. To implement this change, EPA completed a rulemaking that took effect on May 5, 2006.<sup>6</sup> This change allows refiners and importers to produce or import RFG with or without oxygenate as long as the gasoline meets all other RFG requirements. While removal of the oxygen standard provides additional flexibility, enabling refiners and importers to produce and distribute RFG in the most cost-effective manner, the industry's near-universal response has been to remove MTBE from the market and replace its presence in RFG with ethanol. The result has been a movement toward one type of RFG (ethanol blended) nationwide. However, the future economics of producing gasoline, including the blending of ethanol, may be influenced by factors such as compliance with the federal renewable fuels standard (RFS) program, the application of additional state renewable fuel program requirements and incentives, and other such factors. The removal of the oxygen requirement in Federal RFG enables refiners to produce either an oxygenated or un oxygenated RFG, however, as in the past with MTBE-blended RFG, these two fuels are generally not fungible when ethanol is the oxygenate of choice. The potential impact these factors have on the market should be further explored and understood prior to making any recommendations.

**Renewable Fuels Program:** EPAct also set forth a new national renewable fuels program that established renewable fuel volume requirements beginning in 2006. On September 6, 2006, EPA proposed a regulation to implement the comprehensive program for 2007 and later. This important new program is designed to help the U.S. reduce our reliance on foreign sources of energy. Ethanol is expected to be the primary renewable fuel used to meet the requirement for the near future. However, because ethanol must be transported and distributed separately due to its affinity to water and the presence of water in the petroleum distribution system, the need to handle ethanol separately will need to be taken into consideration. For example, the distribution system may need to handle reformulated blendstock for oxygenate blending (RBOB) for ethanol, conventional blendstock for oxygenate blending (CBOB), ethanol, and potentially non-oxygenated RFG (discussed above). As with the other Federal and state legislation and regulations mentioned in this section, closer evaluation of the current and future market dynamics, as well as how the RFS affects air quality, will be necessary to support any recommendations.

## STATE FACTORS

**State Renewable Fuel Programs:** Since 2000, several states have implemented renewable fuels programs, and with the increases in petroleum prices in the past few years, more states are pursuing renewable fuel requirements (Appendix A). While these state renewable programs are not boutique

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<sup>6</sup> Because California is treated differently under the Clean Air Act, EPA removed the oxygen content requirement for California RFG through a separate action in April.

fuels, they may play an increasingly important role in the nation's fuel system in the future.<sup>7</sup> As with the federal renewable fuels program, ethanol is likely to be the main renewable fuel used, at least for a number of years, as other renewable fuels are less widely available and less economically aligned with that of petroleum based fuels. While the federal renewable fuels standard includes a requirement to establish a credit trading program to allow suppliers to use renewable fuels in the most economic and efficient manner nationwide, state renewable fuel mandates could have an effect of limiting some of this flexibility. Additional analysis is necessary to determine to what extent these programs will affect the overall fuels markets.

## **MARKET CHANGES**

In addition to new legislation and regulations, petroleum market changes have occurred that could affect the supply system's ability to manage multiple, distinct fuel types, including boutique fuels, in the future. These issues are discussed in more detail below.

### **CHANGES IN DOMESTIC PRODUCTION AND DISTRIBUTION CAPACITY IN RELATION TO DEMAND**

In recent years, petroleum demand growth has outpaced the growth in both refinery and distribution capacity, reducing excess production and distribution capacity, which in turn, has reduced supply flexibility to handle unexpected supply disruptions. Producing and distributing boutique fuels and other fuel types is easier in an environment that has excess capacity than in one where both production and distribution capacity are tight. At the same time, today's tight supply environment is also resulting in plans for new investments to expand capacity. Increased investments in capacity may work to relieve some of the supply and distribution pressures associated with handling multiple fuel types in the future.

During the first half of the 1990s, refinery capacity in the U.S. changed very little. In the early 1990s, a recession held down demand growth, but capacity utilization still increased from 87 percent in 1990 to 92.6 percent in 1994. By the second half of the 1990s, the U.S. was running its refineries near capacity during the peak summer months. Demand continued to grow, but U.S. refining capacity was growing as well. U.S. capacity growth seemed to keep up with demand increases, and utilization remained around 93 percent. Since 2000, the refinery capacity/demand balance again shifted. Demand growth continued, with demand for products from refineries increasing over one million bpd from 2000 to 2005, but capacity increases slowed to grow only 0.6 million barrels per day (bpd), with increasing imports making up most of the balance.

Another significant change has been that financial incentives for investments have improved since 2000, and the industry is announcing plans for substantial capacity increases over the next five years. Capacity expansion plans and estimates for capacity creep indicate U.S. refineries could

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<sup>7</sup> Boutique fuels are motor fuels that are a part of any clean fuel program designed and enforced under state authority to reduce motor vehicle emissions and improve air quality; approved by the EPA under the authority of Section 211 (c)(4)(c) of CAAA of 1990; and included in an EPA-approved SIP.

expand 1.7 million bpd from 2005 to 2010, which is greater than the Energy Information Administration's projected demand increase for refinery products.

The growth in demand has also affected the distribution infrastructure. Several significant pipeline changes have occurred. The Centennial Pipeline opened in 2002, which helped to ease a critical transportation bottleneck in moving product from the Gulf Coast to the Midwest. This pipeline had been a natural gas pipeline. Converting from a natural gas pipeline to a petroleum product pipeline reduced many of the issues that arise when trying to construct a grass-roots pipeline. At about the same time, the Explorer pipeline, which also moves product from the Gulf Coast to the Midwest, expanded. Another major addition was the Longhorn pipeline, which began operations in 2005. Initially a crude oil pipeline, it was extended and converted to handle light petroleum products. The Longhorn pipeline moves products from refineries on the Gulf Coast to West Texas. From there, shippers may use other pipelines to move product to New Mexico and Arizona. Thus, this pipeline served to connect many Gulf Coast refineries to rapidly growing markets in Arizona and Nevada. While we have not seen widespread public announcements in the past year as with the refining industry, recently, Colonial Pipeline announced a planned expansion from the Gulf Coast to the Southeast.

#### CHANGES IN IMPORT SUPPLY

Motor gasoline imports are a critical component of U.S. East Coast supply, accounting for approximately 25 percent of the East Coast market. Since 2000, U.S. gasoline imports have increased 71 percent or about 500,000 bpd, to average almost 1.1 million bpd in 2005. In 2005, 41 percent of those volumes came from Western Europe, 26 percent came from Canada and the Virgin Islands, and 12 percent from Eastern Europe. These regions were also the areas supplying the largest growth volumes. Western Europe accounted for 62 percent of the growth, Eastern Europe 22 percent, and Canada and the Virgin Islands 13 percent.

As U.S. fuel quality specifications have become more stringent, some sources of imported product have chosen not to invest to comply. Gasoline volumes from Brazil, for example, have declined significantly in recent years, though this situation could reverse in the future. At the same time, other sources of imported product that could meet U.S. specifications have shifted more products to the U.S. In total, there has been a net increase in gasoline imports. Western Europe is an area that has been able to supply a growing volume of high quality fuels, since the European Union fuel specifications are similar to U.S. specifications, and since European demand for gasoline is declining, freeing up more volume for export. The U.S. now depends on fewer import suppliers, which may reduce flexibility to respond to unexpected changes in supply or demand.

Multiple fuel types also can have an impact on how importers respond to changes in the market. Importers must determine which fuel types are needed before they can begin assembling cargoes. Traders have adapted to these issues in various ways. Some are storing blending components that can be used to produce RBOB or conventional gasoline as needed, to be able to respond to market changes more quickly. While this can help traders meet specific fuel needs through more flexibly, it can require the use of more tanks for the different blending components than if storing simply RBOB and finished conventional gasoline, and total inventory volumes stored may be less.

## **CHAPTER SUMMARY**

In summary, since 2001, significant legislative, regulatory, and market changes have occurred that affect boutique fuel incentives and industry's ability to handle these products. While some legislative and regulatory changes were specifically directed at boutique fuel issues, many affected boutique fuel incentives indirectly. Furthermore, some of the changes that have occurred may increase the incentive for states to use boutique fuels, while others may decrease the incentive. Legislative and regulatory changes have also taken place that could have an effect on fuel supply and emissions beyond state boutique fuels, such as the emergence of state renewable fuel requirements and the beginning of the ULSD program. Meanwhile, the petroleum market has experienced shrinking excess capacity in the areas of refining, distribution and storage, and diminished sources of product imports. At the same time, changing financial incentives are encouraging capacity expansion. Additional analysis is needed to assess these many different and competing impacts on the fuels markets.

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## IV. BOUTIQUE FUELS TASK FORCE REPORT (JUNE 2006)

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On April 25, 2006, President Bush directed the EPA Administrator to convene a Task Force of States to review the variety of regulatory requirements related to fuels. The Task Force on Boutique Fuels (Task Force), which included states, EPA, DOE, and the United States Department of Agriculture (USDA), concluded with EPA issuing its most recent report on June 23, 2006.

The Task Force was charged with identifying opportunities to increase cooperation among the federal government and states on gasoline supply decisions and to reduce the number of boutique fuels. In addition, critical stakeholders, including those in the refining, marketing and fuel distribution sectors, were provided with an opportunity to present their views and opinions to the Task Force for evaluation and consideration.

The Task Force was specifically charged with reviewing the current boutique fuels situation in the U.S., any actions taken since EPA last investigated and reported on the boutique fuels situation, and the relevant provisions in EPAct. The process provided for stakeholder input prior to reporting on any options, recommendations or further informational needs necessary to effectively address the impact boutique fuels have on the U.S. fuels market.

Boutique fuels, as defined in the Task Force report (as in the 2001 study) are:

- Fuels that are a part of any clean fuel program designed and enforced under state authority to reduce motor vehicle emissions and improve air quality; and,
- Approved by the EPA under the authority of Section 211 (c)(4)(c) of the CAAA of 1990; and,
- Included in an EPA-approved SIP.

The Task Force gathered relevant information related to boutique fuels from participants and stakeholders. Based on the information collected from the participants and stakeholders, EPA prepared a Report<sup>8</sup> to the President on potential actions and next steps to simplify the U.S. fuel system, increase fuel supply, improve fuel fungibility, and encourage cooperation among the states on fuel supply decisions. Specifically, the Report to the President noted the following conclusions and recommendations:

- The U.S. 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 a disruption occurs (for example, due to a natural disaster), it becomes more difficult to move gasoline supplies around the country because of the limitations

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<sup>8</sup> *Report to the President – Boutique Fuels Task Force*, June 2006, <http://www.epa.gov/otaq/boutique/resources/bftf62306finalreport.pdf>.

imposed by the boutique fuel requirements. EPA has used existing authorities to waive boutique fuel requirements temporarily during such times of supply disruption.

- State boutique fuel programs have provided significant, cost-effective air quality improvements. Any actions to modify the slate of existing boutique fuels or limit a state's ability to adopt fuel specifications should be done in a manner that at least maintains the air quality benefits and avoids unnecessarily restricting state authority.
- Any future analysis of potential changes to the number and types of fuels must utilize the most up-to-date data and analytical tools. In particular, the 2008 EPA/DOE Fuel Harmonization Study should ensure that the impacts of fuel requirement modifications on air quality, vehicle components and performance, fuel fungibility, fuel supply and fuel cost, are appropriately addressed.
- As part of the analyses of future fuel options, careful consideration should be given to the possibility of new legislative authority that would allow for the adoption of regional clean fuel programs. Cleaner burning fuels used in geographic areas broader than states merit further study as an additional option for addressing fuel supply and fungibility concerns.
- Renewable fuels are an important part of the Administration's plan to reduce U.S. dependence on foreign oil. States are undertaking a number of actions to promote the use of such renewable fuels and the federal government is implementing programs, notably the Renewable Fuels Program established by EPAct, to do the same. Additional study is necessary to ensure these programs are working together and will not create undue adverse impacts on air quality, fuel fungibility, fuel supply and/or fuel cost.

The Task Force Report is the first step of a comprehensive effort to reassess issues related to the nation's fuel supply. It is a key part of the broader process in which EPA and DOE, in response to EPAct requirements, will be analyzing the affects of boutique fuels, in addition to other unique fuels, on the nation's fuel system.

The observations and recommendations resulting from the Task Force Report have provided useful input into developing the plan described in Section V of this report, regarding the future Fuel Harmonization Study. The report also serves as a foundation for developing this report. Additional stakeholder involvement, particularly from the states, on this plan will also be critical. In the course of the Fuel Harmonization Study, EPA and DOE will continue to actively engage and seek input from interested state participants from the Task Force as well as other interested stakeholders.

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## V. WORK PLANNED FOR EPAct SECTION 1509 STUDY

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### REQUIREMENTS OF THE ACT

In addition to the Boutique Fuels study required under section 1541 of EPAct, section 1509 of EPAct further requires EPA and DOE to submit a joint report to Congress on the results of a Fuel System Requirements Harmonization Study by June 1, 2008. When completed, the Fuel Harmonization report may contain recommendations for legislative and administrative actions that reflect the following principles: improve air quality, reduce fuel costs to consumers and producers, and increase fuel supply liquidity. The recommendations shall take into account the need to provide advance notice of required modifications to refinery and fuel distribution systems in order to ensure an adequate supply of motor vehicle fuel in all states. In developing the report, EPA and DOE shall consult with the Governors of the States, automobile manufacturers, state and local air pollution control regulators, public health experts, motor vehicle fuel producers and distributors, and the public.

The Fuel Harmonization Study is required to cover standards relating to RFG, volatility (measured in RVP), oxygenated fuel, diesel fuel, and any other requirements that vary from state to state, region to region, or locality to locality. The study must assess the effect the variety of these fuel standards have on the following:

- Supply, quality, and price of motor vehicle fuels available to the consumer;
- Achievement of national, regional, and local air quality standards and goals and related environmental and public health protection standards and goals (including the protection of children, pregnant women, minority or low-income communities, and other sensitive populations);
- Domestic refiners, the fuel distribution system; and industry investment in new capacity;
- Emissions from vehicles, refiners, and fuel handling facilities;
- The feasibility of developing national or regional motor vehicle fuel slates for the 48 contiguous states that, while protecting and improving air quality at the national, regional, and local levels, could enhance flexibility in the fuel distribution infrastructure and improve fuel fungibility; reduce price volatility and costs to consumers and producers; provide increased liquidity to the gasoline market; and enhance fuel quality, consistency, and supply;
- The feasibility of providing incentives, and the need for the development of national standards necessary, to promote cleaner burning motor vehicle fuel; and

- The extent to which improvements in air quality and any increases or decreases in the price of motor fuel can be projected to result from the following programs, rules, and requirements:
  - EPA's Tier 2/Gasoline Sulfur requirements for conventional gasoline and vehicle emission systems,
  - EPA's on-road and off-road diesel rules,
  - The RFG program,
  - The renewable fuels program established under section 1501 of EPAct,
  - State programs regarding gasoline volatility, and
  - Any other requirements imposed by the federal government, states or localities affecting the composition of motor fuel.

#### OVERVIEW OF PLANNED APPROACH TO THE 1509 STUDY

The Fuel Harmonization Study is much broader in scope than the 1541 study, including analysis of more distinct fuel programs and requirements. It also requires a comprehensive evaluation of fuel supply, cost, and emission impacts associated with these distinct fuel programs and, in particular, how these impacts might change under possible legislative or administrative changes.

Figure 4 illustrates the conceptual analytical approach, which will be used for the Fuel Harmonization Study and some of the key interrelationships in the fuel system. As illustrated, two major areas for analysis are interrelated: (1) Emissions and Air Quality and (2) Supply and Price. Potential scenarios to be evaluated generally would be directed towards affecting either fuel characteristics or supply, with accompanying impacts on both emissions and price. For example, a scenario could be evaluated that requires a single very clean fuel, which might have the largest improvement on air quality and the lowest price volatility, but might have the highest increase in costs for the consumer. Scenarios will be developed to explore the implications of a range of potential options and other factors. However, as Figure 5 (Emissions and Air Quality Analysis) and Figure 6 (Supply and Price Analysis) begin to illustrate, these scenarios are complex.



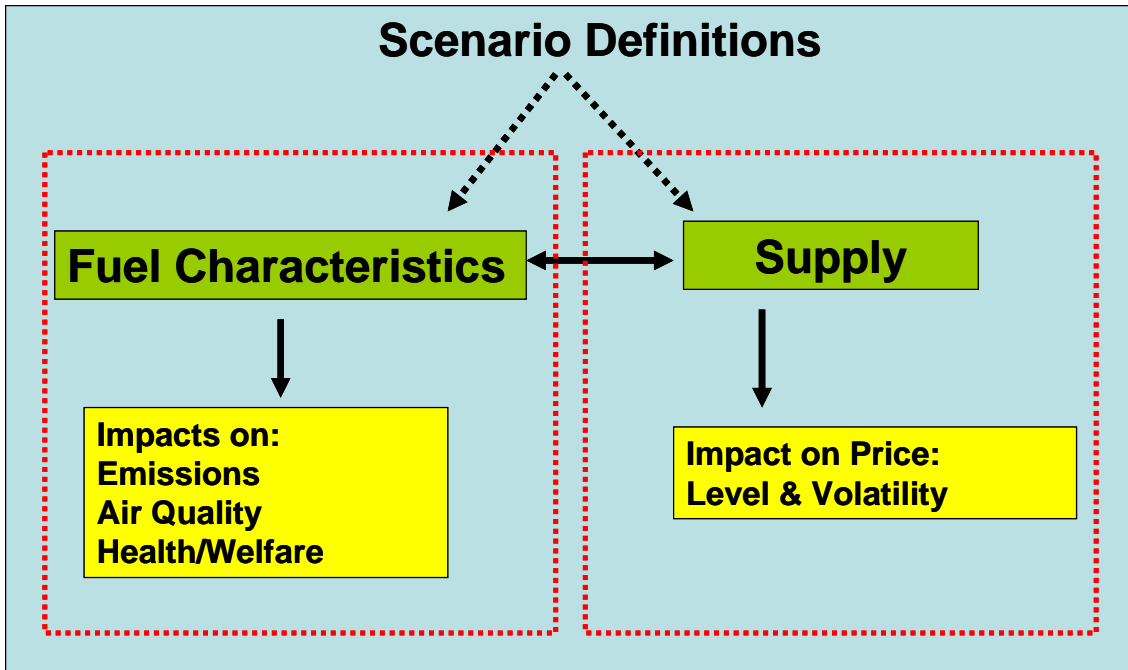


Figure 4. Conceptual Analytical Approach to the Fuel Harmonization Study

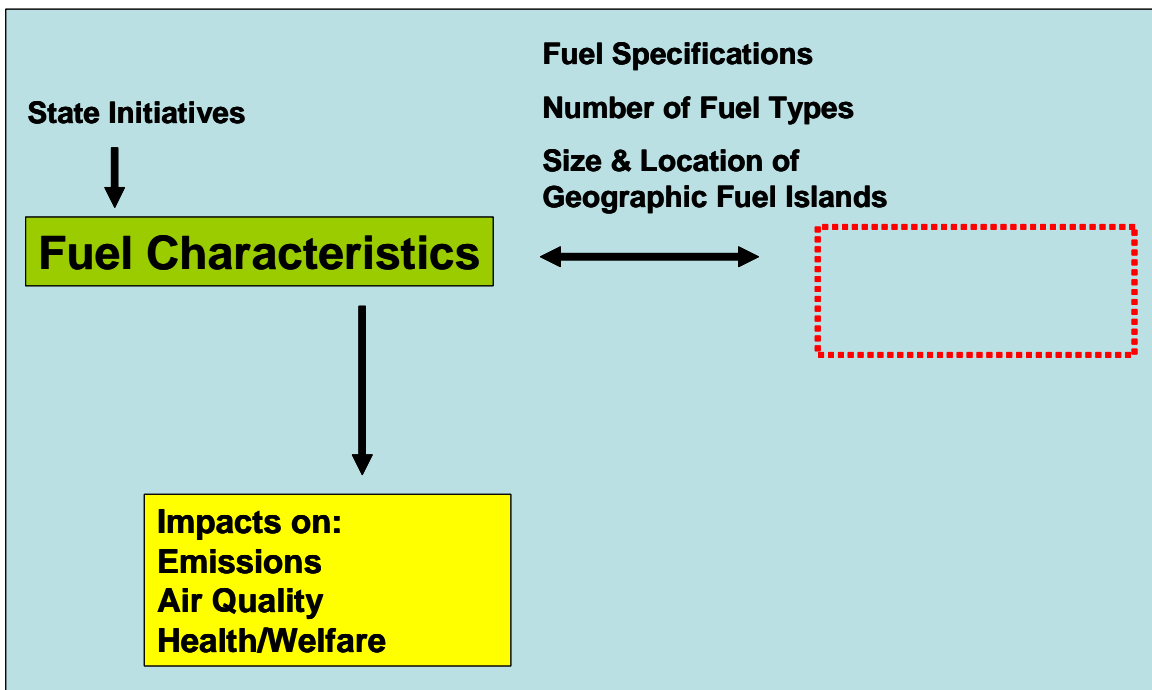
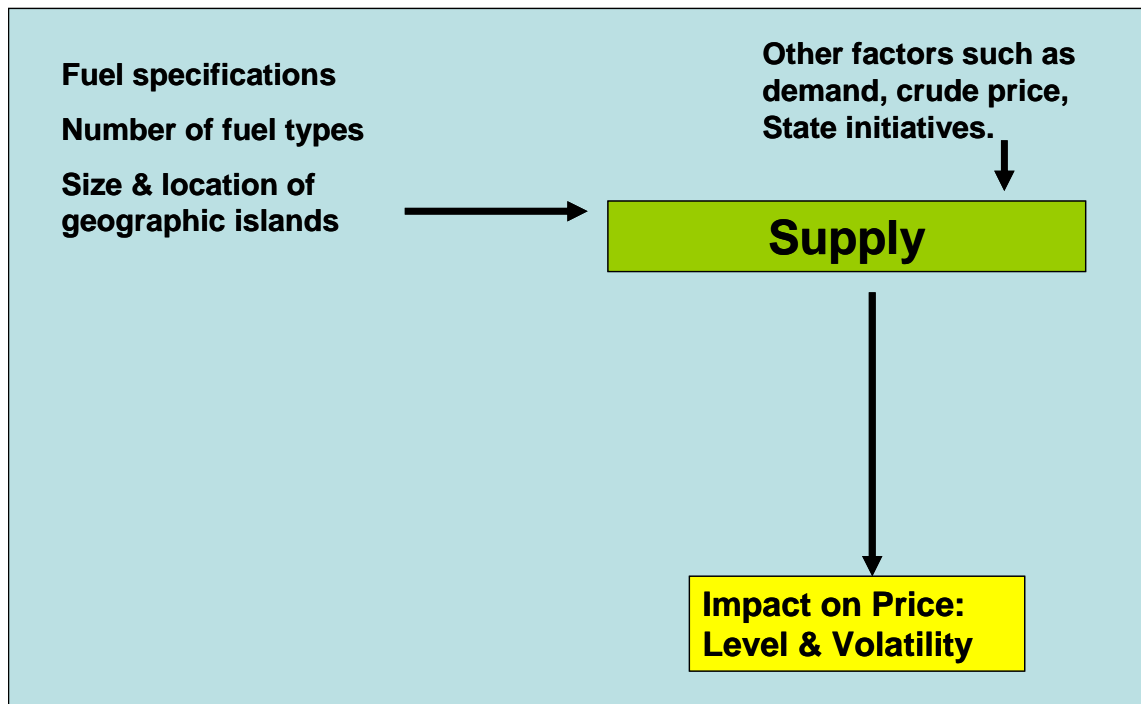


Figure 5. Conceptual Analytical Approach to the Emissions and Air Quality Analysis

Figure 5, while still a simplified diagram, expands further the Emissions and Air Quality Impacts Analysis, which will estimate the air quality impacts and the impacts on health and welfare. Some of the information generated for each individual scenario analysis will also be needed as an input for the Supply and Price Analysis. As described in more detail below, in order to generate the emission outcomes, significant testing and analysis must be done to develop the relevant vehicle and engine emission information. Work must also be done to develop various fuel types and volume for future situations in enough detail to capture the potential fuel specifications and geographic use of those fuels. The Emissions and Air Quality work will also require estimates regarding what will occur in the area of state fuel initiatives, whether they are boutique driven, renewable or other.



*Figure 6. Conceptual Analytical Approach to the Supply/Price Analysis*

Figure 6 expands the Supply and Price Analysis in a similar fashion, illustrating the input information required in order to ultimately evaluate the supply and price implications. The focus of this area (in red) is to generate refinery and distribution capacity and cost impacts for various scenarios, and determine the corresponding changes in factors that would ultimately impact availability or reliability of supply. The diagram shows that, dependent upon the scenario being analyzed, state initiatives may be an input into the analysis along with other supply assumptions such as demand growth, and crude and product prices. It also shows the information needed for and generated from the Emission and Air Quality Analysis supporting the Supply and Price Analysis.

The number of scenarios to be analyzed for the Fuel Harmonization Study must be limited due to the complexity of the analysis. EPA and DOE will attempt to identify the most

important variables for consideration, and structure a set of scenarios to capture a range of policy options and potential impacts in order to provide meaningful policy recommendations.

Before performing these analyses, we must better understand the current situation, which will require significant work to collect and update data in a number of areas, such as vehicle and engine emissions and performance data. We also will need to evaluate past market behavior as fuel types increased, such as in the area of supply distribution, in order to help understand potential future market responses.

In overview, to analyze how policy options may affect air quality and consumer prices, the Fuel Harmonization Study will explore:

- Changes in the nature, size, number, and location of distinct fuel-type areas
- The potential changes to refining and distribution system capacity resulting from such modifications to the fuel system
- The potential local and nationwide impacts on the costs of producing and distributing fuel resulting from such modifications to the fuel system
- The impact such fuel system modifications may have on the reliability of production and distribution capability during times of disruption
- The local and nationwide impacts on emissions and air quality resulting from such modifications to the fuel system
- The sensitivity of these impacts to various critical assumptions, including future expansion of the fuel production and distribution infrastructure, changes in future fuel demand, and changes in future crude oil costs.
- The tradeoffs among the impacts for different scenarios

The subsections that follow describe in detail those things that EPA and DOE believe are the most important to analyze as part of the Fuel Harmonization Study. They also describe the nature of the data and information that will need to be collected in order to carry out these analyses.

## EMISSIONS AND AIR QUALITY ANALYSIS

To ultimately assess the air quality and associated fuel supply and price impacts of future strategies, new vehicle and engine emission factors that represent the current fleet must first be established. Today's vehicle fleet is much different from the fleet used to establish current estimated relationships between fuel specifications/properties and emissions.

Following the 1990 CAAA, fuel effects were well characterized for passenger vehicles utilizing model year 1990 technology. Under Section 211(k) of the CAAA, RFG was required to result in reduced emissions relative to emissions from baseline or representative model year 1990 vehicles. In support of the RFG rulemaking, EPA developed the "Complex Model" to predict emissions based

on fuel properties (such as sulfur, benzene, aromatics, olefins and RVP) that are readily measurable and technologically feasible to control. The data gathering effort necessary to develop this model was enormous, involving both the auto and oil industries and costing approximately \$35 million. Since the development of the Complex Model, with the exception of studies on the effects of gasoline and diesel fuel sulfur (in which EPA, DOE, and industry collectively spent roughly \$10 million), only very limited data collection or analysis efforts have been undertaken to examine the effects of fuel properties on vehicle emissions.

Looking back to the 1990 model year, vehicle technology has changed dramatically. Auto and engine manufacturers have used a combination of higher catalyst precious metal loading, improved catalyst durability, close-coupled catalysts for faster catalyst light off, and electronic controls to greatly improve air-to-fuel ratio control (for achieving hydrocarbon (HC), CO, and oxides of Nitrogen (NO<sub>x</sub>) exhaust emission reductions). Evaporative emissions have also been reduced since 1990 by the use of electronic controls versus earlier vacuum-controlled designs. Additionally, evaporative emissions have been reduced by better canister designs, the use of less permeable materials in vapor control lines, and the addition of a system to collect refueling emissions. Another significant change between 1990 and today's vehicles has been the implementation of an electronic onboard diagnostic control system to monitor the performance of critical emission control components. This system detects failures in individual components and, above prescribed thresholds, indicates an increase in emissions and the need for service to repair components.

As the Complex Model only covered light-duty gasoline, Tier 0 (model year 1990 technology) vehicles under summertime conditions, a significant amount of additional data will be needed on light-duty as well as heavy-duty vehicles and nonroad applications for current engine technology (both gasoline and diesel). Furthermore, a significant amount of data will be needed under summer and winter conditions to form a sound data foundation on which analysis can be performed and conclusions drawn. A comprehensive test program, likely of similar magnitude to that which went into developing the Complex Model (e.g., \$35 million), is necessary to fill these data gaps. Such a comprehensive test program will require substantial resources as requested in the President's 2007 Budget. The test program must assess the impacts of fuel parameters directly affected by the current distinct fuel types (e.g., RVP, sulfur, ethanol content, and biodiesel content), as well as fuel parameters which are impacted indirectly (e.g., benzene, aromatics, olefins, and distillation) in order to allow for an assessment of the cause and effect relationships on emissions.

Once these cause and effect relationships are established, then models can be developed to allow assessments to be performed of a range of possible changes to the current slate of distinct fuel types across the country. Using these emission impacts, air quality modeling can then be performed to evaluate their impact on future ozone and PM (particulate matter) air quality. Outputs from air quality models can also be used to consider the impact of various fuel scenarios on human health and welfare.

## FUELS SUPPLY AND PRICE ANALYSIS

The fuel Supply and Price Analysis requires work in several areas: refining, distribution, and import supply. As shown in Figure 6 in red, for each scenario, the work will be focused on projecting distribution system and refinery costs and capacity impacts, import supply availability and basic changes to supply reliability, which will be the basis for estimating price and price volatility

impacts. Basic scenario inputs for this part of the analysis will include information from the Emission and Air Quality Analysis, such as the fuel specifications, number of fuel types, and the location and size of various fuel type geographic areas. The underlying petroleum market conditions such as demand and crude price will also be needed. It will be critical to separate the external market factor impacts on cost, reliability, and price from the impacts of the distinct fuel types being evaluated. For example, product prices are a function of a number of factors, including worldwide supply and demand for crude oil and the local, national, and even worldwide supply and demand balance for refined products.

### **Cost, Capacity and Import Availability**

Similar to the Emission and Air Quality Analysis, the first step in the Supply/Price Analysis will be to analyze current conditions and the relationships among the various elements of the petroleum supply system as they relates to boutique and other distinct fuels.

The impacts of multiple fuel types on transportation, distribution, and storage must be studied thoroughly. This is true not only in the case of individual distinct fuel specifications, but also in the case of how a unique fuel specification might affect the distribution of other products. Before any recommendations can be made on changes to the slate of fuels, a much better understanding is required of how changes in the number of fuels and in the number and size of fuel-type geographic regions may affect the cost and ability to move and store product, and thus affect overall distribution costs and capacity.

Quantifying delivery and storage system issues will require working with pipeline and terminal operators and marketers on a local and regional basis to assess their experience with how a changing slate of fuels has historically and in the future would likely affect their capacity, flexibility, and costs. As changes to their marketing agreements and practices are also a viable response to a change in fuel slates, it will be important to review past industry responses as a means of projecting into the future. For example, the response of the distribution system may result in “over-compliance” on the part of the fuel producers. Over-compliance can occur when distribution and storage infrastructure do not accommodate a full fuel spectrum. In such a case, suppliers may provide all customers with the cleanest fuel required because of the lack of storage space for multiple fuels.

To assess refinery production cost impacts, refining models and cost databases will be updated to include the current number, type, and volume of motor vehicle fuels produced, the current and planned production capacity and other assumptions concerning feedstocks supply. This will require incorporation of cost information associated with the newest technologies and equipment changes to meet the latest processing requirements, as well as updated information on refinery operational changes, such as changes in purchasing materials from outside of the refinery to meet product specifications, including renewable fuel components. Unlike many historical refinery production analyses, the Fuel Harmonization study will require looking at impacts on different types of refineries rather than an aggregate production analysis, in order to consider both the policy implications and marginal cost changes that affect price. Again, data and models will need to be adjusted to deal with different refinery types.

An increasingly important factor in assessing impacts on fuel supply in the U.S. is having a proper understanding of the import and export market. As U.S. demand has continued to grow

beyond domestic refining capacity, the ability of imports of finished gasoline and diesel fuel to supply the U.S. market has become more critical. The result is that changes in gasoline and diesel fuel demand around the world have a much more direct impact on overall U.S. supply. A consequence is that changes in fuel specifications in the U.S. and abroad can cause significant changes in the import and export market; creating new markets for some and closing down markets for others. Incorporating these changes into our analysis will allow a better understanding of what might happen to import availability in the future under different fuel scenarios and whether further legislative changes would affect our sources of supply.

### **Reliability of Supply**

Reliability of the U.S. supply system can be evaluated with probabilistic techniques which can incorporate variables associated with events or changes at the refinery, in the distribution system, and even from the availability of imports.

At the refinery, a better understanding is required of how producing one high quality fuel versus an array of gasoline types affects production reliability. For example, if one refinery process unit goes down, what is the projected impact on production.

Reliability of the distribution system involves a variety of dimensions that must be explored to assess how reliability changes among different fuel scenarios. For example, pipelines move product in batches. The evolution of increasing the number of distinct fuels serving smaller demand areas means many pipelines now carry more products. Smaller volumes of each product are potentially stored in the different demand regions. Under these conditions, to maintain reasonable inventory levels and prevent inventory outages, tank turnovers may occur more often, which means the time intervals between product shipment arrivals may be smaller. Scheduling becomes more complex, and even without major disruptions, there is the potential for increasing probability of outages. In the past, this may not have reached critical constraints. In some cases, suppliers working with pipelines and terminal operators found various means to solve critical pinch points in the system with operating changes such as using product exchanges to allow one terminal to carry one product, while another terminal carries the second product. In-line blending was added to allow terminals to drop mid-grade gasoline and blend it as needed from conventional and premium gasoline at the retail pump. As we look ahead, understanding the distribution capacity, efficiency, constraints, and ultimately probability of outage will help us determine how fuel harmonization issues may affect distribution system reliability.

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## LIST OF ACRONYMS

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bpd	barrels per day
CAA	Clean Air Act
CAAA	Clean Air Act Amendments
CBOB	conventional blendstocks for oxygenate blending
CO	carbon monoxide
DOE	Department of Energy
EPA	Environmental Protection Agency
EPAct	Energy Policy Act of 2005
HC	hydrocarbons
MSAT	mobile source air toxics
MTBE	methyl tertiary-butyl ether
NAAQS	National Ambient Air Quality Standards
NO <sub>x</sub>	oxides of nitrogen
PADD	Petroleum Administration for Defense District
PM	particulate matter
ppm	parts per million
RBOB	reformulated blendstocks for oxygenate blending
RFG	reformulated gasoline
RFS	renewable fuels standard
RVP	Reid Vapor Pressure
SIP	State Implementation Plan
ULSD	ultra-low sulfur diesel
USDA	U.S. Department of Agriculture
VOC	volatile organic compounds

## APPENDIX A

**Table 1. State Biofuel Standards Enacted**

State	Legislation Status	Enabling Statute(s)	Biofuels Included	Content Requirement & Effective Date
Hawaii	Legislation Enacted mid-1990s; Administrative Rule Signed 9/14/04	<a href="#">Title 15, Chapter 35, Para. 15.35.3</a>	Ethanol	85% of all gasoline must contain at least 10Vol% ethanol by 4/2/06. Exemption if (a) competitively-price ethanol not available or (b) undue hardship.
		<a href="#">Governor's Press Release</a>		
Iowa	Enacted 5/31/06	<a href="#">HF2754</a>	Ethanol; Biodiesel	All motor fuel (gasoline + diesel) contain 10Vol% biofuel (ethanol + biodiesel) by 1/1/09, increasing according to an annual schedule to 25Vol% by 1/1/20.
Louisiana	Enacted 6/13/06	<a href="#">HB685</a>	Ethanol; Biodiesel; Alternative Renewable Fuel	2Vol% total gasoline contain ethanol after rate of 50 MMGY ethanol production in state; 2Vol% total diesel contain biodiesel after rate of 10 MMGY biodiesel production in state; 2Vol% total motor fuel to be alternate renewable after rate of 20 MMGY production in state. All 3 take effect 6 months after production targets reached.
Minnesota	Enacted in 1997; revision 5/12/05	<a href="#">SF4</a>	Ethanol; Biodiesel	All gasoline contain ethanol at least 9.2Vol% and not more than 10Vol%. If all gasoline by 12/31/10 is less than 20Vol%, subject to Federal approval of E20, all gasoline must contain ethanol between 18.4Vol% and 20Vol% by 8/30/13.



State	Legislation Status	Enabling Statute(s)	Biofuels Included	Content Requirement & Effective Date
Missouri	Enacted 7/10/06	<a href="#">HB1270</a>	Ethanol	All gasoline contain 10Vol% ethanol by 1/1/08. Exemption (a) for premium grade gasoline and (b) if ethanol more expensive than oil-based gasoline.
		<a href="#">Governor's Press Release</a>		
Montana	Enacted	<a href="#">SB293</a> (Summary only)	Ethanol	All gasoline contain ethanol at 10Vol% after state's ethanol production reaches rate of 40 MMGY level.
Washington	Enacted 3/30/06	<a href="#">SB6508</a>	Ethanol; Biodiesel	All gasoline contain 2Vol% ethanol by 12/1/08 ramping up to 10Vol% by 2012. All diesel contain 2Vol% by 12/1/08 ramping up to 5Vol% by 2012.

**Table 2. Standards Pending Final Approval**

State	Legislation Status	Enabling Statute(s)	Biofuels Included	Content Requirement & Effective Date
California	Executive Order (Target vs. Standard)		Ethanol; Biodiesel	Targets to produce and all gasoline contain biofuels at minimum of 20Vol% by 2010, 40Vol% by 2020, and 75Vol% by 2050.
Colorado	Passed Legislature; vetoed by Governor		Ethanol	75Vol% of all gasoline contain ethanol at 10Vol% by 1/1/07.
Idaho	Passed by Senate; pending in House		Ethanol	All gasoline contain ethanol at 10Vol% by 60 days after state ethanol production reaches rate of 30 MMGY.
Illinois	Passed by Senate; pending in House		Ethanol; Biodiesel	All gasoline contain 10% ethanol by volume by 1/1/08 increasing to 15% by 1/1/12

State	Legislation Status	Enabling Statute(s)	Biofuels Included	Content Requirement & Effective Date
Indiana	Enacted (Study vs Standard)		Renewable Fuels	Study committee created to find most effective way to implement RFS under EPACT 2005
Kansas	Not passed		Ethanol; Biodiesel	All gasoline contain 10Vol% ethanol and all diesel fuel contain 2Vol% biodiesel by 1/1/10.
New Mexico	Not passed		Ethanol; Biodiesel	All gasoline contain 10Vol% ethanol and all diesel fuel contain 2Vol% biodiesel by 1/1/09.
Pennsylvania	Proposed by Governor; to be taken up by Legislature		Ethanol; Biodiesel	All gasoline contains ethanol at a 'certain percentage' and all diesel contain biodiesel at a 'certain percentage' by unspecified target date.
Virginia	Proposed by Governor; rejected by Legislature		Ethanol	All gasoline contain ethanol at 10Vol% 12 months after state's ethanol production reaches rate of 300 MMGY level for at least 3 months.
Wisconsin	Passed by House; amendment pending in Senate	AB15	Ethanol	All gasoline contain ethanol at 10Vol% by 10/1/07. Standard would be suspended if E10 mandate "contributes to or will contribute to a violation of federal ambient air quality or visibility standards."

Last update: 7/13/06.

Source: *Special Report: United States – State Renewable Content Standards*, International Fuel

Quality Center, Hart, June 6, 2006;

[STATUS: 2006, State by State Ethanol Handbook](#)

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