The Energy Information Administration's Assessment of Reformulated Gasoline

Volume 2

October 1994

**Energy Information Administration
Office of Oil and Gas
U.S. Department of Energy
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MASTER

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Preface

On June 28, 1994, a hearing was held by the U. S. House of Representatives, Committee on Energy and Commerce, Subcommittee on Oversight and Investigations relating to the implementation of the 1990 amendments to the Clean Air Act. As a result of the hearing, the Subcommittee Chairman, Congressman John D. Dingell, sent a letter, dated June 28, 1994, to Ms. Susan Tierney, Assistant Secretary for Policy, Planning and Program Evaluation, of the U.S. Department of Energy. He wrote:

"I request that the Energy Information Administration (EIA) conduct an analysis by October 1994 which examines the final RFG rule, the many guidances, interpretations, etc., the pending rules (if adopted), the ability of the distribution system to handle these matters, including identifying any pipeline and tankage problems, the extent to which smaller refiners will not produce RFG and potentially create supply problems, and all other relevant factors affecting gasoline supplies nationwide, regionally, and by state. The analysis should include expected RFG supply sources beginning December 1, 1994, for each Sub-PAD in PADD I from local refineries, pipelines, barges, and imports...."

This report, prepared in response to the request, is divided into two volumes. The first volume contains EIA's findings and analyses on reformulated gasoline as it affects the petroleum industry. The data contained herein should assist members of the Congress, Federal, State and local governments, analysts, researchers, the media and academia to understand the RFG program and the current status of implementation. The second volume contains 10 appendices that include the letter from Congressman Dingell, survey results, survey forms, and historical summary data. A glossary and a list of acronyms and abbreviations are printed in Volumes 1 and 2.

Recently, two events occurred that impact RFG. The first event occurred September 12, 1994, when the U.S. House of Representatives voted to deny the EPA funds required to enforce its proposed rule to allow foreign refiners to certify RFG using their own 1990 baseline.^{1,2} The Senate had already passed a similar provision. Under these circumstances, the EPA must determine what future course of action will be pursued. Foreign refiners were required to use the statutory baseline in the original final rules on RFG released in December 1993. This event does not affect the RFG supply estimates contained in this report.

Second, the Appeals Court granted a stay of the renewable oxygenate requirement for reformulated gasoline on September 13, 1994. The court will begin hearing oral arguments from all parties on the first available date following the January 12, 1995, filing of Final Briefs. Consequently, the requirement for the use of renewable oxygenates will not be in effect at the January 1, 1995, start-up of the RFG program. The long-term effect is still unresolved. However, the main results presented in the following report pertaining to RFG supply and demand are unaffected by which oxygenate is added to RFG and therefore are unchanged by this event.

¹"Gas Lines, Higher Cost Seen in Tighter Rule on Refined Imported Gas," *Washington Times*, September 14, 1994, B12.

²"House Votes to Deny EPA Funds to Enforce Foreign Rule; Hearing Set on Issue," *The Oil Daily*, September 14, 1994, p.

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Appendix A

**Congressman Dingell's
Letter Requesting the
RFG Study**

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June 28, 1994

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Dear Mr. Watson, Ms. Tierney, and Ms. Nichols:

At our June 22, 1994 hearing, I indicated that, pursuant to Rules X and XI of the Rules of the House of Representatives, the Subcommittee would have additional questions relating to the implementation of the 1990 amendments to the Clean Air Act. Enclosed are the Subcommittee's questions, as well as questions by Representative Sherrod Brown. I request your response by July 20, 1994.

Also, I reiterate my request at the hearing that the Environmental Protection Agency (EPA) and the Department of Energy (DOE) keep the Subcommittee informed of any actual or anticipated problems that will affect compliance with the New Year's Day 1995 date for providing adequate supplies of reformulated gasoline (RFG) and conventional gasoline and for preventing the dumping of components of gasoline into conventional gasoline. Also, the EPA should keep the Subcommittee informed of any delay in the promul-

gation of needed guidance, interpretations, clarifications, and corrections to the December RFG rule.

The Subcommittee is continuing to work with the Environmental Protection Agency and others in the Administration to obtain the remaining documents relating to ethanol matters and appreciate the cooperation received thus far in this regard.

Please include this letter and our earlier correspondence related to the June 22 hearing in the pending rulemaking records relating to the foreign refiners baseline and the ethanol mandate.

With every good wish.

Sincerely,

John D. Dingell
Chairman
Subcommittee on Oversight
and Investigations

Enclosure

cc: The Honorable Dan Schaefer, Ranking Republican Member
Subcommittee on Oversight and Investigations

The Honorable Sherrod Brown, Member
Subcommittee on Oversight and Investigations

The Honorable Leon E. Panetta, Director
Office of Management and Budget

Ms. Sally Katzen, Administrator
Office of Information and Regulatory Affairs
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Mr. Ira Shapiro, General Counsel
Office of the United States Trade Representative

Dr. Helmut A. Merklein, Administrator
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**Additional Questions
by the Honorable John D. Dingell
Chairman, Subcommittee on Oversight and Investigations
regarding
the Clean Air Act Implementation
Hearing of June 22, 1994**

June 28, 1994

1. **Ms. Tierney**, please provide for the record the name of the importing company and exporting country, ports of entry, and volume of gasoline, gasoline blendstocks and oxygenates imported annually for the years 1991-1993.
2. **Ms. Nichols and Ms. Tierney**, enclosed is a declassified State Department document (which was provided to the witnesses as Exhibit 2) about an independent report on RFG. If that study has not been provided to you, please obtain it and indicate to what extent you concur in its findings. To what extent do you expect RFG to be exported to the U.S. from countries other than Venezuela? Do you anticipate conventional gasoline exports after January 1, 1995 to the U.S. from such countries? Are such exports, even though small percentage-wise, important to U.S. suppliers? Will the proposed foreign refiner baseline rule apply to such finished gasoline, if the shipments are not RFG? In responding to this question and the next, please consider the enclosed "Charles River Associates Petroleum Economics Monthly" of May 1994 regarding RFG and foreign refiners.
3. **Ms. Nichols and Mr. Watson**, as I understand the proposed foreign refiner rule, it authorizes an importer, like CITGO, to use a baseline established for a foreign refinery as the importer's individual baseline, but the importer does not establish the baseline. That is done by the foreign refiner by petition to you. Is that correct?

The proposal appears to preclude the EPA from enforcing these requirements against the foreign refinery, including applying penalties. As I understand the proposal, if the requirements are not met, the importer's baseline reverts to a baseline that would apply absent the foreign refiner's baseline. In short, the proposed rule does not subject the Venezuelans to U.S. jurisdiction. They can't be fined, for example. Do you agree? If yes, how does the rule overcome EPA's concerns about enforcement, etc., of last year? Is this in reality a special rule for one entity that runs counter to the general purpose of the Clean Air Act of uniformity and non-discrimination as between regulated entities, particularly those that are also competitors? Why is that a proper rule, taking into consideration your reply and that of Ms. Tierney to question 1 and 2? Why not enter

into a bilateral agreement with Venezuela rather than a rule?

4. **Ms. Tierney**, I request that the Energy Information Administration (EIA) conduct an analysis by October 1994 which examines the final RFG rule, the many guidances, interpretations, etc., the pending rules (if adopted), the ability of the distribution system to handle these matters, including identifying any pipeline and tankage problems, the extent to which smaller refiners will not produce RFG and potentially create supply problems, and all other relevant factors affecting gasoline supplies nationwide, regionally, and by state. The analysis should include expected RFG supply sources beginning December 1, 1994 for each Sub-PAD in PADD I from local refineries, pipelines, barges and imports.
5. **Ms. Nichols**, I understand that the CAA requires EPA to establish appropriate tolerances for RFG. Has that been done and are they consistent with Reg. Neg.? If not, why not? What other rules are needed under section 211(k) of the CAA relative to RFG and related matters and what is the status of such rules?
6. **Ms. Nichols and Ms. Tierney**, at the Subcommittee's hearing, EPA and DOE claimed that the industry had adequate time to prepare for compliance with the RFG rule. EPA and DOE noted that the final RFG rule issued in February 1994 was substantially similar to the parameters of the rule contained in the Reg. Neg. agreement. Of course, the EPA and DOE testimony did not mention that in 1993 the EPA also proposed the Bush ethanol rule. According to EPA documents provided to the Subcommittee, that proposal was not consistent with the Reg. Neg. (see, for example, the Subcommittee's Exhibit 8 which is enclosed). That proposal created uncertainty which was not resolved until December when the EPA abandoned it. In a letter to the Subcommittee on June 21, 1994, the American Petroleum Institute (API) said:

Even though Congress provided the industry with over three years lead time, the refining industry now has only three months before the RFG production will begin and the industry still does not know what fuel it must sell on January 1, 1995.

*

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...The issues needing clarification are not minor ones, but are major concerns that directly affect the implementation of the RFG rule. For example, refiner baselines were due to EPA by June 1, 1994 but the industry never received crucial

guidance (in the form of a direct final rule) that was needed for preparing their baseline submissions.

As you know, the refiners form only a part of the industry that provides gasoline to consumers.

The Secretary of Energy, in her June 20, 1994 reply to my letter of April 21, said that the DOE does not "anticipate any significant shortages or pricing problems" as a result of the RFG requirements. The Subcommittee's concern is the lateness of final promulgation of the RFG rule, the delay in providing guidance, clarification, and corrections of the rule and needed interpretations, the addition of two new proposals, and the many other factors that could contribute to forming shortages or pricing problems. The Subcommittee, like the DOE, is particularly concerned about the distribution system and the logistics generally. Has DOE or EPA analyzed the capabilities of the product distribution system to handle numerous grades of gasoline, storage capacity constraints, etc., to ensure that there will be adequate supplies of RFG? If yes, please provide the results. If no, please explain why not.

7. Ms. Nichols, the 1990 baseline values for certain fuel properties are, as the API points out, a vital element of complying with the simple model RFG requirements. The rule provided industry with the opportunity to adjust actual 1990 refinery production documentation if 1990 was an unrepresentative year. It is my understanding that industry submitted an adjusted and an unadjusted baseline. Production of RFG is likely to begin as early as September. If EPA has not approved these baselines by September can industry utilize their submitted adjusted baseline for purposes of producing RFG and conventional gasoline for 1995?

In the case of diesel fuel, the EPA had to exercise prosecutorial discretion. What is the EPA plan regarding enforcement after December 1, 1994?

8. Ms. Tierney, the DOE reply of June 20 to my letter of April 21, 1994 includes a February 16, 1994 memorandum (Tab 7) from Mr. Carmen Difiglio to Mr. Charles Kyle Simpson. It describes the EPA proposal and sets forth a so-called "Stakeholders Views" and Mr. Difiglio's opinion as follows:

Stakeholder groups are predictably polarized by EPA's proposal. The methanol industry and gasoline refiners oppose it. Farm states and the ethanol industry support it. The proposal particularly benefits Archer Daniel Midlands since it would increase the price of ethanol. In my opin-

ion, the proposal will not increase ethanol investment over currently planned capacity. Nonetheless, the proposal enjoys support from farm interests since EPA and ethanol advocates claim that it will significantly increase ethanol production.

Do you agree with this view and opinion? The memorandum also states that DOE has completed an analysis of EPA's ethanol proposal that could be provided to the EPA even though the comment period ended.

In a memorandum of February 16 to you (Tab 6), the DOE staff mentioned the controversial nature of the analysis and suggested three options on how to proceed. They recommended a peer review option to selected reviewers. In a March 22, 1994 memorandum (Tab 13) to you, marked "confidential," the DOE General Counsel concurred with your plan to seek peer review. He called it a "judicious step in light of the significant implications of DOE's preliminary findings." He also agreed with your plan to share the analysis with the EPA "without delay." He then said:

Finally, I would recommend that the draft technical analysis be presented objectively, without any policy evaluations. Given the controversy surrounding this rulemaking action and the time constraints under which EPA is operating, it is certainly prudent to release these preliminary findings now for peer review, rather than waiting until the draft final rule is submitted to OMB for interagency clearance.

Another undated memorandum (Tab 8) from you to Messrs. White and Nordhaus concludes:

The EPA ethanol proposal is estimated to increase ethanol use by between 30% and 90%. Under the most likely scenario, oil use and greenhouse gas emissions would increase (3% and 1% respectively) and fossil energy use would decrease (2%). Achieving positive greenhouse gas impacts would require that at least 25% of the ethanol used in reformulated gasoline be derived from cellulosic feedstocks. This is unlikely to occur until after the year 2000. There are no likely circumstances under which the proposal would reduce oil use.

The memorandum alerts Messrs. White and Nordhaus that "these results will be controversial and could undercut the legal basis for the proposal." You sought their findings and com-

ments by March 4, 1994. You also said that because of the "complicated nature of the analysis," you planned to circulate a "staff draft for peer review." When was the draft analysis provided to the EPA and made public and when was the peer review started and completed? Now that the analysis is final, please provide the policy review that Mr. Nordhaus urged you not to provide to the EPA.

In a March 8 memorandum (Tab 9) to you, Mr. Carmen Difiglio states:

I have received word from General Counsel that their review of our analysis will take about a week to complete. In the meantime, we have begun to consider the effect of changing our ethanol plant efficiency assumptions. We have assumed that all new ethanol plants have the same overall efficiency and carbon emission characteristics of the industry average. Considering the variety of different sizes and designs of new plants this is probably a good assumption. However, we have begun an analysis of how the results would be affected if all new ethanol plants represented the best practice.

The memorandum adds:

In our analysis of the energy impacts of the mandate, the negative oil, energy use and CO₂ consequences stem from the winter ethanol portion of the mandate. Slightly positive oil and energy use benefits are shown for the summer ETBE mandate by itself. My recommendation is to support the summer ETBE mandate on the basis of reduced emissions and energy use. The Department could actively support the summertime ETBE mandate and oppose the wintertime ethanol mandate or simply support the ETBE mandate and remain silent on the winter mandate.

The ethanol industry clearly benefits from the summer and winter mandates since they guarantee a market and can inflate ethanol prices. However, if the ethanol industry only received the summer ETBE mandate, they would effectively be getting what they originally wanted, *i.e.*, the 1 psi vapor pressure waiver. The vapor pressure waiver only affected the summer use of ethanol, not the winter use. The industry originally was content to compete with MTBE so long as gasoline did not need a lower vapor pressure in order to

use ethanol during the summer. A summertime ETBE mandate effectively provides the industry more benefits than a 1 psi waiver since ethanol must be used, regardless of its market price. Even with the 1 psi waiver, it is unlikely that ethanol would have captured more than 30 percent of the oxygenate market, and it could have been less.

What is the status of that recommendation?

Finally, an "Issue Summary" (Tab 15) states:

EPA's legal justification for this proposal rests on claimed reductions in U.S. oil use and emissions of greenhouse gases resulting from the use of renewable oxygenates.

DOE is participating in interagency meetings on this proposal. A final rule is expected in June. Major issues include:

- The Department of Agriculture has proposed to bar trading between the summer and winter program. This would insure that ETBE is used during the summer. DOE staff has opposed this proposed change.
- EPA is considering phasing in the program: 15% in 1995 then 30% in 1996 and thereafter. DOE staff has supported this proposed change since significant logistical obstacles would make it difficult for refiners to respond to a 30% mandate in less than 6 months.
- EPA is considering adding a "shoulder season" to prevent commingling of ethanol-blended reformulated gasoline with ether-blended reformulated gasoline. This would be achieved by lengthening the summer season so that commingled gasoline does not get used during the summer ozone season. DOE has not had an opportunity to comment on this proposal but intends to oppose such a change.
- EPA staff has acknowledged that it has no capability of its own to provide an assessment of the proposal's impacts on oil use or greenhouse gas emissions and is relying on DOE to help them do so. DOE provided an analysis of these impacts to EPA and the Department of Agriculture. We are answering

their technical questions and responding to their requests to modify assumptions and input data.

Please provide a list of such meetings and of the attendees for each. Why did the DOE oppose the Department of Agriculture's ban on such trading? Please explain the "logistical obstacles" that would make it difficult for refiners to respond to a 30% mandate and please explain how a phasing in will lessen those obstacles. What is the impact on the distribution system of either proposal? Please explain why the DOE opposes a "shoulder season."

9. **Ms. Nichols**, has EPA/DOE analyzed the capability of MTBE facilities to convert to produce ETBE? What logistical problems will be encountered if ethanol must be blended with RFG?
10. **Ms. Nichols**, while I support the use of ethanol, I am also concerned that the EPA, in proposing and promulgating rules, ensure that they comply fully with the applicable law which, in this case is section 211 of the Clean Air Act. EPA's integrity in rulemaking is, at the very least, open to question when the EPA acts otherwise. After examining Exhibit 8, together with Subcommittee Exhibit 4 which is a February 18, 1993 memorandum marked by the EPA as "Privileged and Confidential" from an attorney in EPA's Air and Radiation Division, and the above DOE materials, I am troubled to find that the EPA proposed the Bush rule with so little legal justification and question whether the most recent ethanol mandate is any better legally or otherwise after reading these exhibits.

At the hearing, I requested that the EPA consider the EPA concerns (pages 15-19) expressed in the July 1993 briefing memorandum (see Exhibit 8) about the Bush proposal and explain how and to what extent those concerns are eliminated or substantially mitigated by the EPA's latest proposed ethanol mandate. In providing this response, please take into consideration exhibit 4 and the DOE analysis referenced above.

11. **Ms. Nichols**, since writing to the EPA in our June 13 hearing letter about transportation conformity, the Administrator published a "General preamble for future proposed rulemakings" which I understand is the notice she referenced in her letter of March 30 to the Governor of Ohio. I do not understand how that notice is helpful to Ohio and other states. It is not a rulemaking and it states that the interpretations therein are not binding "as a matter of law." In addition to responding to the Subcommittee's question in my June 13 letter about conformity, please

explain how this notice can grant conditional exemptions of the conformity NOx requirements and why is it not applicable in the Northeast?

Also, why does the EPA want to apply these conformity requirements in attainment areas. Please explain the legal basis for that policy. What is the status of that idea?

12. **Ms. Nichols**, Michigan submitted a redesignation for Southeastern Michigan last November (see enclosed letters from Governor John Engler). I understand that EPA's Region 5 has supported it, but Headquarters has not yet acted. The Governor believes that the state has performed all the requirements to achieve such redesignation. However, your staff recently told us that there are still some problems. I would appreciate your looking into the matter and providing me with an update of the status of this request, including identifying any actions that the state must take and why.

Questions by
The Honorable Sherrod S. Brown

1. As you know, my concerns regarding the RFG rule have centered around the process in which this decision has been made and the effect it will have on my constituents in northeast Ohio. Recently, we have witnessed the difficulties encountered during the introduction of low sulfur diesel (which is only a minor portion of the fuel market) when the government only allotted a one month transition period for that specific fuel to be incorporated into the distribution system.

As you know, this new rule will effect nearly 1/3 of the entire U.S. gasoline market and billions of gallons of fuel. Faced with the fact that there still is not final rule on the ethanol provision, and we have barely six months until the new product must be available across much of America, I am concerned about our ability to meet this deadline. Consequently, is the EPA concerned about recreating similar spot shortages and/or price spikes as we make this dramatic change in such a short time frame? Is there enough time for all effected industries to meet such a deadline? What studies has EPA done on this?

In addition, it is my understanding that there are special requirements for the storage and transportation of ethanol and gasoline. Without a final rule in place, have you studied the impact on pipelines, barges, rail, and trucks, and is there sufficient capacity to move this new product? To your knowledge, have the affected industries proceeded with the necessary capital expenditures to build the new infrastructure required for this change to ensure that they meet the January 1, 1995 deadline?

Do you anticipate any cost difference to the consumer once the new RFG is online? How much difference?

Another of my concerns centers around the availability of sufficient tank storage space. The tight time frame may very well prohibit producers from being able to build new storage tanks for RFG and, therefore, may require them to utilize existing storage tanks to hold this new product, at the expense of other stored fuels. Since I believe these operators are good business people, I assume they will displace their lower value products to make way for this new, mandated product during this time of tank shortage. I understand that in many cases the lower value products are home heating fuel. Could we potentially see a shortage of this product this winter due to a displacement of this

product and a lack of sufficient tank space across the country? Have you considered this possibility?

In short, as we approach the deadline of January 1, 1995, has EPA given enough time to make sure that the market can make a seamless transition from one product to another?

2. It is my understanding that because of this mandate, demand for ethanol will increase in the Northeast, West, and South. In order to meet demand, ethanol supplies in the Midwest will be shifted to these new areas creating a strain on midwestern supplies. Have you studied the effects of regional shifts in supply of ethanol on the consumer? Can you assure me that regional shortages and price spikes, principally in the Midwest, will not occur?

Appendix B

RFG Survey and Results

Appendix B

RFG Survey and Results

This appendix contains four sections. Section 1 provides a description of the survey frame and the coverage of the selected sample. The intent was to have at least 80 percent coverage for all questionnaires. Section 2 provides the response rates of the individual questionnaires that were mailed to respondents. Section 3 provides the survey results, by question, within each questionnaire. Included in this section is a brief summary of written comments to each question. Section 4 contains the cover letter, questionnaires, and instructions sent to respondents. The response was voluntary.

Section 1

Description of the Survey Frame

The following are the titles of the five questionnaires used in the reformulated gasoline (RFG) study:

1. Refinery Operations Questionnaire
2. Product Pipeline Operations Questionnaire
3. Bulk Terminal Operations Questionnaire
4. Tanker/Barge Operations Questionnaire
5. Imports Operations Questionnaire

The sample frame included:

- **29 Integrated oil companies** that operate refineries, bulk terminals, product pipelines, tanker and barge operations, imports operations.
- **72 Non-Integrated Refiners**
- **9 Motor Gasoline Blenders (of MTBE)**
- **5 Product Pipelines**
- **2 Bulk Terminals**
- **9 Tanker and Barge Operators**
- **25 Importers (gasoline importers only during 1993)**

The 29 integrated oil companies were sent *all five* questionnaires. In addition, the nine tanker and barge companies that were strictly in the tanker/barge frame represent companies that are actually engaged in the tanker and barge business, as opposed to oil companies that lease vessels from the actual operators.

Coverage of the survey frame:

- Refineries and Blenders:** • 100% coverage
- Product Pipelines:** • 100% of the movement of Mogas - Gulf Coast to the East Coast.
- 80% of the movement of Mogas - Gulf Coast to the Midwest.
- 100% of the movement of Mogas - Gulf Coast to the West Coast.
- 80% of the Mogas stocks on the U.S. basis.
- Bulk Terminals:** • 80% of the Mogas stocks on the U.S. basis.
- Tanker and Barges:** • 98% of the movement of Mogas - Gulf Coast to the East Coast.
- 99% of the movement of Mogas - Midwest to the East Coast.
- 9 of the largest independent tanker/barge operators in the United States.
- Importers:** • 100% coverage of Mogas importers.

Section 2

Responses To The RFG Questionnaires

Response to the *voluntary* RFG survey was excellent. The overall response to all five surveys was 78 percent. Responses from producers (integrated refiners, i.e., petroleum companies that operate in several segments of the petroleum industry, non-integrated refiners, and gasoline blenders) of RFG and from product pipelines were extremely good. The response rate for integrated refiners was 97 percent; 82 percent for non-integrated refiners; 55 percent for gasoline blenders; and 100 percent for product pipelines. Response rates for non-integrated gasoline importers, bulk terminals, and tanker/barge operators were 64, 50, and 44 percent, respectively.

Refinery Questionnaire¹

Universe	110	
Responses	92	(84% response rate)
RFG Related	38	
Non-RFG Related	54	
Outstanding Questionnaires	18	

Bulk Terminal Questionnaire

Universe	2	
Responses	1	(50% response rate)
RFG Related	0	
Non-RFG Related	1	
Outstanding Questionnaires	0	

Importer Questionnaire

Universe	25	
Responses	16	(64% response rate)
RFG Related	6	
Non-RFG Related	10	
Outstanding Questionnaires	9	

Pipeline Questionnaire

Universe	5	
Responses	5	(100% response rate)
RFG Related	5	
Non-RFG Related	0	
Outstanding Questionnaires	0	

Tanker/Barge Questionnaire

Universe	9	
Responses	4	(44% response rate)
RFG Related	2	
Non-RFG Related	2	
Outstanding Questionnaires	5	

Note: All five questionnaires were sent to 29 integrated companies. Integrated companies operate more than one type of facility (e.g., a company that operates a refinery, bulk terminals, and a pipeline). The universe for the categories listed below the "refinery questionnaire" category do not include counts for integrated companies.

¹The refinery questionnaire was sent to all U.S. refineries and gasoline blenders of MTBE.

Section 3

Survey Results

REFINERY OPERATIONS QUESTIONNAIRE

Following are summaries of the responses to the categorical and the open-ended questions that were contained in the survey.

Q-1 Does your company plan to produce reformulated gasoline (RFG) at any of its facilities?

Total responses	92
Yes	38
No	54

Q-2 Does your company plan to produce RFG for sale on the spot market in 1995?

Total responses	28
Yes	17
No	10
Unknown	1

"Yes" responses ranged from approximate volumes of 4,000 barrels per day to as high as 50,000 barrels per day.

Q-3 For the years 1995 through 1997, indicate which model your company will use to produce RFG, by refinery.

Total responses	28
Simple Model	28
Complex Model	0

Q-4 Which method is your company planning to use to certify RFG?

Total responses	27
Averaging method	19
Per-gallon method	4
Both methods	3
Unknown	1

Q-5 Has the Renewable Oxygenate Standard (ROS) affected your company's plans to produce RFG?

Total responses	29
Yes	27
No	2

At the time the survey was taken, many respondents did not yet have defined plans for meeting the ROS. Many companies had planned to use MTBE for all of their RFG production. With the addition of ROS, there appears to be uncertainty regarding the renewable oxygenate supply (ethanol or ETBE), and where it will come from. Several common themes recurred that indicated industry concerns with the ROS. Many companies will need to depend on credit trading when deciding to produce, buy, or sell excess RFG. Some concerns mentioned were: the demand for scarce renewable oxygenate credits may result in unrealistic prices for such credits; the lead time for ROS is too short; the unknown availability and price of ethanol and ETBE; and, the addition of ROS has significantly increased the number of grades of gasoline in the distribution system, decreasing the flexibility of the system.

Q-6 Will your company have sufficient ethanol supplies to comply with the ROS requirement?

Total responses	29
Yes	5
No	20
Unknown	4

While most companies are seeking supplies of ETBE, there is concern that the only ETBE being offered is at uncompetitive terms. Many do not have ethanol blending facilities in place in covered markets. Some refiners say that they will ship RBOB and let downstream blenders satisfy ROS requirements.

Q-7 Will the need for ethanol result in storage problems at your refineries?

Total responses	29
Yes	18
No	10
Unknown	1

There was a general consensus that additional tankage will need to be built at refineries and that they did not have enough lead time on ROS to obtain permits and installation of additional tankage in time for 1995 compliance. At the same time, companies are hesitant to invest in storage facilities pending the outcome of a lawsuit challenging the ROS.

Q-8 Will the ROS requirement cause your company transportation problems?

Total responses	29
Yes	21
No	7
Unknown	1

Of the 21 who responded "yes," 7 indicated that the distribution system would be less flexible due to the inability to transport gasohol through pipelines. Ethanol RBOB's must be segregated throughout the system, perhaps limiting capacity for other gasoline grades. Moving ethanol from the Midwest to Texas will cause a shortage of rail cars, which might require the use of truck transportation at a higher cost. Most ROS compliance strategies place additional demands on transportation systems. In many instances, these systems are already at capacity due to the increased number of segregations required by the base RFG requirement. Many refineries do not presently have the segregated tankage or dedicated piping systems necessary to receive and blend purchased ETBE. The lack of fungibility, resulting from segregation of RFG and RBOB by oxygenate type, will limit distribution options and reduce access to certain markets. This could ultimately impact cost of product in these markets.

Q-9 Will your participation in the RFG program have an impact on any of your company's exchange agreements?

Total responses	29
Yes	24
No	4
Unknown	1

The general consensus is that all exchange agreements where RFG is involved will have to be renegotiated. Some may have to be replaced or eliminated where agreement cannot be reached. Exchange contracts must be revised to establish terms for RFG/RBOB supply including price differentials and product returns. Under the anti-dumping provisions, downstream oxygenate blending will require additional record keeping and reporting with some exchange partners. This could create an impediment to continuing the exchange.

Q-10 Will the ROS requirement create impediments to your exchange agreements?

Total responses	29
Yes	22
No	5
Unknown	2

The ROS requirement will make exchanges much more difficult since the type of oxygenate becomes a variable. The ROS is delaying finalization of agreements

pending ongoing modifications to suppliers' plans as a result of new ROS provisions. The loss of fungibility hinders the exchange of product across markets or distribution systems and may make some exchange agreements unworkable depending upon how the respective exchange partners elect to satisfy the ROS requirement.

- Q-11 What impact will "anti-dumping" regulations have on the way your company manufactures conventional gasoline?

Total responses	68
Will impact	36
No impact	31
Unknown	1

For those who responded "Will Impact," there was a general feeling that the anti-dumping regulations will severely limit flexibility in crude selection, refinery optimization, turnaround planning, and adjusting to operational outages. This will make the planning process much more difficult, increasing overhead costs. Loss of flexibility may translate to longer response times to change production to meet market demands, and will probably result in reduced domestic conventional gasoline supply.

- Q-12 Are there any motor gasoline markets that your company has historically supplied that your company will not service with either RFG, oxygenated, or conventional gasoline?

Total responses	68
Yes	14
No	54

Lack of tankage in areas that are close to both RFG and conventional gasoline areas may cause problems for some companies to provide more than one type of gasoline to these areas. Mixed responses were received to this question; some respondents provided answers regarding areas of the country that would be affected, and some provided data on volumes of both conventional and RFG they estimate will not be provided to certain areas. To protect company confidentiality, these data will not be summarized here.

- Q-13 Will there be a change in the production of other finished products for the period October 1994 through February 1995, relative to last winter, due to the RFG program?

Total responses	29
Yes	8
No	20
Unknown	1

The general consensus was that while some product mix shifts may occur, they are not likely to be significant.

Q-14 Will sampling, testing, and certification processes for RFG delay your company's refinery shipments of finished products to the market?

Total responses	30
Yes	16
No	13
Unknown	1

Companies reported possible delays from eight hours to five days. The availability and locality of the independent testing companies and delays in approval of in-line blending waivers were given as the reasons for the delays.

Q-15 Will the RFG program cause any storage problems at your refineries?

Total responses	29
Yes	23
No	6

The RFG regulations require that finished fuels and RFG blendstocks be segregated from all other fuels. Most refineries indicated that new storage tanks would not be constructed and that certain grades of other products would no longer be produced or stored at the refinery. Some refineries indicated that inventories of other products may have to be reduced to accommodate fuels and blendstocks mandated by the program. This results in a reduction in refineries' ability to quickly respond to sudden demand surges, or maintain inventory levels sufficient to keep supplies moving in the event of refinery equipment problems.

Q-16 What problems, if any, does your company foresee in reporting accurate and timely refinery data to the Energy Information Administration as a result of the start-up of the RFG program?

Total responses	68
Some problems	14
No problems	51
Unknown	3

It is not clear at this time what problems will occur in meeting EPA's reporting requirements.

PRODUCT PIPELINE OPERATIONS QUESTIONNAIRE

Q-1 Will your company be shipping reformulated gasoline (RFG)?

Total responses	18
Yes	15
No	3

Q-2 Will the RFG program cause any storage problems at your pipeline terminals?

Total responses	17
Yes	9
No	7
Unknown	1

Pipeline respondents were concerned that restrictions placed on handling of RFG/conventional gasoline interface or RFG/distillate transmix would reduce storage capability because tanks would need to be used to store interface/transmix material that was previously blended back into gasoline without requiring intermediate storage. Respondents also mentioned increased tankage requirements associated with additional product segregations and concerns regarding changing tank service from VOC-controlled RFG blended with ethanol to VOC-controlled RFG blended with other oxygenates.

Q-3 Will RFG cause an increase in delivery or transit time of product through your pipeline over 1994 average time?

Total responses	17
Yes	5
No	10
Unknown	2

One respondent indicated an increase in transit time of 5 percent. Other concerns included loss of flexibility and efficiency in operations such as side-cutting (drawing in-transit product out of pipelines) due to smaller batch sizes resulting from RFG related product segregations.

Q-4 Do you plan to offer fuel ethanol blending at your pipeline terminals?

Total responses	18
Yes	6
No	10
Unknown	2

Comments reflected uncertainty as to whether or not ethanol blending would be performed at pipeline terminals.

- Q-5 As a consequence of the introduction of RFG, does your company expect a decrease in the total volume of products that has normally moved through your pipeline systems?

Total responses	17
Yes	4
No	11
Unknown	2

One respondent commented that pipeline capacity and flexibility would be reduced to the extent that RBOB was used. The same respondent indicated uncertainty as to the extent of RBOB activity. One respondent indicated a decrease in flow rate of 1 to 2 percent caused by delays at the source and decreased batch sizes.

- Q-6 Does your company engage in blending and/or additive servicing for your customers?

Total responses	17
Yes	9
No	8

One respondent indicated that additive blending would be moved from refineries to terminals. Other comments indicated concern over expense and complexity of new systems to ensure that gasoline additives are properly dispensed and documented. Additional contractual arrangements will be needed for terminal operators to properly monitor and document additive activity. Additional storage will be needed for proprietary and generic additives to be blended with gasolines that were not previously additized.

- Q-7 What problems, if any, does your company foresee in reporting accurate and timely product pipeline data to the Energy Information Administration as a result of the start-up of the RFG program?

Comments indicated a need for clear definitions and standardized brand (product) codes. One respondent indicated concern that the internal RFG product codes used by the company might not correlate with reporting categories on EIA reports.

BULK TERMINAL OPERATIONS QUESTIONNAIRE

Q-1 Will your company be handling and storing RFG?

Total responses	23
Yes	17
No	6

Nine responses were received from integrated companies. All but one reported that they would handle RFG. Only four non-integrated companies reported that they would handle RFG at their terminals.

Q-2 Will the RFG program cause any storage problems at your terminals?

Total responses	22
Yes	14
No	5
Unknown	3

The common thread among those reporting problems was that they would no longer be able to store all the products that would be required by their customers. This problem is generally being resolved by not producing or storing mid-grade gasolines at refineries, but by blending them from regular and premium grades at terminals close to their customers. Three respondents indicated that they would no longer provide service to some of their traditional markets. Only one respondent indicated that new tankage was being constructed, and only one respondent is undertaking an aggressive program to install new facilities at all of its terminals.

Q-3 Does your company engage in blending and/or additive service for your customers?

Total responses	22
Yes	20
No	2

Companies described aggressive plans underway to add upgraded additive injection systems as soon as possible. Four companies indicated that there would be no change in their current operations or that they would not be affected by the program. Five companies reported that their plans were uncertain pending resolution/completion of the regulatory process.

Q-4 Does your company plan to offer fuel ethanol blending at its terminals?

Total responses	21
Yes	8
No	8
Unknown	5

Only two integrated companies indicated that they had firm plans to offer fuel ethanol blending. The remaining companies that responded "yes" or omitted their responses, indicated that: (1) their plans were not firm, primarily due to uncertainties (ROS regulations) or, (2) they blended ethanol for consumption in non-RFG areas.

Q-5 What problems, if any, does your company foresee in reporting accurate and timely bulk terminal data to the Energy Information Administration as a result of the start-up of the RFG program?

Total responses	21
Some problems	5
No problems	13
Unknown	3

Comments indicated that computer systems would need to be upgraded to provide complete data for the RFG program, which may require additional resources.

TANKER/BARGE OPERATIONS QUESTIONNAIRE

- Q-1 Will the introduction of RFG change your company's methods of operation or cause it to alter the manner or timing that it has historically delivered products to market?

Total responses	14
Yes	6
No	7
Unknown	1

A few companies expressed the concern that introduction of RFG creates additional steps that may cause product movement delays (e.g., how to deal with transmix, testing requirements, coping with conversions, i.e., conventional gasoline to RFG or seasonal change), possibly make more marine moves as pipelines become congested by new grades (reducing pipeline capacity).

- Q-2 What problems, if any, does your company foresee in reporting accurate and timely tanker and barge operations data to the Energy Information Administration as a result of the start-up of the RFG program?

Additional resources and updated computer programs may be required.

IMPORTS OPERATIONS QUESTIONNAIRE

Q-1 Does your company plan to import RFG as part of its supply strategy during October 1994 through January 1995?

Total responses	35
Yes ²	11
No	24

Q-2 List the countries that your company may import RFG from.

Responses included Canada, England, Indonesia, Saudi Arabia, Belgium, Spain, Italy, Venezuela, Caribbean, Europe, Middle East, Denmark, Norway, and United Kingdom.

Q-3 What problems, if any, does your company foresee in reporting accurate and timely import data to the Energy Information Administration as a result of the start-up of the RFG program?

Additional resources may be required.

Section 4

RFG Survey

The remainder of Appendix B presents samples of the PART cover letter, instructions, and questionnaire forms that were sent to survey respondents.

²One of the 11 "yes" responses was from a company with plans to begin importing RFG after January 1995.

PART

Professional Audit Review Team
Room 1842
441 G St., NW
Washington, DC 20548

July 20, 1994

James Duffus III, Chairman
Richard A. Hart, Staff Director
Robert D. Tortora, Census
Hugh Haworth, SEC
Marilyn E. Manser, BLS
David F. Lean, FTC

Dear

The Professional Audit Review Team (PART) is an organization formed by the Congress to review and evaluate the work of the Energy Information Administration (EIA). PART reports on the analytical activities of EIA to ensure that EIA performs its duties in an objective and professional manner, consistent with the intent of the Congress.

EIA is in the process of assessing the impact of the impending Reformulated Gasoline (RFG) regulations on the ability of the petroleum industry to supply sufficient mandated fuels to the market in a timely fashion. Congress will be looking to EIA for quality data on the supply, distribution, and pricing of RFG.

PART's role in this process will be to contact officials of motor gasoline producers, transporters, and storage facilities to explore possible problem areas and changes in historical patterns that may adversely affect the supply and distribution system and the quality of the resulting data. Your response to the enclosed questionnaire will help us to better understand the changes currently underway, how these changes will impact your operations, and the impact of the changes on EIA's petroleum supply reports.

Your responses to the questions will be held as confidential information except for sharing with EIA in order that problems can be considered before the RFG comes on line. Your assistance is voluntary but is an invaluable source of informed expertise on an evolving situation.

If possible, please return the completed questionnaire in the enclosed self-addressed business reply envelope within 10 days of receipt. For your convenience, you may also FAX the information to (202) 586-4451.

The status of the RFG program may only permit answers based on current planning. Therefore, we may need to send you a follow-up questionnaire later in the year to reflect actual operations related to RFG. For this questionnaire, please give your best response to each question and point out problem areas where appropriate.

Thank you for your assistance.

Richard A. Hart

Richard A. Hart
Staff Director

Enclosure

**GENERAL INSTRUCTIONS
REFORMULATED GASOLINE STUDY
REFINERY OPERATIONS QUESTIONNAIRE**

General Instructions

For purposes of reporting, this questionnaire is being sent to **petroleum refiners**, as well as **terminal storage facilities that have reported motor gasoline blending activity** to the Energy Information Administration (EIA) in the past. The attached Form A provides for the collection of 1) Estimated Gasoline Production; 2) Estimated End-of-Month Stocks; and 3) Estimated Reformulated Gasoline (RFG) Production Capacity Range.

Data should be **reported on a site specific basis**, that is, by refinery or blending facility. The data should be reported on the **same basis** as information reported to the Energy Information Administration's (EIA) on **Form EIA-810, "Monthly Refinery Report"**.

Refer to the enclosed "Glossary of Terms" and "District Descriptions and Map".

If you need more space to answer questions, please identify the question number and continue your answer on a separate sheet of paper.

If you have any **technical questions**, contact Steve Patterson (202) 586-5994 or Mike Conner (202) 586-1795.

If you have any **administrative questions**, contact Mr. Richard A. Hart at (202) 586-4474.

Please **return** the completed questionnaire(s) **within 10 days of your receipt** of the survey. You may use the enclosed self-addressed return envelope or you may **fax** the questionnaire to the attention of **Mr. Richard A. Hart** at (202) 586-4451.

FORM A

Estimated Gasoline Production

Report, by refinery or by blending facility, your company's best estimate of finished motor gasoline production, by type of gasoline. Also report your company's best estimate of production of RBOB (Reformulated Gasoline Blendstock for Oxygenate Blending). Please provide these estimates, by month, for the period October 1994 through January 1995. Figures should be reported to the nearest whole number in **thousand barrels per day**.

Estimated End-of-Month Stocks

Report, by refinery or by blending facility, your company's best estimate of finished motor gasoline end-of-month stock levels, by type of finished motor gasoline. Please provide these estimates, by month, for October 1994 through January 1995. Figures should be reported to the nearest whole number in **thousand barrels**.

Estimated RFG Production Capacity Range

Report, by refinery or by blending facility, your company's best estimate of RFG production capacity range. Please provide these estimates, by month, for October 1994 through January 1995. The **RFG production capacity range should represent** your company's best estimate of the **upper and lower limits** of what each facility **is expecting** to produce. Figures should be reported to the nearest whole number in **thousand barrels per day**.

REFORMULATED GASOLINE STUDY-REFINERY OPERATIONS QUESTIONNAIRE

Name of Company _____
Contact Person (please print) _____
Contact Telephone # _____ Contact Fax # _____

1. Does your company plan to produce reformulated gasoline (RFG) at any of its facilities? (Check one [✓].)

☐ Yes If yes, please complete the remainder of the questionnaire and the attached FORM A.

☐ No If no, please answer only questions 11, 12, and 16.

2. Does your company plan to produce RFG for sale on the spot market in 1995? (Check one [✓].) If yes, please indicate the approximate volume.

☐ Yes _____ Thousand barrels per day

☐ No

3. For the years 1995 through 1997, indicate which model your company will use to produce RFG, by refinery. (Check one [✓].)

☐ Simple Model (Check if all your refineries will use this model.)

☐ Complex Model (Check if all your refineries will use this model.)

☐ Both Types (Please indicate below, by refinery, the model your refineries will be using if they are not all using the same model.)

	Refinery Name	Simple Model	Complex Model
1.	_____	_____	_____
2.	_____	_____	_____
3.	_____	_____	_____
4.	_____	_____	_____
5.	_____	_____	_____
6.	_____	_____	_____
7.	_____	_____	_____
8.	_____	_____	_____
9.	_____	_____	_____

4. Which method is your company planning to use to certify RFG? (Check one [✓].)

☐ Per-gallon method

☐ Averaging method

REFORMULATED GASOLINE STUDY-REFINERY OPERATIONS QUESTIONNAIRE

5. Has the Renewable Oxygenate Standard (ROS) affected your company's plans to produce RFG?
(Check one [✓].)

☐

Yes If yes, please explain how your company's production plans will be changed.

☐

No

6. Will your company have sufficient ethanol supplies to comply with the ROS requirement?
(Check one [✓].)

☐

Yes

☐

No If no, what strategy will your company adopt to comply?

REFORMULATED GASOLINE STUDY-REFINERY OPERATIONS QUESTIONNAIRE

7. Will the need for ethanol result in storage problems at your refineries? (Check one [✓].)

☐

Yes

If yes, please indicate what these storage problems entail and how you propose handling them, indicating location and approximate volumes involved.

☐

No

8. Will the ROS requirement cause your company transportation problems? (Check one [✓].)

☐

Yes

If yes, please indicate what these problems may be, the states or geographic areas affected, and estimate the volumes involved.

☐

No

REFORMULATED GASOLINE STUDY--REFINERY OPERATIONS QUESTIONNAIRE

9. Will your participation in the RFG program have an impact on any of your company's exchange agreements? (Check one [✓].)

☐

Yes If yes, please describe in general terms what this impact will be.

☐

No

10. Will the ROS requirement create impediments to your exchange agreements? (Check one [✓].)

☐

Yes If yes, please explain in general terms how these impediments will cause your company to alter these agreements.

☐

No

REFORMULATED GASOLINE STUDY-REFINERY OPERATIONS QUESTIONNAIRE

11. What impact will "anti-dumping" regulations have on the way your company manufactures conventional gasoline?
12. Are there any motor gasoline markets that your company has historically supplied that your company will not service with either RFG, oxygenated or conventional gasoline? (Check one [✓].)
- ☐ Yes If yes, please identify the markets (indicate state(s) or geographic regions) involved, product(s) involved and the volumes associated in thousand barrels per day.
- ☐ No

REFORMULATED GASOLINE STUDY-REFINERY OPERATIONS QUESTIONNAIRE

13. Will there be a change in the production of other finished products for the period October 1994 through February 1995, relative to last winter, due to the RFG program?
- ☐ Yes If yes, please identify the finished products and estimated changes in volume, by refinery.
- ☐ No

14. Will the sampling, testing, and certification processes for RFG delay your company's refinery shipments of finished products to market? (Check one [✓].)
- ☐ Yes If yes, please indicate, by refinery, the product and how long a delay is anticipated.
- ☐ No

REFORMULATED GASOLINE STUDY-REFINERY OPERATIONS QUESTIONNAIRE

15. Will the RFG program cause any storage problems at your refineries? (Check one [✓].)

☐

Yes

If yes, please indicate what these storage problems entail and how you propose handling them, indicating location and approximate volumes involved.

☐

No

16. What problems, if any, does your company foresee in reporting accurate and timely refinery data to the Energy Information Administration as a result of the start-up of the RFG program?

REFORMULATED GASOLINE STUDY-REFINERY OPERATIONS

Refinery Name _____

Refinery Location (City, State) _____

	Estimated Gasoline Production (Thousands Barrels Per Day)				Estimated End of Month Stocks (Thousand Barrels)			Estimated RFG Production Capacity Range (Thousand Barrels Per Day)	
	RFG	Oxygenated	Conventional	RBOB	RFG	Oxygenated	Conventional	Low	High
Oct. 1994								-	-
Nov. 1994								-	-
Dec. 1994								-	-
Jan. 1995								-	-

Refinery Name _____

Refinery Location (City, State) _____

	Estimated Gasoline Production (Thousands Barrels Per Day)				Estimated End of Month Stocks (Thousand Barrels)			Estimated RFG Production Capacity Range (Thousand Barrels Per Day)	
	RFG	Oxygenated	Conventional	RBOB	RFG	Oxygenated	Conventional	Low	High
Oct. 1994								-	-
Nov. 1994								-	-
Dec. 1994								-	-
Jan. 1995								-	-

**GENERAL INSTRUCTIONS
REFORMULATED GASOLINE STUDY
PRODUCT PIPELINE OPERATIONS QUESTIONNAIRE**

General Instructions

For purposes of reporting, this questionnaire is being sent to **product pipeline operators** and provides for the collection of "Estimated End-of-Month Stock" levels of finished motor gasoline, by type.

Refer to the enclosed "Glossary of Terms" and "District Descriptions and Map".

If you need more space to answer questions, please identify the question number and continue your answer on a separate sheet of paper.

If you have any **technical questions**, contact Steve Patterson at (202) 586-5994 or Mike Conner at (202) 586-1795.

If you have any **administrative questions**, contact Mr. Richard A. Hart at (202) 586-4474.

Please **return** the completed questionnaire(s) **within 10 days of your receipt** of the survey. You may use the enclosed self-addressed return envelope or you may **fax** the questionnaire to the attention of **Mr. Richard A. Hart at (202) 586-4451**.

FORM B

Estimated End-of-Month Stocks

Report your company's best estimate of finished motor gasoline end-of-month stock levels, by type, by geographical regions. Please provide these estimates, by month, for October 1994 through January 1995.

The data should be reported on the same basis as information reported to the Energy Information Administration's (EIA) on Form EIA-812, "Monthly Product Pipeline Report".

Report all stocks in the custody of the product pipeline, regardless of ownership.

Figures should be reported to the nearest whole number in **thousand barrels**.

REFORMULATED GASOLINE STUDY--PRODUCT PIPELINE OPERATIONS QUESTIONNAIRE

Name of Company _____

Contact Person (please print) _____

Contact Telephone # _____ Contact Fax # _____

1. Will your company be shipping reformulated gasoline (RFG)? (Check one [✓].)
- ☐ Yes If yes, please complete the remainder of the questionnaire and the attached FORM B.
- ☐ No If no, please answer only questions 4 and 6.
2. Will the RFG program cause any storage problems at your pipeline terminals? (Check one [✓].)
- ☐ Yes If yes, what are your plans for resolving them?
- ☐ No
3. Will RFG cause an increase in delivery or transit time of products through your pipeline over 1994 average time? (Check one [✓].)
- ☐ Yes If yes, estimate the percentage increase in delivery/transit time. ____ percent
- ☐ No
4. Do you plan to offer fuel ethanol blending at your pipeline terminals? (Check one [✓].)
- ☐ Yes
- ☐ No

REFORMULATED GASOLINE STUDY--PRODUCT PIPELINE OPERATIONS QUESTIONNAIRE

5. As a consequence of the introduction of RFG, does your company expect a decrease in the total volume of products that has normally moved through your pipeline systems? (Check one [✓].)

☐

Yes

If yes, what are your pipelines' normal rate of flow, in thousand barrels per day (MB/D), and estimated percentage decrease from normal flow due to the introduction of RFG? Indicate only the pipelines and segments of the pipeline (i.e., Texas to Georgia) where a decrease is anticipated.

☐

No

Pipeline Name	Segment (From/To)	Normal Flow Rate (MB/D)	Estimated Decrease In Flow Rate (percent)
A.			
B.			
C.			
D.			
E.			

6. Does your company engage in blending and/or additive servicing for your customers? (Check one [✓].)

☐

Yes

If yes, how will RFG change the way your company provides these services?

☐

No

7. What problems, if any, does your company foresee in reporting accurate and timely product pipeline data to the Energy Information Administration as a result of the start-up of the RFG program?

REFORMULATED GASOLINE STUDY-PRODUCT PIPELINE OPERATIONS

Company Name _____
 Report all figures in thousand barrels.

Estimated RFG Stocks**Petroleum Administration for Defense Districts (PADD)**

	1X	1Y	1Z	2	3	4	5
Oct. 31, 1994							
Nov. 30, 1994							
Dec. 31, 1994							
Jan. 31, 1995							

Estimated Oxygenated Gasoline Stocks

	1X	1Y	1Z	2	3	4	5
Oct. 31, 1994							
Nov. 30, 1994							
Dec. 31, 1994							
Jan. 31, 1995							

Estimated Other Finished Gasoline Stocks

	1X	1Y	1Z	2	3	4	5
Oct. 31, 1994							
Nov. 30, 1994							
Dec. 31, 1994							
Jan. 31, 1995							

**GENERAL INSTRUCTIONS
REFORMULATED GASOLINE STUDY
BULK TERMINAL OPERATIONS QUESTIONNAIRE**

General Instructions

For purposes of reporting, this questionnaire is being sent to **bulk terminal operators**, and provides for the collection of "Estimated End-of-Month Stock" levels of finished motor gasoline, by type.

Refer to the enclosed "Glossary of Terms" and "District Descriptions and Map".

If you need more space to answer questions, please identify the question number and continue your answer on a separate sheet of paper.

If you have any **technical questions**, contact Steve Patterson at (202) 586-5994 or Mike Conner at (202) 586-1795.

If you have any **administrative questions**, contact Mr. Richard A. Hart at (202) 586-4474.

Please **return** the completed questionnaire(s) **within 10 days of your receipt** of the survey. You may use the enclosed self-addressed return envelope or you may **fax** the questionnaire to the attention of **Mr. Richard A. Hart at (202) 586-4451**.

FORM C

Estimated End-of-Month Stocks

Report your company's best estimate of finished motor gasoline end-of-month stock levels, by type, by geographical regions. Please provide these estimates, by month, for October 1994 through January 1995.

The data should be reported on the same basis as information reported to the Energy Information Administration's (EIA) on Form EIA-811, "Monthly Bulk Terminal Report".

Report all stocks in the **custody** of the terminal operator, regardless of ownership.

Figures should be reported to the nearest whole number in **thousand barrels**.

REFORMULATED GASOLINE STUDY-BULK TERMINAL OPERATIONS QUESTIONNAIRE

Name of Company _____
Contact Person (please print) _____
Contact Telephone # _____ Contact Fax # _____

1. Will your company be handling and storing RFG? (Check one [✓].)
☐ Yes If yes, please complete the remainder of the questionnaire and the attached FORM C.
☐ No If no, please answer only questions 3 and 4.

2. Will the RFG program cause any storage problems at your terminals? (Check one [✓].)
☐ Yes If yes, how do you plan to resolve them?
☐ No

3. Does your company engage in blending and/or additive servicing for your customers? (Check one [✓].)
☐ Yes If yes, how will RFG change the way your company provides these services?
☐ No

REFORMULATED GASOLINE STUDY--BULK TERMINAL OPERATIONS QUESTIONNAIRE

4. Does your company plan to offer fuel ethanol blending at its terminals? (Check one [✓].)

☐

Yes

☐

No

5. What problems, if any, does your company foresee in reporting accurate and timely bulk terminal data to the Energy Information Administration as a result of the start-up of the RFG program?

REFORMULATED GASOLINE STUDY--BULK TERMINAL OPERATIONS

Company Name _____
 Report all figures in thousand barrels.

Petroleum Administration for Defense Districts (PADD)**Estimated RFG Stocks**

Oct. 31, 1994

Nov. 30, 1994

Dec. 31, 1994

Jan. 31, 1995

1X	1Y	1Z	2	3	4	5

Estimated Oxygenated Gasoline Stocks

Oct. 31, 1994

Nov. 30, 1994

Dec. 31, 1994

Jan. 31, 1995

1X	1Y	1Z	2	3	4	5

Estimated Other Finished Gasoline Stocks

Oct. 31, 1994

Nov. 30, 1994

Dec. 31, 1994

Jan. 31, 1995

1X	1Y	1Z	2	3	4	5

REFORMULATED GASOLINE STUDY-TANKER/BARGE OPERATIONS QUESTIONNAIRE

Name of Company_____

Contact Person (please print) _____

Contact Telephone # _____ **Contact Fax #** _____

1. Will the introduction of RFG change your company's methods of operation or cause it to alter the manner or timing that it has historically delivered products to market? (Check one [✓].)

☐ Yes If yes, please explain.

☐ **No**

2. What problems, if any, does your company foresee in reporting accurate and timely tanker and barge operations data to the Energy Information Administration as a result of the start-up of the RFG program?

REFORMULATED GASOLINE STUDY--IMPORT OPERATIONS QUESTIONNAIRE

Name of Company _____
Contact Person (please print) _____
Contact Telephone # _____ Contact Fax # _____

1. Does your company plan to import RFG as part of its supply strategy? (Check one [✓].)

☐

Yes

If yes, please complete the following table. Provide the estimated volume for each month, and the expected Petroleum Administration for Defense Districts (PADD) of entry into the United States.

☐

No

**PADD of Entry
(Thousand Barrels)**

<u>Month</u>	1X	1Y	1Z	2	3	4	5
Oct. 1994							
Nov. 1994							
Dec. 1994							
Jan. 1995							

2. List the countries that your company may import RFG from.

1. _____
2. _____
3. _____
4. _____

3. What problems, if any, does your company foresee in reporting accurate and timely import data to the Energy Information Administration as a result of the start-up of the RFG program?

REFORMULATED GASOLINE STUDY

GLOSSARY OF TERMS

Bulk Terminal. A facility used primarily for the storage and/or marketing of petroleum products which has a total bulk storage capacity of 50,000 barrels or more and/or receives petroleum products by tanker, barge, or pipeline.

Ending Stocks. Primary stocks of petroleum products held in storage as of 12 midnight on the last day of the month. Primary stocks include petroleum products held in storage at (or in) leases, refineries, natural gas processing plants, pipelines, tank farms, and bulk terminals that can store at least 50,000 barrels of petroleum products or that can receive petroleum products by tanker, barge, or pipeline. Primary stocks exclude stocks of foreign origin that are held in bonded warehouse storage.

Motor Gasoline (Finished). A complex mixture of relatively volatile hydrocarbons, with or without small quantities of additives, that has been blended to form a fuel suitable for use in spark-ignition engines. Motor gasoline, as given in ASTM Specification D439 or Federal Specification VV-G-1690B, includes a range in distillation temperatures from 122° to 158° F at the 10-percent recovery point and from 365° to 374° F at the 90-percent recovery point. "Motor gasoline" includes reformulated gasoline, oxygenated gasoline, and conventional (other finished) gasoline. Blendstock is excluded until blending has been completed.

Reformulated Gasoline. Gasoline formulated for use in motor vehicles, the composition and properties of which meet the requirements of the reformulated gasoline regulations promulgated by the U.S. Environmental Protection Agency under Section 211K of the Clean Air Act.

Oxygenated Gasoline. Gasoline formulated for use in motor vehicles that has an oxygen content of 1.8 percent or higher, by weight. Includes gasohol.

Conventional (Other Finished). Motor gasoline not included in the oxygenated or reformulated gasoline categories.

Motor Gasoline Blending. Mechanical mixing of motor gasoline blending components and oxygenates to produce finished motor gasoline. Mechanical mixing of finished motor gasoline with motor gasoline blending components or oxygenates which results in increased volumes of finished motor gasoline, **and/or changes in the classification of finished motor gasoline (e.g., other finished motor gasoline mixed with MTBE to produce oxygenated motor gasoline),** is considered motor gasoline blending.

Motor Gasoline Blending Components. Naphthas which will be used for blending or compounding into finished motor gasoline (e.g. straight-run gasoline, alkylate, reformate, RBOB, benzene, toluene, and xylene). Excludes oxygenates (alcohols, ethers), butane, and pentanes plus. Oxygenates are reported as individual components and included in the total for other hydrocarbons, hydrogens, and oxygenates.

Petroleum Administration for Defense (PAD) Districts. Geographic aggregations of the 50 States and the District of Columbia into five districts by the Petroleum Administration for Defense in 1950. These districts were originally defined during World War II for purposes of administering oil allocation.

Pipeline (Petroleum). Product pipelines used to transport petroleum products (including interstate, intrastate, and intracompany pipelines) within the 50 States and the District of Columbia.

RBOB. "Reformulated Gasoline Blendstock for Oxygenate Blending" - is a petroleum product which, when blended with a specified type and percentage of oxygenate, meets the definition of reformulated gasoline, and which the specified type and percentage of oxygenate is added other than by the refiner or importer of the RBOB at the refinery or import facility where the RBOB is produced or imported.

Refinery. An installation that manufactures finished petroleum products from crude oil, unfinished oils, natural gas liquids, other hydrocarbons, and/or oxygenates.

Refinery Production. Petroleum products produced at a refinery or blending plant.

Tanker and Barge. Vessels that transport crude oil or petroleum products. Data are reported for movements between PAD Districts; from a PAD District to the Panama Canal; or from the Panama Canal to a PAD District.

United States. The United States is defined as the 50 States and the District of Columbia.

District Descriptions and Map Petroleum Administration for Defense (PAD) Districts

PAD District I

Sub-PAD IX (New England): The States of Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island and Vermont.

Sub-PAD IY (Central Atlantic): The District of Columbia and the States of Delaware, Maryland, New Jersey, New York and Pennsylvania.

Sub-PAD IZ (Lower Atlantic): The States of Florida, Georgia, North Carolina, South Carolina, Virginia and West Virginia.

PAD District II

The States of Indiana, Illinois, Kentucky, Tennessee, Michigan, Ohio, Minnesota, Wisconsin, North Dakota, South Dakota, Oklahoma, Kansas, Missouri, Nebraska and Iowa.

PAD District III

The States of Texas, Louisiana, Mississippi, Alabama, Arkansas and New Mexico.

PAD District IV

The States of Montana, Idaho, Wyoming, Utah and Colorado.

PAD District V

The States of Washington, Oregon, California, Nevada, Arizona, New Mexico, Alaska and Hawaii.

Petroleum Administration for Defense (PAD) Districts

Appendix C

**Summary of State
Implementation Plans**

Appendix C

Summary of State Implementation Plans

The Clean Air Act requires that National Ambient Air Quality Standards (NAAQS) be established for 189 regulated hazardous air pollutants. The Act also requires that all areas of the United States be classified for each of the air pollutants as either: (1) in attainment, or (2) as nonattainment. Figure C1 depicts areas affected by carbon monoxide or ozone nonattainment regulations. The map indicates both the counties that are in actual CO and ozone nonattainment, and the additional surrounding areas that are affected by this nonattainment status. The entire State of California is included because it requires statewide oxygenated fuels, Federal reformulated gasoline (RFG) in select areas, and statewide RFG beginning March 1, 1996.

A State Implementation Plan (SIP) is a formal document prepared by the Governor of each State and submitted to the Administrator of the Environmental Protection Agency (EPA). The purpose of the SIP is to establish the official course of action the State will follow to bring nonattainment areas of the State into compliance, as well as to identify how attainment status will be maintained in compliant areas.

Figure C1. Areas Whose Motor Gasoline is Affected by the Clean Air Act

Sources: Derived from: 40 *CFR* 81.031 through 81.351, National Archives and Records Administration, July 1993; various *Federal Register* articles; and phone conversations with EPA Regional Offices.

Provisions of State Implementation Plans

A SIP must include various information. This information includes, but is not limited to:

- the emission limitations and the control measures that will be used by the State;
- the schedules and timetables for compliance;
- the means used to monitor and analyze data on ambient air quality;
- the permitting procedures and controls used for stationary sources; and
- the enforcement procedures used.³

The SIP is reviewed by the EPA Administrator. Although portions of a SIP may be approved by the EPA Administrator, a SIP is not treated as meeting the requirements of the Act until all portions have been approved. If portions of the SIP are not approved, the EPA Administrator may require the State to submit revisions to the SIP. Failure to develop an approved SIP may result in the development of a Federal Implementation Plan (FIP), a moratorium on new stationary source air permits, or withholding of Federal highway funds.

Periodically, revised or new NAAQS may be issued. In such cases, the EPA Administrator may again call for revisions to the SIP.

Revisions to a SIP may also be needed if there is *redesignation* of areas. Thus, because of changed circumstances, the EPA Administrator may decide that an area formerly designated as in attainment is now in nonattainment. Similarly, the severity or classification of nonattainment may be modified either upward or downward. In such cases, the Administrator may require a revised SIP from the State in question.

Similarly, a State may believe that an area designated as nonattainment should now be reclassified as in attainment. In such a case, the State must submit a formal request to the EPA Administrator, and accompany this request with a revised SIP that includes a *maintenance plan*--i.e., the plan the State intends to use to ensure that the requirements of NAAQS are met for at least 10 years after the redesignation. Formal approval must be received from the EPA Administrator to have the area officially redesignated. If approval is granted and the maintenance plan is approved, eight years into the maintenance plan the State must submit a revised maintenance plan for the subsequent 10 years as well.

Options Available Under State Implementation Plans

All states that contain areas designated, by either the Governor or the Administrator of the EPA, as ozone nonattainment were required to submit SIPs for ozone by November 15, 1993. The principle ozone-attainment strategy proposed by EPA is RFG. Areas can also come into attainment by using alternative SIPs that project compliance within the time period specified by the CAA. If they do not submit acceptable plans, they will be mandated by the Federal government, through a FIP, to use RFG.

³ Clean Air Act (U.S.C. 7410), Section 110 (a) (2).

Before the regulations on RFG, Reid Vapor Pressure (RVP) controls had already been initiated, beginning in 1989, to control ozone levels. Some States are planning to enhance RVP controls as an alternative to the use of RFG. However, as noted above, States must obtain formal approval from EPA to do this.

Several States have already received approval from EPA to use enhanced RVP controls as an alternative to the use of RFG. In addition, several States have achieved redesignation to attainment status as a result of the existing Federal RVP Phase II program.

Ozone Nonattainment Areas

The original nine major metropolitan areas for ozone nonattainment are required to use RFG. Other ozone nonattainment areas can petition EPA to "opt in" to the RFG program. Several States, particularly in the northeastern United States, have included statewide RFG programs in their SIP. These States include Connecticut, Delaware, Massachusetts, New Jersey, and Rhode Island. Other States are considering further reductions in RVP, below those specified in RVP II regulations currently in force, as the most cost-effective mechanism of achieving ozone attainment.

Figure C2 is a map of all areas designated as ozone nonattainment, while Figure C3 depicts those areas that will **require** RFG beginning January 1, 1995.

Figure C2. Ozone Non-Attainment Areas

Figure C3. Areas Requiring the Use of Reformulated Gasoline as of January 1995

Sources: Environmental Protection Agency (EPA), "Regulation of Fuels and Fuel Additives; Standards for Reformulated and Conventional Gasoline; Final Rule," (Washington, D.C., December 15, 1993), "Regulation of Fuels and Fuel Additives; Standards for Reformulated and Conventional Gasoline," (Washington, D.C., June 30, 1994), "Reformulated Gasoline and Anti-Dumping Questions and Answers," (Washington, D.C., July 1, 1994).

Table C1 summarizes, by Petroleum Administration for Defense District (PADD) and State, the actions being taken by the different States in each of the ozone nonattainment areas. The areas that have chosen the low-RVP strategy to achieve ozone attainment are shown in Table C2.

Carbon Monoxide Nonattainment Areas

Since the program went into effect in the winter of 1991-1992, most of the areas with CO nonattainment status have participated in the oxygenated winter fuels program. Notable exceptions include Boston and Cleveland. The two cities maintain that they are in attainment and have refused to participate in the oxygenated fuels program. Several other areas have indisputably been in attainment. They are modifying their SIPs and seeking EPA approval to leave the program.

Areas designated as in CO nonattainment, based on CAA statutory criteria, are depicted in Figure C4. Areas that have achieved attainment status through the prescribed SIP process are not included in the map. Table C3 summarizes, by PADD and State, the actions being taken by the different States in each of the CO nonattainment areas.

Figure C4. Carbon Monoxide Non-Attainment Areas

Sources: Derived from: 40 *CFR* 81.031 through 81.351, National Archives and Records Administration, July 1993; various *Federal Register* articles; and phone conversations with EPA Regional Offices.

California

In fashioning its program, California faced a set of complex problems that were unique to the State. The problems included climate, geography, and explosive population growth. Combined, these factors mitigated against achieving the NAAQS because the factors were conducive to creating air pollution from vehicular emissions and stationary sources.

Like the Federal RFG regulations under the Simple and Complex Models, the California regulations prescribed fuel formulations, with the option to utilize an alternative approach that could achieve specific emissions reductions based on the use of a numerical model. The California standards have been developed in two distinct phases. Phase 1 standards went into effect in 1992 and will remain in effect through February 28, 1996. Phase 2 regulations go into effect on March 1, 1996. In Phase 2, California is pursuing emissions performance-based standards using its own numerical model that supplants Federal RFG regulations.

Under a July 1992 order from the Ninth U.S. Circuit Court of Appeals, EPA must prepare FIPs for ozone attainment for Sacramento and for Southern California. The court order specifies that the FIP for Sacramento must be prepared by February 14, 1994, and for Southern California by February 22, 1994. The court order was issued based on a successful argument that EPA should have disapproved the California SIP for these areas as inadequate.⁴

⁴ *Octane Week*, January 24, 1994, p. 5.

Table C1. Ozone Nonattainment Areas and Areas Redesignated as Attainment
(data through: 09/06/94)

State	County	Area	RFG	RVP	Classification	Comments
PAD District IA						
Connecticut	Fairfield (part), Litchfield (part)	New York, NY-NJ-CT (New York-N. New Jersey-Long Island Area) [†]	required		Severe-17	The parts of counties that are not required to use RFG have opted in. Conn. Dept. of Env. Prot. had proposed requiring "Southern" 7.2 RVP RFG during summer months. ^a Will require other offsets equivalent to use of 7.2 rather than require 7.2. RFG beginning January 1, 1995. [‡]
Connecticut	Fairfield (part), Hartford, Litchfield (part), Middlesex, New Haven, New London, Tolland, Windham	Hartford, CT (Greater Connecticut Area) [†]	required		Serious	RFG beginning January 1, 1995. [‡] (See comment above.)
Maine	Androscoggin, Kennebec	Lewiston-Auburn, ME	opted in		Moderate	RFG beginning January 1, 1995. [‡]
Maine	Cumberland, Sagadahoc, York	Portland, ME	opted in		Moderate	RFG beginning January 1, 1995. [‡]
Maine	Knox, Lincoln	Knox-Lincoln, ME	opted in		Moderate	RFG beginning January 1, 1995. [‡]
Maine	Hancock, Waldo	Hancock-Waldo, ME	opted in		Marginal	RFG beginning January 1, 1995. [‡]
Massachusetts	Berkshire, Franklin, Hampden, Hampshire	Springfield (W. Mass), MA	opted in		Serious	RFG beginning January 1, 1995. [‡]
Massachusetts	Barnstable, Bristol, Dukes, Essex, Middlesex, Nantucket, Norfolk, Plymouth, Suffolk, Worcester	Boston-Lawrence-Worcester (E. Mass), MA	opted in		Serious	RFG beginning January 1, 1995. [‡]
New Hampshire	Strafford, Rockingham (part)	Portsmouth-Dover-Rochester, NH-ME	opted in		Serious	RFG beginning January 1, 1995. [‡]
New Hampshire	Hillsborough (part), Rockingham (part)	Boston-Lawrence-Worcester, MA	opted in		Serious	RFG beginning January 1, 1995. [‡]

Table C1. Ozone Nonattainment Areas and Areas Redesignated as Attainment (Continued)
 (data through: 09/06/94)

State	County	Area	RFG	RVP	Classification	Comments
New Hampshire	Hillsborough (part), Merrimack, Rockingham (part)	Manchester, NH	opted in		Marginal	RFG beginning January 1, 1995. [‡]
Rhode Island	Bristol, Kent, Newport, Providence, Washington	Providence (all of Rhode Island), RI	opted in		Serious	RFG beginning January 1, 1995. [‡]
PAD District IB						
Delaware	Kent, New Castle	Philadelphia- Wilmington-Trenton, PA-DE-NJ [†]	required		Severe-15	RFG beginning January 1, 1995. [‡]
Delaware	Sussex	Sussex County, DE	opted in		Marginal	RFG beginning January 1, 1995. [‡]
Maryland	Anne Arundel, City of Baltimore, Baltimore, Carroll, Harford, Howard	Baltimore, MD [†]	required		Severe-15	RFG beginning January 1, 1995. [‡]
Maryland	Cecil	Philadelphia- Wilmington-Trenton, PA-DE-NJ [†]	required		Severe-15	RFG beginning January 1, 1995. [‡]
Maryland	Calvert, Charles, Frederick, Montgomery, Prince Georges	Washington, DC-MD- VA	opted in		Serious	RFG beginning January 1, 1995. [‡]
Maryland	Kent, Queen Anne's	Kent-Queen Anne's, MD	opted in		Marginal	RFG beginning January 1, 1995. [‡]
New Jersey	Bergen, Essex, Hudson, Hunterdon, Middlesex, Monmouth, Morris, Ocean, Passaic, Somerset, Sussex, Union	New York, NY-NJ-CT (New York-N. New Jersey-Long Island Area) [†]	required		Severe-17	RFG beginning January 1, 1995. [‡]
New Jersey	Burlington, Camden, Cumberland, Gloucester, Mercer, Salem	Philadelphia- Wilmington-Trenton, PA-DE-NJ	required		Severe-15	RFG beginning January 1, 1995. [‡]
New Jersey	Atlantic, Cape May	Atlantic City, NJ	opted in		Moderate	RFG beginning January 1, 1995. [‡]

Table C1. Ozone Nonattainment Areas and Areas Redesignated as Attainment (Continued)
(data through: 09/06/94)

State	County	Area	RFG	RVP	Classification	Comments
New Jersey	Warren	Allentown-Bethlehem-Easton, PA-NJ	opted in		Marginal	RFG beginning January 1, 1995. [†] Eligible to be redesignated as attainment area. ^b
New York	Bronx, Kings, Nassau, New York, Orange (part) Queens, Richmond, Rockland, Suffolk, Westchester, Putnam	New York, NY-NJ-CT (New York-N. New Jersey-Long Island Area) [†]	required		Severe-17	RFG beginning January 1, 1995. [†]
New York	Albany, Greene, Montgomery, Rensselaer, Saratoga, Schenectady	Albany-Schenectady-Troy, NY	opted in		Marginal	RFG beginning January 1, 1995. [†]
New York	Dutchess, Putnam, Orange (part)	Poughkeepsie, NY	opted in		Marginal	RFG beginning January 1, 1995. [†] EPA is proposing to reclassify Poughkeepsie as Moderate. ^c
New York	Jefferson	Jefferson County, NY	opted in		Marginal	RFG beginning January 1, 1995. [†]
New York	Erie, Niagara	Buffalo-Niagra Falls, NY	opted in		Marginal	RFG beginning January 1, 1995. [†]
New York	Essex (part)	Essex County, NY	opted in		Marginal	RFG beginning January 1, 1995. [†]
Pennsylvania	Bucks, Chester, Delaware, Montgomery, Philadelphia	Philadelphia-Wilmington-Trenton, PA-NJ-DE [†]	required		Severe-15	RFG beginning January 1, 1995. [†]
Pennsylvania	Allegheny, Armstrong, Beaver, Butler, Fayette, Washington, Westmoreland	Pittsburgh-Beaver Valley, PA	opted in		Moderate	RFG beginning January 1, 1995. [†]
Pennsylvania	Berks	Reading, PA	opted in		Moderate	RFG beginning January 1, 1995. [†]
Pennsylvania	Columbia, Lackawanna, Luzerne, Monroe, Wyoming	Scranton-Wilkes-Barre, PA	opted in		Marginal	RFG beginning January 1, 1995. [†]

Table C1. Ozone Nonattainment Areas and Areas Redesignated as Attainment (Continued)
(data through: 09/06/94)

State	County	Area	RFG	RVP	Classification	Comments
Pennsylvania	Mercer	Youngstown-Warren-Sharon, PA	opted in		Marginal	RFG beginning January 1, 1995. [‡]
Pennsylvania	Adams, York	York, PA	opted in		Marginal	RFG beginning January 1, 1995. [‡]
Pennsylvania	Blair	Altoona, PA	opted in		Marginal	RFG beginning January 1, 1995. [‡]
Pennsylvania	Lancaster	Lancaster, PA	opted in		Marginal	RFG beginning January 1, 1995. [‡]
Pennsylvania	Erie	Erie, PA	opted in		Marginal	RFG beginning January 1, 1995. [‡]
Pennsylvania	Carbon, Lehigh, Northampton	Allentown-Bethlehem-Easton, PA-NJ	opted in		Marginal	RFG beginning January 1, 1995. [‡] Eligible to be redesignated as attainment area. ^d
Pennsylvania	Cumberland, Dauphin, Lebanon, Perry	Harrisburg-Lebanon-Carlisle, PA	opted in		Marginal	RFG beginning January 1, 1995. [‡]
Pennsylvania	Cambria, Somerset	Johnstown, PA	opted in		Marginal	RFG beginning January 1, 1995. [‡]
Washington D.C.	District of Columbia	Washington, DC-MD-VA	opted in		Serious	RFG beginning January 1, 1995. [‡]
PAD District IC						
Florida	Broward, Dade, Palm Beach	Miami-Fort Lauderdale-West Palm Beach, FL			Moderate	Has applied for redesignation as attainment area.
Florida	Hillsborough, Pinellas	Tampa-St. Petersburg-Clearwater, FL			Marginal	No State plans in affect as of 5/94.
Georgia	Cherokee, Clayton, Cobb, Coweta, De Kalb, Douglas, Fayette, Forsyth, Fulton, Gwinnett, Henry, Paulding, Rockdale	Atlanta, GA			Serious	Seeking approval for low-RVP approach (7.0 RVP) beginning in 1995.
North Carolina	Gaston, Mecklenburg	Charlotte-Gastonia, NC			Moderate	Has applied for redesignation as attainment area.

Table C1. Ozone Nonattainment Areas and Areas Redesignated as Attainment (Continued)
(data through: 09/06/94)

State	County	Area	RFG	RVP	Classification	Comments
North Carolina	Durham, Granville (part), Wake	Raleigh-Durham, NC				Achieved redesignation as attainment area in April, 1994.
North Carolina	Davidson, Davie (part), Forsyth, Guilford	Greensboro-Winston-Salem-High Point, NC				Achieved redesignation as attainment area in October 1993.
South Carolina	Cherokee	Cherokee, SC				Achieved redesignation as attainment area in December 1992. Use of 9.0 psi RVP instead of 7.8 passed 09/01/93. ⁶
Virginia	Alexandria City, Arlington, Fairfax City, Fairfax, Falls Church City, Loudoun, Manassas City, Manassas Park City, Prince William, Stafford	Washington, DC-MD-VA	opted in		Serious	RFG beginning January 1, 1995. [‡]
Virginia	Charles City, Chesterfield, Colonial Heights, Hanover, Henrico, Hopewell, Richmond City	Petersburg, Richmond, VA	opted in		Moderate	RFG beginning January 1, 1995. [‡] Seeking redesignation as attainment but will retain the RFG program.
Virginia	Chesapeake, Hampton, James City, Newport News, Norfolk, Poquoson, Portsmouth, Suffolk, Virginia Beach, Williamsburg, York	Norfolk-Virginia Beach-Newport News (Hampton Roads), VA	opted in		Marginal	RFG beginning January 1, 1995. [‡]
Virginia	Smyth (part)	Smyth County			Marginal	Erroneously listed in section 80.70 (j) as opt-in (Technical Correction to RFG Rule.) [†]
West Virginia	Wood	Parkersburg-Marietta, WV-OH			Moderate	Has applied for redesignation as attainment area. (Will not use either RFG or RVP.) Proposed rule by EPA to redesignate Parkersburg as attainment area. ⁹

Table C1. Ozone Nonattainment Areas and Areas Redesignated as Attainment (Continued)*(data through: 09/06/94)*

State	County	Area	RFG	RVP	Classification	Comments
West Virginia	Cabell, Wayne	Huntington-Ashland, WV-KY-OH			Moderate	Has applied for redesignation as attainment area. (Will not use either RFG or RVP.)
West Virginia	Greenbrier	Greenbrier, WV			Marginal	Has applied for redesignation as attainment area. (Will not use either RFG or RVP.)
West Virginia	Kanawha, Putnam	Charleston, WV				Redesignated as an attainment area on 06/13/94. ^h
PAD District II						
Illinois	Cook, Du Page, Grundy (part), Kane, Kendall (part), Lake, McHenry, Will	Chicago-Gary-Lake County, IL-IN-WI [†]	required		Severe-17	RFG beginning January 1, 1995. [‡]
Illinois	Madison, Monroe, St. Clair	St. Louis, MO-IL		Yes	Moderate	No RFG. Plans are to use 7.2 psi RVP. [‡]
Illinois	Jersey	Jersey Area, IL (St. Louis, MO)			Marginal	Have filed for redesignation as an attainment area. [‡]
Indiana	Elkhart, St. Joseph	South Bend-Elkhart, IN				Redesignated as attainment area. ^l
Indiana	Marion	Indianapolis, IN				Redesignated as attainment area. ^l
Indiana	Vanderburgh	Evansville, IN-KY				Redesignated as attainment area. ^k
Indiana	Lake, Porter	Chicago-Gary-Lake County, IL-IN-WI [†]	required		Severe-17	RFG beginning January 1, 1995. [‡]
Indiana	Clark, Floyd	Louisville, KY-IN			Moderate	State intentions unknown as of 9/94.
Kansas	Wyandotte	Wyandotte, KS				Has achieved redesignation as attainment area.
Kansas	Johnson	Johnson, KS				Has achieved redesignation as attainment area.

Table C1. Ozone Nonattainment Areas and Areas Redesignated as Attainment (Continued)
(data through: 09/06/94)

State	County	Area	RFG	RVP	Classification	Comments
Kentucky	Boone, Campbell, Kenton	Cincinnati-Hamilton, OH-KY-IN	opted in		Moderate	RFG beginning January 1, 1995. [‡]
Kentucky	Jefferson, Oldham (part), Bullit (part)	Louisville, KY-IN	opted in		Moderate	RFG beginning January 1, 1995. [‡]
Kentucky	Boyd, Greenup (part)	Huntington-Ashland, WV-KY-OH			Moderate	Has applied for redesignation as attainment area. (Will not use either RFG or RVP.)
Kentucky	Davies, Hancock (part)	Owensboro, KY			Marginal	Has applied for redesignation as attainment area.
Kentucky	Edmonson	Edmonson County, KY			Marginal	Has applied for redesignation as attainment area.
Kentucky	Fayette, Scott	Lexington-Fayette, KY			Marginal	Has applied for redesignation as attainment area.
Michigan	Muskegon	Muskegon, MI		Yes	Moderate	Will use low RVP (7.8) beginning in 1996.
Michigan	Livingston, Macomb, Monroe, Oakland, St. Clair, Washtenaw, Wayne	Detroit-Ann Arbor, MI			Moderate	Seeking redesignation as attainment area. Low RVP is part of contingency measures proposed in case of future violations. RFG opt-in under consideration. ¹
Michigan	Kent, Ottawa	Grand Rapids, MI		Yes	Moderate	Will use low RVP (7.8) beginning in 1996.
Missouri	Franklin, Jefferson, St. Charles, St. Louis, St. Louis City	St. Louis, MO-IL		Yes	Moderate	Using IM plan and low RVP (7.2) in 1994 and considering 7.0 RVP in 1995 with option for suppliers to use RFG rather than low-RVP. ^m
Missouri	Clay, Jackson, Platte	Kansas City, MO-KS				Has achieved redesignation as attainment area. Retains 7.8 RVP requirement.

Table C1. Ozone Nonattainment Areas and Areas Redesignated as Attainment (Continued)
 (data through: 09/06/94)

State	County	Area	RFG	RVP	Classification	Comments
Ohio	Lucas, Wood	Toledo, OH			Moderate	No RFG. If attainment not achieved by November 15, 1996, they will use low RVP.
Ohio	Clark, Greene, Miami, Montgomery	Dayton-Springfield, OH			Moderate	No RFG. If attainment not achieved by November 15, 1996, they will use low RVP.
Ohio	Butler, Clermont, Hamilton, Warren	Cincinnati-Hamilton, OH-KY-IN			Moderate	No RFG. If attainment not achieved by November 15, 1996, will use low RVP.
Ohio	Ashtabula, Cuyahoga, Geauga, Lake, Lorain, Medina, Portage, Summit	Cleveland-Akron-Lorain, OH			Moderate	No RFG. If attainment not achieved by November 15, 1996, they will use low RVP.
Ohio	Mahoning, Trumbull	Youngstown-Warren-Sharon, OH			Marginal	No RFG. Will use reduction from stationary sources, IM plan, etc.
Ohio	Stark	Canton, OH			Marginal	No RFG. Will use reduction from stationary sources, IM plan, etc.
Ohio	Delaware, Franklin, Licking	Columbus, OH			Marginal	No RFG. Will use reduction from stationary sources, IM plan, etc.
Tennessee	Davidson, Rutherford, Sumner, Williamson, Wilson	Nashville, TN			Moderate	Will continue to use 7.8 RVP. Plan has been approved by EPA.
Tennessee	Shelby	Memphis, TN-AR-MS			Marginal	Will continue to use 7.8 RVP. Plan has been approved by EPA.
Tennessee	Knox	Knoxville, TN				Achieved redesignation as attainment area. ^a
Wisconsin	Kenosha, Milwaukee, Ozaukee, Racine, Washington, Waukesha	Milwaukee-Racine, WI [†]	required		Severe-17	RFG beginning January 1, 1995. [‡]
Wisconsin	Sheboygan	Sheboygan, WI	opt-in sought		Moderate	Seeking opt-in, effective June, 1995. Not yet EPA approved.

Table C1. Ozone Nonattainment Areas and Areas Redesignated as Attainment (Continued)
 (data through: 09/06/94)

State	County	Area	RFG	RVP	Classification	Comments
Wisconsin	Kewaunee	Kewaunee County, WI	opt-in sought		Moderate	Seeking opt-in, effective June, 1995. Not yet EPA approved.
Wisconsin	Manitowoc	Manitowoc, WI	opt-in sought		Moderate	Seeking opt-in, effective June, 1995. Not yet EPA approved.
Wisconsin	Walworth	Walworth, WI			Marginal	No RFG.
Wisconsin	Door County	Door, WI			Marginal	No RFG.
PAD District III						
Alabama	Jefferson, Shelby	Birmingham, AL			Marginal	No State plans in affect as of 5/94.
Louisiana	Ascension, East Baton Rouge, Iberville, Livingston, Pointe Coupee, West Baton Rouge	Baton Rouge, LA			Serious	No RFG or RVP. Will use reduction from stationary sources, Inspection and Maintenance (IM) plan, etc.
Louisiana	Calcasieu	Lake Charles, LA			Marginal	No RFG or RVP. Will use reduction from stationary sources, IM plan, etc.
Texas	Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, Waller	Houston-Galveston-Brazoria, TX [†]	required		Severe-17	RFG beginning January 1, 1995. [‡]
Texas	El Paso	El Paso, TX		Yes	Serious	Will use 7.0 RVP not yet approved (08/19/94) but anticipated. [‡]
Texas	Hardin, Jefferson, Orange	Beaumont-Port Arthur, TX			Serious	Will mostly rely on reduction from stationary sources, IM plan, etc. RFG spillover from Houston is expected.
Texas	Collin, Dallas, Denton, Tarrant	Dallas-Fort Worth, TX	opted in		Moderate	RFG beginning January 1, 1995. [‡]

Table C1. Ozone Nonattainment Areas and Areas Redesignated as Attainment (Continued)
 (data through: 09/06/94)

State	County	Area	RFG	RVP	Classification	Comments
PAD District IV						
Utah	Davis, Salt Lake	Salt Lake City, UT			Moderate	EPA found their SIP to be inadequate and incomplete and rejected it. Utah is staying with its plan and has threatened a lawsuit. [‡]
PAD District V						
Arizona	Maricopa (part)	Phoenix, AZ		Yes	Moderate	Gasoline with RVP maximum of 7.0 psi required from June 1 to September 30 beginning in 1995. RVP maximum of 9.0 psi required for remainder of year.
California	Los Angeles Co. (part), Orange, Riverside (part), San Bernadino (part)	Los Angeles-South Coast Air Basin [†] FIP	required		Extreme	Federal RFG beginning January 1, 1995. [‡] State RFG beginning March 1, 1996.
California	Los Angeles (part), Riverside (part), San Bernadino (part)	Southeast Desert Modified AQMA, CA [†] FIP	required		Severe-17	Federal RFG beginning January 1, 1995. [‡] State RFG beginning March 1, 1996.
California	Ventura	Ventura County, CA [†]	required		Severe-15	Federal RFG beginning January 1, 1995. State RFG beginning March 1, 1996.
California	San Diego	San Diego, CA [†]	required		Severe-15	Federal RFG beginning January 1, 1995. [‡] State RFG beginning March 1, 1996.
California	El Dorado (part), Placer (part), Sacramento, Solano (part), Sutter (part), Yolo	Sacramento Metro, CA	(see comment)		Serious (see comment)	State RFG Beginning March 1, 1996. EPA considering moving attainment date from 1999 to 2005 by reclassifying as "Severe" rather than "Serious" nonattainment. ^o Severe areas are required to join the mandatory RFG program.

Table C1. Ozone Nonattainment Areas and Areas Redesignated as Attainment (Continued)
(data through: 09/06/94)

State	County	Area	RFG	RVP	Classification	Comments
California	Fresno, Kern, Kings, Madera, Merced, San Joaquin, Stanislaus, Tulare	San Joaquin Valley, CA	state		Serious	State RFG beginning March 1, 1996.
California	Santa Barbara	Santa Barbara-Santa Maria-Lompoc, CA	state		Moderate	State RFG beginning March 1, 1996. Has begun at the State level the process to apply for Federal redesignation as an attainment area.
California	Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano (part), Sonoma (part)	San Francisco-Bay, CA	state		Moderate	State RFG beginning March 1, 1996. Has applied for Federal redesignation as an attainment area.
California	Monterey, San Benito, Santa Cruz	Monterey Bay, CA	state		Moderate	State RFG beginning March 1, 1996. Has applied for Federal redesignation as an attainment area.
California	Rest of State	Rest of State	state		Unclassified/Attainment	State RFG beginning March 1, 1996.
Nevada	Washoe	Reno, NV			Marginal	No State plans.
Oregon	Clackamas (part), Multnomah (part), Washington (part)	Portland-Vancouver AQMA, OR-WA			Marginal	Using an enhanced IM program.
Washington	Clark (part)	Portland-Vancouver AQMA, OR-WA			Marginal	Using an enhanced IM program.
Washington	King (part), Pierce, Snohomish (part)	Seattle-Tacoma			Marginal	Using an enhanced IM program.

[†] Areas specifically designated in the CAA as requiring year-round RFG beginning January 1, 1995. Only areas with populations over 250,000 were considered for inclusion in the mandatory RFG program.

[‡] Conversations with EPA, April through September 1994, and EPA regulations.

States with no ozone nonattainment areas: Alaska, Arkansas, Colorado, Hawaii, Idaho, Iowa, Minnesota, Montana, Nebraska, New Mexico, North Dakota, Oklahoma, South Dakota, Vermont, and Wyoming.

States with ozone nonattainment areas classified as having "incomplete data." These areas have not opted into the RFG program: Louisiana, Maine, Michigan, New Hampshire, Ohio, Oregon, Pennsylvania, and Texas.

a. "Connecticut Moves to Require Southern-Tier RFG in 1996," *Octane Week*, 06/20/94, p.1, 12.

b. *Ibid.*

c. *Federal Register*, July 28, 1994, p.38410-38411.

d. *Ibid.*

e. *Federal Register*, September 1, 1993, p.46508-46511.

f. *Federal Register*, August 17, 1993, p.43609-43613.

g. *Federal Register*, June 10, 1994, p.29977-29982.

h. *Federal Register*, June 13, 1994, p.30326-30331 (Proposed rule by EPA).

i. *Ibid.*

j. *Federal Register*, July 08, 1994, p.35044-35054.

k. *Ibid.*

l. "Marathon Voluntarily Producing Low-RVP Gasoline in Detroit," *Octane Week*, July 18, 1994, p.3.

m. "Missouri Seen Ready to Propose Low-RVP & RFG for St. Louis," *Oxy-Fuel News*, July 25, 1994, p.5.

n. *Federal Register*, September 27, 1993, p.50271-50275.

o. *Federal Register*, May 5, 1994, p.23264-23605.

Table C2. Ozone Nonattainment Areas that will Utilize Special RVP Restrictions to Achieve Ozone Attainment, Rather than RFG
(data as of 09/02/94)

State	County	Area	RFG	RVP	Classification	Comments
Arizona	Maricopa	Phoenix, AZ		Yes	Moderate	Will require 7.0 psi RVP gasoline beginning in 1995 from June through September. The maximum RVP for the remainder of the year is 9.0.
Georgia	Cherokee, Clayton, Cobb, Coweta, De Kalb, Douglas, Fayette, Forsyth, Fulton, Gwinnett, Henry, Paulding, Rockdale	Atlanta, GA		Yes	Serious	Seeking approval for low-RVP approach (7.0 RVP).
Illinois	Madison, Monroe, St. Clair	St. Louis, MO-IL		Yes	Moderate	Will require 7.2 psi RVP during summer season.
Michigan	Muskegon	Muskegon, MI		Yes	Moderate	Will use low RVP (7.8) beginning in 1996. (Has been approved by EPA.)
Michigan	Kent, Ottawa	Grand Rapids, MI		Yes	Moderate	Will use low RVP (7.8) beginning in 1996. (Has been approved by EPA.)
Missouri	Franklin, Jefferson, St. Charles, St. Louis, St. Louis City	St. Louis, MO-IL		Yes	Moderate	Using IM plan and low RVP (7.2) in 1994 and considering 7.0 RVP in 1995 with option for suppliers to use RFG rather than low-RVP.
Texas	El Paso	El Paso, TX		Yes	Serious	Will use 7.0 RVP.

Table C3. Carbon Monoxide Nonattainment Areas and Areas Redesignated as Attainment
(data through: 8/31/94)

State	Counties	Area	Classification	Control Period	Comments
PAD District IA					
Connecticut	Fairfield (part), Litchfield (part)	New York-N. New Jersey-Long Island Area	Moderate	Oct-Apr	Using oxygenated fuels. ^{††}
Connecticut	Hartford (part), Litchfield (part), Middlesex (part), Tolland (part)	Hartford-New Britain-Middletown, CT	Moderate	Nov-Feb	Will apply to EPA seeking redesignation as attainment area. ^{††} Has suspended oxyfuel program as of November 1993 awaiting redesignation. ^{9†}
Connecticut	Fairfield (part), Litchfield (part), New Haven, CT	New Haven-Meriden-Waterbury, CT	Not Classified	Nov-Feb	Will apply to EPA seeking redesignation as attainment area. ^{††} Has suspended oxyfuel program as of November 1993 awaiting redesignation. ^{9†}
Massachusetts	Middlesex (part)	Lowell, MA	Not Classified	Nov-Feb	Did not take part in oxygenated season for second straight year. Will apply to EPA seeking redesignation as attainment area. [†]
Massachusetts	Middlesex (part), Norfolk (part), Suffolk (part)	Boston, MA	Moderate	Nov-Feb	Did not take part in oxygenated season for second straight year. Will apply to EPA seeking redesignation as attainment area. [†]
Massachusetts	Middlesex (part)	Waltham, MA	Not Classified		Did not take part in oxygenated season for second straight year. Will apply to EPA seeking redesignation as attainment area. [†]
Massachusetts	Worcester (part)	Worcester, MA	Not Classified		Did not take part in oxygenated season for second straight year. Will apply to EPA seeking redesignation as attainment area. [†]

Table C3. Carbon Monoxide Nonattainment Areas and Areas Redesignated as Attainment (Continued)
(data through: 8/31/94)

State	Counties	Area	Classification	Control Period	Comments
Massachusetts	Hampden (part)	Springfield, MA	Not Classified		Did not take part in oxygenated season for second straight year. Will apply to EPA seeking redesignation as attainment area. [†]
New Hampshire	Hillsborough (part)	Nashua	Not Classified		There are no plans to use oxygenated fuels. [†]
New Hampshire	Hillsborough (part)	Manchester	Not Classified		There are no plans to use oxygenated fuels. [†]
PAD District IB					
Maryland	Montgomery (part), Prince Georges (part)	Washington, DC	Moderate	Nov-Feb	Using oxygenated fuels. [†]
Maryland	Baltimore City (part)	Baltimore, MD	Moderate	Nov-Feb	Using oxygenated fuels. [†]
New Jersey	Morris (part)	Morristown	Not Classified	Nov-Feb	Using oxygenated fuels. [†] (See Morris County footnote.)
New Jersey	Monmouth (part)	Freehold	Not Classified	Nov-Feb	Using oxygenated fuels. [†] (See Morris County footnote.)
New Jersey	Burlington (part)	Burlington	Not Classified	Nov-Feb	Using oxygenated fuels. [†] (See Morris County footnote.)
New Jersey	Bergen, Essex, Hudson, Passaic (part), Union	New York-N. New Jersey-Long Island Area	Moderate	Oct-Apr	Using oxygenated fuels. [†] (See Morris County footnote.)
New Jersey	Atlantic (part)	Atlantic City	Not Classified	Nov-Feb	Using oxygenated fuels. [†] (See Morris County footnote.)
New Jersey	Salem (part)	Penns Grove	Not Classified	Nov-Feb	Using oxygenated fuels. [†] (See Morris County footnote.)

Table C3. Carbon Monoxide Nonattainment Areas and Areas Redesignated as Attainment (Continued)
 (data through: 8/31/94)

State	Counties	Area	Classification	Control Period	Comments
New Jersey	Camden	Philadelphia-Camden County Area	Moderate	Nov-Feb	Using oxygenated fuels. [†] (See Morris County footnote.)
New Jersey	Mercer (part)	Trenton	Not Classified	Nov-Feb	Using oxygenated fuels. [†] (See Morris County footnote.)
New Jersey	Ocean (part)	Toms River	Not Classified	Nov-Feb	Using oxygenated fuels. [†] (See Morris County footnote.)
New Jersey	Somerset (part)	Somerville	Not Classified	Nov-Feb	Using oxygenated fuels. [†] (See Morris County footnote.)
New Jersey	Middlesex (part)	Perth Amboy	Not Classified	Nov-Feb	Using oxygenated fuels. [†] (See Morris County footnote.)
New York	Bronx, Kings, Nassau, New York, Queens, Richmond, Westchester	New York-N. New Jersey-Long Island Area	Moderate	Oct-Apr	Using oxygenated fuels. [†]
New York	Onondaga	Syracuse, NY			Achieved redesignation as attainment area. Have kept use of oxygenated fuels as part of contingency plan in case of future violations. [§]
Pennsylvania	Philadelphia (part)	Philadelphia-Camden	Moderate	Nov-Feb	Using oxygenated fuels. [†]
Pennsylvania	Allegheny (part)	Pittsburgh	Not Classified		Status unknown as of August 1994.
Washington D.C.	Washington, DC	Washington, DC	Moderate	Nov-Feb	Using oxygenated fuels. Some parts of plan are approved, others are disapproved by EPA because of inadequate enforcement measures. [†]

Table C3. Carbon Monoxide Nonattainment Areas and Areas Redesignated as Attainment (Continued)
 (data through: 8/31/94)

State	Counties	Area	Classification	Control Period	Comments
PAD District IC					
North Carolina	Mecklenburg	Charlotte, NC	Not Classified	Nov-Feb	The North Carolina Rulemaking Commission is debating a plan for maintenance and redesignation. The plan includes a standby oxygas program if there were a CO violation. [†]
North Carolina	Forsyth	Winston-Salem, NC	Moderate	Nov-Feb	Will apply to EPA seeking official redesignation as attainment area. Will keep use of oxygenated fuels as part of contingency plan, in case of future violations. [†]
North Carolina	Durham, Wake	Raleigh-Durham, NC	Moderate	Nov-Feb	The North Carolina Rulemaking Commission is debating a plan for maintenance and redesignation. The plan includes a standby oxygas program if there were a CO violation. [†]
Virginia	Arlington, Alexandria City	Washington, DC	Moderate	Nov-Feb	Using oxygenated fuels. Some parts of plan are approved, others are disapproved by EPA because of inadequate enforcement measures. [†] EPA has demanded that Northern Virginia cars be inspected at State-contracted facilities instead of service stations. EPA would prevent any new transportation improvements in Northern Virginia from being added to the long-range regional plan that details how the Washington Area will reduce air pollution. [‡]

Table C3. Carbon Monoxide Nonattainment Areas and Areas Redesignated as Attainment (Continued)
 (data through: 8/31/94)

State	Counties	Area	Classification	Control Period	Comments
PAD District II					
Indiana	Lake (part)	East Chicago Area, IN	Not Classified		Status unknown as of August 1994.
Indiana	Marion (part), City of Indianapolis (part)	Indianapolis, IN	Not Classified		Status unknown as of August 1994.
Michigan	Macomb (part), Oakland (part), Wayne (part)	Detroit, MI	Not Classified		Status unknown as of August 1994.
Minnesota	Anoka, Carver (part), Dakota (part), Hennepin, Ramsey, Scott (part), Washington (part), Wright (part)	Minneapolis-St. Paul, MN-WI	Moderate	Oct-Jan	Using oxygenated fuels. [†]
Minnesota	St. Louis (part),	Duluth, MN-WI			Achieved redesignation as attainment area. [†]
Ohio	Cuyahoga	Cleveland, OH			Achieved redesignation as attainment area, in February 1994. [†]
Tennessee	Shelby	Memphis, TN			Redesignated as an attainment area. ^u
PAD District III					
New Mexico	Bernalillo	Albuquerque, NM	Moderate	Nov-Feb	Will apply to EPA seeking redesignation as attainment area. [†] Using oxygenated fuels. [†]
Texas	El Paso (part)	El Paso, TX	Moderate	Nov-Feb	Using oxygenated fuels.
PAD District IV					
Colorado	Boulder (part), Weld (part)	Longmont, CO	Moderate		Status unknown as of August 1994.

Table C3. Carbon Monoxide Nonattainment Areas and Areas Redesignated as Attainment (Continued)
(data through: 8/31/94)

State	Counties	Area	Classification	Control Period	Comments
Colorado	Adams (part), Arapahoe (part), Boulder (part), Denver, Douglas (part), Jefferson (part)	Denver-Boulder, CO	Moderate	Nov-Feb	Using both oxygenated fuels and enhanced inspection and maintenance programs. Denver is requesting reclassification to serious to lengthen the attainment deadline to the year 2000. [†] State legislature is considering increasing average oxygen content to 3.1 percent. [■]
Colorado	El Paso (part), Teller (part)	Colorado Springs, CO	Moderate	Nov-Feb	Using oxygenated fuels. Also using enhanced IM programs. [†]
Colorado	Larimer (part)	Fort Collins, CO	Moderate	Nov-Feb	Using oxygenated fuels. Also using enhanced IM programs. [†]
Colorado	Weld (part)	Greeley, CO	Not Classified		Status unknown as of August 1994.
Idaho	Ada (part)	Boise-Northern Ada County	Not Classified		Status unknown as of August 1994.
Montana	Cascade (part)	Great Falls, MT	Not Classified		Status unknown as of August 1994.
Montana	Missoula (part)	Missoula, MT	Moderate	Nov-Feb	Status unknown as of August 1994.
Montana	Yellowstone (part)	Billings, MT	Not Classified		Using oxygenated fuels. [•]
Utah	Weber (part)	Ogden, UT	Moderate		Status unknown as of August 1994.
Utah	Salt Lake (part)	Salt Lake City, UT	Not Classified	Nov-Feb	Using oxygenated fuels. [•] Also using enhanced IM programs. The SIP submitted by Utah was rejected by EPA. EPA found the plan "technically inadequate and incomplete." Utah has filed suit against EPA maintaining the SIP is acceptable. [†]

Table C3. Carbon Monoxide Nonattainment Areas and Areas Redesignated as Attainment (Continued)
(data through: 8/31/94)

State	Counties	Area	Classification	Control Period	Comments
Utah	Utah (part)	Provo, UT	Moderate	Nov-Feb	Using oxygenated fuels.* Also using enhanced IM programs. The SIP submitted by Utah was rejected by EPA. EPA found the plan "technically inadequate and incomplete." Utah has filed suit against EPA, maintaining that the SIP is acceptable.†
PAD District V					
Alaska	Fairbanks Election District (part)	Fairbanks, AK	Moderate	Nov-Feb	Health concerns have caused suspensions. Testing began in February, 1994 on the use of ETBE in the oxygenated fuels program.*
Alaska	Anchorage Election District (part)	Anchorage, AK	Moderate	Nov-Feb	Health concerns have caused suspensions. Testing began in February, 1994 on the use of ETBE in the oxygenated fuels program.*
Arizona	Maricopa (part)	Phoenix, AZ	Moderate	Oct-Feb	The Arizona legislature passed a bill requiring ethanol blends sold in the Phoenix CO area to be a minimum of 10 percent vol without a volatility waiver (3.5 wt. percent oxygen). Non-ethanol blends must contain 2.7 wt. percent oxygen.*
Arizona	Pima (part)	Tucson, AZ	Not Classified	Oct-Mar	The Tucson area is required to utilize 1.8 wt. percent oxygen gasoline during the control period. ASTM RVP specifications are required.*

Table C3. Carbon Monoxide Nonattainment Areas and Areas Redesignated as Attainment (Continued)
(data through: 8/31/94)

State	Counties	Area	Classification	Control Period	Comments
California	Los Angeles (part), Orange, Riverside (part), San Bernadino (part)	Los Angeles-South Coast Air Basin, CA	Serious	Oct-Feb	Using oxygenated fuels.* Due to special problems with ozone formation resulting from the use of oxygenates in southern CA, the required oxygen content is 1.8-2.2 percent. Once CA Phase 2 RFG is implemented, the oxygen content will be from 1.8 to 2.7 percent.* As of August 1994, EPA had not approved the California oxygenate limit of 1.8-2.2 percent, which is below the Federal requirement of 2.7 percent for CO nonattainment areas.*
California	San Diego (part)	San Diego, CA	Moderate	Nov-Feb	Using oxygenated fuel.* (See Los Angeles comment.)
California	Fresno (part)	Fresno, CA	Moderate	Oct-Jan	Using oxygenated fuel.* (See Los Angeles comment.)
California	Butte (part)	Chico, CA	Moderate	Oct-Jan	Using oxygenated fuel.* (See Los Angeles comment.)
California	Placer (part), Sacramento (part), Yolo (part)	Sacramento, CA	Moderate	Oct-Jan	Using oxygenated fuel.* (See Los Angeles comment.)
California	Alameda (part), Contra Costa (part), Marin (part), Napa (part), San Francisco, San Mateo (part), Santa Clara (part), Solano (part), Sonoma (part)	San Francisco-Oakland-San Jose, CA	Moderate	Oct-Jan	Using oxygenated fuel.* (See Los Angeles comment.)
California	San Joaquin (part)	Stockton, CA	Moderate	Oct-Jan	Using oxygenated fuel.* (See Los Angeles comment.)

Table C3. Carbon Monoxide Nonattainment Areas and Areas Redesignated as Attainment (Continued)
 (data through: 8/31/94)

State	Counties	Area	Classification	Control Period	Comments
California	Stanislaus (part)	Modesto, CA	Moderate	Oct-Jan	Using oxygenated fuel.* (See Los Angeles comment.)
California	El Dorado (part)	Lake Tahoe South Shore, CA	Moderate		Using oxygenated fuel.* (See Los Angeles comment.)
California	Placer (part)	Lake Tahoe North Shore, CA	Not Classified		Using oxygenated fuel.* (See Los Angeles comment.)
California	Kern (part)	Bakersfield, CA	Not Classified		Using oxygenated fuel.* (See Los Angeles comment.)
California		Rest of State			Using oxygenated fuel.*
Nevada	Clark (part)	Las Vegas, NV	Moderate	Oct-Feb	Using oxygenated fuels.*
Nevada	Carson City (part), Douglas (part), Washoe (part)	Lake Tahoe, NV	Not Classified		Status unknown as of August 1994.
Nevada	Washoe (part)	Reno, NV	Moderate	Oct-Jan	Using oxygenated fuels.*
Oregon	Lane (part)	Eugene-Springfield, OR	Not Classified		Using oxygenated fuels.† Also using enhanced inspection and maintenance programs. Reclassified as achieving attainment.* Area not listed as using oxygenated fuels.*
Oregon	Klamath (part)	Klamath County, OR	Moderate	Nov-Feb	Using oxygenated fuels. Also using enhanced IM programs.†
Oregon	Marion (part), Polk (part)	Salem, OR	Not Classified		Using oxygenated fuels. Also using enhanced IM programs.† Area not listed as using oxygenated fuels.*

Table C3. Carbon Monoxide Nonattainment Areas and Areas Redesignated as Attainment (Continued)
(data through: 8/31/94)

State	Counties	Area	Classification	Control Period	Comments
Oregon	Clackamas (part), Multnomah (part), Washington (part)	Portland-Vancouver, OR- WA	Moderate	Nov-Feb	Using oxygenated fuels. Also using enhanced IM programs. [†]
Oregon	Jackson (part)	Medford, OR	Moderate	Nov-Feb	Using oxygenated fuels. Also using enhanced IM programs. [†]
Oregon	Josephine (part)	Grants Pass, OR	Moderate	Nov-Feb	Using oxygenated fuels. Also using enhanced IM programs. [†]
Washington	Spokane (part)	Spokane, WA	Moderate	Sep-Feb	Using oxygenated fuels. Also using enhanced inspection and maintenance programs. [†]
Washington	Clark	Portland-Vancouver, OR- WA	Moderate	Nov-Feb	Using oxygenated fuels. Also using enhanced IM programs. [†]
Washington	King (part), Pierce, Snohomish (part)	Seattle-Tacoma, WA	Moderate	Nov-Feb	Using oxygenated fuels. Also using enhanced IM programs. [†]

*= Areas with acceptable CO levels from 1990 to 1992, *The Oil Daily*, November 12, 1993. These areas have demonstrated short-term attainment of CO standards. To achieve official redesignation as an attainment area, each area must demonstrate, through the SIP process, that specific enforceable actions taken within the area have caused the improvement in air quality and that the quality can be maintained for 10 years. The Administrator of EPA may approve or disapprove the request for redesignation.

†=Telephone conversations with EPA regional offices, April, May, and June 1994.

^=Telephone conversations with State environmental offices, August 1994.

‡=The Washington Post, June 3, 1994, p.1.

■=Oxy-Fuel News, December 6, 1993, pp. 9-10.

♥=Reformulated Gasoline and Anti-Dumping Questions and Answers, EPA, July 1, 1994.

◆=*Oxy-Fuel News*, September 20, 1993, p.1.

♣=Telephone conversation with Arizona Department of Environmental Quality, May 1994.

♣=Telephone conversation with California Air Resources Board (CARB), December 1993 and August 1994.

p. "Hartford Moves to Eliminate Oxy-Fuel Season," *Oxy-Fuel News*, November 8, 1993, p.1,4.

q. *Ibid.*

r. New Jersey requested that oxygenated fuels requirement be dropped for southern part of State beginning 1/1/95, arguing that use of RFG and other means will prevent CO exceedences. Petition was refused by EPA in April-May 1994 because contingency and maintenance plans were found to be "incomplete." New Jersey may petition again in the near future. An application for a waiver for the northern portion of the State may be forthcoming. (Conversation with EPA Region 2 in April and May 1994 and *OxyFuel News*, January 24, 1994, p.4.)

s. *Federal Register*, September 29, 1993, p.50851-50853.

t. *Federal Register*, April 14, 1994, p.17708-17710.

u. *Federal Register*, July 26, 1994, p. 37939-37944.

v. *Federal Register*, December 6, 1993, p.64161-64165.

Notes: States with no CO nonattainment areas: 23 States have no CO nonattainment areas. These States are Alabama, Arkansas, Delaware, Florida, Georgia, Hawaii, Illinois, Iowa, Kansas, Kentucky, Louisiana, Maine, Mississippi, Missouri, Nebraska, North Dakota, Oklahoma, Rhode Island, South Carolina, South Dakota, Vermont, West Virginia, and Wyoming.

EPA released a notice of proposed rulemaking in a FIP covering both areas on February 17, 1994. This proposal was published in May 1994.⁵

California RFG

Generally, the California Air Resources Board (CARB) fuel regulations are more stringent than the Federal requirements. As indicated above, climate, geography, and demography have combined to create unacceptable air quality conditions in California's metropolitan areas. In response, California's regulators have adopted what are generally considered the strictest fuel standards in the world. In some instances, trade-offs in the fuels programs were required to achieve better overall air quality by prioritizing disparate goals. For example, CO problems in California would require higher concentrations of oxygenates in the winter than are currently used in the State. CARB determined, however, that ozone formation is exacerbated at oxygen concentrations over 2 weight percent and that ozone mitigation is a higher priority than CO. As a result, oxygen concentrations are set at 1.8 to 2.2 weight percent in the winter.

California's RFG regulations were developed in two phases. Phase 1, which went into effect on January 1, 1992, required a summer RVP of 7.8 psi, detergent additives, and the total phase-out of lead. Phase 2 goes into effect statewide on March 1, 1996, using a specific fuel formula or a fuel blended to meet stringent emissions standards developed from a model. Limits (caps) are placed on certain gasoline components, and these limits cannot be exceeded even in alternatives to the formula fuel.

Los Angeles and San Diego will be required to use Federally-certified RFG beginning January 1, 1995. Federal RFG use must continue until the statewide California Phase 2 regulations go into effect on March 1, 1996. The California Phase 2 RFG program supplants the Federal RFG program.

California Diesel Regulations

The CARB implemented regulations on diesel fuel that were stricter than Federal CAA requirements for the fuel. The California regulations went into effect on October 1, 1993, as did Federal standards. Like the Federal rules, the California regulations require a maximum sulfur content of 0.05 weight percent; however, unlike the Federal regulations, the California regulations also establish a maximum allowance for aromatics at 10 percent volume. Furthermore, the California diesel regulations are required for both on-highway and off-highway use while the Federal standards are limited to on-highway use only.

⁵ *Federal Register*, May 5, 1994, pp. 23264-23605.

California Oxygenate Program

CARB has submitted its SIP for CO nonattainment with an average 2.0 weight percent oxygen content rather than the Federally mandated 2.7 weight percent standard. EPA has not formally acted to approve or disapprove California's waiver of the Federal standard. California justifies its position by claiming that the State will suffer increased levels of ozone resulting from elevated oxides of nitrogen (NO_x) in emissions with higher oxygen content. California's Phase 2 State RFG program allows oxygen content to be reduced to 1.8 weight percent during the winter season, which begins on March 1, 1996.

Appendix D

**The Regulatory
Paperwork Flow for
RFG Testing and
Documentation**

Appendix D

The Regulatory Paperwork Flow for RFG Testing and Documentation

Background

Testing of fuels is an integral part of gasoline commercial transactions. Recent years have brought increased testing due to the Federal and State enforcement of low Reid Vapor Pressure (RVP) and oxygenated fuels programs. However, the reformulated gasoline (RFG) program imposes more extensive testing throughout the production and distribution system. This appendix will discuss these changes.

Chronology

RFG will be produced and transported for several months prior to the official deadline of being available at retail outlets in "covered areas" on January 1, 1995. December 1, 1995, is the date at which terminals in covered areas must have certified RFG. For gasoline refiners and blenders, therefore, RFG sent to terminals for December 1 will be produced even earlier -- sampling and testing regulations will have been exercised prior to that date.

November 1, 1994, is when refiners and importers of RFG and RBOB (reformulated blendstock for oxygenate blending), as well as all oxygenate blenders who plan to make RFG, must register with the U.S. Environmental Protection Agency (EPA).

Testing for Refiners and Blenders

Each "batch" of RFG must be sampled and then tracked throughout the entire distribution system from the refiner to the retailer. Testing will be a two-phase process: *all* batches must be sampled and tested by the refiner at its facility, and a *percentage* of the batches must be verified by a laboratory independent of the refiner/blender. The EPA must receive data on each batch from the refiner, and correlating data on those batches from the independent laboratory.

EPA has defined an "averaging" procedure that would permit sampling of refiner production for testing. This concept allows flexibility and is discussed later in this appendix.

Using these data, a refiner or blender's total RFG emissions performance will be calculated at the end of each quarter and will be compared with the performance outlined in its EPA-approved

RFG plan. An audit by independent Certified Public Accountants will also be conducted on an annual basis.

The refiner/blender is responsible for producing transfer documents about an RFG shipment's characteristics downstream. Transferees must prove to EPA that they are using the fuel appropriate for the region and time of year. The upstream refiner/blender maintains responsibility for any type of violation unless the refiner can show it did not cause the violation.

The phrase "refiner/blender" is common throughout the regulations, emphasizing the wide range of industry members who are affected by the regulations. The RFG rule rarely distinguishes between refiners and blenders.

Conventional Gasoline

Reporting for conventional gasoline is conducted on an annual instead of quarterly basis, and independent labs do not have to be involved (though EPA will test a representative sample of batches). However, conventional gasoline must remain as clean as a refiner's 1990 baseline to ensure that the refiner is not "dumping" dirty gasoline components such as aromatics into its conventional gasoline stock.

Testing Specifications

A refiner's 1990 baseline for sulfur, T90, and olefins is the core of certification of RFG and compliance with conventional gasoline anti-dumping requirements only until 1998.

Seven properties of RFG must be tested for each batch. A single test has been designated in the regulations for five of the seven, while an alternative test will be allowed for the next two years as a transitional measure for the other two properties.

The required and optional test methods are described below.

Aromatics

- Gas Chromatography-Mass Spectroscopy (GC-MS) by EPA Official Procedure (*Federal Register*, vol. 59, No. 32, p. 7827)
- Option until 1/1/97 is ASTM D1319, if correlated with GC-MS

Olefins

- ASTM D1319 (depentanization not required)

Sulfur

- ASTM D2622. D4294 "is not an option," says EPA.

Oxygen

- Gas Chromatography-Oxygenated Flame Ionization Detector (GC-OFID) by EPA Official Procedure (*Federal Register*, vol. 59, No. 32, p. 7828)
- Option until 1/1/97 is ASTM D4815, if correlated with other GC-OFID

Distillation

- ASTM D86

Volatility

- 40 CFR part 80, Appendix E, method 3

Benzene

- ASTM D3606

Averaging

Flexibility is brought into the RFG program by the "averaging" provision, which enables a refiner to be in compliance if all of its RFG during a year meets Simple Model or Complex Model standards. For example, one batch of RFG could contain benzene above the maximum limit if enough RFG was produced during the year with benzene that was below-limit to balance it.

However, the concept of "Min/Max" levels impacts the operation of the averaging of batches. These Min/Max standards constrain the range over which averaging may occur.

Test Programs

Three test programs are available under the averaging provisions. The first is to have the independent testing laboratory sample and test every batch before it leaves the refinery. Those data would be submitted by the laboratory to EPA and would be the basis for RFG certification. This option is considered likely for blenders and small refiners that do not have full on-site test labs.

The "10 percent option" is the second option. In this case, the laboratory takes a sample of every batch, but only tests 10 percent of them based on a random number sequence generated by EPA. Those results are checked against the claims of a refiner for those same batches -- and if they agree, then EPA assumes all batches are acceptable and uses the refiner's data for annual averaging. Fewer tests and lower expense is the advantage of the second option.

Obtaining a waiver for in-line blending rather than batch sampling is the third choice for refiners. The EPA has yet to fully finalize this concept.

Averaging proves beneficial as long as a refiner stays above the minimum or below the maximum allowed levels for certain fuel parameters, as production of RFG can continue on a basis that would otherwise violate the "per-gallon" requirement. The RFG Regulatory Negotiation (Reg Neg) agreement set forth the ways in which a refiner could show compliance for all RFG produced on an annual basis. Specifically, the Reg Neg agreement provided that under the RFG Simple Model, southern tier states (ASTM Class B areas, or VOC Region 1) are required to meet a 7.2 psi RVP limit during summer months on each gallon of RFG sold. However, if a refiner chose to average the RVP of its RFG, it would be held to a 7.1 psi standard for all gallons sold. The averaging provision would permit a refiner to sell RFG with a vapor pressure of up to 7.4 psi, so long as the average did not exceed 7.1 psi for the season.

EPA will require refiners using the averaging approach to meet a stricter standard in the following year if a refiner fails to meet the "initial standards" on average. For example, in the first adjustment period, the refiner would have to meet a 7.0 psi average limit. If EPA determines that there is an ongoing problem thereafter, the average limit drops again to 6.9 psi.

Specific per-gallon limits on No_x and heavy metals will have to be met, even if overall RFG compliance testing is on an average basis.

Batch Definition

Batch homogeneity is kept under strict control by EPA. A batch of gasoline coming out of a refinery that is then diverted into three separate tanks becomes three new batches of gasoline. EPA reasons that the tank residues are different, and therefore when they mix with the gasoline, they may change parameters governed by the applicable compliance model. Moreover, if the volume in one of those tanks is then reduced by half in a "run down," that tank becomes another new batch when it is refilled.

Retail Testing

Retail-level sampling and testing is mandated for refiners who meet standards on average. More stringent standards will be imposed on *all* marketers within that region if the average RFG is found to be out of compliance. These "ratcheted" standards apply to refiners who average, but not to those who meet standards on a per-gallon basis.

Initially, EPA would reduce allowed RVP by an additional 0.1 psi for a period equal to the violation period. Upon a second violation, EPA may ratchet down the limit by 0.2 psi, and at a third occurrence of failure, the agency could prohibit refiners from using averaging for that area in question.

Refiners and testing companies began meeting in May 1994 to plan a consortium to conduct retail tests to simplify the collection process (and reduce expenses). An independent contractor would conduct the sampling, testing and reporting to EPA, with the participants sharing costs. The American Petroleum Institute and the National Petroleum Refiners Association are coordinating the development of the consortium.

Record Keeping Requirements

All parties in the gasoline distribution network shall maintain records for a period of five years from the date of creation. This stipulation applies to any refiner, importer, oxygenate blender, carrier, distributor, reseller, retailer, or wholesale-purchaser who sells, offers for sale, dispenses, supplies, offers for supply, stores, transports, or causes the transportation of any RFG or RBOB. The following information is to be retained:

- The product transfer documentation for all RFG or RBOB for which the party is the transferor or transferee
- For any sampling and testing on RBOB or RFG, the location, date, time, and storage tank or truck identification for each sample collected; the identification of the person who collected the sample and the person who performed the testing; the results of the tests; the actions taken to stop the sale of any gasoline found not to be in compliance; and the actions taken to identify the cause of any noncompliance and prevent future instances of noncompliance.

In addition to other requirements, any refiner and importer shall, for all RFG and RBOB produced or imported, maintain records containing:

- Results of the tests to determine RFG properties and characteristics
- Results of the tests for the presence of a marker
- The volume of gasoline associated with each of the above test results using the method normally employed at the refinery or import facility for this purpose
- In the case of RBOB, the results of tests to ensure that, following blending, RBOB meets applicable standards; and each contract with each oxygenate blender to whom the refiner or importer transfers RBOB; or compliance calculations based on an assumed addition of oxygenate

- In the case of any refinery or importer subject to the Simple Model standards, the calculations used to determine the 1990 baseline levels of sulfur, T-90, and olefins, and the calculations used to determine compliance with the standards for these parameters
- In the case of any refinery or importer subject to the Complex Model standards before January 1, 1998, the calculations used to determine the baseline levels of VOC, toxics, and No_x emissions performance.

Any refiner, importer, and oxygenate blender who produces or imports any RFG for which compliance with one or more applicable standard is determined on average shall maintain records containing the following information:

- The calculations used to determine compliance with the relevant standards on average, for each averaging period and for each quantity of gasoline for which standards must be separately achieved
- For any credits bought, sold, traded or transferred, the dates of the transactions, the names and EPA registration numbers of the parties involved, and the number(s) and type(s) of credits transferred shall be recorded.

Any oxygenate blender who blends any oxygenate with any RBOB shall, for each occasion such terminal storage tank blending occurs, maintain records containing the following information:

- The date, time, location, and identification of the blending tank or truck in which the blending occurred
- The volume and oxygenate requirements of the RBOB to which oxygenate was added;
- The volume, type, and purity of the oxygenate which was added, and documents which show the source(s) of the oxygenate used.

Any distributor who dispenses any RBOB into a truck used for delivering gasoline to retail outlets shall, for each occasion RBOB is dispensed into such a truck, obtain records identifying:

- The name and EPA registration number of the oxygenate blender that received the RBOB
- The volume and oxygenate requirements of the RBOB dispensed.

Prior to January 1, 1998, any retailer that sells or offers for sale any RFG shall maintain at each retail outlet the product transfer documentation for the most recent three deliveries to the retail outlet of each grade of RFG sold or offered for sale at the retail outlet, and shall make such documentation available to any person conducting any gasoline compliance survey.

Any refiner or importer shall maintain records, for each batch of conventional gasoline and blendstock tested, beginning in 1995, for each averaging period, containing:

- The volume of the batch
- The batch number
- The date of production, importation or receipt
- The designation regarding whether the batch is summer or winter gasoline
- The product transfer documents for any conventional gasoline produced, imported or received
- For any gasoline blendstocks received by or transferred from a refiner or importer, documents that reflect the identification of the product, the date the product was transferred, and the volume of product
- In the case of any refinery-produced or imported products that were transferred for other than gasoline blending purposes, documents that demonstrate the other purpose
- In the case of oxygenate that is added by a person other than the refiner or importer, documents that support the volume of oxygenate claimed by the refiner or importer, including the contract with the oxygenate blender and records relating to the audits, sampling and testing, and inspections of the oxygenate blender operation.

Reporting Requirements

Any refiner or importer that produces or imports any RFG or RBOB, and any oxygenate blender that produces RFG meeting the oxygen standard on average, shall submit quarterly reports to the Administrator for each refinery or oxygenate blending facility at which such RFG or RBOB was produced, and for all such RFG or RBOB imported by each importer.

The quarterly reports shall be for all such RFG or RBOB produced or imported during the following time periods:

- The first quarterly report shall include information for RFG or RBOB produced or imported from January 1 through March 31, and shall be submitted by May 31 of each year beginning in 1995.
- The second quarterly report shall include information for RFG or RBOB produced or imported from April 1 through June 30, and shall be submitted by August 31 of each year beginning in 1995.
- The third quarterly report shall include information for RFG or RBOB produced or imported from July 1 through September 30, and shall be submitted by November 30 of each year beginning in 1995.

- The fourth quarterly report shall include information for RFG or RBOB produced or imported from October 1 through December 31, and shall be submitted by the last day of February of each year beginning in 1996.

The following information shall be included in each quarterly report for each batch of RFG or RBOB:

- The batch number
- The date of production
- The volume of the batch
- The grade of gasoline produced (i.e., premium, mid-grade, or regular)
- For any refiner or importer, each designation of the gasoline and the properties
- For any importer, the PADD in which the import facility is located
- For any oxygenate blender, the oxygen content.

Information pertaining to gasoline produced or imported during 1994 shall be included in the first quarterly report in 1995.

Any refiner or importer that produced or imported any RFG or RBOB under the Simple Model that was to meet RVP standards on average ("averaged RFG") shall submit to the Administrator, with the third quarterly report, a report for each refinery or importer for such averaged RFG or RBOB produced or imported during the previous RVP averaging period. This information shall be reported separately for areas in VOC-Control Region 1 and Region 2. The following information shall be reported:

- The total volume of averaged RFG or RBOB in gallons
- The compliance total value for RVP
- The actual total value for RVP.

Any refiner or importer that produced or imported any RFG or RBOB under the Complex Model that was to meet the VOC emissions performance standards on average ("averaged RFG") shall submit to the Administrator, with the third quarterly report, a report for each refinery or importer for such averaged RFG produced or imported during the previous VOC averaging period. This information shall be reported separately for areas in VOC-Control Region 1 and Region 2. The following information shall be reported:

- The total volume of averaged RFG or RBOB in gallons
- The compliance total value for VOC emissions performance
- The actual total value for VOC emissions performance.

Any refiner or importer that produced or imported any RFG or RBOB that was to meet the benzene content standards on average ("averaged RFG") shall submit to the Administrator, with the fourth quarterly report, a report for each refinery or importer for such averaged RFG that was produced or imported during the previous toxics averaging period. The following information shall be reported:

- The volume of averaged RFG or RBOB in gallons
- The compliance total content of benzene
- The actual total content of benzene
- The number of benzene credits generated as a result of actual total benzene being less than compliance total benzene
- The number of benzene credits required as a result of actual total benzene being greater than compliance total benzene
- The number of benzene credits transferred to another refinery or importer
- The number of benzene credits obtained from another refinery or importer.

Any refiner or importer that produced or imported any RFG or RBOB that was to meet the toxics emissions performance standards on average ("averaged RFG") shall submit to the Administrator, with the fourth quarterly report, a report for each refinery or importer for such averaged RFG that was produced or imported during the previous toxics averaging period. The following information shall be reported:

- The volume of averaged RFG or RBOB in gallons
- The compliance value for toxics emissions performance
- The actual value for toxics emissions performance.

Any refiner, importer, or oxygenate blender that produced or imported any RFG that was to meet the oxygen standards on average ("averaged RFG") shall submit to the Administrator, with the fourth quarterly report, a report for each refinery and oxygenate blending facility at which such averaged RFG was produced and for all such averaged RFG imported by each importer during the previous oxygen averaging period. The following information shall be included in each report:

- The total volume of averaged RBOB in gallons
- The total volume of averaged RFG in gallons
- The compliance total content for oxygen
- The actual total content for oxygen
- The number of oxygen credits generated as a result of actual total oxygen being greater than compliance total oxygen
- The number of oxygen credits required as a result of actual total oxygen being less than compliance total oxygen
- The number of oxygen credits transferred to another refinery, importer, or oxygenate blending facility
- The number of oxygen credits obtained from another refinery, importer, or oxygenate blending facility.

Any refiner or importer that produced or imported any RFG or RBOB that was to meet the No_x emissions performance standard on average ("averaged RFG") shall submit to the Administrator, with the fourth quarterly report, a report for each refinery or importer for such averaged RFG that was produced or imported during the previous No_x averaging period. The following information shall be reported:

- The volume of averaged RFG or RBOB in gallons
- The compliance value for No_x emissions performance
- The actual value for No_x emissions performance.

As an additional part of the fourth quarterly report, any refiner, importer, and oxygenate blender shall, for each refinery, importer, or oxygenate blending facility, supply the following information for any oxygen or benzene credits that are transferred from or to another refinery, importer, or oxygenate blending facility:

- The names, EPA-assigned registration numbers, and facility identification numbers of the transferor and transferee of the credits
- The number(s) and type(s) of credits that were transferred
- The date(s) of transaction(s).

Any refiner or oxygenate blender that produced or imported any RFG that was to meet any RFG standard on average ("averaged RFG") shall, for each refinery and oxygenate blending facility at which such averaged RFG was produced submit to the Administrator, with the fourth quarterly

report, a report that contains the identity of each covered area that was supplied with any averaged RFG produced at each refinery or blended by each oxygenate blender during the previous year.

Any refiner for any refinery, or any importer, that elects to be subject to Complex Model standards shall report such election in writing to the Administrator no later than 60 days prior to the beginning of the calendar year during which such standards would apply. This report shall include the refinery or importer's baseline values for VOC, No_x, and toxics emissions performance.

In the case of RFG or RBOB for which compliance with each of the standards set forth is achieved on a per-gallon basis, the refiner, importer, or oxygenate blender shall submit to the Administrator, by the last day of February of each year beginning in 1996, a report of the volume of each designated RFG or RBOB produced or imported during the previous calendar year for which compliance is achieved on a per-gallon basis, and a statement that each gallon of this RFG or RBOB met the applicable standards.

Beginning with the 1995 averaging period, and for each subsequent averaging period, any refiner for each refinery or group of refineries at which any conventional gasoline is produced, and any importer that imports any conventional gasoline, shall submit to the Administrator a report which contains the following information:

- The total gallons of conventional gasoline produced or imported
- The total gallons of applicable blendstocks produced or imported and transferred to others
- The total gallons of blendstocks included in compliance calculations
- The average exhaust benzene emissions, sulfur, olefins and T90 if using the Simple Model; exhaust benzene emissions if using the optional Complex Model; or exhaust toxic emissions and No_x emissions if using the Complex Model
- The required for each batch of conventional gasoline or batch of blendstock is the batch number, the date of production; the volume of the batch and the grade of gasoline produced (i.e., premium, mid-grade, or regular).

Product Transfer Documentation

On each occasion when any person transfers custody or title to any RFG or RBOB, other than when gasoline is sold or dispensed for use in motor vehicles at a retail outlet or wholesale purchaser-consumer facility, the transferor shall provide to the transferee documents which include the following information:

- The name and address of the transferor
- The name and address of the transferee
- The volume of gasoline which is being transferred
- The location of the gasoline at the time of the transfer
- The date of the transfer
- The proper identification of the gasoline as conventional or reformulated
- In the case of RFG or RBOB, the proper identification and the minimum and/or maximum standards with which the gasoline or RBOB conforms
- Prior to January 1, 1998, in the case of gasoline or RBOB subject to the Complex Model standards the name and EPA registration number of the refinery at which the gasoline was produced, or importer that imported the gasoline; and instructions that the gasoline or RBOB may not be combined with any other gasoline or RBOB that was produced at any other refinery or was imported by any other importer
- In the case of RFG blendstock for which oxygenate blending is intended identification of the product as RBOB and not RFG, the designation of the RBOB as suitable for blending, the oxygenate type(s) and amount(s) which the RBOB requires in order to meet the properties claimed by the refiner or importer of the RBOB; instructions that the RBOB may not be combined with any other RBOB except other RBOB having the same requirements for oxygenate type(s) and amount(s), or, prior to blending, with RFG;
- In the case of transferrers or transferees who are refiners, importers or oxygenate blenders, the EPA-assigned registration number of those persons
- On each occasion when any person transfers custody or title to any conventional gasoline, the transferor shall provide to the transferee documents which include the names and address of the transferor and transferee, the volume of gasoline being transferred, the location of the gasoline at the time of the transfer, the date of the transfer; the EPA-assigned registration number of those persons in the case of transferors or transferees who are refiners or importers; and the following statement: "This product does not meet the requirements for reformulated gasoline, and may not be used in any reformulated gasoline covered area."

Sources

"Octane Week Special Report: RFG Testing Requirements," Summer 1994.

"Final Regulatory Impact Analysis for Reformulated Gasoline," Environmental Protection Agency, December 22, 1993.

Oil and Gas Journal, June 6, 1994.

Appendix E

**Petroleum Product
Supply and
Distribution System
Overview**

Appendix E

Petroleum Product Supply and Distribution System Overview

Background

Networks of terminals, refineries, storage facilities, pipelines, tankers, barges, tank cars, and tank trucks comprise the U.S. petroleum distribution system. These elements move crude oil from its source, convert it into consumer products, and deliver the products to consumers' facilities for their use.

This section presents an overview of the U.S. petroleum distribution system and describes the functions of the primary components.

The Petroleum Distribution System

A complex system has developed to accommodate the logistics of petroleum supply and demand (Figure E1). The flow of petroleum begins with the origins of supply of crude oil, natural gas liquids, and other feedstocks. The process proceeds through refining, that transforms these feedstocks into finished petroleum products (such as motor gasoline, jet fuel, heating oil, and lubricants), and concludes with the distribution of these products to end use consumers. The processing and distribution system can be divided into three levels: primary, secondary, and tertiary.

The **primary level** represents the first tier in the flow of petroleum. This level includes crude oil supply (domestic production and imports), petroleum refineries, motor gasoline blenders, product pipelines, tanker and barge operators, large bulk storage terminals (Figure E2), natural gas liquid production facilities, and product imports. Most finished products move out of the primary level into the secondary level for eventual distribution to the final consumer. However, depending on the logistical network in a particular region and the type of finished products, some distribution will go directly from the primary level to the end use consumer (tertiary level).

The **secondary level** links the primary distribution network with end-users of the various products. Product typically flows in bulk from the primary system into the secondary system before delivery in smaller quantities to consumers. A great deal of secondary product storage is located at bulk plants. These are wholesale storage facilities that have less than 50,000 barrels of storage capacity and, by definition, receive product only by rail or truck. Also included in the secondary system is tankage at retail motor fuel outlets, such as service

Figure E1. U.S. Petroleum Supply, 1993
(Million Barrels per Day)

Source: Energy Information Administration.

Figure E2. Simplified Diagram of the Petroleum Distribution System

stations, truck stops, and convenience stores, as well as storage at retail fuel oil dealers. In the most recent petroleum storage and transportation study (dated 1989) conducted by the National Petroleum Council (NPC) for the Department of Energy, there were an estimated 15,000 companies that own and/or operate bulk plant facilities and 170,000 retail motor fuel outlets. The NPC estimated secondary inventory levels of motor gasoline to be 48 million barrels as of March 31, 1988, with a total storage capacity of 92 million barrels.

The **tertiary level** is comprised of the ultimate consumer of finished petroleum products. The tertiary level is generally broken down into several consuming sectors. These include (with examples):

- *Agricultural* - Farm diesel fuel storage
- *Commercial* - Office building fuel oil tanks
- *Electric Utilities* - Generating plant fuel tanks
- *Industrial* - Factory boiler fuel tanks
- *Military/Government* - Military base fuel depots
- *Residential* - Home heating oil tanks
- *Transportation* - Personal vehicle fuel tanks.

Petroleum products are usually transferred into the tertiary segment from the secondary system, although some product is supplied directly by the primary system. For example, while gasoline for automobiles generally comes from the secondary distribution system through retail gasoline service stations, commercial or rental fleet vehicles may be fueled from bulk product storage that a company itself owns. The NPC estimate for tertiary motor gasoline storage in vehicles, as of March 1988, was 63 million barrels.

The terminus of the primary product distribution system is usually a bulk terminal -- a non-consumer facility, by EIA definition, that has storage capacity of 50,000 barrels or more and/or receives products directly by barge, tanker, or pipeline.

The Function of Bulk Terminals

The operation of the bulk terminal system is best understood by examining the following components (Figure E3), each of which plays an important role in the overall system:

- Unavailable inventory
- Working inventory
- Minimum operating inventory
- Operating space
- Maximum operating inventory
- Contingency space
- Unavailable space.

Figure E3. Simplified Diagram of Terms Describing Petroleum Inventories and Storage Capacities In the Primary Distribution System

Unavailable Inventory

Unavailable inventory, the volume of oil contained in tank bottoms, is unavailable without shutting down part of the system. In most cases, storage tanks are designed so that they cannot be totally emptied by the normal suction piping. This design prevents residue and water, which settle at the bottom, from being introduced into the crude oil or product streams.

Some tanks are equipped with a floating roof, designed so that the roof adjusts to the level of oil in the tank. This prevents air from entering the tank as the oil is pumped out, and as the tank is filled, minimizes hydrocarbon emissions from the tank. A tank of this type is not permitted to reach a level that would allow the floating-roof legs to touch the tank bottom.

Working Inventory

Working inventory is the quantity of refined products, above the unavailable inventory, needed to keep the primary distribution system functioning normally. It is the additional inventory necessary to support the operating cycle, handle unavoidable operating interruptions, and facilitate the blending of products to their final specifications. For all practical purposes, working inventory is also unavailable, but it can be used for a short time at higher operating costs. Descriptions of components of working inventory follow:

- Products manufactured in a refinery generally accumulate at rates slower than the outbound transportation facilities require. Sufficient working inventory must be on

of products from a refinery to a bulk terminal generally require that sufficient inventory be on hand to load a barge in less than a day.

- Shipment of products are subject to interruptions, due to unavoidable but recurring events. Inventories of products are held as protection against these interruptions. For example, in the event of a refinery shutdown, sufficient inventory of finished product at the bulk terminal is needed to continue to supply customers until the refinery is back in operation.
- Products must be accumulated until sufficient quantities are available for blending in specific proportions to make finished products, such as different grades of gasoline.

Minimum Operating Inventory

Minimum operating inventory is the level of inventory that is necessary to maintain smooth operations and avoid runouts, and below which operating problems and shortages would begin to appear in a defined distribution system. It is composed of unavailable inventory and working inventory and is normally not available for sale. The minimum operating inventory is a concept, not a precisely measurable quantity, that can be estimated more accurately for a company than for the industry as a whole. As used by the NPC, minimum operating inventory excludes the effects of seasonal product build-ups.

A company's minimum operating inventory is a function of many factors, including the location of both its supply and demand, the level of its demand, the availability of transportation and refining facilities, the mode of transportation, and the availability, size, and location of tankage. Its actual inventory may, at times, fall below the minimum operating level. In such a circumstance, a company may be able to avoid supply disruptions by special purchases of supply or by an exchange with another company, but only if these additional supplies are available. In the course of normal operations, companies do not plan on drawing down stocks below minimum operating inventories, due to the costs involved.

Estimating the minimum operating inventory on an industry-wide basis requires a complex and very difficult judgment. Merely totaling the minimum operating inventories for all companies, at a given time, may not truly represent the minimum operating inventory for the industry, because it is unlikely that all operators will reach their minimum operating levels simultaneously. It is clear that one or more companies may incur shortages and runouts before the estimated minimum operating inventory for the total industry is reached, as other companies in the system will be above their minimum. This enhances total system flexibility.

Operating Space

Although there are many purposes for maintaining certain inventory levels within the "operating space" (that space in excess of the minimum operating inventory available for holding additional inventories), this discussion will focus on two primary elements:

- **Seasonal Demand** - Consumption of gasoline is greatest in summer months; consumption of heating oil is greatest in winter months. During a given season, refineries generally do not change the mix of gasoline and heating oil sufficiently to balance production with demand. Seasonal demand also results in changes in distribution patterns, such as changes in pipeline cycles and extra transportation by truck and barge. As a result, excess gasoline production in the winter may be held in bulk terminals for summer demand.
- **Planned Maintenance Periods** - Periodically, companies shut down refinery equipment for maintenance. To permit regular deliveries of product to customers during the shutdown, inventories must be built up ahead of time in bulk terminals or alternative supply arrangements must be made.

Other factors affecting inventory levels within the operating space are price expectations and the perceived security of supplies.

Maximum Operating Inventory/Contingency Space/Unavailable Space

Maximum operating inventory is the maximum quantity of petroleum that could be stored in a defined distribution system while still maintaining a workable operating system. The empty tank space above maximum operating inventory is the unavailable space (tank tops and safety allowance) and contingency space required for periods of high inventories. This space is used to smooth out the operating cycles and to permit inventory build-ups during interruptions of refinery or other distribution facility operations. Like minimum operating inventory, maximum operating inventory is a concept, not a precisely measurable quantity.

Blending Operations

MTBE can be blended with gasoline at the refinery. But ethanol, because of its affinity for water, cannot be shipped through existing petroleum product pipelines. Ethanol must be shipped by rail car or tank truck to terminals for blending with gasoline before final shipment by tank truck to retail outlets.

Several methods to physically blend products are utilized by storage operators to satisfy customer demands. They include:

- tank-to-tank blending, which is self-explanatory
- in-line blending, where components are blended in the pipeline and delivered directly to a truck
- splash-blending, where a product is put into a truck and the final component "splashed" on top.

Ethanol has been used as a gasoline extender in the U.S. since the early 1970s. Primarily, it has been used in the form of "gasohol" (10 percent ethanol, 90 percent gasoline). Ethanol can be used as a fuel directly, or it can be used to boost gasoline oxygen content. It can also be converted to ETBE. The U.S. government encourages the use of ethanol through a subsidy for gasohol blenders. Blenders' income tax credits will continue through 2000. Additional State subsidies have further encouraged the use of ethanol.

Ethanol will continue to have a role in downstream blending as long as subsidies exist. Further enhancing the role of ethanol as a reformulated gasoline blendstock is the United States government continuing its policy of granting a one pound Reid Vapor Pressure (RVP) waiver for gasoline that contains ethanol, and the Renewable Oxygenate Standard surviving its court test.

The ever increasing fragmentation of gasoline in terms of quality and the time of year it can be sold is causing shifts in bulk terminal inventories. For example, the change from high to low RVP gasoline and from oxygenated to non-oxygenated gasoline has forced the dumping of winter stocks in order to make room for summer inventories. With the requirement to separately store multiple grades plus blending feedstocks, bulk terminal inventory space will continue to be at a premium.

Sources

National Petroleum Council Study on "Petroleum Storage and Transportation" - April 1989.

Oil and Gas Journal, June 14, 1993.

Petroleum Intelligence Weekly, June 6, 1994.

API Field Operations Workshop, November, 1993.

Appendix F

Pipeline Operations

Appendix F

Pipeline Operations

On common carrier pipelines, any company wishing to ship petroleum products has the right to do so provided it meets the requirements of the pipeline's published tariffs and indicates an intention to request space for (or "nominate") shipment on the pipeline. This nomination must stipulate the products and volumes to be shipped during a specified month, and must be submitted prior to the pipeline's nominating deadline. The pipeline confirms the movement and a shipment date once the shipper meets the published rules and regulations of the pipeline's tariff. If requests for shipments are greater than the capacity available, the pipeline may have to apportion (or "prorate") available capacity among all nominating for it.

As an example, follow a batch of motor gasoline from the refinery in Houston to a terminal in New York Harbor. The refinery has requested ("nominated") space on the pipeline for 25,000 barrels for June 1 and received confirmation from the pipeline. Prior to June 1, the refinery delivers 25,000 barrels to the pipeline's tank farm at the beginning of the pipeline. The pipeline tests and confirms the gasoline is of the quality stated in the published tariff. On June 1, the pipeline pumps the 25,000 barrels from its storage tanks into the pipeline and begins the 19 day trip to New York harbor. At about 3 miles per hour, the batch of gasoline moves slowly through the pipelines. At numerous pumping stations along the way, pumps maintain pressure and speed. Depending on scheduling and other nominations on the pipeline, this batch of 25,000 barrels may be part of a larger batch of similar quality gasoline moving together. Or, the batch may be in between batches of other products (kerosene, jet fuel or distillate fuel oil). If a pipeline is moving kerosene, gasoline, distillate fuels and jet fuel through the same pipeline, the individual products flow one behind the other with very little mixing. The interface between products can be minimized by careful scheduling of the sequence of products moved. For example, gasoline batches may be moved with minimal interface, as the mixed barrels may be sold as the lower specification gasoline. The interface between distillate fuel oil and gasoline must be drawn off and put into a special tank for reprocessing. Some special batches are kept separate by a plastic ball or a "pig." The use of pigs is expensive and slows the line down, for the pig must be manually removed and reinserted at each pump station. The pipeline operators will try to keep interface to a minimum and will try to schedule like products for extended periods of time. As the number of gasoline segregations increases with reformulated gasoline (RFG), the interface and mixing of gasolines becomes critical when gasoline specifications are closely monitored.

For scheduling convenience and efficient operation, pipeline operators may make up a larger batch of gasoline at a terminal along the line and take the 25,000 barrels out of the pipeline and put it into tankage to await the makeup of the larger batch. Each segregation of products slows down the efficiency of the pipeline as it requires the pipeline operators to carefully coordinate line speed and tankage. It is likely the batch will be taken out of the pipeline and placed in the pipeline's storage tankage at tank farms several times along way. Reasons for this are: changing diameters of the pipeline, single and multiple pipes running parallel of each other, requirements

to deliver products to terminals along the way and available tankage at various terminals. The movement of a batch of gasoline calls for close direction/coordination by the pipeline and shipping and receiving facilities. Each batch of gasoline must be ready to be injected into the pipeline when space is available and there must be tankage ready to receive it at the end of the line. The owner must be ready to quickly remove it from the terminal tanks because the tankage is needed for yet another batch of product moving up the pipeline.

Pipeline operators maintain a close watch on each batch of product moving in the pipeline. Computers track movements and gasoline quality specifications taken at intermediate positions along the journey. With the new regulations for RFG, verification of product specifications is very important. Each time the batch of gasoline is taken out of the pipeline and put into tankage a detailed run ticket is generated, giving volumetric and chemical data. Depending on how EPA defines a "batch" of gasoline, the paperwork generated from tracking gasoline volumes moving through the pipeline will be critical to maintaining certification of gasoline quality.

Appendix G

**Petroleum Tanker
Availability**

Appendix G

Petroleum Tanker Availability

There are about 40 to 45 U.S.-flag tankers operating in clean products trade. For U.S. coast-wise trading, the "Jones Act" requires that, with certain exceptions, all shipments by water between points in the United States travel by U.S.-flag, U.S.-built, and U.S.-crewed vessels. The Jones Act is the popular name for Section 27 of the Merchant Marine Act of 1920 (46 USC. App.883).

Marine terminals in the United States tend to be in shallow water where vessel size restrictions limit cargo capacity. A "typical" Jones Act products tanker is less than 50,000 dead weight tons (DWT) and carries 250,000 to 300,000 barrels of product in multiple tanks. These vessels have an average speed of about 15 knots per hour and can make a round trip from Houston to New York in about two weeks. The vessels are loaded by terminal pumps, but unloaded by onboard pumps pumping products into terminal tankage. Most of these are in U.S. coast-wise trading as product tankers to serve the Gulf Coast/East Coast area to move refined products. In 1993, tankers moved about 17 million barrels of petroleum products from the Gulf Coast to the Northeast. (This is about 1 tanker cargo per week.) Most of the Jones Act tankers operate on dedicated routes with specific volumes of products to move. They should not be considered "available" to move additional volumes of products to East Coast markets in an emergency. In comparison with the world tanker fleet, the 40 to 45 Jones Act vessels are but a small portion of the estimated 1,300 tankers under 50,000 DWT worldwide.

Some tankers have special coatings in tanks to haul specialty chemicals, but most operate in "clean" products (e.g, gasoline, jet fuel, distillate fuel) or "dirty" products (residual fuel oil or crude oil) trade. The cost of cleaning a dirty tanker is very high, so tankers tend to stay in clean or dirty products trade for extended periods of time. Because products tankers have multiple tanks, a vessel can carry several types of cargo on each voyage. A single voyage could move finished reformulated gasoline (RFG), RBOB, and distillate fuels. Constraints on the voyage would be individual tank size, and volume of segregated tankage available at the destination terminal. With the EPA "batch" definitions for RFG, each tank on the vessel would be considered a "batch" and appropriate records maintained for each tank.

Currently in the United States, there are only a handful of tankers available for spot charter. A substantial increase in demand for tankers to move RFG or RFG components cannot be met with U.S.-flag tankers. If U.S.-flag vessels are not available, a cargo owner may petition the U.S. Customs Service for a waiver of the Jones Act requirements and seek to haul the cargo in a foreign-flag tanker. Historically, few waivers of the Jones Act have been granted.

Appendix H

Petroleum Refining

Appendix H

Petroleum Refining

Introduction and Economic Importance of Petroleum Refining

The purpose of this appendix is to provide background information on the operations of refineries and to describe the types of gasoline processing units normally found in a refinery. This information will help set the framework for understanding the complexity of changes required in order to produce reformulated gasoline (RFG) and comply with requirements of the Clean Air Act Amendments of 1990.

Petroleum refining is one of the leading manufacturing industries in the United States. The value of shipments by the petroleum refining industry accounts for about 4 percent of the value of shipments by the entire manufacturing sector of the U.S. economy.⁶ The value of shipments by the petroleum refining industry is forecast to be about \$154 billion in 1994.⁷

Overview of Crude Oil Distillation and Downstream Processing

The function of a refinery is to convert crude oil into finished petroleum products and raw materials for other industries. Products of crude oil refining include fuels such as motor gasoline and heating oil, and non-fuel products such as lubricants and solvents. The petrochemical industry and other industries use refinery products to manufacture plastics, polyester clothing, certain pharmaceuticals, and other useful products.

Refining of crude oil is accomplished through distillation, downstream processing, and product treatment. Distillation involves the separation of crude oil into its basic components by application of heat in a distillation tower. The heat causes separation of crude oil into gases, naphthas (which make up the bulk of gasoline volume), distillates and gas oils, and the heaviest products called residuum. Separated crude oil components then go to downstream processing units where heat, pressure, and catalysts are used to change the molecular structure of distillation products. Downstream processing allows refiners to maximize production of products that are most profitable and also allows flexibility in the types of crude oil which can be processed. After downstream processing, products may require treatment to remove impurities such as sulfur. The ability to remove impurities adds further flexibility in the types of crude oil which a refinery is able to process. Figure H1 shows a simplified flow diagram of a typical refining process.

⁶ U.S. Department of Commerce, Bureau of the Census, *1988 Annual Survey of Manufacturers, Statistics for Industry Groups and Industries (M88ASI)*, Table 2.

⁷ U.S. Department of Commerce, Bureau of Economic Analysis, *U.S. Industrial Outlook 1994* (Washington, D.C., January 1994) p. 4-1.

Figure H1. Typical Refining Process

Source: Energy Information Administration

The refining industry is made up of individual plants with wide variation in types of processing units. As of January 1, 1994, there were 179 operable refineries in the United States with the ability to process approximately 15 million barrels of crude oil per day. Of these, 140 were considered to be complex refineries and 137 produced gasoline.

Complex refineries are those which have significant downstream processing and product treating capability. These refineries have considerable flexibility in the types of crude oils that can be processed and the types of products produced. Simple refineries lack substantial downstream processing capability and are limited in the types of crude oil they can process and in the products they produce. In general, simple refineries are the least able to adapt to new product specifications, such as those associated with reformulated motor gasoline, and to changes in crude oil quality which may result from depletion or shutting in of nearby oil fields. This lack of flexibility tends to place simple refineries at greatest risk of shutting down due to their limited ability to adapt to new market conditions.

Downstream Processing for Gasoline Production and Changes Due to RFG

Nearly one-half of all U.S. refinery output is motor gasoline. To achieve this level of output, refiners utilize downstream processing units to upgrade non-gasoline range products from

distillation so that they can be used in gasoline blending. It is important to note that the products of downstream refinery units are actually gasoline blending components that must be mixed in the proper proportions to produce finished gasoline. This finished gasoline may later be mixed with oxygenates outside of refineries. Before being shipped to retail outlets, additives are mixed with gasoline in delivery trucks to give each brand of gasoline the properties that make it a proprietary product.

The following downstream processes are the major ones used in gasoline production.

Catalytic Reforming

This process uses a special catalyst and high temperatures to increase gasoline octane rating by converting non-aromatic hydrocarbons to aromatics (including benzene). Catalytic reforming operations will be modified (temperature and pressure will be reduced) for RFG production to reduce aromatics concentration in gasoline blending components. This will result in less volume produced from reforming as well as lower octane numbers due to removal of aromatics.

Fluid Catalytic Cracking (FCC)

This process uses catalysts and heat to convert heavy distillation products (e.g., residuum) to naphtha range material suitable for use in gasoline. With the introduction of RFG, changes will be made to FCC operations to increase production of refinery gases (including olefins) that can be used for production of the oxygenate methyl tertiary butyl ether (MTBE) and for input to alkylation units. The heavy end of FCC gasoline production will be excluded from gasoline in the future because of its relatively high aromatics content and because of the requirement to control T90 (i.e., the temperature at which 90 percent of gasoline vaporizes).

Alkylation

Alkylation uses refinery gases, including olefins, produced from FCC units to produce materials suitable for blending into motor gasoline. This process allows the maximum use to be made of the lightest FCC products that are not used in production of MTBE. The product of alkylation, referred to as alkylate, has very favorable emissions characteristics for gasoline, and the use of alkylate as a gasoline blending component is expected to increase with introduction of RFG.

Isomerization

This process improves the octane rating of certain distillation products (namely straight run gasoline made up primarily of pentanes and hexanes) by creating isomers of these materials. This involves taking straight-chain molecules and changing them so they have a branched structure. The isomerization process yields material called isomerate which has favorable emissions characteristics for gasoline. The use of isomerate in gasoline is expected to increase with the introduction of RFG.

Catalytic Hydrotreating

This process uses catalysts and substantial quantities of hydrogen to remove sulfur as well as other substances which may inhibit refinery processes or result in poor emissions performance of fuels. Catalytic hydrotreating will be used to treat feeds to downstream units or the gasoline itself to meet sulfur reductions required for RFG.

Gasoline Blending

Gasoline blending involves the mechanical mixing of components to produce a fuel having some set of desired properties. Gasoline blending begins with the mixing of products from the various downstream units described above. Oxygenates, such as MTBE or fuel ethanol, can then be added, either at the refinery or at a downstream blending terminal, to bring the gasoline into compliance with environmental regulations and to boost the octane rating. Additional blending may be done later to adjust the properties of gasoline, such as when premium and regular gasoline are blended to produce a midgrade product. Additives are injected into gasoline when it is loaded onto a truck at racks for delivery and are "splash blended" with the gasoline as on the way to retail outlets.

It is important to recognize that blending may take place in several different ways. Materials may be mixed in batches in a tank and then held until they are tested and delivered. In-line blending provides a highly efficient means for continuous blending, testing, and delivery of products. In-line blending often takes advantage of advanced technology for controlling the blending process and monitoring product quality, and has been adopted by a number of refiners and blenders. RFG testing and certification is complicated when in-line blending is used because RFG testing requirements generally assume batch-mode operation. Waivers are required to use in-line blending for RFG production. Splash blending is often used to blend ethanol in order to avoid having ethanol, and its associated problems in the presence of water, at refineries and storage terminals.

Appendix I

**Historical Summary of
Regulations Affecting
Motor Vehicle Fuel and
Fuel Additives**

Appendix I

Historical Summary of Regulations Affecting Motor Vehicle Fuel and Fuel Additives

During the past 20 years, major changes in the composition of motor vehicle fuels and fuel additives have been driven by environmental considerations. The reformulated gasoline (RFG) program is one part in a series of clean fuel programs that the Environmental Protection Agency (EPA) has implemented to improve air quality. In 1973, unleaded gasoline was introduced as a required fuel for vehicles with catalytic converters in order to reduce tailpipe emissions. The maximum allowable lead in gasoline was gradually reduced from 4.0 grams per gallon in 1975 to 0.1 grams per gallon in 1986. In 1987, the EPA issued regulations requiring vapor recovery systems at service stations located in all or part of 11 Air Quality Control Regions in the United States. The regulations were based on EPA's finding that approximately 90 percent of all refueling emissions consist of vapors displaced from the vehicle fuel tank when the tank is filled with gasoline. In 1989, the EPA issued additional regulations as a two phase program to further reduce evaporative emissions by changing fuel composition.

EPA has been changing the level of motor gasoline volatility since 1989 as part of an ongoing program to reduce ozone pollution. Volatility, the evaporative tendency of fuel, is expressed in terms of Reid Vapor Pressure (RVP), and measured in pounds per square inch (psi). Phase I RVP regulations were implemented during 1989 and restricted summertime gasoline volatility by requiring lower RVP levels for the warmer climate states. Depending upon the State and month, Phase I regulations restricted RVP levels to 10.5 psi, 9.5 psi, or 9.0 psi, beginning June 1 for retail outlets, and on May 1 for all other points in the distribution system. The RVP restrictions apply only during summer months when evaporative emissions are highest, and end at all points in the distribution system on September 15 of each calendar year.

Phase II RVP restrictions were implemented in 1992 and divided the United States into northern (Class B) and southern regions (Class C). The Phase II regulations set a nationwide standard of 9.0 psi except in ozone non-attainment areas in the southern region where a lower 7.8 psi applies. These regulations are in effect through the summer of 1994. In 1995, RVP requirements will be lowered again in certain areas with the implementation of the RFG program.

Since November 1, 1992, all gasoline sold in most of the 39 areas that failed to meet the Federal standard for carbon monoxide (CO) attainment levels must contain a minimum of 2.7 percent oxygen by weight. The oxygenated fuels programs generally covers at least four winter months when CO emissions are at their highest level. Adding oxygenates to motor gasoline lowers the level of CO emissions from gasoline combustion. The most common oxygenates added to gasoline to meet the required oxygen level are ethanol and methyl tertiary butyl ether (MTBE).

Effective October 1, 1993, the EPA required the sulfur content of on-highway diesel fuel to be reduced to a maximum of 0.05 percent by weight. In addition, the on-highway diesel fuel must

have a minimum cetane index specification of 40 or meet a maximum aromatics level of 35 percent.

The RFG program is the most significant and comprehensive clean fuel program for mandating changes in the composition of gasoline and fuel additives. The program is designed to reduce volatile organic compounds and other toxic emissions which combine to form ozone pollution. Refer to the following time charts for an historical summary of the regulations affecting the composition of motor vehicle fuels and their additives.

Chronology

- 1967 The Air Quality Act was enacted by Congress to regulate ambient air quality. The Act established emission standards and a basic fuel and fuel additive registration program.
- 1970 The Clean Air Act (CAA) was instituted to control air pollution problems. It established National Ambient Air Quality Standards (NAAQS) for sulfur dioxide, nitrous oxides, CO, oxidants (ozone), non-methane hydrocarbons, and total suspended particulates.
- 1974 The 1970 CAA required all gasoline stations of a certain size to offer at least one grade of unleaded gasoline by July 1, 1974.
- 1975 The Energy Policy and Conservation Act (EPCA) established standards which mandated increases in average automobile fuel-economy. Eighteen miles per gallon was the established standard for the corporate sales-fleet average beginning in 1978. By 1985, the fleet goal was to be 27.5 miles per gallon.
- 1977 The 1977 Clean Air Act Amendments provided clarification and additions to the 1970 Clean Air Act. Under the NAAQS program, regulations were designed to focus on certain pollutants. These included CO, ozone, lead, and other "criteria pollutants." New stationary sources were to be regulated more strictly than previously existing sources.
- 1989 Beginning June 1, 1989 phase I Reid Vapor Pressure (RVP) regulations were implemented to reduce emissions of volatile organic compounds (VOCs).
- 1990 The Clean Air Act Amendments of 1990 were enacted by Congress and required several clean fuel programs to reduce ozone, CO, and sulfur dioxide emissions.
- 1991 The Regulation Negotiation (Reg Neg) between U.S. governmental agencies, oil industry officials, and environmental groups was concluded.
- 1992 Phase II RVP regulations were implemented, dividing the U.S. into northern and southern regions and setting a nationwide standard of 9.0 pounds per square inch

(psi) except in ozone non-attainment areas in the southern region where a lower 7.8 psi standard applies.

- 1992 The first season of the oxygenated gasoline program began November 1, 1992 to reduce CO pollution in 36 cities.
- 1993 Low sulfur diesel regulations were implemented October 1, 1993, limiting the concentration of sulfur in motor vehicle diesel to a maximum of 0.05 percent by weight or a minimum octane index of 40.
- 1993 The final rule for RFG was signed by EPA Administrator Carol Browner. This document established rules for the certification and enforcement of RFG and provisions for conventional gasoline which would take effect on January 1, 1995.

Important Events This Year

- Jan. 14, 1994 The EPA held a public hearing to receive testimony regarding the Renewable Oxygenate Standard (ROS) proposal. Over 12,000 comments were received.
- March 23, 1994 The EPA agreed to a compromise that would allow Venezuela to export approximately 60,000 b/d of RFG to the U.S., using the PDVSA 1990 baseline. The EPA agreed on the less stringent rules for RFG in exchange for Venezuela withdrawing its request for formation of a GATT panel.
- April 21, 1994 EPA Administrator Browner signed the compromise proposal with Venezuela, but stated that the EPA would seek further comment on the baseline issue through a public comment period. The contents of the new proposal stated that importers would be allowed limited use of their individual baselines. The limitations include: (1) The refiner must petition the EPA to use its own baseline; and (2) The petition must include a prepared report by an independent baseline auditor.
- May 3, 1994 The EPA officially reversed its position on foreign RFG imports by issuing a proposed ruling, granting Venezuela an exemption from the U.S. national average baseline.
- May 23, 1994 A Public Hearing was held on foreign RFG import rules.
- June 30, 1994 The EPA announced its final decision on the ROS. The decision incorporates a two-phase rule, whereby RFG in the first year (1995) will be required to contain 15 percent renewable oxygenates. As of January 1, 1996, 30 percent renewable oxygenates will be required.

- July 13, 1994 The American Petroleum Institute (API) and the National Petroleum Refiners Association (NPRA) filed suit to stop the EPA from requiring the use of renewable oxygenates in RFG. API and NPRA also requested a stay from the U.S. Court of Appeals to halt implementation of the regulation.
- September 13, 1994 A U.S. Appeals Court issued a stay on the EPA's renewable oxygenate requirements.

Important Dates for the RFG Program

- Dec. 1, 1994 Deadline for wholesalers serving covered areas to have RFG in the distribution system.
- Jan. 1, 1995 Deadline for RFG to be at the retailers.
- Jan. 1, 1995 Deposit control and detergent additives requirements begin by this date.
- May 31, 1995 Each refiner must submit first quarter average data for oxygen content and benzene level.
- Jan. 1, 1996 The CAA requires all grades of gasoline to be completely lead-free by this date.
- May 31, 1996 The first annual RFG audit.
- Jan. 1, 1998 Simple Model RFG or conventional gasoline testing is no longer acceptable. Phase I Complex Model RFG must be at the retailers by this date.
- Jan. 1, 2000 Phase II Complex Model RFG must be at the retailers by this date.

Appendix J

**Historical Petroleum
Product Inter-PADD
Movements**

Appendix J

Historical Petroleum Product Inter-PADD Movements

Since producers and consumers are not evenly distributed throughout the Nation, it is necessary that motor gasoline and other petroleum products be transported from one Petroleum Administration for Defense District (PADD) to another. In order to achieve a national balance between supply and demand, the net movement of motor gasoline and other petroleum products is from producing PADDs to consuming PADDs.

Motor gasoline end-users are concentrated in PADDs I, II, and V, which include states with the highest population densities. On the other hand, PADD III is by far the largest provider of the Nation's domestic motor gasoline production. Large volumes of motor gasoline are shipped from this PADD to other regions. However, the actual flow pattern presents a more complex picture. This is due to a variety of factors such as storage capacity, availability of ports capable of handling petroleum products and particular gasoline blends, and demand within the PADD itself.

Movement of motor gasoline between PADDs is accomplished by means of pipelines, tankers, and barges. Tables J1 and J2 show motor gasoline movements between PADDs for October through February for the 1992-1993 winter months and the 1993-1994 winter months. Tables J1 and J2 show that during the winter seasons, PADD III (Gulf Coast) had a high volume of shipments to PADD I (East Coast) and PADD II (Midwest). Net receipts of motor gasoline between PADD (Table J3) show that PADD I, II, IV, and V were net recipients and PADD III the shipper. Consistent patterns in movements of finished gasoline over the winter seasons of 1992-1993 and 1993-1994 were:

Table J1. Finished Gasoline Movements by Pipeline, Tanker, and Barge between PADDs - October 1993 through February 1994
(Thousand Barrels)

FROM	TO				
	PADD I	PADD II	PADD III	PADD IV	PADD V
PADD I	X	25,497	228	0	0
PADD II	8,219	X	5,334	7,684	0
PADD III	241,102	59,746	X	0	7,309
PADD IV	0	2,509	0	X	3,944
PADD V	519	0	0	0	X

Source: Energy Information Administration, *Petroleum Supply Monthly* and *Petroleum Supply Annual*.

**Table J2. Finished Gasoline Movements by Pipeline Tanker and Barge between PADDs -
October 1992 through February 1993**
(Thousand Barrels)

FROM	TO				
	PADD I	PADD II	PADD III	PADD IV	PADD V
PADD I	X	25,566	0	0	0
PADD II	7,860	X	4,398	7,726	0
PADD III	241,829	53,653	X	0	6,221
PADD IV	0	2,226	0	X	4,372
PADD V	158	0	0	0	X

Source: Energy Information Administration, *Petroleum Supply Monthly* and *Petroleum Supply Annual*.

Table J3. Net Receipts of Finished Motor Gasoline by Pipeline, Tanker and Barge.
(Thousand Barrels)

	Receipts	Shipments	Net Receipts
PADD I			
Winter 1993-1994	249,840	25,725	224,115
Winter 1992-1993	249,847	25,566	224,281
PADD II			
Winter 1993-1994	87,752	21,237	66,515
Winter 1992-1993	81,445	19,984	61,461
PADD III			
Winter 1993-1994	5,562	308,157	(302,595)
Winter 1992-1993	4,398	301,703	(297,305)
PADD IV			
Winter 1993-1994	7,684	6,453	1,231
Winter 1992-1993	7,726	6,598	1,128
PADD V			
Winter 1993-1994	11,253	519	10,734
Winter 1992-1993	10,593	158	10,435

Source: Energy Information Administration, *Petroleum Supply Monthly* and *Petroleum Supply Annual*.

- PADD I received very large shipments from PADD III.
- PADD I ships significant quantities to PADD II.
- PADDs I and II shipped and received motor gasoline from each other. PADD I being the net shipper of about 17 million barrels in each winter driving season.
- PADD V does receive shipments from PADDs III and IV.

PADDs I and II are most significant in their reliance on motor gasoline supplied from other PADDs. The following are observations made by comparing demand, expressed as product supplied, to net pipeline and tanker/barge movements of motor gasoline during the last two winter driving seasons.

- Between 45 and 50 percent of PADD I demand for motor gasoline is delivered by pipeline from other PADDs, more than 95 percent of which originates in PADD III.
- Nearly 15 percent of PADD I demand for motor gasoline is delivered by waterborne transports from other PADDs, mostly from PADD III.
- Between 18 and 20 percent of PADD II demand for motor gasoline is delivered by pipeline from other PADDs, about one-third from PADD I and about two-thirds from PADD III.
- Waterborne deliveries of motor gasoline into PADD II account for 1 percent or less of demand.

PADD III is a consistent shipper because it encompasses the major oil producing and refining states of Texas and Louisiana. During 1993, refinery production of finished motor gasoline in this area was approximately 3.3 million barrels per day compared to PADD I with 0.8 and PADD IV with only 0.2 million barrels per day.

Overall motor gasoline movements between PADDs were 2 percent higher during the 1993-94 winter season, mostly due to increased receipts into PADD II.

Distillate fuel oil end-users are also concentrated in PADDs I, II, and V, which include States with the highest population densities. Like motor gasoline, about 70 percent of the total daily production of distillate fuels takes place in PADDs II and III. Distillate shares the same complex distribution routes using pipelines, tankers, and barges to a variety of ports and bulk storage facilities throughout the Nation. Figures J1 and J2 display the distribution patterns by pipeline and water for motor gasoline and distillate fuel oils. Tables J4 and J5 show distillate fuel oil movements between PADDs for October through February for the 1992-1993 winter months and the 1993-1994 winter months. Consistent patterns in movements of distillate fuels over the winter seasons were:

- PADD I received very large shipments from PADD III.
- PADD I ships significant quantities to PADD II.

Figure J1. Motor Gasoline and Distillate Fuel Oil Pipeline Shipments

Source: Energy Information Administration

Figure J2. Motor Gasoline and Distillate Fuel Oil, Tanker and Barge Shipments

Source: Energy Information Administration

Table J4. Distillate Fuel Movements by Pipeline Tanker, and Barge between PADDs - October 1993 through February 1994
(Thousand Barrels)

FROM	TO				
	PADD I	PADD II	PADD III	PADD IV	PADD V
PADD I	X	10,980	50	0	0
PADD II	3,321	X	1,604	2,298	0
PADD III	105,861	17,052	X	0	1,465
PADD IV	0	1,386	0	X	1,171
PADD V	0	0	0	0	X

Source: Energy Information Administration, *Petroleum Supply Monthly* and *Petroleum Supply Annual*.

Table J5. Distillate Fuel Movements by Pipeline, Tanker and Barge between PADDs - October 1992 through February 1993
(Thousand Barrels)

FROM	TO				
	PADD I	PADD II	PADD III	PADD IV	PADD V
PADD I	X	9,820	0	0	0
PADD II	3,126	X	1,032	1,992	0
PADD III	104,003	14,292	X	0	2,120
PADD IV	0	1,301	0	X	1,271
PADD V	0	0	0	0	X

Source: Energy Information Administration, *Petroleum Supply Monthly* and *Petroleum Supply Annual*.

- PADDs I and II shipped and received distillate fuels from each other, PADD I being the net shipper of about 7 million barrels in each year.

PADDs I and II are most significant in their reliance on distillate fuel supplied from other PADDs. The following are observations made by comparing demand, expressed as product supplied, to net pipeline and tanker/barge movements of distillate fuel during the last two winter seasons.

- Approximately 40 percent of PADD I demand for distillate fuel is delivered by pipeline from other PADDs, more than 98 percent of which originates in PADD III.
- Between 6 and 7 percent of PADD I demand for distillate fuel is delivered by waterborne transports from other PADDs, mostly from PADD III.

- Between 13 and 16 percent of PADD II demand for distillate fuel is delivered by pipeline from other PADDs, about 40 percent from PADD I and about 50 percent from PADD III.
- Waterborne deliveries of distillate fuel into PADD II account for less than 1 percent of demand.

During the late 1970s through the mid-1980s, the petroleum product pipeline industry adapted to structural changes in supply sources as a result of numerous refinery closures and shifting import patterns.

Glossary

Glossary

Additive Rule: A proposed regulation released by EPA on December 6, 1993, that requires detergent additives to motor gasoline to meet performance-based standards. The final rule is pending as of September 1994.

Additives: Chemicals blended in small amounts into gasoline and other petroleum products to improve performance. Can also be detergent in nature.

Air Toxics: Under the Clean Air Act, total mass emissions of benzene, formaldehyde, acetaldehyde, butadiene, and polynuclear organic material. These are anticipated to cause serious or irreversible chronic or acute health effects in humans.

Alcohol. The family name of a group of organic chemical compounds composed of carbon, hydrogen, and oxygen. The series of molecules vary in chain length and are composed of a hydrocarbon plus a hydroxyl group; $\text{CH}_3\text{-(CH}_2\text{)}_n\text{-OH}$ (e.g., methanol, ethanol, and tertiary butyl alcohol).

Alkylate: The product of an alkylation reaction. It usually refers to the high octane product from alkylation units. This alkylate is used in blending high octane gasoline.

Alkylation: A refining process for chemically combining isobutane with olefin hydrocarbons (e.g., propylene, butylene) through the control of temperature and pressure in the presence of an acid catalyst, usually sulfuric acid or hydrofluoric acid. The product, alkylate, an isoparaffin, has high octane value and is blended with motor and aviation gasoline to improve the antiknock value of the fuel.

API: American Petroleum Institute.

API Gravity: An arbitrary scale expressing the gravity or density of liquid petroleum products. The measuring scale is calibrated in terms of degrees API.

Antidumping: The prevention of changes to conventional or non-reformulated gasoline properties by inclusion of products removed from the reformulate process that could increase VOC, NO_x , or TAP emissions.

Aromatics: Hydrocarbons characterized by unsaturated ring structures of carbon atoms. Commercial petroleum aromatics are benzene, toluene, and xylene (BTX).

ASTM: The acronym for the American Society for Testing and Materials.

Atmospheric Crude Oil Distillation: The refining process of separating crude oil components at atmospheric pressure by heating to temperatures of about 600° to 750° F (depending on the nature of the crude oil and desired products) and subsequent condensing of the fractions by cooling.

Attainment Area: An area considered to have air quality as good as or better than the National Ambient Air Quality Standards as defined in the Clean Air Act. An area may be an attainment area for one pollutant and a nonattainment area for others.

Barrel: The standard unit of measurement of liquids in the petroleum industry, containing 42 U.S. gallons at 60 degrees Fahrenheit.

Barrel per Calendar Day: The maximum number of barrels of input that can be processed during a 24-hour period after making allowances for the following limitations:

- the capability of downstream facilities to absorb the output of crude oil processing facilities of a given refinery. No reduction is made when a planned distribution of intermediate streams through other than downstream facilities is part of a refinery's normal operation;

- the types and grades of inputs to be processed;

- the types and grades of products expected to be manufactured;

- the environmental constraints associated with refinery operations;

- the reduction of capacity for scheduled downtime such as routine inspection, mechanical problems, maintenance, repairs, and turnaround; and

- the reduction of capacity for unscheduled downtime such as mechanical problems, repairs, and slowdowns.

Barrels Per Stream Day: The amount a unit can process running at full capacity under optimal crude oil and product slate conditions.

Baseline: Summer and winter gasolines as defined in the 1990 Clean Air Act Amendments or by EPA regulations, for use as a reference for required performance standards for VOC, TAP, and NO_x emissions.

Batch: Homogeneous quantity of petroleum product.

Benzene (C₆H₆): An aromatic hydrocarbon present in small proportion in some crude oils and made commercially from petroleum by the catalytic reforming of naphthenes in petroleum naphtha. Also made from coal in the manufacture of coke. Used as a solvent, in manufacturing detergents, synthetic fibers, and petrochemicals and as a component of high-octane gasoline.

Blending Components: See Motor Gasoline Blending Components.

Blending Plant: A facility (including a truck) which has no refining capability but is either capable of producing finished motor gasoline through mechanical blending or blends oxygenates with motor gasoline.

BTX: The acronym for the commercial petroleum aromatics benzene, toluene, and xylene. See individual categories for definitions.

Bulk Terminal: A facility used primarily for the storage and/or marketing of petroleum products which has a total bulk storage capacity of 50,000 barrels or more and/or receives petroleum products by tanker, barge, or pipeline.

Butane (C₄H₁₀): A normally gaseous straight-chain or branch-chain hydrocarbon extracted from natural gas or refinery gas streams. It includes isobutane and normal butane and is designated in ASTM Specification D1835 and Gas Processors Association Specifications for commercial butane.

CARB: California Air Resources Board.

CARB Phase 1 Gasoline: California Air Resources Board regulations set a limit on RVP at 7.80 psi and extend the control period for selected portions of the state beginning in 1992. Detergent additives (subject to certification criteria) to control engine deposits are also required year-round beginning January 1, 1992.

CARB Phase 2 Gasoline: California Air Resources Board reformulated gasoline regulations go into effect statewide and year-round beginning March 1, 1996. California reformulated gasoline regulations will supplant Federal RFG requirements that begin January 1, 1995 for Los Angeles and San Diego. Detergent additive requirements remain in effect.

Captive Refinery Oxygenate Plants: Oxygenate production facilities located within or adjacent to a refinery complex.

Catalytic Cracking: The refining process of breaking down the larger, heavier, and more complex hydrocarbon molecules into simpler and lighter molecules. Catalytic cracking is accomplished by the use of a catalytic agent and is an effective process for increasing the yield of gasoline from crude oil. Catalytic cracking processes fresh feeds and recycled feeds.

Fresh Feeds: Crude oil or petroleum distillates which are being fed to processing units for the first time.

Recycled Feeds: Feeds that are continuously fed back for additional processing.

Catalytic Hydrocracking: A refining process that uses hydrogen and catalysts with relatively low temperatures and high pressures for converting middle boiling or residual material to high-octane gasoline, reformer charge stock, jet fuel, and/or high grade fuel oil. The process uses one or more catalysts, depending upon product output, and can handle high sulfur feedstocks without prior desulfurization.

Catalytic Hydrotreating: A refining process for treating petroleum fractions from atmospheric or vacuum distillation units (e.g., naphthas, middle distillates, reformer feeds, residual fuel oil, and heavy gas oil) and other petroleum (e.g., cat cracked naphtha, coker naphtha, gas oil, etc.) in the presence of catalysts and substantial quantities of hydrogen.

Hydrotreating includes desulfurization, removal of substances (e.g., nitrogen compounds) that deactivate catalysts, conversion of olefins to paraffins to reduce gum formation in gasoline, and other processes to upgrade the quality of the fractions.

Catalytic Reforming: A refining process using controlled heat and pressure with catalysts to rearrange certain hydrocarbon molecules, thereby converting paraffinic and naphthenic type hydrocarbons (e.g., low-octane gasoline boiling range fractions) into petrochemical feedstocks and higher octane stocks suitable for blending into finished gasoline. Catalytic reforming is reported in two categories. They are:

Low Pressure: A processing unit operating at less than 225 pounds per square inch gauge (PSIG) measured at the outlet separator.

High Pressure: A processing unit operating at either equal to or greater than 225 pounds per square inch gauge (PSIG) measured at the outlet separator.

Charge Capacity: The input (feed) capacity of the refinery processing facilities.

Common Carrier: Transportation line or system carrying persons or goods for compensation, impartially for all persons or shippers.

Complex Emissions Model (also called "Complex Model"): A term for the equations describing the relation between fuel properties and regulated emissions. Starting in 1998 and optional before that time, emission performance for gasoline will be calculated by the complex emission model specified by the EPA. The model methodology allows each refinery to vary certain individual parameters to best meet emission standards. The complex model parameters considered are oxygen content, RVP, benzene, aromatics content, sulfur, olefins, and distillation range.

Conventional Gasoline: See Motor Gasoline (Finished).

Distillate Fuel Oil: A general classification for one of the petroleum fractions produced in conventional distillation operations. It is used primarily for space heating, on-and-off-highway diesel engine fuel (including railroad engine fuel and fuel for agricultural machinery), and electric power generation. Included are products known as No. 1, No. 2, and No. 4 fuel oils; No. 1, No. 2, and No. 4 diesel fuels. Distillate fuel oil is reported in the following sulfur categories: 0.05% sulfur and under and Greater than 0.05% sulfur.

Ethanol: See Fuel Ethanol.

ETBE (Ethyl tertiary butyl ether) ((CH₃)₃COC₂H₅): An oxygenate blend stock formed by the catalytic etherification of isobutylene with ethanol.

Ether: A generic term applied to a group of organic chemical compounds composed of carbon, hydrogen, and oxygen, characterized by an oxygen atom attached to two carbon atoms (e.g., methyl tertiary butyl ether).

Federal Implementation Plan (FIP): A plan, or portion thereof, promulgated by the Administrator of EPA to fill a gap or otherwise correct all or part of an inadequacy in a State Implementation Plan, and which contains requisite sections as are required for State Implementation Plans.

Fuel Ethanol (C₂H₅OH): An anhydrous denatured aliphatic alcohol intended for gasoline blending as described in the Oxygenate definition.

Fungibility: Interchangeability, particularly with regard to commingling or mixing of liquids for the purposes of transport or storage.

Gasohol: A blend of finished motor gasoline and alcohol (generally ethanol but sometimes methanol), limited to 10 percent by volume of alcohol.

Gasoline Blending Components: Naphthas which will be used for blending or compounding into finished aviation or motor gasoline (e.g., straight-run gasoline, alkylate, reformate, benzene, toluene, and xylene). Excludes oxygenates (alcohols, ethers), butane, and pentanes plus.

Gasoline Volatility: The properties of gasoline that characterize its tendency to evaporate. Reid Vapor Pressure is a measure of gasoline volatility.

Gravity: A measure of the density, that is the weight per unit volume of petroleum liquid, usually expressed in either degrees API or related to water as a specific gravity.

GTBA: See Oxygenate (Methanol).

Idle Capacity: The component of operable capacity that is not in operation and not under active repair, but capable of being placed in operation within 30 days; and capacity not in operation but under active repair that can be completed within 90 days.

Imports: Receipts of crude oil and petroleum products into the 50 States and the District of Columbia from foreign countries, Puerto Rico, the Virgin Islands, and other U.S. possessions and territories.

Interface: A quantity of petroleum product between two surrounding batches of petroleum product. The interface quantity does not contain the product specifications of either adjoining petroleum product.

Jones Act: Commonly used term for the Merchant Marine Act of 1920 that provides for the protection of the U.S. merchant fleet by excluding foreign-built, owned, or operated ships from the U.S. domestic trades. The Jones Act covers all waterborne transportation between U.S. ports, including inland waterways, Great Lakes, and the oceanborne trade between the U.S. mainland and the noncontiguous areas of Alaska, Hawaii, and Puerto Rico; also designates all vessel personnel, longshoremen, and harbor workers as "seamen" and wards of the Federal court.

Liquefied Petroleum Gases (LPG): Ethane, ethylene, propane, propylene, normal butane, butylene, isobutane, and isobutylene produced at refineries or natural gas processing plants, including plants that fractionate raw natural gas plant liquids.

Merchant Oxygenate Plants: Oxygenate production facilities that are not associated with a petroleum refinery. Production from these facilities is sold under contract or on the spot market to refiners or other gasoline blenders.

Methanol (CH₃OH): A light, volatile alcohol intended for gasoline blending as described in the Oxygenate definition.

Motor Gasoline (Finished): A complex mixture of relatively volatile hydrocarbons, with or without small quantities of additives, that has been blended to form a fuel suitable for use in spark-ignition engines. Motor gasoline, as given in ASTM Specification D4814 or Federal Specification VV-G-1690B, includes a range in distillation temperatures from 122° to 158° F at the 10-percent recovery point and from 365° to 374° F at the 90-percent recovery point. "Motor gasoline" includes reformulated gasoline, oxygenated gasoline, and other finished gasoline. Blendstock is excluded until blending has been completed.

Reformulated Gasoline: Gasoline formulated for use in motor vehicles, the composition and properties of which meet the requirements of the reformulated gasoline regulations promulgated by the U.S. Environmental Protection Agency under Section 211K of the Clean Air Act. Includes oxygenated fuels program reformulated gasoline (OPRG). Excludes reformulated gasoline blendstock for oxygenate blending (RBOB).

Oxygenated Gasoline: Gasoline formulated for use in motor vehicles that has an oxygen content of 1.8 percent or higher, by weight. Includes gasohol. Excludes reformulated gasoline, oxygenated fuels program reformulated gasoline (OPRG) and reformulated gasoline blendstock for oxygenate blending (RBOB).

Other Finished or Conventional Gasoline: Motor gasoline not included in the oxygenated or reformulated gasoline categories.

Motor Gasoline Blending: Mechanical mixing of motor gasoline blending components and oxygenates to produce finished motor gasoline. Mechanical mixing of finished motor gasoline with motor gasoline blending components or oxygenates which results in increased volumes of finished motor gasoline, and/or changes in the classification of finished motor gasoline (e.g., other finished motor gasoline mixed with MTBE to produce oxygenated motor gasoline), is considered motor gasoline blending.

Motor Gasoline Blending Components: Naphthas which will be used for blending or compounding into finished motor gasoline (e.g. straight-run gasoline, alkylate, reformat, benzene, toluene, and xylene) and includes reformulated gasoline blendstock for oxygenate blending (RBOB). Excludes oxygenates (alcohols, ethers), butane, and pentanes plus. Oxygenates are reported as individual components and included in the total for other hydrocarbons, hydrogens, and oxygenates.

MTBE (Methyl tertiary butyl ether) ((CH₃)₃COCH₃): An ether intended for gasoline blending as described in Oxygenate definition.

National Ambient Air Quality Standards (NAAQS): The standards are a set of concentrations of various air-borne substances as required by the Clean Air Act.

Neat: The material prior to blending; e.g., neat ethanol or neat MTBE.

Net Imports: The difference between total imports and total exports.

Net Receipts: The difference between total movements into and total movements out of each PAD District by pipeline, tanker, and barge.

Nonattainment Area: Any area that does not meet (or that contributes to ambient air quality in a nearby area that does not meet) the national primary or secondary ambient air quality standards for a pollutant or pollutants as determined by EPA.

NO_x: Nitrogen Oxides. Gaseous chemical compounds containing nitrogen and oxygen; reacts with the volatile organic compounds in the presence of heat and sunlight to form ozone. It also contributes to acid rain.

Olefins: A class of unsaturated (open-chain, hydrogen-deficient) paraffinic hydrocarbons recovered from petroleum and characterized by one double bond connecting one carbon atom. The general formula is C_nH_{2n}. Examples are ethylene, propylene, and butylene.

Operable Capacity: The amount of capacity that, at the beginning of the period, is in operation; not in operation and not under active repair, but capable of being placed in operation within 30 days; or not in operation but under active repair that can be completed within 90 days. Operable capacity is the sum of the operating and idle capacity and is measured in barrels per calendar day or barrels per stream day.

Operating Capacity: The component of operable capacity that is in operation at the beginning of the period.

Operable Utilization Rate: Represents the utilization of the atmospheric crude oil distillation units. The rate is calculated by dividing the gross input to these units by the operable refining capacity of the units.

Operating Utilization Rate: Represents the utilization of the atmospheric crude oil distillation units. The rate is calculated by dividing the gross input to these units by the operating refining capacity of the units.

Opt-in: Voluntary commitment of a non-attainment area (or under certain circumstances, attainment areas within a transport region) to join the reformulated gasoline program prior to the specific attainment dates prescribed by the Clean Air Act Amendments of 1990 that are based on severity of ozone pollution. The commitment must come from the Governor of the State as required by the Act.

Other Finished Gasoline: See Motor Gasoline (Finished).

Other Oxygenates: Other aliphatic alcohols and aliphatic ethers intended for motor gasoline blending (e.g., isopropyl ether (IPE) or n-propanol).

Oxygenate: Any substance which, when added to gasoline, increases the amount of oxygen in that gasoline blend. Through a series of waivers and interpretive rules, the Environmental Protection Agency (EPA) has determined the allowable limits for oxygenates in unleaded gasoline. The "Substantially Similar" Interpretive Rules (56 FR (February 11, 1991)) allows blends of aliphatic alcohols other than methanol and aliphatic ethers, provided the oxygen content does not exceed 2.7 percent by weight. The "Substantially Similar" Interpretive Rules also provides for blends of methanol up to 0.3 percent by volume exclusive of other oxygenates, and butanol or alcohols of a higher molecular weight up to 2.75 percent by weight. Individual waivers pertaining to the use of oxygenates in unleaded gasoline have been issued by the EPA. They include:

Fuel Ethanol: Blends of up to 10 percent by volume anhydrous ethanol (200 proof) (commonly referred to as the "gasohol waiver").

Methanol: Blends of methanol and gasoline-grade tertiary butyl alcohol (GTBA) such that the total oxygen content does not exceed 3.5 percent by weight and the ratio of methanol to GTBA is less than or equal to 1. It is also specified that this blended fuel must meet ASTM volatility specifications (commonly referred to as the "ARCO" waiver).

Blends of up to 5.0 percent by volume methanol with a minimum of 2.5 percent by volume cosolvent alcohols having a carbon number of 4 or less (i.e., ethanol, propanol, butanol, and/or GTBA). The total oxygen must not exceed 3.7 percent by weight, and the blend must meet ASTM volatility specifications as well as phase separation and alcohol purity specifications (commonly referred to as the "DuPont" waiver).

MTBE (Methyl tertiary butyl ether): Blends up to 15.0 percent by volume MTBE which must meet the ASTM D4814 specifications. Blenders must take precautions that the blends are not used as base gasolines for other oxygenated blends (commonly referred to as the "Sun" waiver).

Oxygenated Fuels Program Reformulated Gasoline (OPRG): Reformulated gasoline which is intended for use in an oxygenated fuels program control area during an oxygenated fuels program control period.

Oxygenated Gasoline: See Motor Gasoline (Finished).

Ozone: A compound consisting of three oxygen atoms, which is a significant constituent of smog. It is formed through chemical reactions in the atmosphere involving volatile organic compounds, nitrogen oxides, and sunlight.

Petroleum Administration for Defense Districts (PADD): Geographic aggregations of the 50 States and the District of Columbia into five districts by the Petroleum Administration for

Defense in 1950. These districts were originally defined during World War II for purposes of administering oil allocation.

PADD I (U.S. East Coast)

Sub-PADD IA (New England)- Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island and Vermont.

Sub-PADD IB (Central Atlantic)- District of Columbia, Delaware, Maryland, New Jersey, New York and Pennsylvania.

Sub-PADD IC (Lower Atlantic)- Florida, Georgia, North Carolina, South Carolina, Virginia and West Virginia.

PADD II (U.S. Midwest)- Indiana, Illinois, Kentucky, Tennessee, Michigan, Ohio, Minnesota, Wisconsin, North Dakota, South Dakota, Oklahoma, Kansas, Missouri, Nebraska, and Iowa.

PADD III (U.S. Gulf Coast)- Texas, Louisiana, Mississippi, Alabama, Arkansas, and New Mexico.

PADD IV (U.S. Rocky Mountain states)- Montana, Idaho, Wyoming, Utah, and Colorado.

PADD V (U.S. West Coast)- Washington, Oregon, California, Nevada, Arizona, Alaska, and Hawaii.

Phase I RVP: EPA regulations (phase 1 of a 2 phase program) that set maximum limits on the summer volatility of motor gasoline to control evaporative emissions, and therefore ozone formation. The regulations were in effect for summer months from June 1989 through the summer of 1991. Phase II RVP regulations supplanted Phase I in 1992.

Phase II RVP: EPA regulations (phase 2 of a 2 phase program) that set maximum limits on the summer volatility of motor gasoline to control evaporative emissions, and therefore ozone formation. The regulations became effective for summer months beginning June 1992 and remain in effect for all areas that are not under other, more stringent, requirements (such as RFG or a SIP-reduced RVP).

Product Compatibility: The ability to mix separate batches of a specific, complying product type with the resulting product remaining on-specification: a quality necessary for the effective operation of the logistics system.

RBOB. "Reformulated Gasoline Blendstock for Oxygenate Blending" is a motor gasoline blending component which, when blended with a specified type and percentage of oxygenate, meets the definition of reformulated gasoline.

Refinery: An installation that manufactures finished petroleum products from crude oil, unfinished oils, natural gas liquids, other hydrocarbons, and oxygenates.

Refinery Input, Crude Oil: Total crude oil (domestic plus foreign) input to crude oil distillation units and other refinery processing units (cokers, etc.).

Refinery Input, Total: The raw materials and intermediate materials processed at refineries to produce finished petroleum products. They include crude oil, products of natural gas processing plants, unfinished oils, other hydrocarbons and oxygenates, motor gasoline and aviation gasoline blending components and finished petroleum products.

Refinery Production: Petroleum products produced at a refinery or blending plant. Published production of these products equals refinery production minus refinery input. Negative production will occur when the amount of a product produced during the month is less than the amount of that same product that is reprocessed (input) or reclassified to become another product during the same month. Refinery production of unfinished oils, and motor and aviation gasoline blending components appear on a net basis under refinery input.

Refinery Yield: Refinery yield (expressed as a percentage) represents the percent of finished product produced from input of crude oil and net input of unfinished oils. It is calculated by dividing the sum of crude oil and net unfinished input into the individual net production of finished products. Before calculating the yield for finished motor gasoline, the input of natural gas liquids, other hydrocarbons and oxygenates, and net input of motor gasoline blending components must be subtracted from the net production of finished motor gasoline. Before calculating the yield for finished aviation gasoline, input of aviation gasoline blending components must be subtracted from the net production of finished aviation gasoline.

Reformulated Gasoline: See Motor Gasoline (Finished).

Reformulated Gasoline Credit: The unit of measure for the paper transfer of oxygen or benzene content resulting from reformulated gasoline which contains more than 2.1 weight percent of oxygen or less than 0.95 volume percent benzene.

Reg Neg (Regulatory Negotiation): An agreement in principle, signed August 6, 1991, between environmental, industry, and government representatives, that concluded regulatory negotiation on implementation guidelines of the Clean Air Act Amendments of 1990.

RFG Phase I: The years 1995-1999.

RFG Phase II: The year 2000 and beyond.

Rundown: The depletion of stock in a tank preparatory to its use for another product.

RVP (Reid Vapor Pressure): Typically measured in terms of pounds per square inch (psi); a common measure of fuel volatility, or tendency to evaporate.

Shell Storage Capacity: The design capacity of a petroleum storage tank which is always greater than or equal to working storage capacity.

Simple Model. A certification model used to determine whether RFG meets VOC and TAP reduction standards. Parameters considered are oxygen content, RVP, benzene, and aromatics content.

Spillover: The supply of Clean Air Act-mandated fuels to areas not requiring such material because of limitations on the distribution (logistical) system.

State Implementation Plan (SIP): A statutory requirement of the Clean Air Act, that serves as the official plan of regulatory action that a State will implement to achieve and maintain air quality standards.

Sub-octane: Unfinished gasoline that is specifically formulated to have an octane value below the commonly recognized gasoline grades in order to allow downstream octane enhancement through oxygenate (ethanol) blending. Oxygenate may be blended for its octane properties and/or its oxygen content.

Sulfur: A yellowish nonmetallic element, sometimes known as "brimstone".

T₅₀: Temperature (°F) at which 50 percent of product is distilled away.

T₉₀: Temperature (°F) at which 90 percent of product is distilled away.

TAME (Tertiary amyl methyl ether) ((CH₃)₂(C₂H₅)COCH₃). An oxygenate blend stock formed by the catalytic etherification of isoamylene with methanol.

Tank heels: That residue including water found after marketable product has been withdrawn from a tank.

TBA (Tertiary butyl alcohol) ((CH₃)₃COH): An alcohol primarily used as a chemical feedstock, a solvent or feedstock for isobutylene production for MTBE; produced as a co-product of propylene oxide production or by direct hydration of isobutylene.

TAP (Toxic Air Pollutants): "Toxic Air Pollutants" is defined as the aggregate emissions of: benzene; 1,3 butadiene; polycyclic organic matter (POM); acetaldehyde; and formaldehyde.

Testing Consortium: A group of refining and testing companies established in May 1994 that will perform sampling and testing of finished motor gasoline at the retail level. Results of the tests must comply with the Clean Air Act Amendments of 1990 provisions.

Toluene (C₆H₅CH₃): Colorless liquid of the aromatic group of petroleum hydrocarbons, made by the catalytic reforming of petroleum naphthas containing methyl cyclohexane. A high-octane gasoline-blending agent, solvent, and chemical intermediate, base for TNT.

Transition Periods: Periods before and after seasonal specification changes when product specifications are potentially influenced by logistical constraints (e.g., delivery of oxygenated gasoline prior to its mandated requirement to ensure compliance with the Clean Air Act).

VOC (Volatile Organic Compound): As defined by the Administrator of the Environmental Protection Agency.

Waiver: The EPA can grant waivers from the requirements for oxygenated gasoline in a nonattainment area, based on inadequate domestic supply of or distribution capacity for oxygenated gasoline, or the deleterious effect of oxygenate on other certain air pollutants (NO_x).

Working Storage Capacity: The difference in volume between the maximum safe fill capacity and the quantity below which pump suction is ineffective (bottoms).

Xylene ($\text{C}_6\text{H}_4(\text{CH}_3)_2$): Colorless liquid of the aromatic group of hydrocarbons made the catalytic reforming of certain naphthenic petroleum fractions. Used as high-octane motor and aviation gasoline blending agents, solvents, chemical intermediates. Isomers are metaxylene, orthoxylene, paraxylene.

Acronyms and Abbreviations