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Economic Analysis of Air Pollution Regulations: NESHAP for Organic Liquids Distribution

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16. ABSTRACT

This report evaluates the economic impacts of the final NESHAP for organic liquids distribution. The industry impacts and social costs of the rule are estimated by incorporating the expected costs of compliance to a partial equilibrium model of the U.S. industry and projecting the market impacts for affected markets (organic chemicals, petroleum liquids, and commercial distribution). The report also evaluates small business impacts.

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SECTION 1

INTRODUCTION AND EXECUTIVE SUMMARY

Under Title II of the Clean Air Act (CAA) Amendments of 1990, the Office of Air Quality Planning and Standards (OAQPS) is developing a national emission standard for hazardous air pollutants (NESHAP) to limit air emissions from organic liquid distribution activities. Industries that will be affected by this NESHAP include chemical manufacturers, liquid terminals, petroleum refiners, and pipeline owners and operators. The NESHAP requires distributors of nongasoline organic liquids to meet emission standards for the release of hazardous air pollutants (HAPs) into the environment. To meet these standards, some firms will have to modify their equipment and institute leak detection and repair procedures. These changes result in higher costs of production for the affected producers. They may also have broader societal implications because these effects are transmitted through market relationships to their customers. This report profiles the affected industries and analyzes the economic impacts expected to be incurred as a result of the NESHAP.

1.1 Profile of the Affected Industries

The organic liquids distribution (OLD) source category consists of all the source category operations that receive, store, and distribute organic liquids (other than gasoline) throughout the economy. To provide data on the affected industry, EPA collected survey information from OLD facilities. In this report, these survey data are scaled up to reflect the entire affected universe of facilities. EPA estimates that 381 facilities will be affected by the NESHAP. Table 1-1 shows a frequency distribution of facilities by North American Industry Classification System (NAICS) code. Facilities affected may either produce, consume, store, and distribute regulated organic liquids, or only store and distribute them. The four major industries affected by the NESHAP are chemical manufacturing, petroleum refining, crude oil and natural gas pipeline transportation,[1] and liquid terminalling and warehousing. The liquids being distributed fall into two broad categories:

[1]Natural gas pipeline distribution is not affected by this rule.

Table 1-1. Number of Facilities Affected by OLD NESHAP, by NAICS Code

NAICS Code	Description	Number of Affected Facilities
211	Crude Petroleum and Natural Gas Extraction	2
325	Industrial Organic Chemical Production	183
32411	Petroleum Refineries	93
4831	Water Transportation	1
493	Liquid Terminals	57
48611	Crude Petroleum Pipelines	16
422, 454	Petroleum and Chemical Terminals	29
Total		381

- organic chemicals, including synthetic chemicals and petrochemicals, and
- petroleum liquids, including crude oil, natural gas liquids, and nongasoline refined products.

In NAICS 324 and 325, the majority of facilities employ more than 500 people. Within the other NAICS codes, however, many facilities employ 25 or fewer people. Thirty percent of affected organic chemical producers (NAICS 325) and 31 percent of facilities in the other industry groups are located in Texas. Other states with substantial numbers of facilities include Louisiana, Alaska, Ohio, Illinois, and California. Firms owning OLD facilities range from small single-facility specialized distributors to large integrated companies that own numerous production and distribution facilities. Of 57 known companies owning affected OLD facilities, only 6 are considered small according to Small Business Administration (SBA) criteria. Of OLD firms in NAICS 325, most have baseline company sales exceeding $1 billion, and baseline employment exceeding 10,000 employees. Among firms owning petroleum OLD facilities, however, baseline sales vary more widely. Approximately 20 percent have sales less than $50 million, while more than 65 percent have sales exceeding $1 billion. Many firms in the affected industries are highly integrated, both vertically and horizontally. This means they may own numerous affected facilities, and that their distribution facilities are an integral part of their overall organic liquid operations. For this reason, we have paid special attention in our analysis to the impacts on the companies owning the OLD facilities. In these integrated firms, EPA expects that many of the distribution-only facilities in NAICS 422, 454, 483, 486, and 493 are not profit centers for the firms that own them, but instead provide a service to other facilities owned by the firm, and operate as a cost center for the firm. Thus, the impacts of the regulation will be evaluated in terms of its overall impact on the firm's profitability, in addition to examining the impact on the profitability of individual facilities. For merchant firms, however, that own only distribution facilities, EPA expects that the impact of the regulation will be evaluated in terms of its effect on facility profitability.

1.2 The Costs of the OLD NESHAP

The OLD rulemaking will increase the costs of distributing organic liquids. Specifically, the costs of several general types of businesses are expected to increase. These businesses include facilities that manufacture and distribute organic chemicals and/or nongasoline petroleum products and facilities that specialize in the distribution of these products. Of the latter facilities, some are owned by companies that also manufacture the products, while others are independent businesses that only distribute the products. Table 1-2 shows the estimated costs for model plants. The costs are shown in greater detail in Section 3.

Table 1-2. Per-Facility and Nationwide Control Costs by Model Plant (1997$/yr)

Model Plant Group	Scaled Number of Facilities	Total Capital Cost (1997 $)	Total Annualized Cost ($/yr)
Totals for SIC 13	2	12,350	45,776
Totals for SIC 28	183	14,093,459	9,404,551
Totals for SIC 29	93	4,739,352	3,556,461
Totals for SIC 42	57	12,669,737	6,802,304
Totals for SIC 44	1	2,500	12,233
Totals for SIC 46	16	6,316,442	1,861,567
Totals for SIC 51	29	11,476,167	3,425,106
GRAND TOTALS	381	49,310,007	25,107,998

1.3 Estimated Economic Impacts of the OLD NESHAP

Section 4 presents the economic impact analysis methods and results. EPA developed a multi-market partial equilibrium simulation model in which buyers and sellers exert no individual influence on market prices of two aggregated commodities potentially affected by the rule—petroleum and chemical products—and the market for distribution services. Prices in these markets are set by the collective actions of producers and consumers, who take the market price as a given in making their production and consumption choices. Figure 4-1 illustrates this market in which prices and quantities are determined by the intersection of market supply and demand curves. The baseline consists of a market price and quantity (P, Q) that is determined by the downward-sloping market demand curve (D_1) and the upward-sloping market supply curve (S_1).

With the regulation, the costs of production increase for organic liquid suppliers because they incur additional costs associated with the rule. Incorporating these regulatory control costs is represented by an upward shift (from S_1 to S_2) of the aggregate supply curve by the per-unit compliance cost.

At the new equilibrium with the regulation, the market price increases from P_1 to P_2 and market output (as determined from the market demand curve, D) declines from q_1 to q_2. This illustrates the theory underlying estimation of the economic impacts of the rule. Note that EPA is modeling the impacts of the rule on facilities and companies that both produce and distribute organic liquids by examining the changes in market prices and quantities for the liquids being distributed. For integrated organic liquid producers, distribution operations are a cost center, not a profit center. The distribution operations are an essential part of the process of providing the delivered liquids to customers, but are not required to be profitable if they are to continue. Instead, the companies examine the impact of the rule on the overall profitability of their chemical or petroleum product operations. In the merchant distribution sector, however, distribution facilities are assumed to operate as profit centers; that is, they continue to operate only if they are profitable.

1.3.1 Market Responses to the NESHAP

The theory presented above suggests that producers attempt to mitigate the impacts of higher-cost production by shifting the burden on to other economic agents to the extent the market conditions allow. We would expect the model to project upward pressure on prices as producers reduce output rates in response to higher costs. Higher prices reduce quantity demanded and output for each product, leading to changes in economic surplus to consumers and profitability of firms. These market adjustments determine the social costs of the regulation and its distribution across stakeholders (producers and consumers).

1.3.1.1 Market- and Industry-Level Impacts

The increased cost of production due to the regulation is expected to slightly increase the price of petroleum and chemical products and reduce their production/consumption from baseline levels. As shown in Table 1-3, the regulatory alternative is projected to increase prices of organic liquids by less than 0.1 percent. Domestic production of petroleum products declines by 0.02 million metric tons and domestic chemical production declines by 0.02 million metric tons. Supply from foreign producers (imports) increases by 0.01 million metric tons in the petroleum market and 0.001 million metric tons in the chemical market, resulting in a net decline of 0.02 million metric tons in each market (less than 0.01 percent). Supply from merchant distributors declines by approximately 0.01 million metric tons, less than 0.01 percent.

Table 1-3. Market-Level Industry Impacts of the OLD NESHAP (1997$)

	Absolute Change	Percent Change
Petroleum Products		
Price ($/Mt)	$0.002	0.001%
Quantity (10^6 Mt/yr)	–0.02	–0.001%
Domestic	–0.02	–0.001%
Foreign	0.01	0.001%
Organic Chemical Products		
Price ($/Mt)	$0.006	0.001%
Quantity (10^6 Mt/yr)	–0.02	–0.002%
Domestic	–0.02	–0.002%
Foreign	0.00	0.002%
Merchant Distributors		
Price ($/Mt)	$0.01	0.106%
Quantity (10^6 Mt/yr)	–0.01	–0.001%

Revenue, costs, and profitability of the directly affected industry also change as prices and production levels adjust to increased costs associated with compliance. For domestic petroleum producers, operating profits are projected to decline by $3.37 million (see Table 4-2). For domestic chemical producers, operating profits are projected to decline by $5.18 million. Operating profits earned by merchant distributors are projected to increase by $0.09 million.

1.3.1.2 Facility-Level Impact Results

EPA estimated quantity adjustments by affected OLD facilities, in response to the costs of compliance with the rule. EPA defined closure of an OLD operation when an OLD facility is projected to reduce their quantity distributed by the entire amount of their baseline distribution. One facility with very low baseline throughput is projected to close their OLD operations in response to the rule.

1.3.1.3 Company-Level Impacts Results

For the company level analysis, EPA computed the change in profits associated with the regulation to baseline *company* profits. A company may become unprofitable if the predicted change in OLD facility profits eliminates *total baseline profits of the firm* (i.e., ratio = 100 percent). For companies affected by the rule, profit changes range from +5 percent to -23 percent. For the median company, profits decrease by less than 1 percent. None of these firms are projected to become unprofitable as a result of the regulation.

EPA also performed a screening analysis to assess the impacts of the OLD NESHAP on small businesses. The results of this screening analysis are shown in Section 5. EPA examined the ratio of compliance costs to baseline company revenues, without incorporating market adjustments to the rule. Six of the companies owning facilities responding to the OLD questionnaire are small businesses. Of the six small firms, none is projected to incur costs exceeding one percent of their baseline revenues. Given the relatively low costs and the small number of small companies incurring them, EPA finds that significant economic impacts will not be incurred by a substantial number of small businesses.

1.3.1.4 Social Costs

The value of a regulatory action is traditionally measured by the change in economic welfare that it generates. The regulation's welfare impacts, or the social costs required to achieve environmental improvements, will extend to consumers (customers) and producers alike. Consumers experience welfare impacts due to changes in market prices and consumption levels associated with the rule. Producers experience welfare impacts resulting from changes in profits corresponding with the changes in production levels and market prices. However, it is important to emphasize that this measure does not include benefits that occur outside the market, that is, the value of reduced levels of air pollution with the regulation.

The economic analysis accounts for behavioral responses by producers and consumers to the regulation (i.e., shifting costs to other economic agents). This approach provides insights on how the regulatory burden is distributed across stakeholders. As shown in Table 4-4, the economic model estimates total social cost of the rule of $17.6 million (1997$). As a result of higher prices and lower consumption levels, consumers (domestic and foreign) are projected to bear $10.1 million of the social costs, with petroleum consumers accounting for slightly less than 50 percent of the total. Domestic producers lose $8.46 million in profits, with chemical producers accounting for 61 percent of the total. Foreign producers unambiguously gain as a result of the regulation, with profits increasing by $1 million. Foreign producers benefit from higher prices while not incurring control costs associated with the rule.

SECTION 2

INDUSTRY PROFILE

The OLD NESHAP potentially affects companies and facilities that distribute petrochemicals and petroleum liquids. Industries that will be affected by this NESHAP include chemical manufacturers, petroleum refiners, liquid terminals, and pipeline owners and operators (organic liquids other than gasoline). Information on the affected facilities, companies, and industries is necessary in determining the effects of a regulation. This profile describes the supply and demand of petrochemicals and petroleum liquids, the facilities and companies that operate within affected industries, and the market conditions in those industries.

Section 2.1 provides a brief description of the entire OLD source category. Sections 2.2 and 2.3 focus on the two primary facility categories—chemical liquids and petroleum liquids, which are briefly described in Section 2.1. Sections 2.2 and 2.3 are both organized as follows: background, production overview, industry organization, characterization of uses and consumers, and market information. Facilities that may distribute either chemicals or petroleum products are discussed in Section 2.3 only, for convenience.

2.1 Brief Description of Source Category

The OLD source category consists of all of the source category operations that receive, store, and distribute organic liquids throughout the economy. For the purposes of this maximum achievable control technology (MACT) standard, only those organic liquids with appreciable HAP content (beyond trace quantities) are considered to be "organic liquids." These liquids may consist of pure HAP chemicals (single HAP) or chemical blends, refined petroleum products, natural gas liquids, or crude oil. They also may consist of "appreciable" organic HAPs blended with inorganic, non-HAP liquids (such as water).

OLD operations are carried out by a large number of industries. "Plant sites performing OLD activities include those that produce, consume, or merely store and distribute organic liquids. The four principal industries with the greatest volumes of OLD operations are chemical manufacturing, petroleum refining, crude oil and natural gas liquids pipeline transportation, and liquid terminalling and warehousing" (Abt, 1998).

Distributed organic liquids of concern in this profile fall under two broad categories:

- chemicals, including synthetic chemicals and petrochemicals (i.e., chemicals manufactured from crude petroleum); and
- petroleum liquids, including crude oil, natural gas liquids, and nongasoline refined products.

Gasoline, which is subject to the gasoline distribution NESHAP, is not covered by the OLD source category. Sections 2.2 and 2.3 2 provide a more detailed description of the liquids covered by this regulation.

For the purposes of this regulation, *distribution* includes the bulk transfer of an organic liquid across a plant site boundary, either into or out of the plant site (Abt, 1998). Also covered under this definition are the storage of OLD liquids after receipt and before distribution. Not included in the OLD source category are the following activities: the movement of packaged liquids (e.g., drummed or canned liquids); any production, compounding, blending, or packaging activities at OLD facilities; and the transportation of OLD liquids for activities other than loading and unloading.

The OLD activities described above take place at sites that serve as distribution points from which organic liquids can be obtained for further use and processing. Distribution activities are either collocated with liquid production operations, or they are carried out at stand-alone storage and distribution terminals. Although the MACT standards developed under this regulation will apply to any facility that receives, stores, and/or distributes nongasoline liquids with HAP content, this profile focuses on five categories of OLD facilities for which model plants were developed:

- chemical production,
- petroleum refineries,
- liquid terminals
- crude oil pipeline pumping/breakout stations, and
- petroleum terminals.

These categories were identified from EPA's April 1998 source category survey as accounting for the majority of OLD HAP emissions (Gale Research, Inc., 1999a,b,c).

2.1.1 Current Economic Conditions and Trends

OLD distribution points will incur the costs of this regulation; therefore, this profile examines the current condition of the OLD source category as it relates to distribution activities. This section briefly describes recent trends in each of the five principal, OLD facility categories.[1]

2.1.1.1 Chemical Production

Recent trends in the chemical manufacturing industry include increased capital spending and declining employment. In an effort to save money and increase efficiency, many of the activities associated with repackaging, blending, reformulating, bar-coding, testing, and quality assurance have been outsourced. That is, contracted out to third-party operators. This trend has been growing in the chemical manufacturing business. With more of this work being outsourced, manufacturers' costs are decreasing (*Distribution*, 1996).

2.1.1.2 Petroleum Refineries

Over the past two decades, oil companies have been closing refineries that are no longer profitable. To avoid expensive environmental cleanup costs, companies have started to convert the refineries' storage tanks and to operate them as storage and distribution centers. However, in recent years, a stable supply market for crude oil has led to a reduction in oil inventories, creating excess storage space at refineries. Refineries have responded to this situation by leasing out this excess space to third parties. With continued merger and cost-cutting activities in the source category, it is conceivable that more excess space will be created in the future and more refineries will continue to lease increasing amounts of storage space at their installations.

2.1.1.3 Liquid and Petroleum Terminals

The bulk liquid terminalling industry is undergoing changes as the major manufacturers of organic liquids and chemicals are restructuring their industries to meet present and future demands. Terminals face a dual challenge in the future. One challenge is increasing regulatory demands that are raising the cost of operation for refineries, chemical plants, and terminals. In addition, excess storage capacity at petroleum refineries and newly created storage capacity at smaller chemical distributors have started to directly compete

[1]This discussion is largely based on the July 24, 1998, EPA memorandum entitled "Production Projections for the OLD Source Category."

with the larger bulk terminals. Major consolidations within the chemical industry have also affected the bulk terminalling industry. Major chemical companies have begun to consolidate their storage requirements by contracting out storage to outside firms that operate single-party terminals, rather than spreading their operations across many terminals.

2.1.1.4 Crude Oil Pipeline Pumping and Breakout Stations

The Federal Energy Regulatory Commission (FERC) regulates interstate pipeline companies. Similar to some of the other categories, these pipeline companies are experiencing difficult times as well. In 1997 earnings from operations were down, following a 2-year trend. The effects of warmer-than-normal weather during 1997 in North America also caused oil deliveries to decrease. This decrease affected both operating revenues and net income for pipeline companies (*Oil & Gas Journal*, 1998).

2.1.2 Environmental Concerns

EPA has identified four emission sources that account for the majority of HAP emissions from OLD activities:[2]

- storage tanks,
- liquid transfer activities involving tank trucks and railcars (loading racks), and
- leaks from equipment components (e.g., pumps, valves).

Table 2-1 shows the nationwide HAP totals for each industry resulting from the different emission sources. Storage tanks emit 63,315 tons/yr of HAPs, accounting for approximately 70 percent of the total OLD source category. Equipment leaks are the next greatest source of HAP emissions, representing almost 19 percent of the source category total.

Table 2-2 lists all of the facility categories as well as the modes of transportation employed and the emission sources covered by the OLD source category.

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[2]Originally, wastewater and semi-aqueous waste were also believed to be sources of HAP emissions for the OLD source category. However, responses to the OLD survey indicated that insufficient information is available to determine nonzero MACT floors for wastewater. In addition, the survey indicated that semi-aqueous waste generated from OLD operations is generally kept in closed containers once it is collected. The handling of these wastes, at both chemical facilities and refineries, is already covered under the Resource Conservation and Recovery Act (RCRA) ("MACT Floor Development for the OLD Source Category," Memo, May 5, 1999). Consequently, emission sources associated with wastewater and semi-aqueous waste are excluded from this analysis.

Table 2-1. Nationwide HAP Totals from OLD Activities (tons/yr)[a]

Model Plant Group	No. of Major Source Facilities Nationwide[b]	Storage Tanks	Loading Racks	Container Filling	Equipment Leaks	Totals
13	2	<1	2	0	5	7
28	183	835	362	345	1,306	2,503
29	93	204	259	0	199	662
42	57	854	568	0	537	1,959
44	1	2	0	0	8	10
46	16	283	0	0	10	293
51	29	161	288	6	199	648
Total	**381**	**2,339**	**1,479**	**351**	**2,265**	**6,082**

[a] There are no transfer rack or container filling emissions at pipeline facilities.
[b] Estimated number of facilities based on industry data and scaled up to estimate national total.

Source: U.S. Environmental Protection Agency (EPA). 2000. *Technical Support Document for the Organic Liquids Distribution (Non-gasoline) Industry*. Washington, DC: U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards.

2.2 Distribution of Organic Chemical Liquids

Organic chemical liquids include synthetic chemicals and petrochemicals (chemicals manufactured from crude petroleum). Synthetic organic chemicals cover a wide range of intermediate products, including inputs to the manufacture of synthetic resins, plastics materials, and nonvulcanized elastomers, as well as cyclic organic intermediates and dyes/pigments, and aliphatic and acrylic chemicals and solvents.

Petrochemicals are intermediate products resulting from the refinery process. Petrochemical feedstocks include naphtha, a liquid obtained from refining crude oil, as well as products recovered from natural gas and refinery gases (ethane, propane, and butane). Other feedstocks include ethylene; propylene; normal- and iso-butylenes; butadiene; and aromatics such as benzene, toluene, and xylene. The volume of petroleum liquids available

Table 2-2. Summary of Facility Categories, Liquids, Modes of Transportation, and Emissions Sources Covered by the OLD Source Category

Facility Category	Liquids Handled	Mode of Liquid Transportation	Emission Sources
Chemical production	Synthetic chemicals Petrochemicals	Tank truck Tank car (railroad) Sometimes pipelines	Storage tanks Liquid transfer Container filling Equipment leaks
Petroleum refineries	Crude oil Natural gas liquids, (NGLs) Nongasoline refined products	Pipeline Tanker ships Barges Tank car Tank truck	Storage tanks Liquid transfer Container filling Equipment leaks
Liquid terminals	Synthetic chemicals Petrochemicals Crude oil Nongasoline refined products	Tank car Tank trucks	Storage tanks Liquid transfer Container filling Equipment leaks
Crude oil pipelines	Crude oil	Pipeline Tanker ships Barges Tank car Tank truck	Storage tanks Equipment leaks
Petroleum terminals	Crude oil NGLs Nongasoline refined products	Tanker ship Barge Pipeline Tank car Tank truck	Storage tanks Liquid transfer Container filling Equipment leaks

Sources: Various background documents.
Gale Research Inc. 1999b. "Pipelines, Crude Petroleum." *Ward's Business Directory of U.S. Private and Public Companies: 1999*. Detroit, MI: Gales Research, Inc.
American Petroleum Institute. August 1998. *Heating Oil in the United States.*

to the petrochemical industry depends primarily on the following three factors: crude petroleum input to refineries, refinery process configuration and operating conditions, and the demands and prices for naptha and gas oil in their primary fuel markets (DOE, EIA, 1999e).

Synthetic chemicals are associated with the OLD source category when they are distributed from synthetic organic chemical manufacturing industry (SOCMI) facilities to liquid terminals. These chemicals are typically transported by means of tank truck or tank car.

Petrochemical feedstocks travel by various modes throughout their product life. The distribution components associated with the OLD source category are the shipments of feedstocks from refineries to liquid terminals and SOCMI facilities. Most often, petrochemicals travel by means of tank truck or tank car; however, some SOCMI facilities have pipelines by which their products are distributed.

Synthetic organic chemical and petrochemical distribution facilities are most likely to be classified under the three SIC codes listed in Table 2-3. The table includes the NAICS codes that correspond to the affected SIC-coded industries.

2.2.1 Overview of Distribution Service

OLD distribution is a service that is part of the production process for organic liquids. After a refining process, petrochemicals might be distributed to chemical production plants for processing into synthetic chemicals, or they might be transported to an independent liquid terminal for storage before further processing. In addition, independent liquid terminals may also receive processed synthetic chemicals for storage. Liquids stored at independent liquid terminals might be transported to chemical production plants or refineries for further processing, they might be sent to a blending/packaging/distribution facility, or they might be distributed to end users (Abt, 1998).

2.2.1.1 Elasticity of Supply

The supply elasticity for synthetic organic chemicals and petrochemicals depends on the ability and willingness of firms to scale up production in the face of higher demand. Supply elasticity refers to the ratio of a given percentage change in price to a resulting percentage change in quantity supplied. At a given point in time, firms can be expected to supply an approximately profit-maximizing quantity, given their available technology. For a given increase in the price of chemicals, the increase in quantity supplied will be greater when the producers of that chemical have excess capacity and when new production lines for the chemical are easy and inexpensive to establish. In this analysis, EPA aggregates all organic chemical liquids into a single market, and incorporates supply elasticities estimated for other analyses. The elasticity of supply for the organic chemicals market is assumed to

Table 2-3. Principal OLD Facility Categories

SIC Code	SIC Description	NAICS Codes	NAICS Description
Chemical Production (118 survey responses)			
2821	Plastics Materials, Synthetic and Resins, and Nonvulcanizable Elastomers	325211	Plastics Material and Resin Manufacturing
2865	Cyclic Organic Crudes and Intermediates, and Organic Dyes and Pigments	325192	Cyclic Crude and Pigment Manufacturing
		32511	Petrochemical Manufacturing[a]
		325132	Synthetic Organic Dye and Pigment Manufacturing
2869	Industrial Organic Chemicals, NEC	325188	All Other Basic Inorganic Chemical Manufacturing[a]
		32511	Petrochemical Manufacturing[a]
		325193	Ethyl Alcohol Manufacturing
		32512	Industrial Gas Manufacturing
		325199	All Other Basic Organic Chemical Manufacturing[a]

[a] Only part of the NAICS industry is made up of facilities from the corresponding SIC-coded industry.

Source: U.S. Census Bureau. March 2000a. "1987 SIC Matched to 1997 NAICS." <http://www.census.gov/epcd /naics/NSIC3B.HTML>. As obtained on March 13, 2000.

be 1.5 (organic chemicals producers will distribute 1.5 percent more organic liquids for each 1 percent increase in price).

2.2.2 Industry Organization

This subsection describes the organization of the segments of the chemical industry most likely to be affected by the NESHAP regulation and provides specific information on affected OLD facilities and firms when such information is available. The section begins with a discussion of market structure, followed by information on facilities that distribute organic chemicals and the firms that own them.

The structure of the affected market(s) is an important factor in estimating the potential impacts from a regulation. For example, in a competitive market where each producer has little market power, it would be difficult for an affected firm to pass on compliance costs to its consumers. On the other hand, in an industry with very few producers or where the products are highly differentiated, it may be possible for affected firms to recover part or all of the compliance costs through price increases. The most important factors determining the competitive structure of an industry are the number of producers, the degree of product differentiation, and the presence of barriers to entry. The remainder of this subsection provides a brief explanation of these factors and discusses the competitive structure of the OLD markets in terms of each factor (CMA, 1995a,b).

EPA estimates that currently thirty-one companies produce and distribute organic chemical liquids and will be affected by the rule. These companies include many large integrated chemical companies. Only one OLD company that distributes organic chemicals is classified as a small company. Product differentiation is a form of nonprice competition used by firms to establish market power in a specific product market. Product differentiation may result from unique product characteristics or from brand recognition. In general, a company that sells a product with valued characteristics that no or few other products possess will have more market power than a company that sells a product that has no distinguishable characteristics from other products in the same market. Similarly, market power is created if customers place a higher value on a product produced by a specific company, or brand, even though the product characteristics are identical to the products produced by other companies. The products of concern to the OLD source category are characterized by a high degree of homogeneity. Thus, brand loyalty is not expected to be an important factor in the organic chemicals market (CMA, 1995a,b; Arnold, 1989; Gale Group, 1999; DOE, EIA, 1999e).

The number of producers and the market shares of the largest firms are important determinants of the degree of market power individual firms may have. The term "concentration" refers to the combined percentage of total output accounted for by the largest producers in the industry. For example, the four-firm concentration ratio (CR4) refers to the market share of the four largest firms. The higher the concentration ratio, the more concentrated the industry. A market is generally considered highly concentrated if the CR4 is greater than 50 percent. The Herfindahl-Hirschmann index (HHI) is an alternative measure of concentration. It is equal to the sum of the squares of the market shares for the largest 50 firms in the industry. The higher the index, the fewer the number of firms supplying the industry and the more concentrated the industry is at the top. The Justice Department uses the HHI for antitrust enforcement purposes. The benchmark used by the Justice Department is 1,000, where any industry with an HHI less than 1,000 is considered to be unconcentrated. The advantage of the HHI over the concentration ratio is that the former gives information about the dispersion of market share among all the firms in the industry, not just the largest firms (Arnold, 1989).

In general, an industry with a large number of firms and a small concentration will be relatively more competitive than an industry with few firms and a high concentration. Firms that operate in a more competitive market will be relatively more affected by new regulations because they are less likely to be able to pass on compliance costs.

Table 2-4 shows concentration ratios by SIC code for the affected OLD industries from the 1992 and 1997 Economic Census.. Ratios are included for the census years 1987 and 1992 (where possible). The numbers in Table 2-4 show that, by and large, the OLD industries are characterized by a large number of firms and generally unconcentrated markets, indicating a high degree of competitiveness in their respective product markets. The exception is Cyclic Organic Crudes and Intermediates, which undergoes a significant increase in concentration between 1992 and 1997.

Table 2-4. Concentration Ratios by SIC Code

SIC/NAICS Code	Year	Total Number of Firms	Concentration Ratio				Herfindahl-Hirschmann Index
			4 Firm	8 Firm	20 Firm	50 Firm	
Chemical Production							
2821, 325211: Plastics Materials, Synthetic Resins, and Nonvulcanizable Elastomers							
	1987	288	20%	33%	61%	89%	248
	1992	240	24%	39%	63%	90%	284
	1997	299	26%	39%	64%	89%	304
2865, 325192: Cyclic Organic Crudes and Intermediates, Organic Dyes and Pigments							
	1987	131	34%	50%	77%	96%	542
	1992	150	31%	45%	72%	94%	428
	1997	36	62%	79%	99%	100%	1701
2869, 325199: Industrial Organic Chemicals, NEC							
	1987	491	31%	48%	68%	86%	376
	1992	489	29%	43%	67%	86%	336
	1997	487	25%	38%	57%	80%	256

Source: U.S. Department of Commerce, Bureau of the Census. 1992. Economic Census. Washington, DC: Government Printing Office. <http://www.census.gov/epcd/www/92result.html>. (Includes results for 1987 and 1992).

U.S. Department of Commerce, Bureau of the Census. 1997. Economic Census. Washington, DC: Government Printing Office. <http://www.census.gov/prod/ec97/m31s-cr.pdf>

The chemical industry is undergoing a trend of mergers, acquisitions, and general industry consolidation. According to an analysis by Speed (1999), "the market will [comprise] fewer but larger companies, global in scope, and more focused in their business pursuits."

Barriers to entry are the mechanisms through which the total number of firms in an industry can be kept small and a high degree of market concentration can exist. Where barriers to entry are present, new firms find it impossible or unprofitable to enter the market. Barriers to entry therefore create market power for the firms that already operate in the market. Typically, barriers to entry exist when industries are capital intensive, are characterized by significant economies of scale, require specialized knowledge (e.g., patents), or are subject to government regulation (Speed, 1999). While relatively capital-intensive, chemical production in general is not extremely specialized. Thus, the Agency believes the barriers to entry are moderate.

2.2.2.1 Facilities

Table 2-5 presents an overview of the total number of facilities for each OLD NAICS code, the total number of firms potentially affected by the OLD source category, and the percentage of the source category potentially affected.

Although EPA received surveys from only about 32 percent (59 out of 183)[3] of the universe of affected organic liquids distributors in the chemical industry, an examination of the data provided in the surveys does illustrate general characteristics of those facilities. The figures and tables in this section include facilities classified in NAICS codes 325211, in addition to the 117 facilities classified as part of the chemical industry. Facilities in NAICS code 325211 use synthetic organic chemicals and petrochemicals as an input into their production of various plastic parts and products.

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[3] Some portions of the Technical Support Document (TSD) report that 118 facilities in SIC code 28 returned surveys. However, the report shows assigned model plant numbers for only 117 facilities in this SIC code. (One facility, numbered 30-Q, was listed in the TSD but is nonexistent in the database compiled from ICR survey responses.) The TSD failed to report a model number for plant 32-E, which was in the database. Facility 30-Q was excluded from analysis and 32-E was included.

Table 2-5. Number of Total OLD Facilities and Affected Facilities, 1997

NAICS Code	NAICS Description	Total Number of Facilities[a]	Total Number of Affected Facilities[b]	% of Source Category that is Affected
Chemical Production				
325110	Petrochemical Mfg	54	183	12.5%
325132	Synthetic Organic Dyes and Pigments	112		
325192	Cyclic Organic Crudes and Intermediates	50		
325193	Ethyl Alcohol Mfg	38		
325199	All Other Basic Organic Chemical Mfg	676		
325211	Plastics Materials, Synthetic and Resins, and Nonvulcanizable Elastomers	532		

[a] U.S. Census Bureau. August 1999c. "Cyclic Crude and Intermediate Manufacturing." *1997 Economic Census, Manufacturing—Industry Series*, E97M-3251I, Washington, DC: Government Printing Office.
[b] U.S. Environmental Protection Agency (EPA). 2003. *Final OLD Costs 6-23-03.xls.*

Sources: U.S. Census Bureau. August 1999a. "All Other Basic Inorganic Chemical Manufacturing." *1997 Economic Census, Manufacturing—Industry Series*, E97M-3251I, Washington, DC: Government Printing Office.
U.S. Census Bureau. August 1999b. "All Other Basic Organic Chemical Manufacturing." *1997 Economic Census, Manufacturing—Industry Series*, E97M-3251I, Washington, DC: Government Printing Office.
U.S. Census Bureau. August 1999d. "Ethyl Alcohol Manufacturing." *1997 Economic Census, Manufacturing—Industry Series*, E97M-3251I, Washington, DC: Government Printing Office.
U.S. Census Bureau. August 1999e. "Industrial Gas Manufacturing." *1997 Economic Census, Manufacturing—Industry Series*, E97M-3251I, Washington, DC: Government Printing Office.
U.S. Census Bureau. August 1999f. "Petrochemical Manufacturing." *1997 Economic Census, Manufacturing—Industry Series*, E97M-3251I, Washington, DC: Government Printing Office.
U.S. Census Bureau. August 1999h. "Plastics Material and Resin Manufacturing." *1997 Economic Census, Manufacturing—Industry Series*, E97M-3251I, Washington, DC: Government Printing Office.
U.S. Census Bureau. August 1999i. "Synthetic Organic Dye and Pigment Manufacturing." *1997 Economic Census, Manufacturing—Industry Series*, E97M-3251I, Washington, DC: Government Printing Office.

Figure 2-1 shows the distribution of 105 organic chemical liquids distribution facilities across 26 states. The data presented here are for the 105 facilities (out of 121) who responded to the ICR and did not request that their surveys be considered confidential information. Twenty-nine percent of organic chemical liquids distribution facilities are located in Texas, 9 percent are located in Louisiana, and 8 percent are located in Ohio.

Capacity utilization at organic chemical facilities is about 80 percent. The OLD NESHAP is specifically concerned with the distribution of chemicals, rather than their production. However, a facility's ability to store and transfer chemicals is considered in the calculation of plant capacity, so the data below provide some indication of storage and transfer capacity.

Figure 2-2 shows almost all organic chemical liquids distribution facilities employ more than 50 people and that more than 35 percent of those facilities employ at least 500 employees each.

2.2.2.2 Firm Characteristics

Although facilities are the physical unit regulated by the OLD source category, this regulation may also affect the firms that own the facilities. Firms are legal business entities that have the capacity to conduct business transactions and make business decisions that affect the facility. In this analysis, the terms firm and company are used synonymously. The chemical industry is heavily dominated by corporations, with few proprietorships or partnerships.

Firm size is important when analyzing the distribution of the regulation's financial impacts. Analysis of likely impacts on small entities is required under the Small Business Regulatory Flexibility Enforcement Act (SBREFA) and requires the categorization of firms as either small or large. The Small Business Administration (SBA) now publishes general size standard definitions for small entities by NAICS code.[4] The size standards are defined either by employment or by annual firm revenue, depending on the NAICS code.

[4]As of October 1, 2000, small business determinations are defined based on NAICS codes rather than SIC codes.

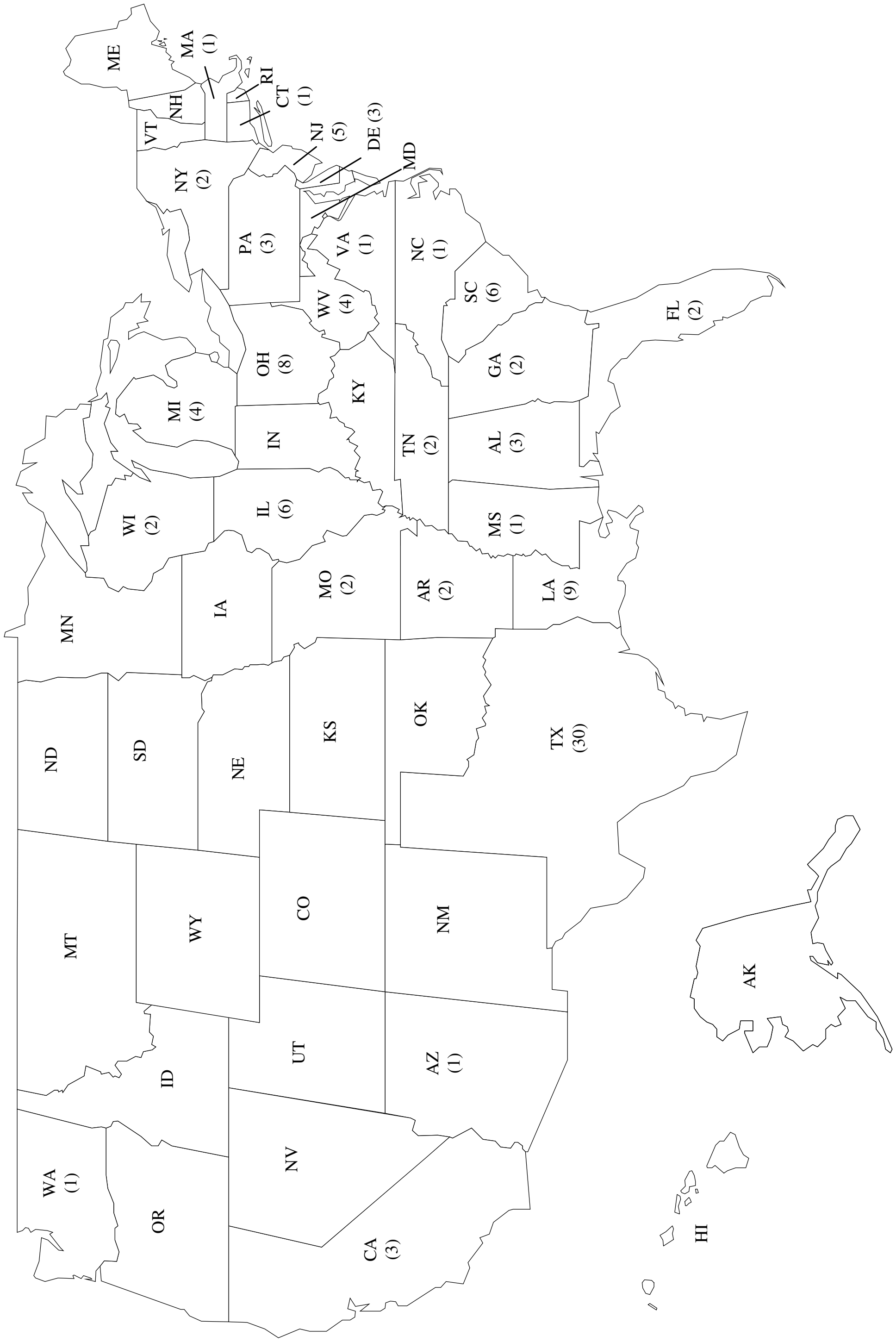

Figure 2-1. Distribution of Organic Chemical Liquids Facilities that Responded to the ICR Survey

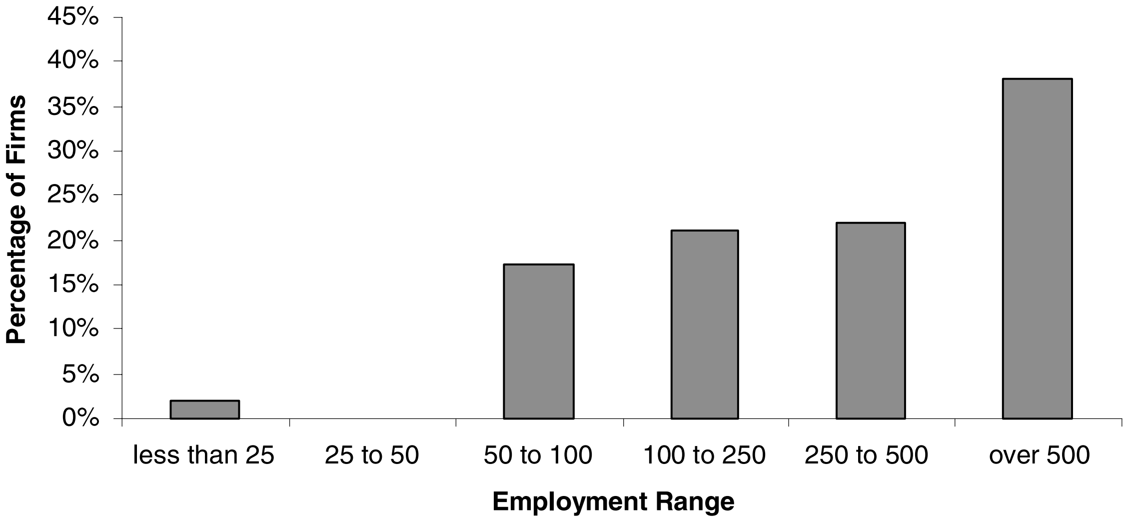

Figure 2-2. The Distribution of Organic Chemical Liquids Facilities that Responded to the ICR Survey by Employment

Source: Nonclassified responses to the 1998 Industry Specific Information Collection Request for the Development of an Organic Liquids Distribution Maximum Achievable Control Technology.

The SBA size definitions for all chemical industries is defined in terms of number of employees. The size standard for these NAICS categories ranges from 750 to 1,000 employees. As previously stated, only 117 facilities (or 32 percent) of an estimated 370 that handle organic chemical liquids responded to the ICR survey. Those facilities are owned by 31 different firms. Only one of those 31 firms is small according to the SBA small business standards. That one small firm owns two facilities that distribute organic liquids. If the 121 facilities are an accurate sample of the actual facilities, we can conclude that only a very small share of all affected facilities are owned by small businesses. Figures 2-3 and 2-4 show the distribution of surveyed firms by firm size as measured by revenue and employment; respectively. In 1998, the majority of affected firms took in more than $1 billion in revenues (approximately 87 percent) and employed more than 10,000 people (approximately 81 percent).

Vertical and horizontal integration are important determinants in analyzing a firm's potential for impacts. Both measures are concerned with the types of industries in which a firm operates. Vertical integration refers to the degree to which a firm operates facilities that are part of the same supply chain. For example, if the same firm owns facilities in the

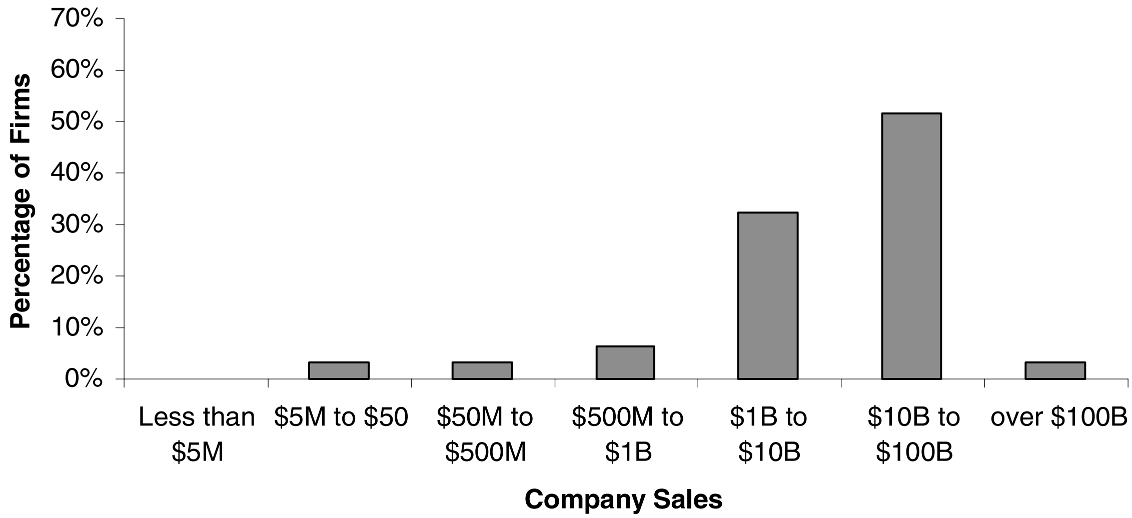

Figure 2-3. The Size Distribution of Companies that own OLD Facilities that Responded to the ICR Survey and are Involved in Chemical Distribution, by 1998 Sales (in $1997)

Sources: Dun & Bradstreet. 1999. Company Capsules. As available on EBSCO.
Gale Group. 1999. General Business File International (formerly Business ASAP). Gale Group Collections. As obtained from InfoTrac Web. <web6.infotrac.galegroup.com/itw>.
Hoover's Incorporated. 1999. Hoover's Company Profiles. Austin, TX: Hoover's Incorporated. <http://www.hoovers.com/>.
Company websites.
Company 10k reports.
U.S. Environmental Protection Agency (EPA). 2000. *Technical Support Document for the Organic Liquids Distribution (Non-gasoline) Industry*. Washington, DC: U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards.

petroleum production, refining, and transportation industries, it would be considered vertically integrated. Vertical integration is potentially important in analyzing firm-level impacts because a regulation could affect a vertically integrated firm at more than one level. Horizontal integration refers to the scale of production in a single-product firm or its scope in a multiproduct one. A single-product firm is considered horizontally integrated if it owns more than one facility producing the same product, which may be an advantage to the firm's ability to absorb costs if not all of the facilities are subject to the regulation and if the firm can shift parts of the production to the unregulated facilities. A multiproduct firm is considered horizontally integrated if it owns facilities in several unrelated industries. Here, horizontal integration may improve a firm's ability to absorb compliance costs if only one or

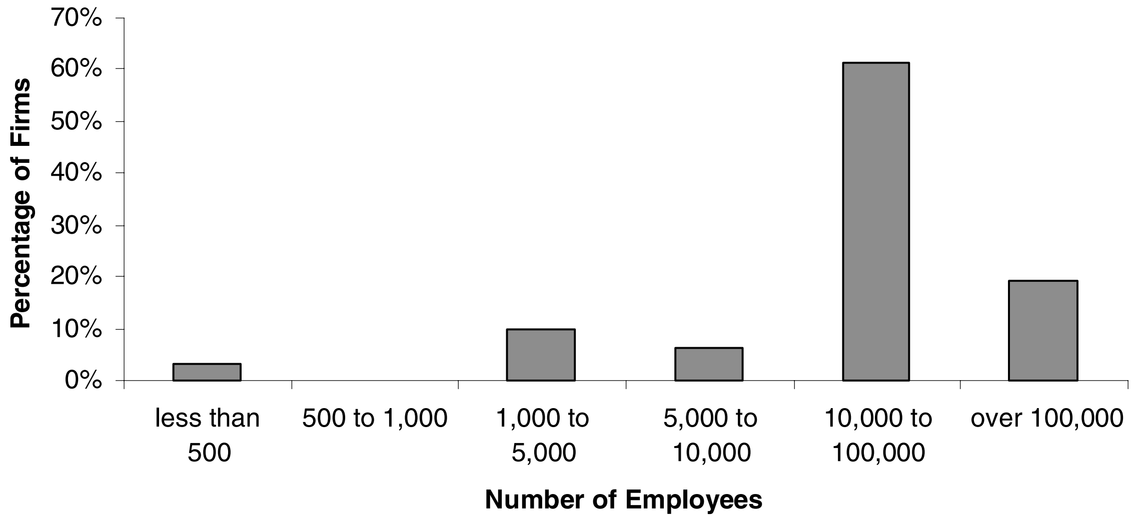

Figure 2-4. Size Distribution of Companies that own OLD Facilities that Responded to the ICR Survey and are Involved in Chemical Distribution

Sources: Dun & Bradstreet. 1999. Company Capsules. As available on EBSCO.
Gale Group. 1999. General Business File International (formerly Business ASAP). Gale Group Collections. As obtained from InfoTrac Web. <web6.infotrac.galegroup.com/itw>.
Hoover's Incorporated. 1999. Hoover's Company Profiles. Austin, TX: Hoover's Incorporated. <http://www.hoovers.com/>.
Company websites.
Company 10k reports.
U.S. Environmental Protection Agency (EPA). 2000. *Technical Support Document for the Organic Liquids Distribution (Non-gasoline) Industry*. Washington, DC: U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards.

a few of the industries in which the firm operates are directly affected by the regulation. Firms producing and distributing organic chemical liquids are generally integrated both horizontally and vertically, while firms only distributing organic chemicals are not highly integrated.

The 31 firms that are known to own chemical facilities that will be affected by the OLD NESHAP have an median (average) profit margin of 5.4 (5.3) percent. Table 2-6 shows the average, median, minimum, and maximum profit margins of these 31 firms. Figure 2-5 shows the distribution of profit margins among the firms.

Table 2-6. Profit Margins of Firms that Responded to the ICR Survey and that own Organic Chemical Liquids Distribution Facilities

Median	5.41%
Average	5.28%
Minimum	–4.09%
Maximum	11.83%

Source: Nonclassified responses to the 1998 Industry Specific Information Collection Request for the Development of an Organic Liquids Distribution Maximum Achievable Control Technology.

2.2.3 Uses and Consumers

As with petroleum liquids, the demand for organic chemicals depends primarily on their end use. Organic chemicals, particularly petrochemicals, play an important role in society. Petrochemicals are usually an intermediate product that is converted into a variety of consumer and industrial products. Some of the end products include plastics, antifreeze, synthetic fibers, rubber, solvents, and detergents. Higher demand for these products translates into higher demand for their inputs (EPA, 1995). This section lists the major consumers of organic chemicals, the purposes of chemical consumption, and the factors affecting the elasticity of demand for chemicals.

Nearly everyone is a consumer of chemicals in some way. Chemicals are used as inputs into the majority of manufacturing industries both domestically and internationally. As with petroleum products, the markets for end-use products drive the demand for individual chemicals. The major industrial consumers of chemicals in the United States are housing, motor vehicles, agriculture, tires, paper products, plastic products, textile mill products, apparel, and furniture and fixtures (*Oil & Gas Journal*, 1999).

2.2.3.1 Characterization of Demand—Derived Demand Elasticity

As with petroleum products, the price elasticity of demand for chemicals depends on the availability of substitutes, either substitute products for the same use or alternative production processes that do not need this chemical. There are 65 HAPs covered; since the availability of substitutes varies among these chemicals, so will their demand elasticities. For this analysis, however, the Agency is employing an aggregated market model, using a demand elasticity estimated for another analysis of the chemical industry. This demand

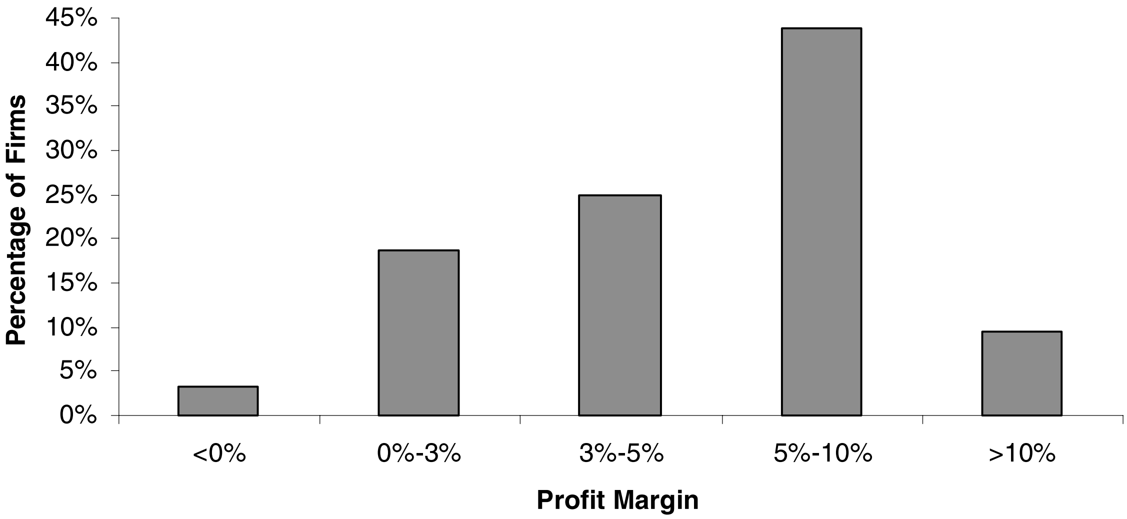

Figure 2-5. Distribution of Companies Owning Organic Chemical Liquid Facilities that Responded to the ICR Survey, by Profit Margin

Sources: Dun & Bradstreet. 1999. Company Capsules. As available on EBSCO.
Gale Group. 1999. General Business File International (formerly Business ASAP). Gale Group Collections. As obtained from InfoTrac Web. <web6.infotrac.galegroup.com/itw>.
Hoover's Incorporated. 1999. Hoover's Company Profiles. Austin, TX: Hoover's Incorporated. <http://www.hoovers.com/>.
Company websites.
Company 10k reports.
U.S. Environmental Protection Agency (EPA). 2000. *Technical Support Document for the Organic Liquids Distribution (Non-gasoline) Industry*. Washington, DC: U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards.
Dun & Bradstreet. 1997. *Industry Norms & Key Business Ratios*. Desk-Top Edition 1996–1997.

elasticity is –1.5, meaning that a one percent increase in the price of organic chemical liquids would decrease the quantity demanded by 1.5 percent.

2.2.4 Markets

A recent study conducted by the Chemical Manufacturers Association (CMA), now known as the American Chemistry Council (ACC), showed that U.S. shipments of chemicals and allied products for 1998 had increased by only 0.6 percent compared to the previous year. Domestic demand was the main driver of this increase as exports declined 2.0 percent, the result of the Asia crisis and the high U.S. dollar. Shipments of industrial chemicals, however, fell by 6.9 percent. Imports rose 8.5 percent, which led to a reduction in the trade surplus from $19.1 billion (1997) to $13.4 billion (1998). Deficits occurred in organic chemicals, pharmaceuticals, and inorganic chemicals.

The CMA projected the overall condition of the U.S. economy to remain favorable through the first half of 2000. The financial crisis in Asia has come to an end, and exports rebounded through June 2000. With continued expansion of the U.S. economy, overall growth in chemical and allied products production volume is expected to be 1.3 percent during 1999 (CMA, 1999; CMA, 2000).

2.2.4.1 Market Volumes

Market volumes for EPA's analysis were compiled from published reports of production, imports, and exports of all the chemicals produced or distributed by OLD facilities (ChemExpo, 2000). Table 2-7 presents production, imports and exports in the aggregated organic chemical market, for chemicals affected by the OLD NESHAP.

Table 2-7. Organic Chemical Market Volumes, 1997 (10^6 Mt)

Domestic Supply	Imports	Total
191	11	202

Sources: EPA OLD Industry Questionnaire Database; ChemExpo. <http://www.chemexpo.com>. Reports for all chemicals distributed by OLD facilities. Accessed June 2000.

2.2.4.2 Market Prices

The baseline market price used for the organic chemicals market, $498.62 per metric ton, was estimated as a quantity-weighted average of the individual chemical prices obtained from ChemExpo (ChemExpo, 2000).

2.2.4.3 Future Projections

Constant-dollar shipments of organic chemicals are forecasted to increase at less than 5 percent annually through 2002. This low growth rate is expected to result from slowing U.S. domestic markets and competition from foreign producers. Competition in the chemical industry is not only increasing in foreign markets, but in domestic markets as well. While imports have grown consistently since 1989 (and now account for 17 percent of demand), export prospects have been less positive. The United States is expected to remain a net exporter but the country's trade surplus is expected to continue to decline (U.S. Department of Commerce, 1998, 2000).

2.3 Distribution of Petroleum Liquids

Petroleum liquids are made up of a number of different liquids: crude oil, natural gas liquids, and nongasoline petroleum products. Table 2-8 shows the distribution of petroleum products in 1997. Since gasoline is already covered by the gasoline distribution NESHAP, this profile discusses the two major categories of nongasoline refined products—fuels and liquified petroleum gases (LPGs). The main fuel products included in the OLD source category are distillate fuel oil, kerosene-type jet fuel, and residual fuel oil. Distillate fuel oil includes diesel oil, heating oils, and industrial oils. It is used to power diesel engines in buses, trucks, trains, automobiles, and other machinery. In addition, it is used to heat residential and commercial buildings and to fire industrial and electric utility boilers. Kerosene-type jet fuel is primarily used in commercial airlines. Sometimes it is blended into heating oil and diesel fuel during periods of extreme cold weather. Residual fuel is used by electric utilities to generate electricity. It is also used as fuel for ships, industrial boiler fuel, and heating fuel in some commercial buildings (DOE, EIA, 1999b).

Table 2-8. Petroleum Products Produced at U.S. Refineries, 1997

Petroleum Product	Percent Produced
Motor gasoline	45.7%
Distillate fuel oil	22.5%
Jet fuel	10.3%
Residual fuel oil	4.7%
Still gas	4.4%
Petroleum coke	4.6%
Liquefied petroleum gases	4.6%
Asphalt and road oil	3.2%
Petrochemical feedstocks	2.9%
Lubricants	1.2%
Other	1.4%

Source: U.S. Department of Energy, Energy Information Administration. July 1999b. *Petroleum: An Energy Profile 1999*. DOE/EIA-0545(99).

2.3.1 Affected Markets

Three types of petroleum liquids are covered by the OLD source category—crude oil, NGLs, and refined petroleum products. Table 2-9 shows the SIC codes and NAICS codes associated with their production. Since crude oil and NGLs are the primary inputs into the production of refined petroleum products, the discussion in this section focuses on the consumers of, demand for, and price elasticities of the refined petroleum products (DOE, EIA, 1999e).

Petroleum liquids are inputs to virtually every industry in the United States. Crude oil becomes gasoline, diesel fuel, and jet fuel, which affects the transportation industry and facilitates the distribution of manufactured goods and the transportation industry. Refineries separate crude oil into petrochemical feedstocks that are used as inputs in the chemical industry and eventually become plastic or synthetic rubber products, automobile lubricants or antifreeze, cleaning compounds, or cosmetics. LPGs also become inputs into chemical compounds or fuel for household or farm use.

2.3.2 Production/Service Overview

OLD distribution is a service that is part of the production process for petroleum liquids. Organic liquids first enter the path of the OLD source category at the point of custody transfer, shortly before the refinery stage. Pipelines carry crude oil and/or NGLs from production fields into the refineries. Along the way, the liquids are channeled through crude oil pipeline stations, which are used for surge capacity, sorting, measuring, rerouting, and temporary storage of the transported liquid. Crude oil pipeline stations are the first point of OLD regulation for petroleum liquids.

From the crude oil pipeline station, crude oil and NGLs are transported to a petroleum refinery; crude oil can also be transported to an independent liquid terminal (either a liquid terminal or a petroleum terminal). Petroleum refineries process crude oil and/or NGLs into refined petroleum products (including gasoline, distillate fuel oil, residual fuel oil, liquified petroleum gases, and petrochemicals).

After the refining process, the refined petroleum products might be distributed to one of three destinations—refined petroleum products might be distributed to end users belonging to different industries or they might be transported to an independent liquid terminal for storage before further processing. Liquids stored at independent liquid terminals might be transported to chemical production plants or refineries for further processing, they

Table 2-9. Principal OLD Facility Categories

SIC Code	SIC Description	NAICS Code	NAICS Description
Oil and Gas Extraction (2 survey responses)			
1311	Crude Petroleum and Natural Gas	211	Crude Petroleum and Natural Gas Extraction
Petroleum Refinery (56 survey responses)			
2911	Petroleum Refining	32411	Petroleum Refineries
Liquid Terminal (32 survey responses)			
4226	Special Warehousing and Storage, NEC	49311 49319	General Warehousing and Storage Other Warehousing and Storage
Water Transportation Terminal			
4412	Deep Sea Freight Transportation	4831	Deep Sea, Coastal, and Great Lakes Freight Transportation
Crude Oil Pipeline Pumping/Breakout Station (24 survey responses)			
4612	Crude Petroleum Pipelines	48611	Pipeline Transportation of Crude Oil
Petroleum Terminal (10 survey responses)			
5169	Chemicals and Allied Products, NEC	42269	Other Chemical and Allied Products Wholesalers
5171	Petroleum Bulk Stations and Terminals	42271	Petroleum Bulk Stations and Terminals
		454311	Heating Oil Dealers[a]
		454312	LP Gas Sold Via Retail Method[a]

[a] Only part of this NAICS-coded industry consists of facilities that would also be classified in the corresponding SIC code.

Source: U.S. Census Bureau. March 2000a. "1987 SIC Matched to 1997 NAICS." <http://www.census.gov/epcd/naics/NSIC3B.HTML>. As obtained on March 13, 2000.

might be sent to a blending/packaging/distribution facility, or they might be distributed to end users.

2.3.2.1 Elasticity of Supply

The price elasticity of supply, or own-price elasticity of supply, is a measure of the responsiveness of producers to changes in the price of a product. The price elasticity of supply indicates the percentage change in the quantity supplied of a product resulting from each 1 percent change in the price of the product.

The EIA for the petroleum refinery NESHAP (EPA, 1995) econometrically estimated the price elasticity of supply for five petroleum products (motor gasoline, jet fuel, residual fuel oil, distillate fuel oil, and LPGs). The price elasticity of supply for the five petroleum products was estimated to be 1.24. Foreign supply is assumed to have the same price elasticity of supply as domestic supply. A supply elasticity of 1.24 is considered elastic, because in response to a one percent increase in the market price, the quantity of petroleum products would increase by more than 1 percent.

2.3.3 Industry Organization

This section describes the organization of industries that distribute petroleum liquids, including market structure, the characteristics of distribution facilities, and the firms that own them. Overall, the petroleum liquids distributors face a large degree of competition from fellow distributors. This section describes the producers, product differentiation, market concentration, and barriers to entry.

Suppliers in the petroleum industry can be divided into two principal types of firms:

- "Majors" are large companies that are typically fully vertically integrated and operate facilities in all of the different petroleum sectors (i.e., exploration, production, transportation, refining, and marketing).
- "Independents" are smaller, nonintegrated companies that generally specialize in one aspect, such as crude oil exploration and production or product marketing (DOE, EIA, 1999e).

Historically, majors have dominated the petroleum industry. However, the majors recently began a trend of selective refining/marketing divestiture that reduced their share of U.S. refining capacity from 72 percent in 1990 to 54 percent in 1998. Over the same period, the share of the independents rose from 8 percent to 23 percent.

Petroleum products are produced according to quality grade specifications and therefore do not vary much from one another. Brand loyalty is not expected to be an important factor in the petroleum products market (DOE, EIA, 1999e).

Table 2-10 shows concentration ratios by SIC code for the affected OLD industries involved in petroleum product distribution, based on data from the 1992 Economic Census. (Concentration information by NAICS code from the 1997 Economic Census is not yet

Table 2-10. Concentration Ratios by SIC Code

SIC Code	Year	Total Number of Firms	Concentration Ratio				Herfindahl-Hirschmann Index
			4 Firm	8 Firm	20 Firm	50 Firm	
Petroleum and Natural Gas Extraction							
1311, 211 Crude Petroleum and Natural Gas Extraction							
	1997	NA	NA	NA	NA	NA	NA
Petroleum Refinery							
2911, 32411: Petroleum Refining							
	1987	200	32%	52%	78%	95%	435
	1992	132	30%	49%	78%	97%	414
	1997	122	28%	49%	82%	98%	422
Liquid Terminal							
4226, 49319: Special Warehousing and Storage, NEC							
	1992	1,212	27%	36%	50%	64%	NA
	1997	1,213	30%	40%	57%	73%	NA
Water Freight Transportation							
4412, 483 Water Freight Transportation							
	1997	1,921	31%	41%	57%	77%	NA
Crude Oil Pipeline Station							
4612: Crude Petroleum Pipelines							
	1992	52	60%	80%	97%	100%	NA
	1997	382	48%	71%	95%	100%	NA
Petroleum Terminal							
5169, 42269: Chemicals and Allied Products, NEC							
	1992	7,446	27%	35%	50%	65%	NA
	1997	11,571	14%	21%	35%	52%	NA
5171: Petroleum Bulk Stations and Terminals							
	1992	8,266	21%	34%	53%	64%	NA
	1997	7,690	19%	34%	54%	66%	NA

Source: U.S. Department of Commerce, Bureau of the Census. 1992. Economic Census. Washington, DC: Government Printing Office. <http://www.census.gov/epcd/www/92result.html>. (Includes data for 1992 and 1987)
U.S. Department of Commerce, Bureau of the Census. 1997. Economic Census. <http://www.census.gov/epcd/www/pdf/97conc/>.

available.) Industry concentration information is not yet available for the 1997 Economic Census. Ratios are included for the census years 1987 and 1992 (where possible), although only 1992 data are available for some SIC codes. The numbers in Table 3-7 show that, by and large, the petroleum liquids distribution industries are characterized by a large number of firms and generally unconcentrated markets, indicating a high degree of competitiveness in their respective product markets. The exception is crude oil pipeline stations, which has relatively few firms (52) and high concentration ratios (a CR4 of 60.3 percent and a CR8 of 79.7 percent), indicating a high degree of concentration. These numbers are not surprising given that the pipeline industry is highly capital intensive (see discussion on barriers to entry, above. In addition, FERC legislates and monitors the liquids pipeline industries. FERC ensures fair access to pipeline transportation at reasonable rates. Interestingly, the vast majority of crude oil pipeline companies with corporate offices in the United States are operated as subsidiaries of other corporate entities, mostly major oil companies. Only a few of the pipeline companies are independently listed on any stock exchange (Gale Research, Inc., 1999b).

Recently, two trends in the petroleum market have affected the number and market shares of firms—mergers/joint ventures and divestitures. Over the past few years, a number of mergers and joint ventures have been undertaken in an effort to cut costs and increase profitability. This merger activity has occurred among the largest firms (as best illustrated by the recently approved acquisition of U.S.-based Amoco Corporation by UK-based British Petroleum and the announced mega-merger of Exxon and Mobil Corporation) as well as among independent refiners and marketers (e.g., the independent refiner/marketer Ultramar Diamond Shamrock [UDS] acquired Total Petroleum North America in 1997 and announced a joint venture with Phillips Petroleum in October 1998, which was later abandoned) (DOE, EIA, 1999d).

As explained above, barriers to entry are an important component of the market structure. As indicated above, common carrier pipelines in the United States are government regulated due to the industry's structure, which can be characterized as a natural monopoly. The crude oil pipeline industry is capital intensive. Start-up costs are high, and entry into the industry is restricted, as is indicated by the small number of firms operating with headquarters in the United States. However, since the day-to-day maintenance of capital-intensive industries tends to be relatively moderate, successful companies within the pipeline industries have been able to take advantage of economies of scale.

2.3.3.1 Facilities

Although EPA has received surveys from only about 41 percent (81 out of 198) of the universe of OLD in the petroleum industry, an examination of the data provided in the surveys illustrates general characteristics of those facilities. The data presented here are for the 118 facilities (out of 126 who responded to the survey) who did not request that their surveys be considered classified information.

Figure 2-6 shows that of the 118 nonclassified facilities, 31 percent of petroleum liquids distributors are located in Texas, 12 percent are in Louisiana, and 10 percent are located in Alaska.

Facilities in NAICS code 32411 were operating at 91 percent capacity in 1998 and 1997 according to the U.S. Census Bureau (U.S. Census Bureau, 1999f). Figure 2-7 shows that almost 40 percent of facilities involved in the distribution of petroleum liquids employ fewer than 25 people on-site, while another 40 percent of facilities employ more than 250 employees each.

2.3.3.2 Firm Characteristics

Table 2-11 presents an overview of the total number of firms for each petroleum OLD SIC code, the total number of firms potentially affected by the OLD source category, and the percentage of the source category potentially affected.

The OLD source category is heavily dominated by firms organized as corporations. For example, in 1987, 177 of 200 petroleum refineries (or 88.5 percent) were classified as corporations. In 1992, 914 of 1,212 liquid terminals (or 75.4 percent), and 49 of 52 crude oil pipeline stations (or 94.2 percent) were classified as corporations (DOE, EIA, 1999e; Speed, 1999).

Table 2-12 presents the SBA small business standards for the OLD source category and also shows the number of small firms in the industry. The SBA size definitions for most OLD industries is defined in terms of employees. The size standard for these NAICS categories ranges from 100 employees in the petroleum terminal industry to 1,500 employees for petroleum refineries[5] and crude oil pipeline stations.

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[5]In addition to the maximum number of employees, small petroleum refining firms may not have more than a total input capacity of 75,000 barrels per day of petroleum-based inputs, such as crude oil.

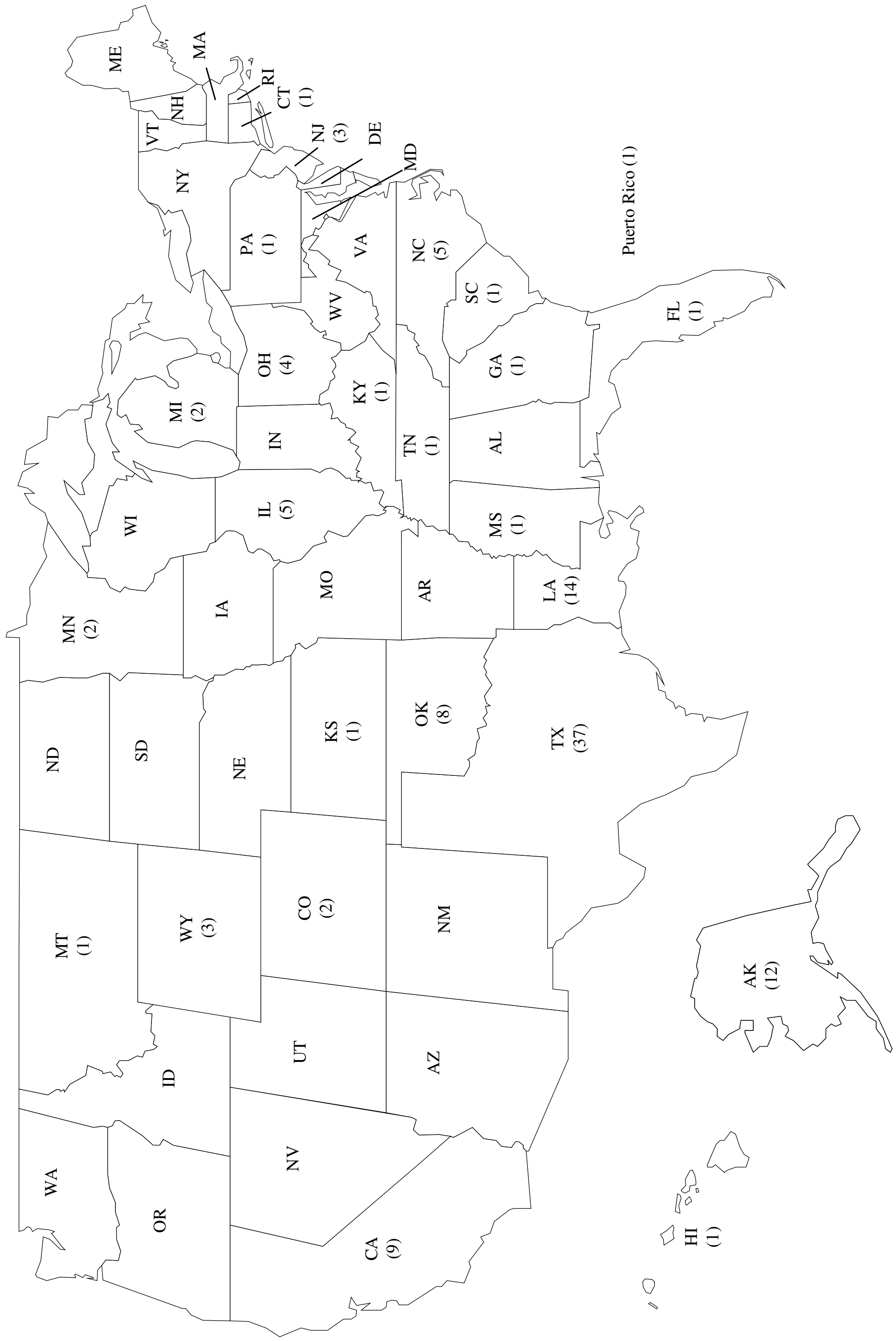

Figure 2-6. Location of Petroleum Liquids Distributors that Responded to the ICR Survey

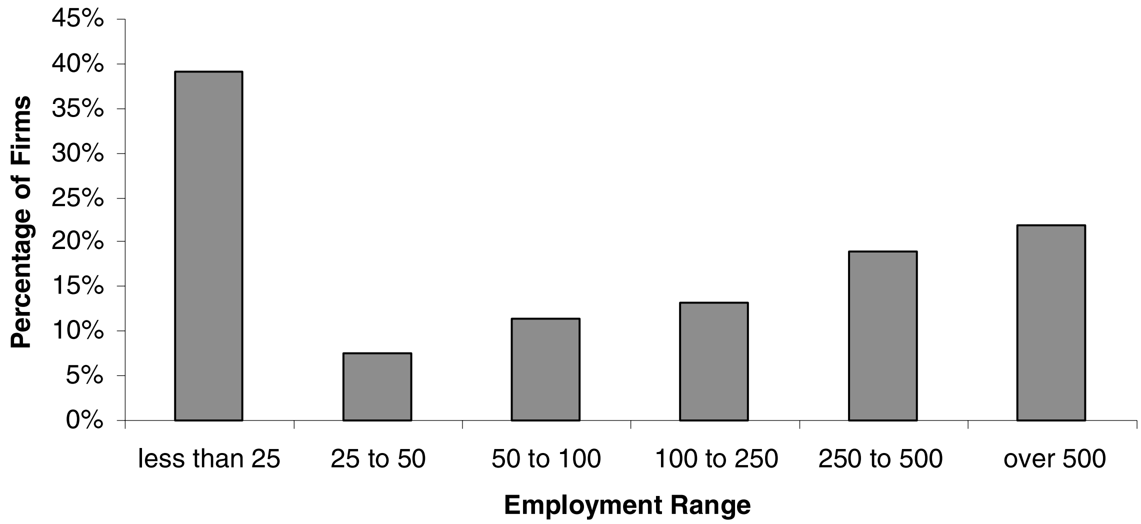

Figure 2-7. The Distribution of Petroleum Liquids Facilities that Responded to the ICR Survey by Employment

Source: Nonclassified responses to the 1998 Industry Specific Information Collection Request for the Development of an Organic Liquids Distribution Maximum Achievable Control Technology.

EPA's survey of OLD facilities provides data on firms owning facilities affected by the OLD NESHAP. The 126 surveyed facilities are owned by 45 companies. According to SBA standards, 9 percent (4 out of 45) of those companies are small businesses.

Figures 2-8 and 2-9 show the distribution of surveyed firms by firm size as measured by revenue and employment. The majority of affected firms took in more than $1 billion in revenues in 1998 and employ more than 5,000 people. The industry exhibits a high degree of vertical integration with many firms operating in more than one sector (DOE, EIA, 1999e). For example, the crude petroleum pipeline industry is dominated by giant oil companies with assets in many of the downstream sectors of the industry (Gale Research, Inc., 1999b). Of the two types of petroleum firms, majors are generally fully integrated and operate facilities in all the different sectors. Independents, on the other hand, are nonintegrated and generally specialize in one aspect, such as crude oil exploration and production or product marketing (DOE, EIA, 1999e). Similarly, major petroleum companies are horizontally integrated, but the smaller independent firms typically operate only one refinery each and are therefore not horizontally integrated (EPA, 1995).

Table 2-11. Number of Total OLD Firms and Affected Firms, 1996

NAICS Code	NAICS Description	Total Number of Establishments[a]	Total Number of Affected Facilities	% of Source Category that is Affected
Petroleum Refinery				
32411	Petroleum Refineries	244	93	38.1%
Liquid Terminal				
49311	General Warehousing and Storage	3,911	57	1.1%
49319	Other Warehousing and Storage	1,213		
Crude Oil Pipeline Station				
48611	Pipeline Transportation of Crude Oil	482	16	3.3%
Petroleum Terminal				
42269	Other Chemical and Allied Products Wholesalers	8,892	32[b]	0.0%
42271	Petroleum Bulk Stations and Terminals	6,729		
454311	Heating Oil Dealers	5,657		
454312	LP Gas Dealers	6,623		

[a] U.S. Census Bureau. February 1998. "Statistics for Industry Groups and Industries." *1997 Economic Census, Manufacturing—Industry Series*, E97M-3251I. Washington, DC: Government Printing Office.
U.S. Census Bureau. September 1999g. "Petroleum Refinery." *1997 Economic Census, Manufacturing—Industry Series*. E97M-3251I, Washington, DC: Government Printing Office.
U.S. Census Bureau. January 2000c. "Transportation and Warehousing." *1997 Economic Census, Manufacturing—Industry Series*. E97M-3251I, Washington, DC: Government Printing Office.
U.S. Census Bureau. January 2000d. "Wholesale Trade." 1997 Economic Census, Manufacturing—Industry Series. E97M-3251I, Washington, DC: Government Printing Office.
U.S. Census Bureau. March 2000b. "Retail Trade." *1997 Economic Census, Manufacturing—Industry Series*, E97M-3251I. Washington, DC: Government Printing Office.

[b] This is the combined estimated number of affected facilities in this industry.

Table 2-12. Small Business Size Standards for OLD Industries

NAICS Code	NAICS Description	SBA Small Business Standard
Petroleum Refinery		
32411	Petroleum Refineries	1,500 employees and 75,000 barrels per day capacity of petroleum-based inputs[a]
Liquid Terminal		
49311 49319	General Warehousing and Storage Other Warehousing and Storage	$18.5 million[b]
Crude Oil Pipeline Station		
4612	Crude Petroleum Pipelines	1,500 employees
Petroleum Terminal		
42269	Chemicals and Allied Products, NEC	100 employees
42271	Petroleum Bulk Stations and Terminals	100 employees
454311	Heating Oil Dealers	$9.0 million
454311	LP Gas Dealers	$5.0 million

[a] Petroleum-based inputs include crude oil or bona fide feedstocks.
[b] The SBA small business standard for NAICS code 493 represents annual firm revenue. Firm size by revenue is not available in *Statistics of U.S. Businesses 1996*.

Sources: Small Business Administration. "Small Business Size Standards Matched to North American Industry Classification System Codes Effective October 1, 2000."
Speed, Phillip J. "The Changing Competitive Landscape of the Chemical Industry." *Chemicalbond*. <http://www.socma.org/bond/feature1.html>. As obtained on September 2, 1999.
U.S. Department of Energy, Energy Information Administration. July 1999b. *Petroleum: An Energy Profile 1999*. DOE/EIA-0545(99). Washington, DC.

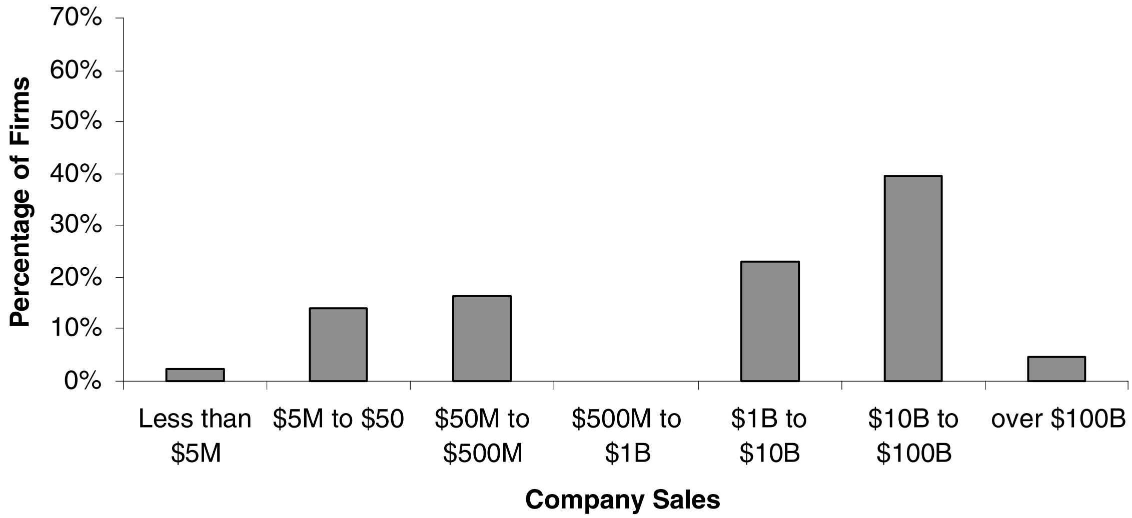

Figure 2-8. The Size Distribution of Companies that own OLD Facilities that Responded to the ICR Survey and are Involved in the Distribution of Nongasoline Petroleum Liquids, by 1998 Sales (in $1997)

Note: Sales data are from 1998 but were converted into 1997 dollars to facilitate comparison with other figures reported in this profile and allow easy comparison with estimated compliance costs, which are calculated in 1997 dollars.

Sources: Dun & Bradstreet. 1999. Company Capsules. As available on EBSCO.
Gale Group. 1999. General Business File International (formerly Business ASAP). Gale Group Collections. As obtained from InfoTrac Web. <web6.infotrac.galegroup.com/itw>.
Hoover's Incorporated. 1999. Hoover's Company Profiles. Austin, TX: Hoover's Incorporated. <http://www.hoovers.com/>.
Company websites.
Company 10k reports.
U.S. Environmental Protection Agency (EPA). 2000. *Technical Support Document for the Organic Liquids Distribution (Non-gasoline) Industry*. Washington, DC: U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards.

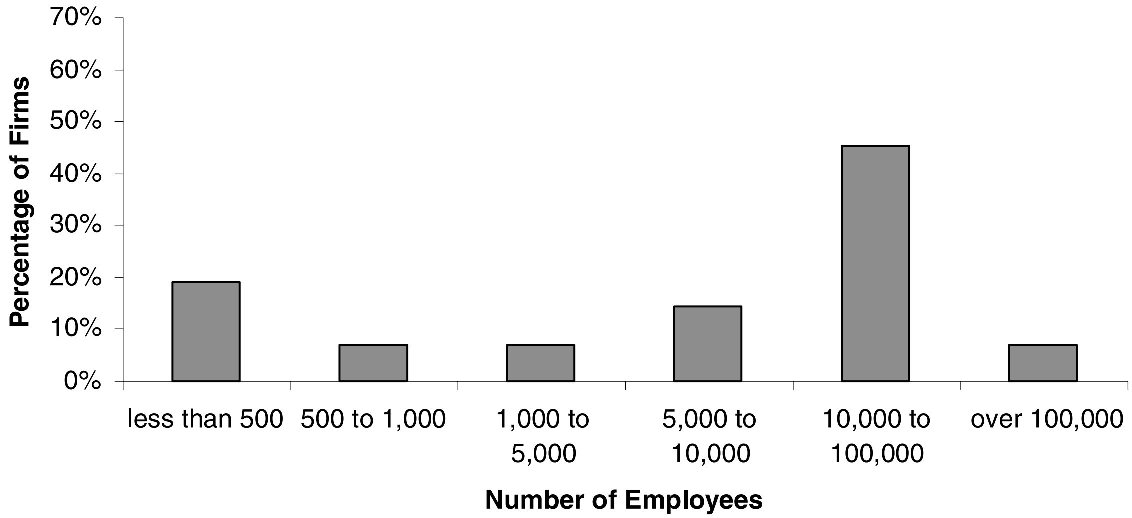

Figure 2-9. Size Distribution of Companies that own OLD Facilities that Responded to the ICR Survey and are Involved in the Distribution of Nongasoline Petroleum Liquids

Sources: Dun & Bradstreet. 1999. Company Capsules. As available on EBSCO.
Gale Group. 1999. General Business File International (formerly Business ASAP). Gale Group Collections. As obtained from InfoTrac Web. <web6.infotrac.galegroup.com/itw>.
Hoover's Incorporated. 1999. Hoover's Company Profiles. Austin, TX: Hoover's Incorporated. <http://www.hoovers.com/>.
Company websites.
Company 10k reports.
U.S. Environmental Protection Agency (EPA). 2000. *Technical Support Document for the Organic Liquids Distribution (Non-gasoline) Industry*. Washington, DC: U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards.

Throughout the 1990s, the U.S. refining and marketing industry was characterized by unusually low product margins, low profitability, selective retrenchment, and substantial restructuring. During 1997, the profitability of U.S. refining and marketing was the highest since 1989, which was in part achieved by low energy costs as well as cost-cutting measures, including a number of mergers and joint ventures in the downstream sector (DOE, EIA, 1999d). The crude petroleum pipeline industry has experienced modest but steady growth since 1993. As a result, company profits have also increased. This trend has been a result of lower operating costs and moderate expanses in deliveries (Gale Research Inc., 1999b; DOE, EIA, 1999a). During 1999, Major U.S. energy companies experienced "50 percent increases in cash flows from oil and gas production," but profits were uneven, reflecting volatility in petroleum prices (U.S. DOE, EIA, 2000, 2001). During 2000, petroleum producers almost uniformly experienced tremendous increases in profits; for some, record levels of net income were reported. For a sample of 11 major oil companies, profits increased by amounts ranging from 58 percent to 2,387 percent.[6] The average increase in profits over the period 1999 to 2000 for these oil companies was 366 percent.

Table 2-13 shows that, for the firms that own the 126 facilities that responded to the EPA survey,[7] the average (median) profit margin was (4.7) 4.3 percent. Figure 2-10 shows the distribution of profit margins among firms that own petroleum liquids distributors.

2.3.4 Uses and Consumers

Five major economic sectors consume petroleum products (DOE, EIA, 1999e): the residential sector, the commercial sector, the industrial sector, the transportation sector, and the electric utility sector.

The demand for petroleum products is influenced by several factors, including crude oil prices, economic growth trends, and weather conditions. Low oil prices tend to stimulate demand. Demand also increases during periods of economic expansion, particularly in the industrial and transportation sectors. Economic expansions lead to an increase in the production of goods, which contributes in turn to an increase in the demand for transportation of raw materials and the deliveries of finished products. Petroleum demand is also influenced by weather conditions. Extreme weather tends to either increase or decrease the use of heating oil and electricity, which contributes to the demand for petroleum products. Weather can also contribute to the seasonal variations in demand for transportation fuels (such as gasoline).

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[6]See U.S. SEC 10-K reports for Amerada Hess, Anadarko, Atlantic Richfield, Chevron, CITGO, Conoco, Exxon Mobil, Occidental Petroleum, Phillips Petroleum, Sunoco, and Texaco. <http://www.sec.gov/cgi-bin/srch-edgar>.

[7]Forty-five firms own surveyed facilities distributing petroleum products or performing merchant distribution. Profit, employment, and sales data were identified for only 43 of those facilities.

Table 2-13. Profit Margins of Firms that Own Organic Chemical Liquids Distribution Facilities that Responded to the ICR Survey

Median	4.34%
Average	4.73%
Maximum	34.74%
Minimum	–6.94%

Source: Nonclassified responses to the 1998 Industry Specific Information Collection Request for the Development of an Organic Liquids Distribution Maximum Achievable Control Technology.

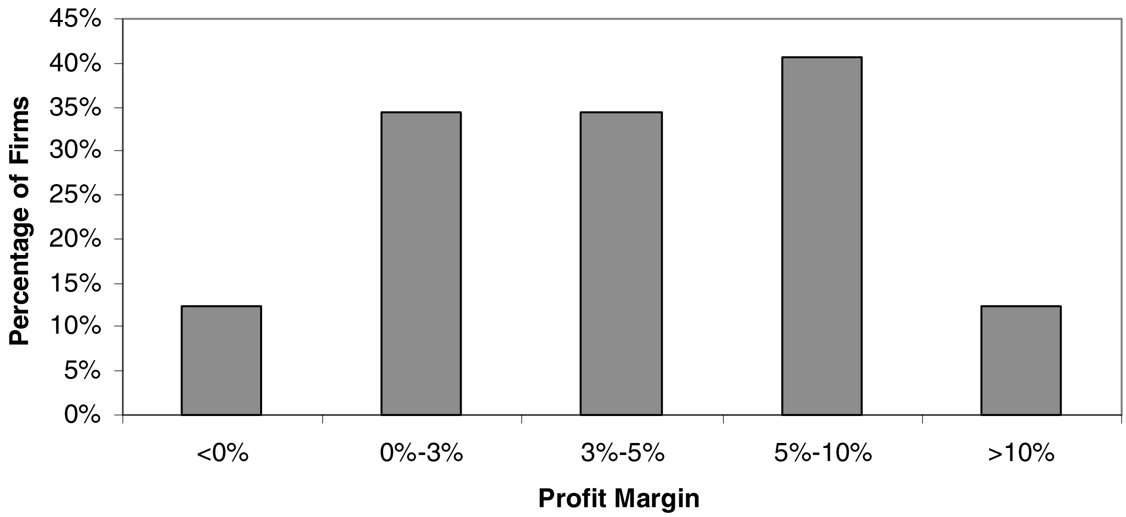


Figure 2-10. Distribution of Companies Owning Petroleum Liquid Facilities that Responded to the ICR Survey, by Profit Margin

Sources: Dun & Bradstreet. 1999. Company Capsules. As available on EBSCO.
Gale Group. 1999. General Business File International (formerly Business ASAP). Gale Group Collections. As obtained from InfoTrac Web. <web6.infotrac.galegroup.com/itw>.
Hoover's Incorporated. 1999. Hoover's Company Profiles. Austin, TX: Hoover's Incorporated. <http://www.hoovers.com/>.
Company websites.
Company 10k reports.
U.S. Environmental Protection Agency (EPA). 2000. *Technical Support Document for the Organic Liquids Distribution (Non-gasoline) Industry*. Washington, DC: U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards.
Dun & Bradstreet. 1997. *Industry Norms & Key Business Ratios*. Desk-Top Edition 1996–1997.

2.3.4.1 Characterization of Demand—Derived Demand Elasticity

The demand for petroleum is also influenced by the price of petroleum itself and the price of available substitutes. The degree to which the price of petroleum influences the quantity of petroleum products demanded is called the price elasticity of demand. Generally speaking, the price elasticity of demand represents the percentage change in the quantity demanded resulting from a 1 percent change in the price of the product. Table 2-14 lists the price elasticities of demand for several of the major petroleum products. In modeling the demand for the composite petroleum product, EPA has assumed a demand elasticity of –0.6.

Table 2-14. Estimates of Price Elasticity of Demand for Petroleum Products

Jet fuel	–0.15
Residual fuel oil	–0.61 to –0.74
Distillate fuel oil	–0.50 to –0.99
Liquified petroleum gases	–0.60 to –1.0

Source: U.S. Environmental Protection Agency (EPA). July 1995. *Economic Impact Analysis for the Petroleum Refinery NESHAP*, Revised Draft for Promulgation.

The elasticity estimates indicate that each of these products has inelastic demand. Regulatory control costs are more likely to be paid by consumers of products with inelastic demand as compared to products with elastic demand, all other factors held constant. Price increases for products with inelastic demand lead to revenue increases for the producers. Thus, one can predict that price increases resulting from implementation of regulatory control costs will lead to higher gross revenues for the producers (EPA, 1995).

Demand becomes more elastic with the availability of substitutes and the passage of time. In the short run, there may not be substitutes readily available for consumption. However, over time, consumers have the opportunity to adjust to the price increase and will seek alternatives. In the case of the petroleum industry, as the prices of crude oil and petroleum products increase, consumers may not be able to respond immediately. The short-run demand elasticity is inelastic because petroleum plays a critical role in today's lifestyles (*Oil & Gas Journal*, 1999). As time passes, consumers can adjust to price changes, and consumer behavior may change, and the price elasticity of demand will be higher.

2.3.5 Markets

The petroleum industry is a major sector in the U.S. economy. A significant portion of the petroleum consumed domestically is imported. The industry experienced relatively high prices in 1996 and 1997; however, petroleum prices declined substantially in 1998 (Gale Research, Inc., 1999b).

2.3.5.1 Market Volumes

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. In 1996, the value of shipments by the petroleum refining industry was an estimated $158 billion (DOE, EIA, 1999b).

Table 2-15 shows domestic production and consumption, imports, and exports of the aggregated petroleum product in 1997.

Table 2-15. Petroleum Product Market Volumes, 1997 (10^6 Mt)

Domestic Supply	Imports	Total
1,924	441	2,365

Source: EPA OLD Industry Questionnaire Database; ChemExpo. <http://www.chemexpo.com>. Reports for all chemicals distributed by OLD facilities. Accessed June 2000.

Foreign trade plays a critical role in the U.S. crude oil market, and imports of crude oil in the United States far outweigh exports of crude oil. With a decline in domestic production and an increase in consumption, crude oil imports provide the missing link as U.S. oil demand continues to increase. U.S. imports of crude oil have increased 49 percent in the last decade alone. Imports of refined petroleum products, on the other hand, have declined since the mid-1980s, accounting for slightly more than one-third of total petroleum imports in 1985, but less than one-fifth by 1997 (DOE, EIA, 1999a).

Although the United States is a net importer of petroleum, some exports of crude oil and petroleum products do occur. The United States exported a combined 1 million barrels per day of crude oil and petroleum products in 1997, matching the record level set in 1993. The five leading countries that receive U.S. exports of petroleum are Mexico, Canada, Japan, Republic of Korea, and Spain. Crude oil exports averaged 110,000 barrels per day in 1998. This average is down from its peak in 1980 of 287,000 barrels per day. Product exports have averaged more than 600,000 barrels per day since 1986 and reached 896,000 barrels per day in 1997, when they accounted for more than 89 percent of petroleum exports. This number dropped in 1998 to 835,000 barrels per day, representing 88 percent of total petroleum exports. The three leading petroleum product exports, in order of volume exported, are petroleum coke, distillate fuel oil, and motor gasoline (DOE, EIA, 1999b,c).

2.3.5.2 Market Prices

Crude oil prices are set in international market and have been on a general decline since 1981. The Organization of Petroleum Exporting Countries (OPEC) has the ability to influence oil prices worldwide because its members possess such a large portion of the world's oil supply. If OPEC restricts supply, prices increase. If OPEC floods the market with crude oil, prices decrease. The sharp price decline in 1998 was attributable to plentiful crude oil supplies (partly due to Iraq's increased production). There has also been a general trend of price decline in petroleum products. Part of this decline is due to a reduction in demand from suffering Asian economies and a decrease in U.S. demand for heating oil because of unseasonably warm weather (API, 1999). In modeling the market for the aggregate petroleum product, EPA estimated the price of the composite commodity as the quantity-weighted average of the petroleum products distributed by OLD facilities. The market price used in the model is $191.84 per metric ton.

2.3.5.3 Future Projections

The current status of the potentially affected industries is important to establish a baseline for the economic impact analysis. However, since compliance costs will not be incurred until some time in the future, it is also important to consider projections of future economic trends when estimating likely impacts of a regulation.

The Energy Information Administration (EIA) publishes the Annual Energy Outlook, which presents midterm forecasts on energy supply, demand, and prices. The analysis performed focuses on a reference case and four other cases that assume higher and lower economic growth and higher and lower world oil prices than in the reference case. The projections are based on results from EIA's National Energy Modeling System (NEMS). Information on petroleum found in this section is based on the 1999 Annual Energy Outlook.

Domestic crude oil production is expected to continue to decline throughout the next 20 years. It is expected to decrease by 1.1 percent a year, from 6.5 million barrels per day in

1997 to 5.0 million barrels per day in 2020. This decline in domestic production will lead to a decline in domestic petroleum supply. Domestic supply in 1997 was 9.4 million barrels per day. In NEMS's low price projection, supply drops to 7.6 million barrels per day in 2020; in its high price projection, supply drops to 9.3 million barrels.

Domestic consumption of petroleum is expected to increase over the next 20 years. U.S. petroleum consumption is projected to increase by 6.0 million barrels per day between 1997 and 2020 in the reference case, 3.9 million barrels per day in the low growth case, and 8.2 million in the high growth case. The transportation sector is expected to account for most of the increase in petroleum consumption. However, a change in the consumption pattern of the transportation sector is expected to occur. Gasoline accounted for 65 percent of the petroleum consumed for transportation. However, this share is expected to decrease to 61 percent in 2020 as alternative fuels are introduced to the transportation market. The share of jet fuel is expected to increase from 13 percent to 17 percent as air travel continues to expand.

As domestic production continues to decline and domestic consumption continues to grow, oil imports will continue to increase. The projections for net petroleum imports in 2020 range from a high of 18.3 million barrels per day in the low oil price case to a low of 14.3 million barrels per day in the low growth case. This is more than double the 1997 level of 9.2 million barrels per day. Table 2-16 shows consumption and net imports of crude oil and petroleum products for 1997 and projections for 2020.

As discussed earlier, crude oil imports currently account for the majority of foreign imports of petroleum. Crude oil is expected to continue as the major component of petroleum imports. However, the import share of refined products is expected to increase in the future. More imports of petroleum products will be needed as growth in demand for refined products exceeds the expansion of domestic refining capacity.

Future exports of petroleum from the United States will depend on economic conditions worldwide and the restrictions placed on trade both in the United States and abroad. The industrialized countries will continue to be the major oil consumers over the next 20 years. However, petroleum use will increase at the fastest rate in developing countries. The United States will continue to export petroleum products (especially the heavy products, which are in less demand in this country) (DOE, EIA, 1999c).

Table 2-16. Petroleum Consumption and Net Imports in 1997 and 2020 (10^6 barrels/day)

Year and Projection	Consumption	Net Imports	Net Crude Imports	Net Product Imports
1997	18.6	9.2	8.1	1.0
2020 Projections				
Reference	24.7	16.0	12.0	4.0
Low oil price	26.0	18.3	13.1	5.2
High oil price	24.0	14.6	11.5	3.1
Low growth	22.5	14.3	11.4	2.9
High growth	26.8	17.7	12.6	5.1

Source: U.S. Department of Energy, Energy Information Administration. 1999a. *Annual Energy Outlook, 1999.*

Oil prices have fluctuated greatly in the past, which makes future price projections uncertain. However, future oil prices are expected to be higher than current prices. The latest year for which comprehensive data is available is 1998, a year which saw uncharacteristically low prices for petroleum-based products. The world price for crude oil is most heavily influenced by OPEC's limits on production. As of the publication of this document, prices for crude oil and petroleum-based products are much higher than during the years presented in the tables in this report. Increased world demand has not been met with production increases, resulting in higher prices.

The reference case for oil projects prices to rise by about 0.9 percent a year, reaching $22.73 in constant 1997 dollars in 2020. In nominal dollars, the reference case price exceeds $43 in 2020. The low price case projects prices rising to $14.57 by 2005 and remaining at about that level until 2020. The high price case has a price rise of about 2.5 percent per year until 2015 and then remains at $29.35 until 2020. The leveling off at about $29.35 in the high price case is due to the market penetration of alternative energy supplies that could become economically viable at that price (DOE, EIA, 1999a).

SECTION 3

ENGINEERING COST ANALYSIS

HAP emissions occur at several common points during the storage and distribution of organic liquids other than gasoline. To control these emissions, EPA has developed MACT floor levels of control under the authority of Section 112 of the CAA. This section summarizes EPA's control costs estimates for the rule.

3.1 Control Cost Estimates

The engineering analysis identified 381 major sources that are potentially affected by the rule. To estimate nationwide costs, EPA developed 15 model plants with control costs for the following emission points:

- storage tanks,
- cargo tank transfers, and
- equipment leaks.

The costs include capital costs associated with tank, rack, and leak detection and repair devices (appropriately annualized using the equipment lifetime and discount rate) and variable costs associated with operating and maintaining pollution control devices and other costs associated with monitoring, recordkeeping, and reporting (MRR). The Agency identified 273 facilities, or 72 percent of the total that will incur control and MRR costs, with the remaining 108 facilities (28 percent) incurring MRR costs only.

The nationwide compliance cost estimates for the rule are $25.11 million for the required controls (see Table 3-1).[1] These costs are distributed by industry as follows:

- SIC 13 Oil and Gas Extraction—$0.46 million (1.8 percent)
- SIC 28 Chemical Production—$9.40 million (37.4 percent)
- SIC 29 Petroleum Refineries—$3.56 million (14.2 percent)
- SIC 42 Liquid Terminals—$6.80 million (27.1 percent)
- SIC 44 Water Transportation—$0.12 million (0.5 percent)
- SIC 46 Crude Oil Pipelines—$1.86 million (7.4 percent) and
- SIC 51 Petroleum Terminals—$3.43 million (13.7 percent)

EPA expressed these control costs on a per-unit basis for input in the market model described in Appendix A. EPA also assigned costs to individual facilities within each industry, as described in Appendix B, and scaled the facility-specific costs up to SIC totals using escalation factors. In addition, the Agency assigned model plant costs to each of the 248 survey facilities[2] to compute cost-to-sales ratios (CSRs) for facilities and their ultimate parent companies (see Appendix B).

[1]Although most of EPA's analysis employs NAICS codes, model plants were developed based on the SIC codes listed in the facilities' survey response.

[2]The Agency collected survey data for 140 of 381 potentially affected facilities (37 percent) and these are referred to as the "known" facilities in the analysis.

Table 3-1. Facility and Nationwide Control Costs for the OLD MACT

Model Plant	Tank Capital Cost per Facility (1997 $)	Tank Annualized Cost per Facility ($/yr)	Rack Capital Cost per Facility (1997 $)	Rack Annualized Cost per Facility ($/yr)	LDAR Capital Cost per Facility (1997 $)	LDAR Annualized Cost per Facility ($/yr)	Total Capital Cost per Facility (1997 $)	Annualized Control Cost per Facility ($/yr)	MRR Annual Cost/Facil. ($/yr)	Total Annualized Cost/Facil. ($/yr)
Totals for SIC 13	0	0	0	0	7,350	22,785	12,350	22,785	22,991	45,776
Totals for SIC 28	9,618,324	32,221	3,417,750	3,230,423	693,135	2,783,329	14,093,459	6,045,973	3,358,577	9,404,551
Totals for SIC 29	3,525,552	663,546	696,000	702,306	352,800	1,093,680	4,739,352	2,459,532	1,096,929	3,556,461
Totals for SIC 42	10,037,512	1,548,812	2,346,300	2,478,535	150,925	606,047	12,669,737	4,633,394	2,168,910	6,802,304
Totals for SIC 44	0	0	0	0	0	0	2,500	0	12,233	12,233
Totals for SIC 46	6,166,192	1,324,064	0	0	110,250	341,775	6,316,442	1,665,839	195,728	1,861,567
Totals for SIC 51	11,129,907	2,293,004	195,750	217,390	85,260	264,306	11,476,167	2,774,700	650,406	3,425,106
Totals	**40,477,487**	**5,861,647**	**6,655,800**	**6,628,654**	**1,399,720**	**5,111,922**	**49,310,007**	**17,602,223**	**7,505,774**	**25,107,998**

SECTION 4

ECONOMIC IMPACT ANALYSIS: METHODS AND RESULTS

The NESHAP requires distributors of nongasoline organic liquids to meet emission standards for the release of HAPs into the environment. To meet these standards, firms will have to modify their plant and equipment and institute leak detection and repair procedures. These changes result in higher costs of production for the affected producers. They may also have broader societal implications because these effects are transmitted through market relationships to their customers.

The OLD rulemaking will increase the costs of distributing organic liquids. Specifically, the costs of several general types of businesses are expected to increase. These businesses include facilities that manufacture and distribute organic chemicals and/or nongasoline petroleum products and facilities that specialize in the distribution of these products. Of the latter facilities, some are owned by companies that also manufacture the products, while others are independent businesses that only distribute the products.

4.1 Overview of Economic Modeling Approaches

Several types of economic impact modeling approaches have been developed to support regulatory development. Models incorporating different levels of economic decisionmaking can generally be categorized as *with* behavior responses (behavioral approach) and *without* behavior responses (nonbehavioral/accounting approach).

The behavioral approach is grounded in economic theory related to producer and consumer behavior in response to changes in market conditions. In essence, this approach models the expected reallocation of society's resources in response to a regulation. The behavioral approach explicitly models the changes in market prices and production. Resulting changes in price and quantity are key inputs into the determination of a number of important phenomena in an EIA, such as changes in producer surplus, changes in consumer surplus, and net social welfare effects. For example, a large price increase may imply that consumers bear a large share of the regulatory burden, thereby mitigating the impact on producers' profits and plant closures. The following describes the methods and results of this approach.

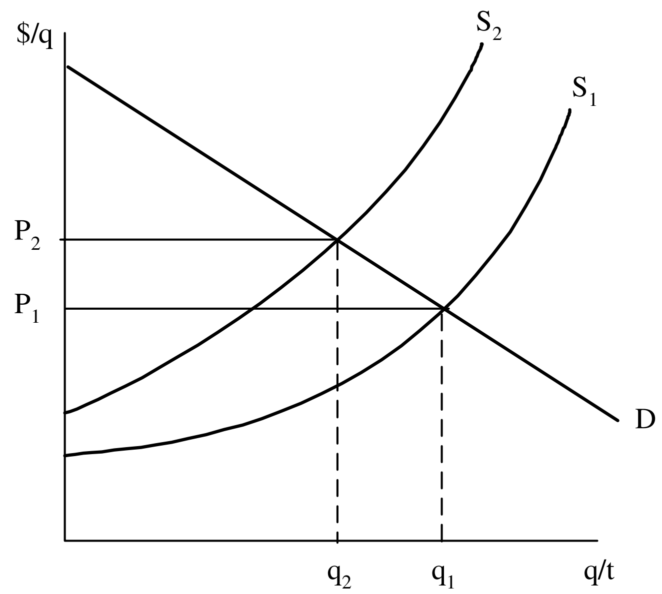
In contrast the nonbehavioral/accounting approach essentially holds fixed all interaction between facility production and market forces. In this approach, a simplifying assumption is made that the firm absorbs all control costs, and the analysis assesses the burden of the control costs under this assumption. Typically, engineering control costs are then compared to facility, company, or industry sales to evaluate the regulation's economic impact. The Agency employed a nonbehavioral approach to conduct an initial screening analysis of impacts on small businesses (described in Section 5).

4.2 Conceptual Approach

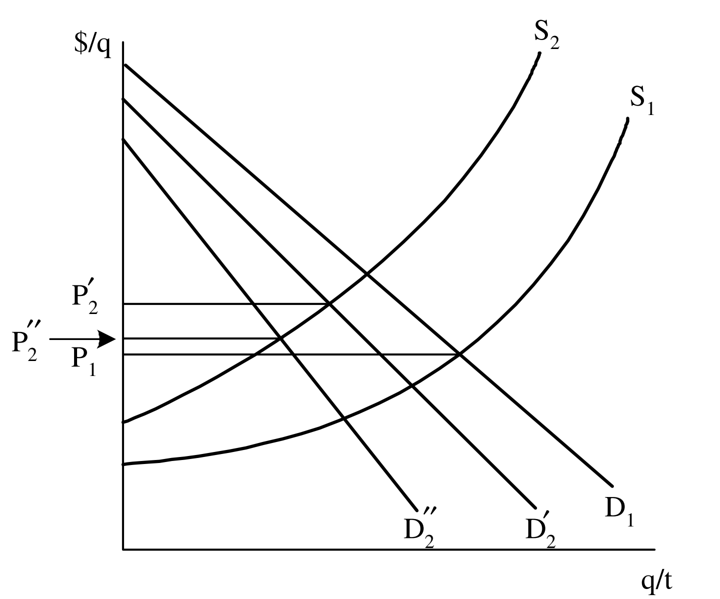
EPA developed a simple competitive market model in which buyers and sellers are price takers in three commodity markets potentially affected by the rule: petroleum and chemical products and merchant organic liquid distribution services. Prices in these markets are set by the collective actions of producers and consumers, who take the market price as a given in making their production and consumption choices. EPA's model compares baseline conditions in the two product markets and the merchant distribution service market to with-regulation conditions in those markets. Because the suppliers of organic chemicals and petroleum liquids are also the demanders of merchant services, EPA paid particular attention to the interactions between the markets.

With the regulation, the costs of production increase for organic liquid suppliers and distributors because they incur additional costs associated with the rule. Incorporating these regulatory control costs is represented by an upward shift of the aggregate supply curve in each of the three markets. In addition, the increased costs incurred by organic liquid and petroleum product facilities reduces their demand for merchant distribution services.

At the new equilibrium with the regulation, the market prices of organic chemicals and petroleum products increase and output in those markets (as determined from the market demand curve, D^M) declines. In the market for merchant distribution services, market quantity declines. However, depending on the interaction of the decrease in demand and the decrease in supply in that market, the market price may either increase or decrease.
Figure 4-1 illustrates the theory underlying estimation of the economic impacts of the rule.



a) Quantity of organic liquid distributed by SICs 28 and 29



b) Quantity of organic liquids distributed by merchant distributors

Figure 4-1. Market Responses to the OLD NESHAP

4.2.1 Operational Model

To develop quantitative estimates of economic impacts, the Agency developed an operational model using spreadsheet software. As described below and in detail in Appendix A, this model characterizes baseline supply and demand and the behavioral responses to changes in costs and/or market prices.

4.2.1.1 Market Supply

For each organic liquid market, EPA defines market supply as the sum of domestic and foreign supply. Domestic supply is the sum of baseline quantities supplied by facilities within the market. EPA obtained questionnaire data on baseline quantities of liquids distributed by a subset of facilities, and estimated the quantities distributed by the rest of the estimated universe of OLD facilities as described in Appendix B. Each supply function's parameters were calibrated using baseline production, price data, and the responsiveness of supply to changes in price (supply elasticity).

4.2.1.2 Market Demand

Similar to supply, the Agency modeled two aggregate consumers (domestic and foreign) in each product market, and domestic demand for distribution, with downward-sloping demand curves that are consistent with the theory of demand. This characterization simply indicates that consumption of commodities is high at low prices and low at high prices. The Agency constructed demand functions for each consumer using baseline quantity, price data, and assumptions about the responsiveness to changes in price (demand elasticity). EPA obtained estimated demand elasticities for the liquid markets from previous EPA economic impact analyses. The elasticity of demand for distribution services, like the demand itself, is derived from the demand for the liquids being distributed.

4.2.1.3 Control Cost Inputs and With-Regulation Equilibrium

The OLD NESHAP will increase the cost of distributing organic liquids, which will increase the costs of facilities producing organic liquids both directly (because they also distribute organic liquids) and indirectly (because they purchase merchant distribution services, whose costs will also increase due to the regulation). The increased cost and reduced quantity of organic liquids distributed by producing facilities also reduces the demand for merchant distribution services. EPA's analysis estimates the adjustment in equilibrium quantity at each distribution facility and in each market, using the model described in Appendix A.

Many of the facilities potentially affected by the regulation are located in 1-hour ozone nonattainment areas. These facilities probably have many of the controls and processes on which the estimated costs of compliance are based in place at baseline. The costs of compliance for these facilities would likely be much lower than the costs estimated by EPA. They would therefore incur lower impacts as a result of the regulation, and the market adjustments would be somewhat smaller. To account for these differences, EPA conducted two sensitivity analyses. Sensitivity Analysis A decreases estimated compliance costs for facilities located in 1-hour ozone nonattainment areas by the amount of leak detection and repair (LDAR) costs and MRR costs. Sensitivity Analysis B reduces their costs by the amount of MRR costs only. The results of these two sensitivity analyses are shown in Appendix C.

4.2.2 Results

The theory presented above suggests that producers attempt to mitigate the impacts of higher-cost production by shifting the burden on to other economic agents to the extent the market conditions allow. We would expect the model to project upward pressure on prices for merchant distribution services as producers reduce output rates in response to higher costs. Increased price of merchant services, plus direct costs of compliance for organic liquid producers that also distribute, results in increased prices for organic liquids as producers reduce output rates to respond to higher costs. Higher prices reduce quantity demanded and output for organic liquids, leading to changes in economic surplus to consumers and profitability of firms. Reduced production of organic liquids reduces the demand for merchant distribution services. These interacting market adjustments determine the social costs of the regulation and its distribution across stakeholders (producers and consumers).

4.2.3.1 Market- and Industry-Level Impacts

The increased cost of production due to the regulation is expected to slightly increase the price of petroleum and chemical products and reduce their production/consumption from baseline levels. As shown in Table 4-1, the regulatory alternative is projected to increase prices by 0.001 percent in the markets for petroleum products and organic chemicals. Domestic production of petroleum products declines by 0.021 million Mt and domestic chemical production declines by 0.016 million Mt. Supply from foreign producers (imports) increases by 0.006 million Mt in the petroleum market and less than 0.001 million Mt in the chemical market, resulting in a net decline of 0.015 million Mt and 0.006 million Mt respectively (less than 0.002 percent). In the market for merchant distribution services,

Table 4-1. Market-Level Industry Impacts of the Organic Liquid Distribution (OLD) NESHAP: 1997

	Baseline	With Regulation	Change	
			Absolute	Relative
Petroleum Products				
Price ($/metric ton)	$191.84	$191.84	$0.002	0.001%
Quantity (10^6 metric tons/yr)	2,365	2,365	–0.015	–0.001%
Domestic	1,924	1,924	–0.021	–0.001%
Foreign	441	441	0.006	0.001%
Chemical Products				
Price ($/metric ton)	$498.65	$498.66	$0.006	0.001%
Quantity (10^6 metric tons/yr)	836	836	–0.002	–0.002%
Domestic	825	825	–0.002	–0.002%
Foreign	11	11	0.000	0.002%
Distribution Services				
Price ($/metric ton)	$12.32	$12.33	$0.013	0.106%
Quantity (10^6 metric tons/yr)	478	478	–0.006	–0.001%

equilibrium quantity is projected to decline by 0.006 million Mt, less than 0.01 percent, and market price is projected to increase by $0.013, less than 0.2 percent.

Revenue, costs, and profitability of the directly affected industry also change as prices and production levels adjust to increased costs associated with compliance. For domestic petroleum producers, operating profits are projected to decline by $3.4 million (see Table 4-2). Operating profit losses are the net result of three effects: decreased revenue, reductions in production costs as output declines, and increased control costs. For domestic chemical producers, operating profits are projected to decline by $5.2 million.

4.2.3.2 Facility-Level Impact Results

Using the quantity adjustment equation shown in Appendix A, EPA estimated each facility's adjustment to the regulation. First, EPA estimates the change in the facility's quantity distributed. EPA then combines the estimated decrease in quantity, coupled with the change in the market price for the commodity distributed, to estimate the facility's change in revenue.

Table 4-2. National-Level Industry Impacts of the Organic Liquid Distribution (OLD) NESHAP: 1997

	Absolute Change
Petroleum	
Revenue	–$0.03
Costs	$3.34
Operating Profit	–$3.37
Facilities	0
Chemicals	
Revenue	–$2.71
Costs	$2.46
Operating Profit	–$5.18
Facilities	0
Distribution Services	
Revenue	$6.17
Costs	$6.07
Operating Profit	$0.09
Facilities	-1
Total	
Revenue	$3.42
Costs	$11.88
Operating Profit	–$8.46
Facilities	–1

Detailed information about facility-level profitability was unavailable from ICR survey responses. However, Agency estimated the change in each facility's profit, using the following formula:

$$\Delta\pi = (\Delta p - c_i)\cdot q_{i1} + 0.5(\Delta p - c_i)\cdot \Delta q_i \qquad (4.1)$$

This formula estimates the facility's change in producer surplus based on the change in the market price and the facility's quantity and compliance costs. Facility costs are estimated by subtracting estimated with-regulation facility profits from with-regulation facility revenues. EPA then aggregated the changes in facility revenues, costs, and profits across facilities in each market to estimate national-level industry impacts shown in Table 4-2. One facility is projected to become unprofitable and close its OLD operations as a result of the rule.

In the petroleum markets, revenues fell slightly, and costs increased, so that overall, profits decreased by approximately $3.4 million. In the chemicals market, revenues fell by $2.7 million, and costs increased by $2.5 million, so that overall profits fell $5.2 million. For the merchant distributors, revenues increased by $6.2 million and costs increased by $6.1 million, so profits increased slightly, by $0.1 million. Nationwide, profits fell by $8.5 million across all three affected sectors.

4.2.3.3 Company-Level Impacts Results

To analyze the impacts of the rule on the companies owning affected facilities, EPA estimated the change in profits they would experience as a result of the regulation. These results are shown in Table 4-3. Generally, the regulation is projected to result in slight reductions in the profits of companies owning OLD facilities. No company that was profitable at baseline is projected to become unprofitable due to the regulation. Of the 57 companies owning facilities analyzed in the market model, nine are projected to experience a positive percentage change in profits as a result of the regulation. Three companies are projected to experience a reduction in profits of more than 5 percent. Forty-three are projected to experience reductions in profits less than 1 percent, and two companies are projected to experience reductions in profits of between 1 percent and 5 percent. Seven companies are expected to experience positive absolute changes in profits. This differs from the number of companies expected to experience a positive percentage change because some companies that are not profitable at the baseline level would experience negative absolute profit changes, resulting in positive percentage changes.

Table 4-3. Estimated Company-Level Impacts of the OLD NESHAP: 1997

Percent Change in Profits	Number of Companies
Positive	19
Between –1.0 and 0	33
Between –1.0 and –5.0	2
Greater than –5.0	3
Total	57

In addition to the companies owning facilities included in the market model, the companies owning the Trans-Alaska Pipeline (TAP) will also be impacted. (The TAP was omitted from the market impacts model because the volume of petroleum transferred via the pipeline is so large, and because it is not really competing with other pipeline facilities affected.) EPA analyzed the impacts of the rule on the company owning the TAP by comparing the costs of compliance with company sales. Affected TAP facilities include 11 pipeline pump stations and the Valdez Marine Terminal. The TAP is owned by the Alyeska Pipeline Company, the major partner in which is BP-Amoco. Presently, BP Amoco owns 46.93 percent of the TAP. To be conservative, EPA compared the TAP's costs with the revenues of BP-Amoco, ignoring revenues of other partners. The TAP is estimated to incur $0.41 million to comply with the regulation, which is 0.0006 percent of Amoco's annual sales. If revenues of other pipeline owners were included, the estimated costs of the rule would represent an even smaller share. EPA thus believes that the rule will not impose significant impacts on the owners of the TAP.

In addition to analyzing impacts on companies in general, EPA also examined the impacts of the regulation on small businesses. This analysis is presented in Section 5.

4.2.3.4 Social Costs

The value of a regulatory action is traditionally measured by the change in economic welfare that it generates. The regulation's welfare impacts, or the social costs required to achieve environmental improvements, will extend to consumers and producers alike. Consumers experience welfare impacts due to changes in market prices and consumption levels associated with the rule. Producers experience welfare impacts resulting from changes in profits corresponding with the changes in production levels and market prices. However, it is important to emphasize that this measure does not include benefits that occur outside the market, that is, the value of reduced levels of air pollution with the regulation.

The economic analysis accounts for behavioral responses by producers and consumers to the regulation (i.e., shifting costs to other economic agents). This approach provides insights on how the regulatory burden is distributed across stakeholders. As shown in Table 4-4, the economic model estimates the total social cost of the rule of $17.6 million. As a result of higher prices and lower consumption levels, consumers (domestic and foreign) are projected to lose $10.1 million, with chemical consumers accounting for slightly more than half of the total. Domestic producers lose $8.5 million in profits, with chemical producers accounting for 61 percent of the total. Foreign producers unambiguously gain as a

Table 4-4. Distribution of Social Costs Associated with Organic Liquids Distribution (OLD) NESHAP: 1997

	Value ($$10^6$/yr)
Change in Consumer Surplus	**–$10.14**
Petroleum	–$4.95
Chemical	–$5.19
Change in Producer Surplus	**–$7.47**
Domestic Producers	–$8.46
Petroleum	–$3.37
Chemical	–$5.18
Distribution Services	$0.09
Foreign Producers	$0.99
Petroleum	$0.92
Chemical	$0.07
Total Social Cost	**–$17.6**

result of the regulation with profits increasing by $1.0 million. These producers benefit from higher prices with additional control costs associated with production.

4.3 Energy Impacts

Executive Order 13211 "Actions Concerning Regulations that Significantly Affect Energy Supply, Distribution, or Use" (66 Fed. Reg. 28355, May 22, 2001) requires federal agencies to estimate the energy impact of significant regulatory actions. The NESHAP will directly affect the distribution of petroleum products, and will trigger both an increase in energy use due to the operation of new abatement equipment and a decrease in energy distribution due to a small increase in its cost. Neither of these impacts is expected to be significant, however. The reduction in coal, natural gas, and electricity output resulting from this rule is expected to be negligible.

4.3.1 Increase in Energy Consumption

The implementation of the NESHAP may result in a minor increase in energy consumption for affected facilities. Energy consumption may increase due to the increased need for pumps, blowers, and automatic valves and dampers. Energy in the form of electricity and supplemental fuels may display this slight increase. Some of the vapors that result from organic liquid storage, transfer, and distribution may also serve as fuel for combustion devices, which may partially offset increases in energy consumption. It is anticipated that the energy requirements for the control devices mandated by this NESHAP will comprise only a very small fraction of the energy required to operate an OLD-type facility. It is therefore anticipated that there will be no significant increases in energy consumption attributable to this NESHAP.

4.3.2 Reduction in Energy Consumption

The NESHAP will directly increase the cost of petroleum distribution operations, resulting in a series of responses within the market for distribution services and the market for petroleum products. The estimated impacts are summarized in Table 4-5. As a result of these market adjustments, the quantity of petroleum products distributed is projected to fall by about 15,500 metric tons per year (slightly over 300 barrels per day). In addition, commercial distribution of petroleum products is projected to decline by approximately6,500 metric tons per year (130 barrels per day). The price of petroleum products is projected to increase by approximately 0.001 percent, and the price of commercial distribution services is projected to increase by approximately 0.1 percent. As shown in Table 4-5, none of these impacts is estimated to be large enough to be considered significant as measured by the screening criteria described by the White House Office of Management and Budget (OMB) Memoranda M-01-27, Guidance for Implementing E.O. 13211 (OMB, 2001).

Table 4-5. Estimated Energy Impacts of the OLD NESHAP

Type of Impact	OMB Significance Criterion	Estimated OLD NESHAP Impact
Reduction in quantity of Petroleum Products Distributed by Producer	4,000 bbl/day	311 bbl/day
Reduction in quantity of Petroleum Products Distributed Commercially	4,000 bbl/day	130 bbl/day
Increase in price of petroleum products	1 percent	0.001 percent
Increase in price of energy distribution	1 percent	0.1 percent

4.3.3 Net Impact on Energy Consumption and Cost

As described above, the operation of control equipment at affected OLD facilities is projected to require negligible increases in the use of energy, the quantity of petroleum products distributed is projected to decrease by an insignificant amount, and the cost of petroleum products and petroleum distribution services are projected to increase by insignificant amounts. The reduction in coal, natural gas, and electricity output resulting from this rule is expected to be negligible. Hence, the NESHAP is not likely to have any significant adverse impact on energy prices, distribution, availability, or use.

SECTION 5

SMALL BUSINESS IMPACT ANALYSIS

Although environmental regulations can affect all businesses, small businesses may have special problems complying with such regulations. The Regulatory Flexibility Act (RFA) of 1980 requires that special consideration be given to small entities affected by federal regulations. The RFA was amended in 1996 by the Small Business Regulatory Enforcement Fairness Act (SBREFA) to strengthen its analytical and procedural requirements. Under SBREFA, the Agency must perform a regulatory flexibility analysis for rules that will have a significant impact on a substantial number of small entities (SISNOSE). This section focuses on the compliance burden for the small businesses to determine whether this final rule is likely to impose a SISNOSE within this industry.

5.1 Identifying Small Businesses

The Small Business Administration (SBA) defines a small business in terms of the sales or employment of the owning entity. These thresholds vary by industry and are evaluated based on the industry classification (NAICS code) of the affected facility. EPA identified 26 different four-digit SIC codes, and an even larger number of NAICS codes, for the affected companies. The size standards for these industries range from a maximum of 100 to 1,500 employees or from a maximum of $5 million to $18.5 million in revenues. Based on the reported company employment or revenue and SIC size standards, EPA classified six of the 57 known companies in the survey as small, or 10.5 percent of the total. In other sections of this analysis, the Agency scaled up the number of known facilities to represent all facilities potentially affected by the ruling. Scaling up the number of companies using the methods described in appendix B, EPA estimates that there are139 large companies and 16 small companies affected by the rule.

5.2 Screening-Level Analysis

For the purposes of assessing the potential impact of this rule on these small businesses, the Agency calculated the ratio of the annual compliance cost relative to baseline sales for each company. When a company owns more than one affected facility, the costs for each facility it owns are summed to develop the numerator of the test ratio. For this screening-level analysis, annual compliance costs were defined as the engineering control costs imposed on these companies; thus they do not reflect the changes in production expected to occur in response to imposing these costs and the resulting market adjustments. As shown in Table 5-1, the Agency estimated that all of the affected small firms have CSRs between 0 and 0.5 percent. The distribution of CSRs presented in Figure 5-1 shows that, based on available information, small firms are not disproportionately affected compared to large firms. Ninety-six percent of the large companies have CSRs between 0 and 0.5 percent.

Table 5-1. Impacts on Small and Large Companies Owning OLD Facilities: Cost-to-Sales Ratios

	Large Companies (139 Companies)	**Small Companies** (16 Companies)
Cost-to-Sales Ratio (CSR)		
Minimum	0.00%	0.00%
Median	0.00%	0.02%
Maximum	3.76%	0.10%
Number of Companies with		
CSR < 1%	133	16
CSR between 1% and 3%	3	0
CSR >3%	3	0

5.3 Economic Analysis

The Agency also examined the economic impacts on small businesses under with-regulation conditions expected to result from the rule. Unlike the screening analysis described above, this approach examines small business impacts in light of the expected behavioral responses of producers and consumers as described in Section 4. As shown in Table 5-2, for affected small companies, profit percentage changes range from 0.00 to -11.84 percent. The median percentage change in small company profits is approximately -0.21 percent. The median absolute decline in small company profits is approximately $21,000 dollars. Large companies were expected to experience a median percentage change of -0.003 percent and a median absolute decline of $33,000.

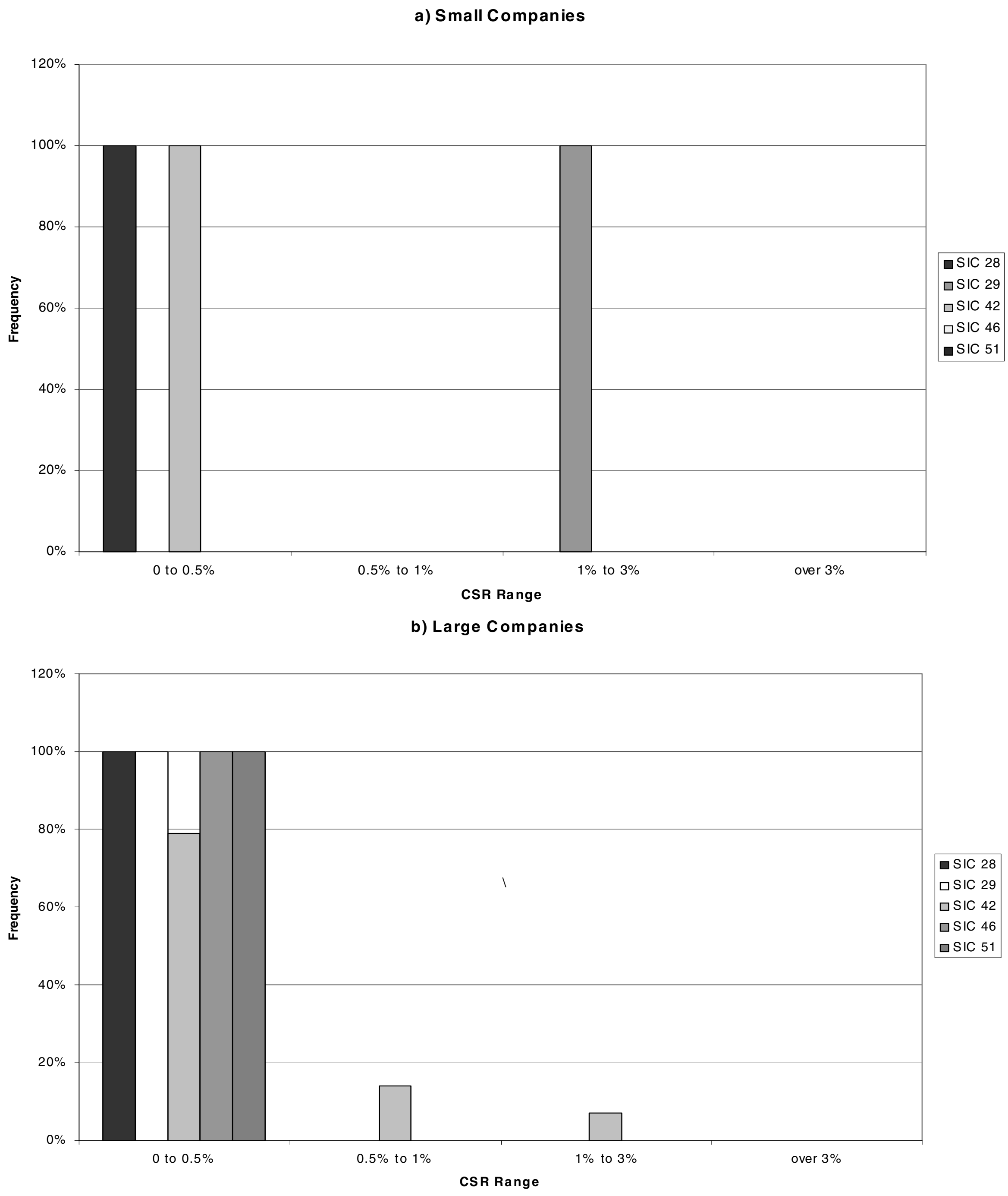


Figure 5-1. Distribution of Compliance CSRs by Industry

Table 5-2. Impacts on Companies Owning OLD Facilities: Changes in Company Profits

	Large Companies	Small Companies[a]
Percent Change in Profits		
Minimum	-22.75%	-11.84%
Median	0.00%	0.00%
Maximum	5.00%	0.00%
Number of Companies for which		
Profits increase or unchanged	52	3
Profits decrease by less than 1%	76	11
Profits decrease by 1% to 5%	5	0
Profits decrease by more than 5%	5	3

[a] Note: number of companies does not equal the estimated total (138 and 16) due to rounding.

5.4 Assessment

The RFA generally requires an agency to prepare a regulatory flexibility analysis of any rule subject to notice and comment rulemaking requirements under the Administrative Procedure Act or any other statute unless the agency certifies that the rule will not have a significant economic impact on a substantial number of small entities. Small entities include small businesses, small organizations, and small governmental jurisdictions.

For purposes of assessing the impacts of today's rule on small entities, small entity is defined as

- a small business whose parent company has fewer than 100 or 1,500 employees, depending on size definition for the affected SIC or NAICS code, or a maximum of $5 million to $18.5 million in revenues;
- a small governmental jurisdiction that is a government of a city, county, town, school district or special district with a population of less than 50,000; and
- a small organization that is any not-for-profit enterprise independently owned and operated and is not dominant in its field.

It should be noted that companies in 26 four-digit SIC codes and 42 NAICS codes are affected by this rule, and the small business definition applied to each industry by SIC code or NAICS code is that listed in the SBA size standards (13 CFR 121, and on www.sba.gov/size).

After considering the economic impacts of the rule on small entities, EPA certifies that this action will not have a significant economic impact on a substantial number of small entities. The Agency has determined that of the 57 companies with known sales data, only 6 are small companies that may be affected by the ruling. Scaling up, EPA estimates that a of a total 155 companies affected by the rule, 16 are small. Out of the affected small firms, none are estimated to have compliance costs that exceed 1 percent of their revenues. The reported impacts on the small firms are therefore not considered to be significant. Finally, while there is a difference between the median compliance cost-to-sales estimates for the affected small and large firms (0.02 percent for small firms compared to 0.0003 percent for the large firms), both groups of facilities generally incur costs below 1 percent of sales.

Although this rule will not have a significant economic impact on a substantial number of small entities, EPA nonetheless has tried to reduce the impact of this rule on small entities. In this rule, the Agency is applying the minimum level of control to affected sources allowed by the CAA.

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APPENDIX A

ORGANIC LIQUIDS DISTRIBUTION (OLD) METHODOLOGY

The primary purpose for the EIA for the OLD rule is to "describe and quantify" the reallocation of society's resources in response to the regulatory action. To develop these estimates, we used a basic framework that is consistent with other EIAs performed by ISEG. This approach employs standard microeconomic concepts to model behavioral responses expected to occur with regulation.

EPA compared baseline conditions in two organic liquid product markets (chemicals and petroleum products) and a service market (distribution) in 1997 with with-regulation conditions in the same markets. By including the service market, we placed particular emphasis on the interactions between the market for organic liquid products *and* the market for distribution services.

The regulation will increase the costs of performing distribution services. This will increase the costs of facilities producing organic liquids, either directly or indirectly. For example, costs will increase for chemical and petroleum manufacturing companies performing on-site distribution services. We assumed that all producers of organic liquids perform on-site distribution, either while bringing their organic liquid inputs into the facility, while sending their organic liquid products out of the facility, or both. Costs will also increase for stand-alone distribution service providers, both independent merchant distribution facilities and captive distribution facilities owned by the same companies producing the organic liquids. The increase in the price of merchant distribution services will indirectly increase the costs of chemical and petroleum producers purchasing distribution services. Figure 4-1, in Section 4, illustrates the interacting market responses.

This methodology plan describes the model in detail and discusses how the Agency

- characterized the supply and demand of the affected commodities and services at the market level,
- linked three standard partial equilibrium models by specifying the interactions between supply functions and then solving for prices and quantities across all markets simultaneously,

- introduced a policy “shock” in the model with control costs inducing shifts in the affected supply functions, and
- used a solution algorithm to determine a new with-regulation equilibrium.

A.1 Baseline Data Set

ISEG collected the following market information to characterize the baseline:

- *Market quantities*—Using responses from the EPA industry survey, the Agency identified known facilities producing petroleum and chemical products potentially affected by the rule. Quantities for unknown facilities were developed using the procedure described in Appendix B. Import and export quantities for these commodities were collected from ChemExpo. Domestic and import quantities were aggregated to develop baseline market quantities for the petroleum and chemical markets (see Table A-1). The market quantity of distribution services was computed by multiplying the estimated share (α) of the organic liquid product distributed by merchant service providers and the total baseline quantities of the known and unknown facilities. Using data contained in the facility database, the Agency estimated $\alpha = 17.4\%$.
- *Market prices*—Petroleum and chemical prices were collected from the Chemical Market Reporter. A weighted average price for each aggregate market was computed based on the petroleum and chemical quantities. Absent data on the market price for distribution services, we assumed that the market price is set by the highest unit cost service supplier. Using an engineering cost function[1] and quantities for service providers, the baseline market price for services was estimated to be $12.32 per metric ton.
- *Supply and demand elasticities*—For the chemical and petroleum industries, we utilized industry (SIC) elasticities gathered from previous EPA economic impacts analyses (EPA, 1995; Shapiro, 1987). For the distribution service industry, we assumed a supply elasticity of one. The model does not specify an exogenous demand function for services because this demand is derived from the supply decisions of the chemical and petroleum producers. Table A-2 shows the elasticities used.

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[1]The engineering cost function used for this analysis is as follows: $TC = 598(q/29)^{0.8}$.

Table A-1. Baseline Data Set, 1997

Market	Average Price ($/metric ton)	Domestic Production (10^6 metric tons)	Imports (10^6 metric tons)	Exports (10^6 metric tons)
Petroleum	$191.84	1,924	441	25
Chemical	$498.65	191	11	8
Distribution Services	$12.32	368	NA	NA

Table A-2. Supply and Demand Elasticities Used in the Market Model

Market	Supply	Demand
Petroleum	1.2	–0.6
Chemical	1.5	–1.5
Distribution Services	1	derived demand

A.2 Market for Organic Liquid Products

A.2.1 Market Supply

Market supply for the organic liquid product market i can be expressed as:

$$Q^S = \sum_{i=1}^{n} q_j^S + q_F^S \tag{A.1}$$

where

q_j^S = product (i) supply from plant (j), and

q_F^{Si} = product (i) supply from foreign sources (imports).

A.2.1.1 Domestic Facility-Level Supply

Domestic facilities will be affected by the change in costs of distribution on-site and by changes in the price for distribution services. Foreign producers do not face additional costs of production with regulation. However, their output decisions are affected by price changes expected to result from the regulation. The facility survey did provide sufficient information on baseline revenues, costs, or profits. Therefore, estimates of the change in supply were generated as follows:

$$q_{j1}^{Si} = q_{j0}^{Si} \cdot \left[1 + \varepsilon^{Si} \cdot \left(\frac{\Delta p_i - c_j - \alpha \Delta p_{svc}}{p_{i0}}\right)\right] \qquad \text{(A.2)}$$

where

q_{j1}^{Si} is the with regulation supply for facility j,

q_{j0}^{Si} is the baseline supply for facility j,

ε^{Si} is the domestic supply elasticity,

Δp_i is change in price for market i,

c_j is the per-unit control costs for facility j,

α is the share of output distributed through merchant terminals,

Δp_{svc} is the change in the price of merchant services, and

p_{i0} is the baseline price for market i.

A.2.1.2 Foreign Supply (imports)

Foreign producers do not face additional costs of production with regulation. However, their output decisions are affected by price changes expected to result from the regulation. Therefore, changes imports were modeled as follows:

$$q_{F1}^{Si} = q_{F0}^{Si} \cdot \left[1 + \varepsilon^{Si} \cdot \left(1 + \frac{\Delta p_i}{p_{i0}}\right)\right] \tag{A.3}$$

where

q_{F1}^{Si} is the with regulation imports for market i,

q_{F0}^{Si} is the baseline imports for market i,

ε^{Si} is the foreign supply elasticity,

Δp_i is the change in price for market i, and

p_{i0} is the baseline price for market i.

A.2.2 Market Demand

Market demand for market i can be expressed as the sum of domestic and foreign demand, that is,

$$Q^{Di} = q_{dom}^{Di} + q_{F}^{Di} \tag{A.4}$$

where q_{dom}^{Di} is the domestic demand and q_{F}^{Di} is the foreign demand (or exports).

A.2.2.1 Domestic Demand

Changes in domestic demand for each market was computed as follows:

$$q_{dom1}^{Di} = q_{dom0}^{Di} \cdot \left[1 + \eta^{Di} \cdot \left(1 + \frac{\Delta p_i}{p_{i0}}\right)\right] \tag{A.5}$$

where

q_{dom1}^{Di} is the with regulation demand for market i,

q_{dom0}^{Di} is the baseline domestic consumption for market i,

η^{Di} is the domestic demand elasticity,

Δp_i is the change in price for market i, and

p_{i0} is the baseline price for market i.

A.2.2.2 Foreign Demand (Exports)

Changes in domestic demand for each market was computed as follows:

$$q_F^{Di} = q_{F0}^{Di} \cdot \left[1 + \eta^{Di} \cdot \left(1 + \frac{\Delta p_i}{p_{i0}}\right)\right] \tag{A.6}$$

where

q_{F1}^{Di} is the with regulation exports for market i,

q_{F0}^{Di} is the baseline exports for market i,

η^{Di} is the foreign demand elasticity,

Δp_i is the change in price for market i, and

p_{i0} is the baseline price for market i.

A.3 Market for Old Distribution Services

A.3.1 Market Supply

Market supply for OLD distribution services can be expressed as

$$Q^{S_{svc}} = \sum_{j=1}^{n} q_j^{S_{svc}} \qquad \text{(A.7)}$$

where

$q_j^{S_{svc}}$ = supply from plant (j) providing distribution services.

A.3.1.1 Domestic Facility-Level Supply

$$q_{j1}^{Si} = q_{j0}^{Si} \cdot \left[1 + \varepsilon^{Si} \cdot \left(\frac{\Delta p_i - c_j}{p_{i0}}\right)\right] \qquad \text{(A.8)}$$

where

q_{j1}^{Si} is the with regulation supply for facility j,

q_{j0}^{Si} is the baseline supply for facility j,

ε^{Si} is the domestic supply elasticity,

Δp_{svc} is the change in price for the service market,

c_j is the per-unit control costs for facility j, and

p_{svc0} is the baseline price for the service market.

A.3.2 Market Demand

$$Q^{D_{svc}} = \sum_{j=1}^{n} q_j^{Dsvc} \tag{A.9}$$

As noted above, demand for services is derived form the supply decisions of chemical and petroleum producers. Therefore, individual facility demand, $q_j^{D_{svc}}$, is computed as follows:

$$q_j^{Dsvc} = \alpha \cdot q_j^{Si} \tag{A.10}$$

APPENDIX B

ECONOMIC COMPUTATIONS

To prepare the baseline for the economic impact analysis of the OLD NESHAP, EPA used data from a variety of sources, including publicly available data on the chemical and petroleum industry, publicly available data on distribution firms and the independent liquid terminals, and data provided by respondents to the Agency's Organic Liquid Distribution Questionnaire. To establish the baseline for each affected facility and sector, EPA needed to estimate

- baseline quantity of product (chemical or petroleum liquid) at each facility and for the sector as a whole;
- baseline quantity distributed through captive distribution system, for each facility and sector-wide;
- baseline quantity distributed through merchant distributors, for each facility and sector-wide; and
- baseline price of chemicals, petroleum liquids, and merchant distribution services.

B.1 Baseline Quantities of Chemicals and Petroleum Liquids Distributed by Each Facility

All organic liquids produced and marketed in the United States must be distributed. Thus, EPA all organic liquids (except gasoline) sold in the United States could potentially be affected by the OLD NESHAP. EPA has publicly available data on total quantities of organic chemicals and petroleum products produce in the U.S. In addition, EPA has data on organic liquids distribution facilities responding to the OLD questionnaire, and the quantities of organic liquids they distribute. The questionnaire data provide information on a subset of organic liquids, distributed by a subset of organic liquid distributors. To construct the model's baseline, EPA first examined the database information, then developed a method for estimating the volume of organic liquids distributed by the "unknown" organic liquids distribution facilities. This section describes these methods.

B.1.1 Quantities of Organic Liquids Distributed Onsite and Off-site by Known OLD Facilities

To compute the baseline quantity of product distributed at each facility, EPA began with the OLD questionnaire database information on quantities of each organic liquid transferred at each facility. EPA first designated each product distributed by these "known" facilities as either organic chemical or petroleum liquid, then aggregated across products to estimate the quantity of chemicals and/or petroleum products distributed at each known facility.

Facilities in model plant groups 28 and 29 are assumed to both produce and distribute organic liquids. The increased costs associated with the regulation are assumed to directly increase their costs of supplying delivered organic liquids to the organic liquid markets they serve. Facilities in model plant groups 13, 42, 44, 46, and 51 offer off-site distribution services to the producers and consumers of organic liquids. EPA does not have sufficient data to be able to determine which of the off-site suppliers of OLD services offer their distribution services to each organic liquid producer. Thus, EPA has assumed that all of the off-site distribution facilities are merchant suppliers of distribution services, who supply these services to the distribution market. Similarly, EPA is not able to determine which of the organic liquid producers purchase off-site distribution services and which ones supply their organic liquids directly to customers. EPA has computed the share of organic liquid distribution that takes place at off-site facilities (17.4 percent) and assumes that *all* organic liquid producers distribute 17.4 percent of their output through off-site distributors. This is clearly a simplification that reduces the variability of secondary impacts of the NESHAP on organic liquid producers. In the absence of more detailed information, however, it is a reasonable simplifying assumption.

For the market model, EPA assumes that companies owning more than one OLD facility regard their individual facilities as part of a single integrated production and distribution operation. Thus, we model supply at the company level, rather than at the facility level, by summing the quantities distributed at all facilities owned by a company within each model plant group. This is probably a simplification in that companies would consider the profitability of individual facilities incurring unusually high compliance costs in addition to considering the profitability of the overall operation.

B.1.2 Estimating Quantities of Organic Liquids Distributed by Unknown OLD Facilities

To complete the baseline characterization of quantities of organic liquids distributed by OLD facilities, EPA created pseudo-facilities and assigned quantities of organic liquids to them. EPA has an estimate of the number of OLD facilities represented by each model plant. Subtracting known OLD facilities from the database that are assigned to each model plant from the total number represented by each model plant yields an estimated number of unknown plants in a model plant group. The unknown facilities are divided between those incurring only monitoring, recordkeeping, and reporting costs (MRR-only facilities) and those incurring costs of compliance control and MRR costs. Table B-1 presents the number of known and unknown facilities by model plant group.

Table B-1. Number of Known and Unknown Facilities by Model Plant Group

Model Plant Group	Total Facilities	Known Facilities	Unknown Facilities
13	2	2	0
28	183	59	124
29	93	31	62
42	57	21	36
44	1	1	0
46	16	16	0
51	29	10	19
Total	381	140	241

.

EPA used a two-step process to estimate the quantity of organic liquids distributed by the unknown facilities. First, for model plant groups 28 and 29, EPA assigned quantities randomly over the interval between the minimum and maximum quantities distributed by facilities in each model plant group. Then, EPA estimated the total quantity of merchant distribution services demanded by these unknown facilities in model plant groups 28 and 29 by multiplying their total distribution times 0.174. EPA allocated employment to the unknown facilities within each model plant group randomly over the range of actual employment for known facilities in each model plant group and allocated the merchant distribution quantity to these facilities proportional to their estimated employment.

It should be noted that EPA analyzed the Trans-Alaska Pipeline (TAP) differently from other merchant distributors. According to the OLD database, the TAP distributes 715,851,794 Mt per year, 55 times the total for all other model plant group 46 firms. This volume of crude oil also represents more than half of the total market quantity of petroleum products distributed in the U.S. in a year. Clearly, the TAP is completely different from the other "merchant" distributors in our database. For this reason, EPA has chosen to model the impacts of the NESHAP on the TAP separately from the market model. The impact of the rule on the owners of the TAP will be approximated by examining the costs of the rule for the TAP as a share of the baseline company revenues of the largest shareholder in the consortium that owns and operates the TAP (BP/Amoco).

B.2 Market Prices of Organic Liquids and Distribution Services

EPA obtained data on product-specific prices for organic liquids mentioned in the OLD database. EPA estimates the market price for organic chemicals as the quantity-weighted average of the prices for organic liquids designated as organic chemicals. Similarly, EPA estimates the market price for petroleum liquids as the quantity-weighted average of the prices for organic liquids designated as petroleum liquids.

The market price of organic liquid distribution services was found by first estimating the cost of OLD services, then setting the price equal to the maximum average cost. The costs of distribution services were estimated based on loading, unloading, and tank storage costs, scaled to the volume of liquid distributed. Baseline costs of merchant distribution services range from $1.68/Mt to $12.32/Mt. The baseline market price of distribution services is thus set at $12.32/Mt.

B.3 Compliance Costs per Facility

EPA estimated costs of complying with the rule based on 16 model plants, and assigned each known facility to a model plant. Within each model plant, a range of compliance costs are possible depending on the baseline equipment and processes in place at a facility. EPA has estimated costs for

Because some of the OLD facilities are located in ozone nonattainment areas, and would therefore be likely to have LDAR and MRR operations in effect at baseline, EPA also prepared sensitivity analyses that reduce the costs of compliance for each facility located within a nonattainment area by the amount of MRR costs and by the sum of MRR and LDAR costs.

B.3.1 Scaling Nonbehavioral Impacts to Provide Industry-Wide Estimates

Of the 381 facilities potentially affected by the rule, 140 are estimated to incur costs . For the nonbehavioral analysis, of company impacts used in the SBREFA screening analysis, EPA did not create simulated facilities. Instead, EPA computed scaling factors relating the number of known facilities to the total number of facilities within each model plant group (see Table B-2):

$$\left[\frac{N_i}{n_i}\right] \tag{B.1}$$

where

N_i = number of facilities estimated to incur compliance costs for model plant group i, and

n_i = number of known facilities in model plant group i.

Table B-2. Facility Counts and Scaling Factor for each Model Plant Group

Model plant group	Total Number of Facilities in Model Plant Group	Number of Known Facilities in Model Plant Group	Scaling Factor
13	2	2	1.0
28	183	59	3.1
29	93	31	3.0
42	57	21	2.7
44	1	1	1.0
46	16	16	1.0
51	29	10	2.9

Using these scaling factors, we estimate the impacts incurred by all facilities that incur costs. This method also assumes that the facilities estimated to incur costs for control and MRR that are unknown are similar to the known facilities in the same model plant group, and that the companies that own them are also similar.

B.4 Company-Level Factors: Cost-to-Sales Ratios (CSRs) and Scaling Factors

To assess the potential economic impact of the rule on companies, the Agency calculated a cost-to-sales ratio as follows:

$$CSR\ (\%) = \left[\frac{\sum_{i=1}^{n} C_{fi}}{Sales} \right]_p \cdot 100 \qquad (B.3)$$

where ΣC_{fi} is the sum of the annual control cost for all facilities owned by company p and sales is the total revenue for company p.

Baseline company profit margins were collected from secondary source data (see Section 2). If these margins were not available, an industry profit margin (D&B return-on-sales) was used for the company. With-regulation profit margins were computed by subtracting the CSR from the baseline profit margin.

B.4.1 Scaling Company Impacts to Provide Industry-Wide Estimates

To estimate company impacts on an industry-wide basis, the Agency used a scaling process similar to the approach used for facilities. First, we assign a company model plant group based on the model plant group for the largest number of facilities owned by the company. Next, we compute the average number of facilities per company by model plant group, based on the facilities and companies in the database as follows:

$$\frac{F_k}{n_k} \qquad (B.4)$$

where

F = number of firms,

n = number of facilities, and

k = known facilities in database.

We then create a company scaling factor for each model plant group by dividing the total number of facilities by the average number of facilities per company. This method provides an estimate of the total number of companies in that model plant group.

$$F_t = \frac{n_t}{\left[\frac{F_k}{n_k}\right]} \tag{B.5}$$

where

F	=	number of firms,
n	=	number of facilities,
k	=	known in database, and
t	=	total number affected.

Next, we compute the scaling factor for the model plant group as the ratio of the estimated total number of companies divided by the companies in the database.

$$S = \left[\frac{F_t}{F_k}\right] \tag{B.6}$$

Finally, we tabulate the cost-to-sales and profit margin results by model plant group and scale it up using the scaling factor.

APPENDIX C

OLD ECONOMIC IMPACT ANALYSIS: SENSITIVITY ANALYSIS FOR DIFFERENT SCENARIOS

To provide an alternative set of results that incorporate differing assumptions about baseline controls at affected plants, EPA conducted sensitivity analysis, varying the costs assigned to facilities depending on whether they are located in NAAQS ozone nonattainment areas. EPA expects that facilities located in 1-hour NAAQS ozone nonattainment areas will have MRR and perhaps also LDAR operations in effect at baseline. Such facilities would not incur the full estimated compliance costs, but rather they would incur the estimated total annual cost minus either monitoring recordkeeping and reporting and leak detection and repair costs (Sensitivity Scenario A) or total annual costs minus monitoring, recordkeeping and reporting (Sensitivity Scenario B). This appendix presents results of these sensitivity analyses. Tables C-1 through C-4 present the results of Sensitivity Scenario A, and Tables C- through C-8 present the results of Sensitivity Scenario B.

Overall, if facilities in NAAQS ozone nonattainment areas have monitoring, recordkeeping, and reporting operations in place at baseline (Sensitivity Scenario B), the social cost of the rule will be $12.5 million instead of $17.6 million. Operating profits will fall by $6.0 million nationwide as opposed to $8.5 million. Price and output changes will also be somewhat diminished. If in fact affected facilities located in NAAQS ozone nonattainment areas have both leak detection and repair and monitoring, recordkeeping, and reporting operations in effect at baseline (Sensitivity Scenario A), estimated impacts of the rule will be even smaller. Social cost will be $5.4 million rather than $17.6 million, and profits will fall by $2.5 million rather than $8.5 million.

Table C-1. Market-Level Industry Impacts of the Organic Liquid Distribution (OLD) NESHAP: 1997

Sensitivity A: No LDAR or MRR for Nonattainment Area Facilities

	Baseline	With Regulation	Change	
			Absolute	Relative
Petroleum Products				
Price ($/metric ton)	$191.84	$191.84	$0.001	0.000%
Quantity (10^6 metric tons/yr)	2,365	2,365	–0.01	–0.000%
Domestic	1,924	1,924	–0.01	–0.000%
Foreign	441	441	0.00	0.000%
Chemical Products				
Price ($/metric ton)	$498.65	$498.65	$0.002	0.000%
Quantity (10^6 metric tons/yr)	836	836	–0.00	–0.001%
Domestic	825	825	–0.00	–0.001%
Foreign	11	11	0.00	0.001%
Distribution Services				
Price ($/metric ton)	$12.32	$12.32	$0.01	0.036%
Quantity (10^6 metric tons/yr)	478	478	–0.00	–0.001%

Table C-2. National-Level Industry Impacts of the Organic Liquid Distribution (OLD) NESHAP: 1997

Sensitivity A: No LDAR or MRR for Nonattainment Area Facilities

	Absolute Change
Petroleum	
Revenue	–$0.01
Costs	$1.08
Operating Profit	–$1.08
Facilities	0
Chemicals	
Revenue	–$0.80
Costs	$0.76
Operating Profit	–$1.56
Facilities	0
Distribution Services	
Revenue	$2.07
Costs	$1.97
Operating Profit	$0.10
Facilities	-1
Total	
Revenue	$1.28
Costs	$3.81
Operating Profit	–$2.53
Facilities	-1

Table C-3. Distribution of Social Costs Associated with Organic Liquids Distribution (OLD) NESHAP: 1997

Sensitivity A: No LDAR or MRR for Nonattainment Area Facilities

	Value ($\$10^6$/yr)
Change in Consumer Surplus	**–$3.19**
Petroleum	–$1.60
Chemical	–$1.59
Change in Producer Surplus	**–$2.21**
Domestic Producers	–$2.53
Petroleum	–$1.08
Chemical	–$1.56
Distribution Services	$0.10
Foreign Producers	$0.32
Petroleum	$0.30
Chemical	$0.02
Total Social Cost	**–$5.40**

Table C-4. Company Impacts Associated with Organic Liquids Distribution (OLD) NESHAP: 1997

Sensitivity A: No LDAR or MRR for Nonattainment Area Facilities

	Large Companies	Small Companies
Cost-to-Sales Ratio		
Minimum	0.00%	0.00%
Median	0.00%	0.02%
Maximum	3.76%	0.07%
Number of Companies with		
CSR less than 1%	133	16
CSR 1% to 3%	3	0
CSR over 3%	3	0
Percent Change in Profits		
Minimum	-46.7%	-7.8%
Median	0.0%	-0.2%
Maximum	1.4%	0.0%
Number of companies for which		
Profits increase or are unchanged	54	3
Profits decrease by less than 1%	73	11
Profits decrease by 1% to 5%	5	0
Profits decrease by more than 5%	5	3

Table C-5. Market-Level Industry Impacts of the Organic Liquid Distribution (OLD) NESHAP: 1997

Sensitivity B: No MRR for Nonattainment Area Facilities

	Baseline	With Regulation	Change	
			Absolute	**Relative**
Petroleum Products				
Price ($/metric ton)	$191.84	$191.84	$0.001	0.001%
Quantity (10^6 metric tons/yr)	2,365	2,365	–0.01	–0.000%
Domestic	1,924	1,924	–0.01	–0.001%
Foreign	441	441	0.00	0.001%
Chemical Products				
Price ($/metric ton)	$498.65	$498.71	$0.005	0.001%
Quantity (10^6 metric tons/yr)	836	836	–0.01	–0.001%
Domestic	825	825	–0.01	–0.001%
Foreign	11	11	0.00	0.001%
Distribution Services				
Price ($/metric ton)	$12.32	$12.33	$0.01	0.061%
Quantity (10^6 metric tons/yr)	478	478	–0.00	–0.001%

Table C-6. National-Level Industry Impacts of the Organic Liquid Distribution (OLD) NESHAP: 1997

Sensitivity B: No MRR for Nonattainment Area Facilities

	Absolute Change
Petroleum	
Revenue	–$0.01
Costs	$2.16
Operating Profit	–$2.17
Facilities	0
Chemicals	
Revenue	–$2.05
Costs	$1.88
Operating Profit	–$3.93
Facilities	0
Distribution Services	
Revenue	$3.55
Costs	$3.47
Operating Profit	$0.08
Facilities	-1
Total	
Revenue	$1.49
Costs	$7.50
Operating Profit	–$6.01
Facilities	-1

Table C-7. Distribution of Social Costs Associated with Organic Liquids Distribution (OLD) NESHAP: 1997

Sensitivity B: No MRR for Nonattainment Area Facilities

	Value ($\$10^6$/yr)
Change in Consumer Surplus	**–$7.14**
Petroleum	–$3.20
Chemical	–$3.94
Change in Producer Surplus	**–$5.37**
Domestic Producers	–$6.01
Petroleum	–$2.17
Chemical	–$3.93
Distribution Services	$0.08
Foreign Producers	$0.65
Petroleum	$0.60
Chemical	$0.05
Total Social Cost	**–$12.5**

Table C-8. Company Impacts Associated with Organic Liquids Distribution (OLD) NESHAP: 1997

Sensitivity B: No MRR for Nonattainment Area Facilities

	Large Companies	Small Companies
Cost-to-Sales Ratio		
Minimum	0.00%	0.00%
Median	0.00%	0.02%
Maximum	3.76%	0.07%
Number of Companies with		
CSR less than 1%	133	16
CSR 1% to 3%	3	0
CSR over 3%	3	0
Percent Change in Profits		
Minimum	-46.7%	-7.8%
Median	0.0%	-0.2%
Maximum	1.4%	0.0%
Number of companies for which		
Profits increase or are unchanged	60	5
Profits decrease by less than 1%	68	8
Profits decrease by 1% to 5%	5	3
Profits decrease by more than 5%	5	0