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SURFACE TRANSPORTATION

Issues Associated With Pipeline Regulation by the Surface Transportation Board

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The Honorable John McCain
Chairman
The Honorable Ernest F. Hollings
Ranking Minority Member
Committee on Commerce, Science,
and Transportation
United States Senate

The Honorable Bud Shuster
Chairman
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Ranking Minority Member
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House of Representatives

The Surface Transportation Board (STB) was created in 1996 as a successor agency to the Interstate Commerce Commission (ICC). STB regulates, among other things, the rates charged by interstate pipelines carrying products other than gas, oil, or water.[1] The ICC Termination Act of 1995 requires that we report to you on the impact of STB's regulation on pipeline competitiveness. You were particularly concerned about the impact of STB's regulation on the transportation of anhydrous ammonia (an important crop fertilizer in the Midwest). Accordingly, this report examines (1) the historical reasons for regulating pipelines; (2) STB's role in regulating pipelines, including the number of pipelines regulated by STB; (3) the ability of alternatives to compete with pipelines that transport anhydrous ammonia to the Midwest; and (4) issues before the Congress as it examines whether to extend, modify, or rescind STB's authority to regulate pipelines.

Results in Brief

Historically, the federal government has regulated the rates charged by interstate pipelines because these pipelines have the characteristics of natural monopolies and associated cost advantages that make it difficult for other pipelines or other transportation modes to compete. Specifically, because pipelines are expensive to build—but relatively inexpensive to

[1]Pipeline safety is the responsibility of other agencies, including the Office of Pipeline Safety within the Department of Transportation and the Environmental Protection Agency. Oil and natural gas pipelines are regulated by the Federal Energy Regulatory Commission. Water pipelines are primarily intrastate and are regulated by the states.

operate—it is more efficient to build one large pipeline to transport a given amount of a commodity rather than two or more smaller pipelines. In addition, low operating costs may enable a pipeline to reduce its rates temporarily if faced with competition from other modes of transportation. The regulation of pipelines has been imposed to ensure that all shippers have access to pipeline transportation services and that the rates charged by pipeline carriers for these services are reasonable and nondiscriminatory.

The ICC Termination Act of 1995 limited the Surface Transportation Board's role in regulating pipelines by specifying that the Board can investigate pipeline issues only in response to a complaint by a shipper or other interested party. The act also eliminated the requirement for pipeline carriers to file the rates they charge to transport commodities, which was the sole reporting requirement for pipelines under the Interstate Commerce Commission's regulation. Over the last 10 years, only five cases concerning pipeline issues have come before the Interstate Commerce Commission or the Surface Transportation Board—one of these cases is ongoing. One factor that may have limited the number of cases is that over half of the 21 pipelines we identified as subject to the Surface Transportation Board's oversight have entered into multiyear contracts with shippers to provide guaranteed rates in return for minimum shipment volumes. The use of these contracts makes it less likely that shippers will be dissatisfied with the rates charged by a pipeline.

The ability of alternatives to pipelines—local production plants and barge and rail transport—to compete with the two anhydrous ammonia pipelines in the Midwest varies, depending on their (1) access to market areas served by the pipelines and (2) ability to increase their supply of anhydrous ammonia to compete within those market areas. While some market areas currently served by the pipelines also have access to alternatives, other market areas may not. However, even where alternatives to the pipelines are available, they may not offer effective competition because they have limited ability to increase their supply of anhydrous ammonia without additional investments in capital. Because of the large number of local markets that exist along the two midwestern anhydrous ammonia pipelines, we were not able to definitively determine the number of market areas that do or do not have competitive alternatives to the pipelines.

No clear conclusions can be reached on whether the continued economic regulation of pipelines under the Surface Transportation Board's jurisdiction is needed because such a determination requires the examination of competition in numerous local markets along 21 pipelines. However, as the Congress considers reauthorizing the Surface Transportation Board, issues to consider include (1) whether pipelines lack effective competition in a significant number of market areas, and subsequently have the potential to charge unreasonably high rates; (2) what are the costs of regulating pipelines; (3) whether the limited number of pipeline cases in the history of the Surface Transportation Board and its predecessor indicates that there is no need for continued regulation; and (4) whether shippers would have any recourse if the Surface Transportation Board's economic regulation of pipelines were eliminated.

Background

STB is an independent agency administratively housed within the Department of Transportation. It is responsible for the economic regulation of interstate surface transportation to ensure that competitive and efficient transportation services are provided to meet the needs of shippers, receivers, and consumers. While STB is primarily responsible for railroads, it also regulates pipelines that provide interstate transportation of commodities other than oil, gas, or water. This oversight involves ensuring that pipelines fulfill their "common carrier" obligations. These obligations include (1) charging reasonable rates; (2) providing rates and services to all upon reasonable request; (3) not unfairly discriminating among shippers; (4) establishing classifications, rules, and practices that are reasonable; and (5) interchanging traffic with other carriers or modes of transportation.

As part of its oversight of pipeline rates, STB may investigate complaints from shippers that pipeline rates are high. An important element of an STB rate investigation is the determination of the methodology to apply in evaluating the reasonableness of rates. STB does not have specific guidelines for investigating the reasonableness of the rates pipeline carriers charge. Instead, when feasible, it refers to the "rate reasonableness guidelines" that it developed for railroad rate cases.[2] Under those rate reasonableness guidelines, shippers have the option of presenting evidence that the rates being charged for particular services exceed the rates that a hypothetical, fully efficient carrier would need to charge to cover all its costs (including a fair return on investment). While the ICC Termination Act specifically sanctioned such an approach, shippers

[2]The rate reasonableness guidelines, also known as constrained market pricing, incorporate four basic constraints on a carrier's pricing. STB does not have formal guidelines for investigating complaints that rail or pipeline rates are alleged to be discriminatory.

may also present evidence supporting the use of alternative methodologies to demonstrate the unreasonableness of rates.

However, the ICC Termination Act does require STB to take several specific factors into consideration, including the availability of other economic transportation alternatives.[3] STB examines these alternatives to determine whether a pipeline carrier can exercise significant market power—the ability to charge rates that are unreasonably high relative to the cost of providing the service. If competition is sufficient to prevent a pipeline carrier from exercising market power, STB believes that, absent unreasonable discrimination among shippers, the marketplace should be allowed to determine the most efficient level of prices.[4] In determining whether a carrier can exercise market power, STB looks for the existence of (1) other carriers, including those from other modes of transportation, that could transport the commodity; (2) other sources of the commodity; and (3) the availability of other products that could be substituted for the commodity. STB also examines other factors, such as the costs and capacity associated with each alternative. For example, while a barge terminal may be located close to a pipeline terminal that delivers the same commodity, the barge terminal's capacity for shipping additional amounts of the commodity may not be sufficient to compete effectively.

The ICC Termination Act authorized STB to exempt pipelines from rate regulation. Exemption proceedings may be initiated by STB or at the request of an interested party. As of February 1998, STB had neither initiated any pipeline exemption proceedings nor received any requests to do so. STB may also revoke an exemption, if necessary.

During congressional consideration of the ICC Termination Act, one commodity under ICC's jurisdiction and now under STB's jurisdiction—anhydrous ammonia—was of particular interest. Anhydrous ammonia, a nitrogen-rich compound, is the basic building block for the nitrogen chemical industry. About 75 percent of the anhydrous ammonia

[3]The act also requires STB to consider the effect of a certain rate level on the movement of traffic by the pipeline carrier and the pipeline carrier's need for revenues that are sufficient to enable it, if it is efficient, to provide the transportation or service at issue.

[4]In the regulation of rail rates, a finding that a carrier cannot exercise market power deprives STB of jurisdiction to review the rates' reasonableness. For pipelines, the absence of market power does not deprive the agency of jurisdiction over the level of the rates; rather, it is a factor that must be considered in STB's review.

used in the United States is used as a nitrogen fertilizer for crops,[5] while the remaining 25 percent is used in nonagricultural applications, as a refrigerant or as a component in producing plastics, fibers, and resins, for instance. Anhydrous ammonia is classified as a hazardous substance because it is a corrosive chemical that can severely burn the skin and eyes.

Pipelines Have Inherent Cost Advantages That Historically Have Led Them to Be Regulated

Historically, the federal government has regulated the rates charged by interstate pipelines because these pipelines have the characteristics of natural monopolies and associated cost advantages that make it difficult for other pipelines or other transportation modes to compete. The regulation of firms with these characteristics has been imposed to enforce the common carrier obligations, including ensuring that, in the absence of competition, the firms do not charge unreasonably high rates relative to the cost of producing the good or providing the service.

The Federal Government Historically Has Regulated Industries With Natural Monopoly Characteristics

The federal government has often regulated industries engaged in interstate competition when the market structure exhibits the characteristics of a natural monopoly. A market's structure refers to the characteristics of firms and purchasers of a particular product and the way their interaction determines the market price and quantities transacted. Markets that have a competitive structure should, by their nature, have product prices that are low relative to the cost of producing the good. The key characteristics of competitive markets are the presence of many firms producing a good (so that no one firm has influence over the market price) and the lack of any significant barriers to new firms entering or exiting the market.

Markets may not be competitively structured when the production of a good entails significant economies of scale, meaning that firms need to be fairly large in relation to the market to be served in order to produce the good efficiently. In particular, a large firm may be considered a natural monopoly if it has very high fixed costs but low marginal costs of production, enabling it to produce the good at a lower per-unit cost than any combination of two or more firms. This single firm has the ability to temporarily charge low prices in the face of real or potential competition, thus frustrating the emergence of competitive alternatives. However, in the absence of competition, the firm could, if unregulated, charge rates that are high relative to the cost of providing the service. Economic

[5]Anhydrous ammonia is used as a fertilizer in two ways: (1) "direct application," in which ammonia is injected directly into the soil and (2) "upgrades," in which ammonia is used as a component in other nitrogen fertilizers—either liquid or dry—before being applied to cropland.

regulation, then, is intended to protect consumers against the unreasonably high prices that might be charged by an unregulated natural monopolist.

Pipelines Have Been Regulated Because of Concerns Over Their Natural Monopoly Characteristics

Interstate pipelines have historically been regulated because of concerns that they have the characteristics of natural monopolies and, if left unregulated, pipeline companies could exercise market power to set unreasonably high rates—relative to costs—for transporting goods.[6] Pipelines exhibit significant economies of scale for transporting bulk liquid or gas commodities.[7] These economies of scale result in low operating costs because, after a substantial initial investment for construction, the marginal (or additional) cost of transporting an additional unit of a commodity through a pipeline is extremely low. In addition, larger pipelines have lower operating costs than smaller pipelines because transport capacity rises more than proportionately with increases in the diameter of the pipeline. For example, a pipeline that is 12 inches in diameter can transport more than twice as much as a pipeline that is 8 inches in diameter.[8] These characteristics make it more efficient to build one large pipeline rather than two or more small pipelines and may also make it difficult for other modes, such as water carriers (barges), railroads, and trucks, to compete.

Pipelines also offer transportation advantages over other modes: They provide safe and dependable service with little opportunity for accidents and weather-related delays because the product is transported underground and is completely encased. For example, out of more than 7,000 accidents involving railroad, barge, and pipeline transport in 1995, only about 350, or 5 percent, occurred on pipelines.[9]

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[6]Regulation has also been imposed because of concerns that pipelines may not act as common carriers and may discriminate among shippers, including refusing to provide service to certain shippers.

[7]Pipelines play a key role in the domestic movement of several liquid and gas bulk commodities. In 1994, pipelines transported more than half of the crude oil and refined petroleum products. Pipelines also play an important role in transporting natural gas in the United States. Federal and industry sources do not maintain information on the amounts shipped for nonpetroleum and nongas products, such as anhydrous ammonia and carbon dioxide.

[8]The throughput volume of a pipeline is roughly proportional to the square of its diameter. Therefore, the throughput volume of a pipeline that is 12 inches in diameter is about 2.25 times as much as that of a pipeline that is 8 inches in diameter.

[9]While pipelines offer advantages over other modes of transportation, they also have some disadvantages. Because they are suited only for bulk transportation of liquid or gas commodities, pipelines can provide service for only a limited number of commodities. Pipelines are also fixed geographically, limiting the number of access and delivery points.

The federal economic regulation of interstate pipelines is provided by two agencies: the Federal Energy Regulatory Commission and STB. Most pipelines—for oil and natural gas—are regulated by the Federal Energy Regulatory Commission. These pipeline carriers are required to file reports disclosing the rates charged to transport commodities through their pipelines and, in most cases, an annual report on their operations. As described in the next section, STB does not require such filings from the pipeline carriers under its jurisdiction.

Barges come closest to meeting pipelines' low operating costs and rates for transportation. However, domestic barge transportation is limited to areas that are accessible by river and by weather conditions that restrict it during winter and periods of severe flood or drought. While railroads offer more flexibility in delivery points, rail transportation is generally more expensive. Truck delivery is also much more costly than pipeline delivery over long distances and, when used at all, generally complements, rather than competes with, delivery by pipeline or barge because trucks generally deliver the product from pipeline or barge delivery points to final retail destinations.

STB Has a Limited Regulatory Role for Pipelines

The ICC Termination Act provided a limited role for STB in the economic regulation of pipelines. The act retained the requirement that pipeline carriers must fulfill the entire range of common carrier obligations. However, STB—unlike ICC—may not begin investigations of a pipeline's rates on its own initiative. Instead, STB may begin investigations only in response to complaints by shippers or other affected parties. In addition, the act eliminated the requirement for pipeline carriers to file the rates they charge to transport goods—which was the sole reporting requirement under ICC—and does not provide STB with any authority to regulate a pipeline carrier's decision to enter or abandon markets.

STB does not routinely collect information from pipeline carriers. As a result, STB does not attempt to identify all products or pipelines under its jurisdiction. We identified five products—anhydrous ammonia, carbon dioxide, coal slurry, hydrogen, and phosphate slurry—carried by 21 pipelines subject to STB's jurisdiction. (See table 1.) Appendix I provides more detailed information about each of these products and pipelines.

Table 1: Commodities Transported by Pipelines Under STB's Jurisdiction

Commodity	Number of pipelines
Anhydrous ammonia	4
Carbon dioxide	14
Coal slurry	1
Hydrogen	1
Phosphate slurry	1
Total	**21**

Sources: Office of Pipeline Safety, Department of Transportation; STB; the Federal Energy Regulatory Commission; and pipeline operators.

According to STB officials, over the past 10 years, only five cases concerning pipeline issues have come before STB or its predecessor, ICC.[10] One case concerned a pipeline's status as a common carrier and the obligation to file its rates in response to the request of an independent shipper. Three of the cases—one of which is ongoing—involved investigations of the reasonableness of pipeline rates, as well as other common carrier issues.[11] The fifth case concerned ICC's jurisdiction over anhydrous ammonia pipelines. STB is currently receiving evidence in the ongoing case, which was initiated in March 1996, and expects to issue a final decision by the statutory deadline of March 1999. As a result of this limited caseload, STB devotes few resources to pipeline issues. For example, STB devoted the equivalent of 1.1 full-time staff positions in fiscal year 1997—out of a total of about 131 for the agency as a whole—to pipeline issues.

The use of contracts may explain why there have been only five cases related to pipeline issues. Shippers sometimes find it economically advantageous to enter into long-term contracts with pipeline carriers to ship certain volumes at rates that are typically lower than noncontract rates. The ICC Termination Act specifies that the rates charged for the transportation of most commodities provided under contract by rail carriers are not subject to STB's jurisdiction. Although the act has no corresponding provision for STB's regulation of pipelines, STB officials stated that shippers that have entered into contracts with pipeline carriers are probably much less likely to file a rate complaint with STB. We determined that over half of the pipelines transporting commodities

[10]STB officials advised us that a very limited number of additional cases have been disposed of by ICC or STB staff offices under delegations of authority from the Commission or Board.

[11]The ongoing case involves a complaint by CF Industries, Inc., and Farmland Industries, Inc., against the Koch Pipeline Company, which owns an anhydrous ammonia pipeline.

subject to STB's jurisdiction—12 out of 21—currently have contracts with their shippers.[12]

Ability of Alternatives to Compete With Anhydrous Ammonia Pipelines Varies Across the Midwest

The ability of alternatives to anhydrous ammonia pipelines—local production within the Midwest, as well as barge and rail transport from other areas of the United States—to compete with pipelines within local market areas in the Midwest depends on two factors.[13] First, because storage terminals are key to the distribution of anhydrous ammonia in local midwestern market areas, alternatives must have access to storage terminals within market areas that are also served by pipelines. Second, alternatives to pipelines must have the ability to increase their supply of anhydrous ammonia to serve these markets. Considering these factors, alternatives to pipelines may not offer effective competition because they may not have access to all the market areas served by the pipelines and because they have limited ability to increase their supply of anhydrous ammonia without additional investments in capital. In addition, it does not appear likely that a significant number of farmers would choose to substitute other forms of nitrogen fertilizer for the direct application of anhydrous ammonia if pipeline transport rates increased because these rates are a relatively small portion of the price of anhydrous ammonia to farmers.

Anhydrous Ammonia Is Supplied to the Midwest Through Four Sources

Local production and pipeline, barge, and rail transport from production plants in other areas of the United States, currently supply anhydrous ammonia to the Midwest. Of the estimated 6.4 million tons of anhydrous ammonia used in the Midwest in 1996, local production and pipelines accounted for the largest portion—about 47 percent and 33 percent, respectively. Barge and rail shipments accounted for the remainder. (See table 2.)

[12]For five of the nine pipelines that do not use contracts, the pipeline owners are the only shippers.

[13]Midwestern states are Illinois, Indiana, Iowa, Kansas, Kentucky, Michigan, Minnesota, Missouri, Nebraska, Ohio, South Dakota, and Wisconsin.

Table 2: Sources of Anhydrous Ammonia for Midwestern States, 1996

Source	Estimated amount (tons in millions)	Percent
Local production	3.0	47
Pipelines	2.1	33
Barge	0.9	14
Rail	0.4	6
Total	**6.4**	**100**

Sources: GAO's analysis of data from Blue, Johnson, and Associates (fertilizer industry consultant); pipeline and barge carriers; and data on railroad shipments maintained by the Association of American Railroads.

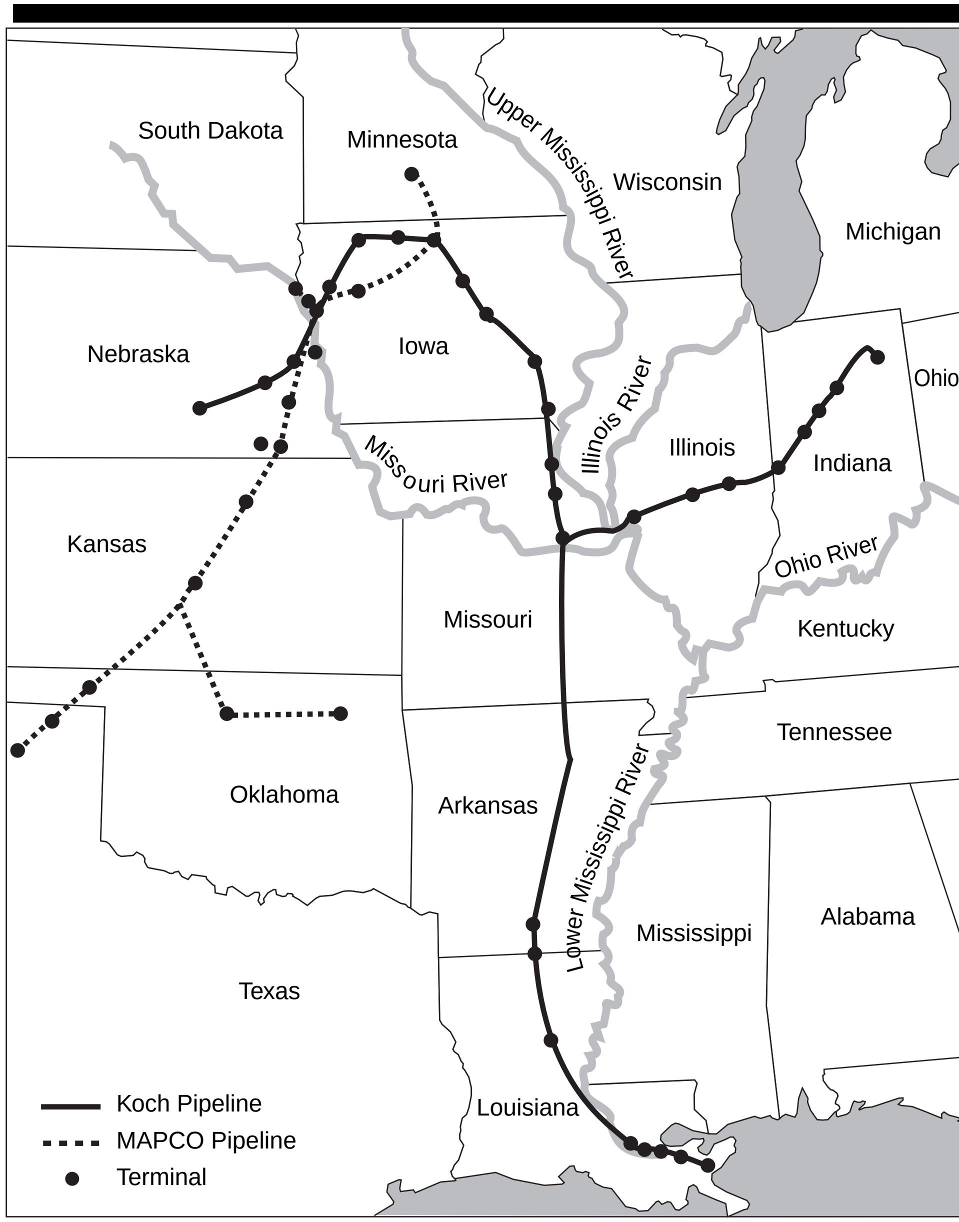
Local Production

Ten anhydrous ammonia production plants are scattered throughout the Midwest. These plants primarily produce anhydrous ammonia as the first step in manufacturing other forms of nitrogen fertilizer, such as urea-ammonium nitrate solutions and urea (called "upgrades"), rather than for direct application to fields. Of the 10 production plants in the Midwest, 9 can manufacture upgrades. The remaining plant produces anhydrous ammonia for direct application as a fertilizer.

Pipeline

Two pipelines, one owned by Koch Pipeline Company, L.P., and one owned by MAPCO Ammonia Pipeline, Inc., carry anhydrous ammonia from Louisiana, Oklahoma, and Texas to the midwestern states. (See fig. 1.)

Figure 1: Koch and Mapco Pipelines



Note: Anhydrous ammonia is generally injected into the pipelines at the Louisiana, Oklahoma, and Texas terminals.

Sources: Koch Pipeline Company, L.P., and MAPCO Ammonia Pipeline, Inc.

Rates charged to transport anhydrous ammonia through these pipelines ranged from about $14 to $36 per ton in 1997, depending on the area of delivery in the Midwest.[14] Pipeline shippers and fertilizer dealers we spoke with told us that these pipelines are the most dependable means of transporting anhydrous ammonia to the Midwest because they are always full, resulting in instantaneous delivery of certain volumes of the product.[15] This feature is particularly important during peak application seasons, when storage tanks may be depleted and a quick, dependable source of additional supply is needed to meet the demand for anhydrous ammonia throughout the remainder of the season.

Barge

Barges transport anhydrous ammonia from Louisiana to the Midwest, primarily up the Mississippi, Illinois, and Ohio rivers. Although barge transportation is slower—taking about 11 days to travel from Louisiana to the Midwest—it is a primary source of supply in some areas and may have rates that are lower than pipeline rates. For example, barge rates for transporting anhydrous ammonia from Louisiana to Missouri, Illinois, and Indiana ranged from $20 to $27 per ton in 1997, while pipeline rates ranged from $19 to $36 per ton. However, barge rates to Iowa and Minnesota on the upper Mississippi River ranged from $28 to $37 per ton compared with $22 to $28 per ton on a pipeline. In addition, the upper Mississippi River is generally closed for about 3 months during the winter, making it difficult for barge terminals in this area to obtain a dependable supply of anhydrous ammonia during that season.

Rail

Rail shipment is typically not used in areas served by pipeline or barge because rail deliveries of anhydrous ammonia are generally more expensive and less dependable. For example, rail shipments from Louisiana to Missouri and Illinois ranged from $25 to $55 per ton in 1996 (the latest date for which data were available), while pipeline rates ranged from $19 to $30 per ton. Shippers told us that railroads generally require about a week or more for delivery and do not offer a dependable supply of anhydrous ammonia, especially during the peak application seasons. For these reasons, rail is generally used to bring anhydrous ammonia to the Midwest from areas that are not served by the pipelines, such as sources of production in Canada.

[14]In Dec. 1997, the retail price for anhydrous ammonia in the Midwest was about $250 per ton.

[15]The demand for the delivery of anhydrous ammonia to terminals may exceed the amount that can be delivered by a pipeline during the peak seasons in the spring and fall. If this occurs, pipeline carriers generally allocate supply to shippers on the basis of the volume transported by each shipper during the preceding year.

Storage Terminals Are Key to Anhydrous Ammonia Markets in the Midwest

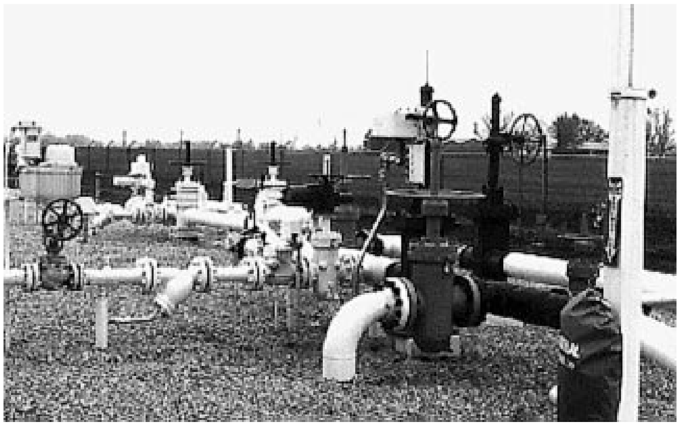
The highly seasonal demand for anhydrous ammonia applied directly to fields as a fertilizer makes it important to have large amounts of anhydrous ammonia stored close to farms. In 1996, about 3.4 million tons of anhydrous ammonia—or about 53 percent of the total midwestern demand of 6.4 million tons for agricultural and industrial uses—was applied as fertilizer directly to fields for crops, such as corn, that depend on nitrogen fertilizer. This application occurs primarily during a limited period of time in the spring and fall. Each application period may last as little as 10 days because the temperature and moisture content of the soil need to be within certain limits. In addition, the timing of these application periods is difficult to predict because they depend on the weather.

The only way to meet this large, time-critical, and somewhat unpredictable demand for anhydrous ammonia is to have storage locations close to fertilizer dealers and farmers throughout the Midwest. However, the safety requirements associated with handling anhydrous ammonia make it difficult for individual dealers to store large amounts of the product. This safety concern and the associated high costs of storage, combined with the economic efficiency of storing anhydrous ammonia in a centralized location, has led to the practice of storing anhydrous ammonia in large tanks (generally from 20,000 to 40,000 tons of anhydrous ammonia per tank). These tanks, located at 60 terminals throughout the Midwest, are accessible by numerous local fertilizer dealers.

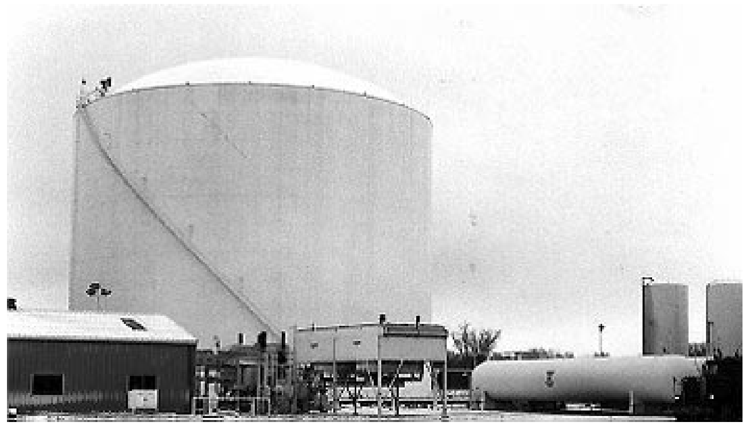
The short application season and high cost of storage require fertilizer dealers to obtain a reliable supply of anhydrous ammonia from nearby terminals. Thus, anhydrous ammonia markets in the Midwest appear to be fairly localized. However, these markets may encompass more than one terminal. (App. II describes the importance of seasonality, storage, and transport in anhydrous ammonia markets in more detail, as well as the difficulty in defining these markets.)

As shown in figure 2, anhydrous ammonia is delivered from the tanks at the storage terminals to farms in three steps. First, specialized tank trucks deliver the anhydrous ammonia from the terminal to local retail fertilizer dealers, where it is stored temporarily in "bullet" tanks. These bullet tanks typically hold from 65 to 200 tons of product each and are replenished multiple times throughout the peak season. Next, the dealers transfer the anhydrous ammonia to smaller "nurse" tanks, each of which holds about 2.5 tons (about 1,000 gallons). Finally, the dealers or farmers transport the nurse tanks to farms, where they are attached to specialized application equipment. The application equipment cuts narrow furrows 8 inches into the soil, injects the anhydrous ammonia into the furrows, and covers the furrows to retain the anhydrous ammonia in the soil.

Figure 2: Anhydrous Ammonia From the Pipeline to the Farmer's Fields



The underground pipeline rises above the ground to deliver anhydrous ammonia to the terminal.



At the terminal, the anhydrous ammonia is stored in refrigerated tanks. This tank holds 25,000 tons.

Trucks with pressurized tanks pick up the anhydrous ammonia at the terminal for delivery to dealerships that sell fertillizer to farmers.

At the dealerships, the anhydrous ammonia is stored in pressurized "bullet" tanks. This bullet tank holds 30,000 gallons (about 77 tons).

Fertilizer dealers typically put the anhydrous ammonia in 1,000 gallon "nurse" tanks for delivery to farms, where the tanks are hooked to application equipment. This application equipment spans 16 rows and injects anhydrous ammonia 8 inches underground.

Ability of Alternatives to Pipelines to Compete Depends on Access to Market Areas and Ability to Increase Supply

The extent to which local production, barge, or rail sources can compete effectively with pipelines within local markets depends on these alternatives' ability to obtain access to local markets that are also served by pipeline terminals. Of the 60 anhydrous ammonia terminals in the Midwest, 28 terminals (47 percent) are on the pipelines.[16] Sixteen of these 28 terminals (57 percent) are served exclusively by a single pipeline; that is, they do not have direct access to alternative sources. (See table 3.) For the remaining 12 terminals, alternative sources that can provide anhydrous ammonia directly to the terminal may limit the pipelines' ability to charge high rates to deliver the product to that terminal.

Table 3: Alternative Types of Access for Terminals Served by Pipelines

Type of access	Number of terminals (percent)
Single pipeline	16 (57)
Pipeline and rail	7 (25)
Pipeline, local production, and rail	2 (7)
Pipeline and barge	2 (7)
Pipelines and rail	1 (4)
Total	**28 (100)**

Note: No other combination of access exists, such as a location served by pipeline, barge, and rail.

Some of the 32 terminals not on the pipelines may also be able to supply anhydrous ammonia to fertilizer dealers in a pipeline terminal's market area and effectively limit the pipeline's ability to charge high rates. For example, if the price of anhydrous ammonia were to increase at a pipeline terminal in response to higher shipping rates on the pipeline, fertilizer dealers in the area could turn to cheaper sources of anhydrous ammonia—such as terminals served by barge, rail, local production, or the other pipeline—if available. If these other sources could increase their supply to serve the pipeline's customers without significant increases in costs, thereby keeping their prices steady, the pipeline terminals might be forced to keep their prices reasonable in order to retain customers. The ability of these 32 terminals to compete with pipeline terminals depends on their proximity to a pipeline and their excess capacity. We were not able to examine individual markets to determine these factors.

However, the ability of local production, barge, and rail sources to expand their supply of anhydrous ammonia beyond current levels without additional investment may be limited. Regarding local production, plants

[16]This represents about 52 percent of the storage capacity in the Midwest.

that devote all or a portion of their anhydrous ammonia production to upgrades are not likely to change their product mix to compete with pipelines. Changing their product mix to produce anhydrous ammonia exclusively would require idling expensive portions of their plants devoted to the manufacture of upgrades. In addition, these plants might have to construct storage tanks and truck loading facilities to deliver the product that was previously upgraded. Alternatively, plants that do not devote their entire production of anhydrous ammonia to upgrades are more likely to offer competition to pipelines, perhaps by changing their distribution channels. For example, a representative from a plant located relatively close to a pipeline told us that the plant currently distributes a portion of the anhydrous ammonia it produces to areas not served by the pipeline. For this plant, changing its distribution channels to serve the market currently served by a pipeline terminal is feasible.

The fleet of specialized barges that transport anhydrous ammonia is currently operating at or near capacity, according to representatives from barge companies. In addition, the owners of barge storage terminals told us that their terminals are operating near capacity. To compete more effectively with the pipelines in areas where barges can travel, owners would have to make substantial capital investments in new barges as well as additional storage at terminals along the rivers. A new barge costs between $4 million and $5 million, while a new barge terminal is estimated to cost approximately $15 million.

Finally, the fertilizer dealers and anhydrous ammonia shippers in the Midwest that we contacted were skeptical about the ability of rail to expand capacity to compete with the volume of product currently provided by the pipelines. Expanding rail capacity to compete with pipelines would require additional rail access and more railcars specifically designed to carry anhydrous ammonia to provide more timely and dependable delivery.

Product Substitution Depends on Farmers' Preferences

If the price of anhydrous ammonia were to increase because of an increase in the rates charged to transport anhydrous ammonia via pipeline, midwestern farmers might convert from using anhydrous ammonia to using upgrades. However, large changes in pipeline transport rates will not lead to significant changes in the final price of anhydrous ammonia because transport rates are a relatively small portion of the price of anhydrous ammonia to farmers. In addition, direct application of anhydrous ammonia offers several advantages over other nitrogen forms.

Pipeline transport rates account for about 10 percent of the cost of anhydrous ammonia to farmers. Compared with upgrades, the cost of the nitrogen in anhydrous ammonia form to farmers is relatively low. For example, in April 1997, the cost to farmers of the nitrogen in anhydrous ammonia form—with 82 percent nitrogen content—was $369 per ton, while the cost of nitrogen in a liquid upgrade form—with 28- to 32-percent nitrogen content—was $533 per ton. Given the magnitude of this cost difference and the relatively low percentage of the cost that can be attributed to pipeline transport rates, it is not likely that changes in the transport rates would significantly affect farmers' choices of the form of fertilizer that they use.

According to the midwestern agronomists we spoke to, even if the price of anhydrous ammonia were to increase in relationship to that for upgrades, many farmers might be unwilling to switch from anhydrous ammonia to upgrades for two reasons. First, many farmers prefer to apply fertilizer in the fall to get a head start on the busy spring planting season. Of the nitrogen fertilizers, anhydrous ammonia is best suited for fall application because the soil loses less of the nutrient during the winter in this form than in other forms. Second, farmers who have invested in equipment to apply anhydrous ammonia may be reluctant to idle that equipment to switch to applying upgrades. (App. II presents a more detailed discussion of the substitutability of upgrades for direct application of anhydrous ammonia.)

Issues Before the Congress in Deciding the Future of STB's Regulation of Pipelines

No clear conclusions can be reached on whether the continued economic regulation of pipelines under STB's jurisdiction is needed because such a determination requires the examination of competition in numerous local markets along 21 pipelines. Such an examination was not feasible for our study; nor was it feasible to address whether anhydrous ammonia pipelines are representative of other pipelines under STB's jurisdiction. However, there will be several issues before the Congress as it decides whether to extend, modify, or rescind STB's authority to regulate pipelines carrying products other than gas, oil, or water. These issues deal with whether to substantively change or leave in place the way in which STB regulates pipelines. They do not address whether the current approach to the economic regulation of pipelines might remain substantially unchanged but be carried out by another agency. The issues before the Congress include the following:

- Do pipelines under STB's jurisdiction lack effective competition in a significant number of market areas and subsequently have the ability to charge unreasonably high rates? Pipelines in general possess characteristics that may allow them to exert market power and act in a monopolistic manner. Whether the pipelines under STB's jurisdiction have such power is uncertain. As discussed above, limited competition may exist in a number of anhydrous ammonia markets on the two pipelines in the Midwest, while other markets may have sufficient alternatives to constrain pipeline rates. According to a 1986 Department of Justice report on oil pipeline deregulation, a pipeline should be either regulated or deregulated with respect to all of its markets because it would be impractical to regulate only a portion of a pipeline's markets.[17] However, all markets along a pipeline do not necessarily have to be competitive in order to justify the deregulation of the pipeline. Instead, Justice concluded that the number of markets along a pipeline that do not have competitive alternatives—and therefore require regulation—should be balanced against the societal burden of regulating that pipeline. For example, if nearly all of a pipeline's markets have competitive alternatives and the cost of regulating the pipeline is substantial, then the pipeline should be deregulated.

  In addition to considering the current ability of alternatives to compete with pipelines, the potential ability of these alternatives should be considered in deciding whether pipelines under STB's jurisdiction can limit market competition. For example, the demand for domestic barges to transport anhydrous ammonia from Louisiana to Texas through the Gulf of Mexico could decrease if overseas exports to Texas increase. Such an increase could result in additional barges becoming available to transport anhydrous ammonia from Louisiana to the Midwest. However, the capacity of the barge terminals would still be limited.

- What are the costs of regulation to pipeline carriers under STB's jurisdiction? The regulatory requirements imposed on pipeline carriers do not appear to be excessive. As described, STB does not have the authority to initiate rate cases. Furthermore, STB does not impose requirements on pipelines wanting to start up or go out of business; nor does it impose reporting requirements or require that pipelines file rate schedules with STB before they go into effect. STB officials typically devote relatively few staff-years' effort to pipeline cases.

[17] Oil Pipeline Deregulation, U.S. Department of Justice (May 1986).

If a rate case is brought before STB, the cost to the pipeline carrier of defending the case could be substantial. The limited number of pipeline rate cases in STB's history provides little basis for estimating the cost of these cases. However, STB officials told us that the cost of rail rate cases ranges from less than $50,000 to about $1 million.

STB's regulatory presence would be reduced even more if STB were to grant an exemption from regulation to a pipeline or group of pipelines carrying the same commodity. An exemption could be structured narrowly or broadly and potentially could eliminate all regulatory requirements imposed on the pipelines. Before STB granted an exemption, it would have to determine whether such an exemption was warranted. This determination would require STB to devote more staff to pipeline issues. If an exemption were granted for a pipeline, shippers would still have the right to contest rates charged by the pipeline. Given that STB does not currently impose many requirements on pipelines, it appears that an exemption would not significantly affect a pipeline.

- Does the limited number of pipeline cases under ICC and STB indicate there is no need for continued regulation? It is possible that the limited number of rate cases brought before STB and its predecessor in the last 10 years is evidence of effective competition, and therefore there is no need to continue pipeline regulation. Alternatively, the shippers we spoke with state that the five cases—including one in which ICC required a pipeline to establish common carrier rates and one in which STB found that the same pipeline was charging unreasonably high rates at certain volume levels—indicate a need for continued regulation. In addition, they point out that the mere existence of a federal regulatory agency with the authority to roll back rate increases and levy civil penalties acts as a deterrent to unfair rate increases. Finally, 12 of the 21 pipelines we identified under STB's jurisdiction were operated under contracts with shippers. The contracts we reviewed guarantee prices for a given level of product over a certain time period. Shippers that enter into such contracts may be much less likely to complain to STB.
- Would shippers have recourse if STB's economic regulation of pipelines were eliminated? Absent STB or any other regulatory body, shippers that believe they are being charged unfair rates would presumably complain to the Department of Justice or the Federal Trade Commission. However, neither agency currently has the statutory authority to investigate

shippers' complaints about unreasonable or discriminatory rates, unless the complaint alleges a violation of antitrust laws.

Agency Comments and Our Evaluation

We provided copies of a draft of this report to the Surface Transportation Board and the Department of Transportation. Surface Transportation Board officials, including the Director, Office of Economics, Environmental Analysis, and Administration, agreed with the contents of the report. They also provided clarifying comments throughout the report, particularly regarding the Board's role in enforcing common carrier obligations. These comments have been incorporated where appropriate. The Department of Transportation elected not to comment on the draft report.

Scope and Methodology

To understand why pipelines historically have been subject to economic regulation, we reviewed economic texts and discussed this issue with officials in economic regulatory agencies. To identify STB's responsibilities for regulating pipelines, we reviewed the authorizing legislation, regulations, and guidelines pertaining to its regulatory activities, and discussed these responsibilities with STB officials. To identify pipelines that transport commodities under STB's jurisdiction, we collected and analyzed information from the Department of Transportation's Office of Pipeline Safety and the Federal Energy Regulatory Commission. To identify the competitive characteristics of the two anhydrous ammonia pipelines in the Midwest that are regulated by STB, we interviewed representatives from each of these pipelines and from all companies that ship on them. We also reviewed data on railroad transportation and interviewed representatives from federal agencies, industry associations, midwestern anhydrous ammonia production facilities, barge companies, and others. We visited three terminals located along an anhydrous ammonia pipeline and interviewed shippers at the terminals, as well as fertilizer dealers and farmers. The organizations that we contacted are listed in appendix III. We performed our work from August 1997 through March 1998 in accordance with generally accepted government auditing standards.

We are sending copies of this report to the congressional committees with responsibilities for transportation and regulatory issues; the Secretary of Transportation; the Chairman, STB; and the Director, Office of Management and Budget. We will also make copies available to others upon request.

If you or your staff have any questions about this report, please contact me at (202) 512-3650. Major contributors to this report were Amy Abramowitz, Stephen Brown, Helen Desaulniers, James Ratzenberger, Deena Richart, and Sara Vermillion.

Phyllis F. Scheinberg
Associate Director,
Transportation Issues

Contents

Abbreviations

GAO	General Accounting Office
ICC	Interstate Commerce Commission
STB	Surface Transportation Board

Pipelines and Commodities Under STB's Jurisdiction

We identified 21 pipelines that are subject to regulation by the Surface Transportation Board (STB). These pipelines transport five commodities—anhydrous ammonia, carbon dioxide, coal slurry, hydrogen, and phosphate slurry. Although we believe that we performed a reasonably exhaustive search, other pipelines under STB's jurisdiction may exist. In addition, we identified two pipelines that transport xylene—a petroleum product frequently used as a solvent. Officials from both STB and the Federal Energy Regulatory Commission could not tell us which agency had jurisdiction over xylene pipelines. This appendix describes the five commodities transported by the 21 pipelines we identified.

Anhydrous Ammonia

Anhydrous ammonia is the primary source of nitrogen for the nitrogen chemical industry. Over 75 percent of the anhydrous ammonia consumed in the United States is used as a nitrogen fertilizer—either by being injected directly into the soil or by being used to manufacture other nitrogen-based fertilizers. Anhydrous ammonia is generally produced through a chemical reaction of nitrogen from air and hydrogen from natural gas. Most domestic anhydrous ammonia is produced near sources of natural gas in Louisiana, Oklahoma, and Texas and then is transported primarily via two pipelines to the farmlands of the Midwest. (See table I.1.) Additional anhydrous ammonia is imported from other countries by barge and then shipped via two pipelines to phosphate fertilizer plants in Florida.

Table I.1: Anhydrous Ammonia Pipelines

Pipeline	Pipeline owner(s)	Route From	Route To
Koch Pipeline Company, L.P.	Koch Agriculture; Koch Industries	Louisiana	Nebraska, Iowa, Missouri, Illinois, Indiana
MAPCO Ammonia Pipeline, Inc.	MAPCO Natural Gas Liquids, Inc.	Texas	Oklahoma, Kansas, Nebraska, Iowa, Minnesota
		Oklahoma	Kansas, Nebraska, Iowa, Minnesota
Tampa Bay Pipeline Company	Tampa Pipeline Corporation	Tampa Bay, Florida	Central Florida
Tampa Pipeline Transport Company	Tampa Pipeline Corporation	Tampa Bay, Florida	Central Florida

Sources: Pipeline operators, Office of Pipeline Safety, and STB.

Carbon Dioxide

Carbon dioxide is used in the oil industry for enhanced oil recovery. After most of the oil in a field is forced to the surface through natural pressure and the injection of water, carbon dioxide is injected into the oil field, where it mixes with the remaining oil and draws that oil to the surface. This recovery process is best suited for oil fields in the Permian Basin in western Texas. Three major pipelines transport carbon dioxide to Texas from naturally occurring sources of carbon dioxide: (1) the Cortez pipeline in southwestern Colorado, (2) the Sheep Mountain pipeline in southern Colorado, and (3) the Bravo pipeline in northeastern New Mexico. (See table I.2.) The 11 remaining pipelines are also located in the Southwest and Central United States.

Table I.2: Carbon Dioxide Pipelines

		Route	
Pipeline	**Pipeline owner(s)**	**From**	**To**
Bravo Pipeline	Bravo Pipeline Company; Shell Western Exploration and Production; Cross Timbers	New Mexico	Texas
Canyon Reef Carriers Pipeline	Chevron's Sacroc Unit; Pennzoil	Upton County, Texas	Scurry County, Texas
Central Basin Pipeline	Kinder Morgan Energy Partners, L.P.	Denver City, Texas	Upton County, Texas
Comanche Creek Pipeline	Canyon Reef Carriers	Upton County, Texas	Crane County, Texas
Cortez Pipeline	Shell Western Exploration and Production; Mobil Exploration and Production, U.S.; Cortez Vickers Partnership	Colorado	New Mexico, Texas
Este Pipeline	Amoco Este Pipeline Company; Conoco Este Pipeline Company; Mobil Este Pipeline Inc.; Oxy USA, Inc.	Yoakum County, Texas	Kent County, Texas
Exxon Pipeline	Exxon Company, U.S.A.	LaBarge, Wyoming	Bairoil and Rock Springs, Wyoming
LLANO System	Air Liquide America Corp.	Tatum, New Mexico	Maljamar, New Mexico
Raven Ridge Pipeline	Chevron; Amoco; UNOCAL; Marathon; Equity; Cameron Family Trust	Rock Springs, Wyoming	Rangely, Colorado
Seminole to Means Pipeline	Exxon Corporation, U.S.A.	Gaines County, Texas	Andrews County, Texas
Sheep Mountain Pipeline	Atlantic Richfield Company; Exxon; Amerada Hess	Walsenburg, Colorado	Seminole, Texas
Transpetco Pipeline	Transpetco Pipeline Co., L.P	New Mexico	Texas, Oklahoma
Wasson to Wellman Unit Pipeline	The Wiser Oil Company; Apache; Diverse; Shore Oil Company	Yoakum County, Texas	Terry County, Texas
West Texas System	Air Liquide America Corp.	Denver City, Texas	Pecos, Texas

Sources: Pipeline operators, Office of Pipeline Safety, and STB.

Coal Slurry

Coal slurry is a mixture of ground coal and water. The Black Mesa Pipeline, owned by Black Mesa Holdings, Inc., transports coal slurry across northern Arizona from a coal mine in the Black Mesa area of northeastern Arizona to a coal-fired energy plant in Laughlin, Nevada. Although rail cars are normally used to transport coal, there is no direct rail line across northern Arizona, and the rough terrain in that area was more conducive to pipeline than rail construction. There are no other interstate coal slurry pipelines in the United States because the rail infrastructure already exists for transporting coal.

Hydrogen

Hydrogen is used in refining crude oil for gas or as an aid in the production of some products. For example, hydrogen can be used in the production of margarine or shortening to turn liquid oils into semisolid and solid fats. One interstate hydrogen pipeline exists. Hydrogen from natural gas sources and chemical companies is injected into the Praxair Hydrogen Pipeline in Texas City, Texas, and transported to refining and chemical plants belonging to the pipeline company's customers in Westlake, Louisiana. The pipeline is owned by Praxair, Inc.

Phosphate Slurry

Phosphate slurry—a mixture of ground phosphate ore and water—is used to produce fertilizer. The Phosphate Slurry Pipeline, owned by the S.F. Pipeline Limited Company, transports phosphate slurry from storage tanks near Vernal, Utah, through the pipeline to a phosphate fertilizer plant near Rock Springs, Wyoming. This pipeline is the only interstate phosphate slurry pipeline in the nation.

Competitive Structure of Anhydrous Ammonia Markets

This appendix discusses several issues about competition and anhydrous ammonia. Specifically, it discusses the (1) importance of defining the product and geographic boundaries of a market correctly when attempting to evaluate competition for a particular product; (2) specific characteristics of the market for anhydrous ammonia that are important in defining the degree of substitutability between related products; and (3) appropriate geographic extent of the market for evaluating competitiveness.

Defining a Market Correctly Is Key to Evaluating Competition and Addressing Competitive Problems

A discussion about the degree of competition and the possible regulation of natural monopoly markets presupposes that markets are easily identified and understood. In the most general sense, the supply side of a market is the collection of firms that produce the same, or a closely substitutable, product. But applying that simple concept can be very complicated, and, in practice, it is often difficult to define the "boundaries" of a market.

The key to defining markets from the perspective of a competitive analysis is to include any products or geographic purchase areas for which the substitutability of the products is great enough that buyers could respond to a price rise for one firm's product by buying something different or by buying the same thing in a different location. For example, what products should be included in the market for "personal driving vehicles"? Does the market only include sedan passenger cars or should it also include minivans, sport utility vehicles, trucks, or even motorcycles? The geographic component can also be important. For instance, in considering retail cement markets, how large is the geographic area over which dealers should be considered as competing with one another, given the significant costs of delivering cement?

Defining a market incorrectly can lead to an inappropriate evaluation of competition. If the market for passenger vehicles is defined narrowly—only passenger sedans—it is presumed that a significant price increase for these vehicles would not result in substitution of other vehicles, such as minivans. A market that is too narrowly defined appears to be less competitive—consumers appear to have fewer substitute products. But if in fact some consumers would switch to buying a minivan if the price of sedans went up by 10 percent, then the market should be defined more broadly. On the other hand, a market can be defined too broadly. If it is assumed that the cement dealer market includes all dealers located in a particular state, the market would appear competitive if there were many dealers throughout a state. If, however, a particular consumer is in a town with only one dealer, and if the next closest dealer is many miles away, making delivery quite costly, the user would be unlikely to purchase cement from anyone but the local dealer, unless that dealer's price was significantly higher than some distant dealer's. As such, the relevant market for this user is really the one dealer in town, and that market is, in fact, not very competitive because the other dealers in the state are not very viable competitors.

Market Definition for Anhydrous Ammonia Must Consider Competition From Other Products and Geographic Areas

In order to assess the competitiveness of anhydrous ammonia pipeline transportation, the appropriate market must be defined.[1] As discussed above, this analysis needs to examine (1) the availability of alternative products to anhydrous ammonia that are reasonably substitutable and (2) the geographic area in which the product is transported, sold and used.

Anhydrous Ammonia May Be a Unique Product Market Within a Market for Nitrogen Fertilizer

The yields of many crops, most notably corn, can be increased with nitrogen fertilizers to augment the nitrogen that is naturally found in soil. Most anhydrous ammonia used in the United States is applied as nitrogen fertilizer, either directly or after further manufacture into upgraded fertilizer forms such as urea, ammonium nitrate, or nitrogen solution. Because anhydrous ammonia is an important component in the production of nitrogen upgrades, the prices of the various nitrogen fertilizers tend to move up and down together, although changes in the price spreads between anhydrous ammonia and its alternatives (known as upgrades) do occur and are a factor in influencing the farmer's choice of nitrogen form. At the same time, a variety of weather-related and agronomic considerations may be more important in determining the mix of nitrogen forms actually applied in a given crop year.[2]

[1]In analyzing transportation markets, such as pipelines, there may be competitiveness issues at both the gathering and distribution ends. For example, producers of the good that is shipped on the pipeline may have several other options for selling or transporting their product, or they may have few options. Likewise, users of the product delivered by the pipeline may have many other sources of the product, or close substitutes, or they may rely heavily on the pipeline for deliveries. Because the focus of this report was on the Midwest, we emphasized competitiveness issues at the distribution end.

[2]In general, analysts have found that the demand for fertilizer is quite inelastic, that is, increases in the price of fertilizer result in only very small decreases in its use. While changes in nitrogen fertilizer prices would thus be expected to have only a small influence on the amount of fertilizer applied in a given year, changes in planted corn acres have a large influence on the amount of nitrogen fertilizer used in a crop year.

In some important corn-growing states, such as Illinois, Indiana, Iowa, Missouri, Nebraska, and Ohio, about one-half of the nitrogen fertilizer is anhydrous ammonia directly applied to the soil; nitrogen solutions are the second most widely used type of nitrogen fertilizer form. The various forms of nitrogen fertilizer have different chemical and application characteristics, which make them less than perfect substitutes for one another. For farmers, anhydrous ammonia's primary advantage is that it is the lowest cost nitrogen fertilizer, in terms of dollars per pound of nitrogen.[3] Additionally, the chemical form of anhydrous ammonia and the manner in which it is applied presents certain advantages in some soil and weather contexts. Conversely, and despite their higher cost per pound of nitrogen, other forms of nitrogen fertilizers provide farmers with some advantages over anhydrous ammonia: They are safer and easier to handle, can be applied more rapidly and less expensively, can be combined and applied at the same time with other nutrients and chemicals, and have more flexible application schedules because they can be put down before, during or after planting; in contrast, anhydrous ammonia should be applied at least 7 to 10 days before planting.[4]

In general, if the price of anhydrous ammonia became higher compared with the price of solutions, holding other things constant, economic theory suggests that farmers would be likely to apply more upgrades.[5] In fact, some statistical tests of the price patterns of anhydrous ammonia and two key nitrogen upgrades suggest that these three products should be considered as competing in the same product market.[6] However, several experts we spoke to stated that the most important single factor explaining the proportions of anhydrous ammonia and nitrogen upgrades applied in a crop year is the weather, rather than price.

[3]Anhydrous ammonia is 82-percent nitrogen, so that about 1.2 tons of product provides 1 ton of nitrogen, whereas nitrogen solutions, which range from 28- to 32-percent nitrogen, require approximately 3 tons of product to provide 1 ton of nitrogen. According to U.S. Department of Agriculture estimates, in April 1997, the cost to farmers of a ton of nitrogen in anhydrous ammonia form was $369, while the cost in solution form was about $533, a difference of $164, per ton or about 8 cents per pound. A farm with 1,000 corn acres planted and an application of 130 pounds per acre (about the national average) requires about 65 tons, or 130,000 pounds of nitrogen. At these relative prices, the difference in product cost between the two forms is over $10,000.

[4]This refers to spring "pre-plant" applications of anhydrous ammonia. Across the Midwest, most anhydrous ammonia is applied in the spring.

[5]Over the last decade or so, much of the growth in nitrogen fertilizer used on the farm has been in the form of upgrades, particularly nitrogen solutions. In tonnage terms, the growth in the amount of anhydrous ammonia used on the farm has been modest, but its share of total nitrogen fertilizer has declined because of the more rapid growth in the use of other nitrogen forms.

[6]This information was provided by Koch Industries. It is not clear how these statistical tests of price patterns should be interpreted as a guide for product substitutability when one of the products is an input into the production of the other two.

Because anhydrous ammonia must be injected into the soil, its successful application depends on weather-related conditions. If the ground is too moist or too cold, the anhydrous ammonia cannot be applied or, if applied, the nitrogen component of anhydrous ammonia is at risk of being lost and thus not available to the plant as nutrient.[7] However, if weather conditions are conducive to the anhydrous ammonia application, farmers might apply significant amounts of it even if upgrades were favorably priced.[8] In particular, some farmers value anhydrous ammonia because they can apply it in the fall if application conditions are right, thereby reducing their work in the spring. In some important growing regions, such as the states of Illinois and Iowa, university agronomists recommend that any nitrogen fertilizer applied in the fall be in anhydrous ammonia form to prevent nitrogen loss. In these states, fall application may typically account for 15 to 25 percent of the annual nitrogen applied statewide, and considerably more in some areas. Therefore, the price of anhydrous ammonia compared with upgrades may have little influence on farmers' choices in the fall.

The investment in fertilizer application equipment may also be important in explaining the proportions of anhydrous ammonia and upgrades farmers choose. The equipment required to apply anhydrous ammonia cannot be used for other forms of nitrogen fertilizer. Although some application equipment is owned by retailers and rented out to farmers, farm equipment manufacturers and dealers we spoke to suggest that the general trend is for farmers to own more application equipment themselves. Modern application equipment is fairly expensive—at least $15,000. Therefore, farmers who have made investments in dedicated

[7]Excessive moisture is a problem that can lead to nitrogen loss for any form of nitrogen fertilizer.

[8]In general, most corn growers apply nitrogen once during a crop year, although additional applications can be made for various reasons. In addition to fall and spring pre-planting applications, farmers may also make a "sidedress" application in the summer. Farmers can generally apply anhydrous ammonia at any of these times, although there are some areas, such as southern Illinois, for which fall application of any kind of nitrogen fertilizer is not recommended. Summer applications of anhydrous ammonia must be performed in the early stages of plant development to avoid harming the plants with the application equipment. Because nitrogen can be applied at different times and in different forms, farmers have a wide variety of ways to substitute across forms. For example, a farmer could make a fall or spring anhydrous ammonia application but apply fewer pounds per acre and apply additional nitrogen in a solution form as a carrier for a subsequent liquid application of a pesticide. Thus, to the extent that farmers are price-responsive in their fertilizer choice, a price change unfavorable to anhydrous ammonia might induce a farmer to make a partial rather than a total substitution away from anhydrous ammonia.

application equipment may be more likely to use anhydrous ammonia, even if it becomes more expensive compared with upgrades.[9]

Overall, then, while other forms of nitrogen fertilizer can be substituted for anhydrous ammonia, this substitutability may be limited. Therefore, it may be important to evaluate the competitiveness of the transport market on the assumption that, in terms of the product market, competition is limited to sources of anhydrous ammonia. In fact, this limitation may be particularly appropriate for the current analysis because, as discussed in the report, even fairly large increases in pipeline rates would translate into fairly small increases in the retail anhydrous ammonia price paid by farmers. Therefore, it appears that, at least in some portions of the Midwest, the price difference between anhydrous ammonia and nitrogen upgrades may not have much influence on farmers' choice of nitrogen fertilizer.

The Importance of Seasonality, Storage, and Transport in the Geographic Market for Anhydrous Ammonia

Anhydrous ammonia is produced in plants specifically designed for that purpose. Because natural gas is the primary component used in the production of anhydrous ammonia, much anhydrous ammonia production capacity is located near natural gas deposits in Louisiana, Oklahoma, and Texas, although other domestic sources of production are found throughout the country, including locations in the Midwest.[10] Anhydrous ammonia is produced around the clock for many months at a time and plants operate at close to full capacity. Despite the clustering of production capacity near sources of natural gas, a significant demand for anhydrous ammonia is the midwestern farming states.

One of the most important characteristics of the midwestern demand for direct application of anhydrous ammonia is its intense seasonality: About 70 to 80 percent of the product is applied during two short periods in the

[9]While the investment in the application equipment itself is a sunk cost, ownership of the equipment influences the farmer's incremental costs of applying nitrogen in a given crop year. Regardless of whether the farmer owns equipment, he or she must consider the costs of product application as well as the cost of acquiring the physical product. A variety of equipment rental and custom application arrangements are generally available.

[10]The United States is a net importer of anhydrous ammonia.

fall and spring.[11] As a result of this concentrated seasonal pattern of application and the lack of excess capacity or the ability to step up production during peak seasons, large inventories of anhydrous ammonia must be built up over time and stored so that the anhydrous ammonia will be available during the peak application periods. In principle, storage could occur at many stages of production or distribution—at anhydrous ammonia plants, at specialized storage facilities, at retail locations, or on individual farms. However, this product requires specialized equipment for transport and storage—for example, anhydrous ammonia has to be kept under pressure or stored at –28 degrees Fahrenheit. Moreover, the product is hazardous and poses significant health and safety risks. Therefore, transport and storage facilities represent a significant investment. Furthermore, because of the complexities associated with its storage and handling, the storage of anhydrous ammonia benefits from considerable economies of scale. For these reasons, anhydrous ammonia storage has tended to occur at fewer, but larger, storage facilities than might have been the case if the product were easier to transport and store.

The geographic extent of the market for anhydrous ammonia also depends on how it is distributed to retail outlets and ultimately to farmers.[12] More specifically:

- Transport to midwestern terminals. As mentioned earlier, pipelines and river barges are the two primary bulk transportation modes used to deliver large volumes of anhydrous ammonia from production locations in Louisiana, Oklahoma, and Texas to the Midwest; shipments occur throughout the year. Most midwestern storage capacity is situated on the two anhydrous ammonia pipelines or on the Illinois, Mississippi, and Ohio Rivers, and consists of large, refrigerated tanks that hold from 20,000 to 40,000 tons of anhydrous ammonia. Anhydrous ammonia manufacturers and other shippers inject anhydrous ammonia into the pipeline and fill terminals connected to the pipelines. River terminals are filled by barges from the sources of production on the inland river system, most often from Louisiana but also from sources in Arkansas, Tennessee, and

[11]The season may be particularly intense for about 1 to 2 weeks, and the trend is toward a more concentrated season, especially in the spring. The earlier the corn crop can be planted the better are its prospects in terms of overall crop development. Observers state that the introduction of larger anhydrous ammonia application equipment has resulted in the ability of farmers to apply anhydrous ammonia to their acreage more quickly, and this shorter application period in turn permits earlier planting. Because weather conditions vary from year to year, as well as across the region, the timing of the periods of peak intensity varies annually and across the Midwest.

[12]Many firms that distribute anhydrous ammonia are vertically integrated: They manufacture and distribute the anhydrous ammonia (and other fertilizer products), and they may also operate retail fertilizer outlets and truck fleets. Other companies may be involved at only one stage of this multistaged production and distribution process.

elsewhere. Anhydrous ammonia is also produced in Kansas, Illinois, Iowa, Nebraska, and Ohio and stored in terminals at these production locations. There is also some limited transport to midwestern terminals and retail locations via rail.

- Wholesale ownership at storage terminals and the sale to retailers. The wholesale stage of anhydrous ammonia delivery occurs as firms that own the product at terminals sell it to retail outlets. Wholesalers—who may also be manufacturers and/or shippers of the product—secure supplies of anhydrous ammonia at terminals located throughout the areas in which they supply retailers. To ensure the desired geographic distribution of anhydrous ammonia, wholesalers often trade ownership of anhydrous ammonia at various terminals with other wholesalers. This trading helps to minimize the need for hauling anhydrous ammonia over long distances. By peak season, most major wholesalers will own some anhydrous ammonia at many terminals across the region, including terminals filled by both primary transport sources (barge and pipeline). Thus, even if a wholesaler is a vertically integrated anhydrous ammonia producer and pipeline shipper, the wholesaler is likely to own some anhydrous ammonia located at terminals that are not served by the pipelines.

  Storage capacity at retail outlets is fairly small compared with the volume of anhydrous ammonia sold at peak season. Retailers prepare for the peak seasons by securing formal or informal arrangements governing the future sale and delivery with one or more anhydrous ammonia producers or wholesale providers. If retailers think that “off-season” anhydrous ammonia prices are low, they may be able to “prepay” at that price and take delivery later. However, because of storage constraints, retailers would typically not be able to take the physical delivery of a large portion of their anticipated anhydrous ammonia sales volume from a distant source in the off season.

- Retail and final delivery of anhydrous ammonia. Many retail fertilizer outlets, of which there may be as many as 2,500 in the Midwest, are cooperatively owned, some are independent small businesses, and others are outlets of larger agribusiness companies. Retail transactions occur between farmers and local fertilizer dealers. Most farmers are located within a few miles of more than one retailer and rely on local retailers for a variety of nutrients, agricultural chemicals, and other goods and services. Anhydrous ammonia is delivered to farms from these retail outlets in pressurized “nurse tanks” that hold 1,000 gallons (about 2.5 tons).

The transportation and storage costs of anhydrous ammonia appear to be important in determining nearly every aspect of how this product makes its way from production facilities to the final users. As we discussed, these costs are the likely cause of large terminal storage facilities located on pipelines and rivers, and the attempt to reduce truck transport costs, given the widespread distribution of terminal storage facilities, also motivates most retailers to take delivery from the nearest terminal facility. Therefore, it does not appear appropriate to define the geographic boundaries of this market as the "Midwest," because it is clear that a retail establishment in Iowa cannot chose to take delivery from a terminal in Indiana without exorbitant costs.

On the other hand, it is unlikely that markets are so local as to be a simple circle around a given terminal. One indication that this is not the case is that wholesale prices for anhydrous ammonia are usually identical across broad geographic areas,[13] with no price distinction between pipeline, river, or local production terminals. This would indicate that prices are not being set within the bounds of "terminal" markets. In addition, while truck delivery from each terminal is primarily limited to locations close to the terminal, truck delivery to more distant locations does occur during peak delivery seasons if necessary.

To conclude, a clear picture of the relevant geographic market boundaries does not emerge from this analysis of the anhydrous ammonia market. However, it is clear that the relevant market is unlikely to be the entire Midwest. This definition is likely to be too broad because, for reasons related to local transportation and storage conditions, retailers in one area cannot routinely purchase the product at a terminal that is too far away, and therefore the product from that distant terminal cannot be considered a viable competitor with the retailer's closer terminals. In contrast, the relevant market is unlikely to be limited to small geographic areas surrounding each terminal. This definition is likely to be too narrow because (1) the wholesale function appears to help trade product ownership across terminals in a way that may smooth out price differentials over reasonably broad regions and (2) retail truck transport from locations beyond the closest terminals does occur during peak delivery seasons and likely helps to broaden the relevant retail market.

[13]Although terminal-specific wholesale price information is not publicly available, industry observers and participants stated that wholesale anhydrous ammonia prices do not vary much if at all over broad areas of the Midwest. In particular, they noted that there is a single freight-on-board terminal price at which anhydrous ammonia could be acquired at terminals in much of Iowa and Illinois.

Organizations Contacted

Federal and State Agencies

Department of Energy
Department of Justice
Department of Transportation
Federal Trade Commission
Office of Indiana State Chemist
U.S. Department of Agriculture

Industry Associations

Agricultural Retailers Association
American Trucking Associations
Association of Oil Pipe Lines
The Fertilizer Institute
National Council of Farmer Cooperatives
National Tank Truck Carriers, Inc.

Pipeline Owners and Operators

Air Liquide America Corporation
Amoco Pipeline Company
ARCO Permian
ARCO Pipeline Company
Black Mesa Pipeline
Chevron Pipe Line Company
Cortez Pipeline Company
Exxon Chemical
Exxon Corporation, U.S.A.
Exxon Pipeline Company
Kinder Morgan Energy Partners, L.P.
Koch Industries
Koch Pipeline Company, L.P.
Mid-America Pipeline Company
Mobil Pipeline Company
Pennzoil Company
Praxair, Inc.
Production Operators, Inc.
Raven Ridge Pipeline Company
Shell Pipeline Company
Tampa Pipeline Corporation
Transpetco Transport Company
Wiser Oil Company

Product Manufacturers

Agrium U.S., Inc.
C.F. Industries, Inc.
Dyno Nobel
Farmland Industries, Inc.
Green Valley Chemical
IMC Agrico
J.R. Simplot Company
Koch Nitrogen
Mississippi Chemical
PCS Nitrogen
Solutia, Inc.
Terra Nitrogen
UNOCAL Agricultural Products

Companies Receiving Product From Pipelines

Altura Energy Ltd.
Chevron Production Company
Continental Nitrogen and Resources
Mobil Exploration and Production
Shell Western Exploration and Production

Retail Product Sellers and Brokers

Agland Coop Agronomy
Cenex/Land O'Lakes
The Cropmate Company
Deere & Company
Eldon Stutsman, Inc.
IMC AgriBusiness
Mark II Agronomy
Nielson Fertilizer
P&W, Inc.
P.C., Ltd.
Reinbold & Sons
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Farmers

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