IV. Price Information

As energy markets become more competitive, prices assume several increasingly important roles. As one of the primary means of conveying information in a market-based system, prices give market participants the practical mechanism to make transaction choices. Prices also convey useful information, which can be used to understand how the markets are functioning and suggest ways to improve market structures, particularly during crucial transitions in market development.

Background and Regulatory Context

Price formation is a critical part of market mechanisms. As individual decision-makers in the market interact and conduct transactions, competing sellers offering comparable goods or services effectively present a series of bids. Buyers also effectively bid on the goods or services, since buyers offering various prices present a choice to the seller.

Prices provide useful information on how markets are functioning and serve as a primary basis for customer choices.

As transactions occur, repeated interactions of individuals over time produce price information that makes its way into the market through a variety of means. The details of price formation vary from market to market because there are many different types of market interaction, from private contracts through centrally cleared auction floors, trading centers, and other types of spot markets, pools, etc. Economic theory often refers simply to the auctioneer in this context, but the details are important when market transitions occur. This will be discussed further below, in the performance indicator examples.

However prices arise, once they become available in a market they serve a variety of purposes. Allowing transactions between distant parties is one central role of prices, but the complexity underlying market conditions, including factors affecting supply and demand, also creates other information-related roles for prices. For example, the pattern of price movement over time presents opportunities to anticipate future prices and take actions based on anticipated prices. This is the basis for risk hedging and arbitrage in commodity markets, as discussed in Section III, New Service Availability.

The Commission faces the challenge of understanding and reviewing the design and operation of efficient markets. Prices play a key role in determining both short-run incentives, which affect immediate production decisions, and long-run incentives, which affect investment and planning decisions. The role of price incentives in long-term decision making has important implications for system reliability over time, for example, and it is part of the Commission's responsibility to understand how prices in network industries affect capacity planning and reliability. This is especially true in the formation of RTOs in the interstate electric power markets, since under Order No. 2000 it is envisioned that RTOs will have a formal role in system planning and capacity expansion decisions. Pipeline networks are also affected by such

considerations and the Commission continues to work to improve its approaches to pipeline capacity expansion, including the role of price incentives over time.

Developing Performance Indicators: Methods and Data

Performance indicators in the area of prices should take into account the variety of roles that prices play in market systems. Most fundamentally, variations in prices allow for analysis of how and why the markets are working. For example, weather affects energy prices because of strong linkages between temperature and demand for end use energy services such as space heating and air conditioning. Analysis of the interaction between weather and prices allows for such cost-saving practices as designing maintenance schedules to avoid having equipment unavailable during periods of high demand. During periods of restructuring or the creation of new markets, prices can also be used to understand how the market is functioning, and this is the basis of some of the performance indicators applied in this section.

Network industries, such as natural gas and electric power, tend to exhibit particular types of price behavior.

In network industries, such as natural gas and electric power, the transportation system is physically interconnected and is often subject to constraints on the physical capability to deliver the commodity. Such network industries exhibit characteristic types of price behavior, and this has implications both for market design and for the kinds of price patterns which can be expected in the new energy markets.

Some of the important characteristics of prices in network industries include:

- *Variability.* Regulated rates were generally stable, even if some time-differentiated rates such as peak and non-peak period pricing were offered to a few customers. In contrast, the new energy markets exhibit great price responsiveness, or variability. Some of the factors contributing to price variability in commodity energy markets include rapid changes in demand, variations in production costs, and the lack of effective storage technology for electricity. Price variability is important because it reflects changes in the underlying physical status of the commodity markets. Without price variability these physical changes would lead to implicit prices, and could distort incentives to market participants.

- *Step functions/threshold effects.* Network industries are typically subject to limits on the ability of the transportation network to deliver goods and services. These limits can create sudden changes in prices because a limit may be reached which forces the curtailment of transactions, or the rerouting of transactions to more costly routes on the network. The resulting price behavior can be described as a step function or a threshold effect, since the prices will make a rapid transition from one state to another. This can be seen, for example, as a rapid price rise when a network constraint is encountered.

- *Locational interdependence of prices.* Because a network industry has a strongly linked transportation system, changes in the factors underlying prices in one area can have immediate impacts on prices in other areas. These effects assume a dynamic over time in which prices are partially dependent on prices in other areas, and this adds to the complexity of price information in the marketplace. It also means that market design in one area can impact markets and price patterns in other areas (for instance, a market may attract goods and services away from another market because it offers a better price).

- *Implicit value of transportation constraints.* Constraints on the transportation network can cause price effects, and this means that the constraints themselves have a market value. Pricing of these constraints, whether explicit or implicit, will play a role in the efficiency of the market incentives for short-term operating practices and long term investment decisions. For example, it is important to have price information on the value of upgrading a transmission link as opposed to providing new generation on either side of the constraint.

- *Linkages between services and interactions between related markets.* Just as the strong linkages in the transportation system create linkages between prices in locationally distinct markets, they also create linkages between the prices for related goods and services. This is most apparent in electric power reserve or balancing markets, where changes in the bulk commodity price can be reflected in changes in price for related goods and services. Efficient markets will develop these linkages in a way which allows the market to make resource allocations based on cost, so that energy suppliers can move their product from reserve markets to spot energy markets, etc., as market conditions change.

Even with an understanding of the basic mechanisms of price formation and behavior in network industries, the interpretation of price data is extremely difficult and remains subject to uncertainty. The Commission is not in a position to create definitive or automatic procedures for the analysis and interpretation of price information. Informed analysis can add to the knowledge base the Commission uses to arrive at decisions, but strong caveats must be applied to any simplistic interpretation of price information.

Despite some limitations, much can be learned by analyzing prices.

Nevertheless, this uncertainty does not mean that no clear lessons can be learned from price analysis. Nor does it mean that the Commission cannot develop general sets of issues and outcomes for use in analyzing a specific situation. Two key points which go beyond the details of specific markets are:

- *Market-based price information can lead to lowered costs and enhanced efficiency.* The presence of competing prices is what allows arbitrage or

bargain hunting. Getting price information into the marketplace is a basic step in creating the possibility of efficient, lower-cost outcomes, while also offering market participants the incentives to create new types of goods and services. Even if price information does not always lead to lower costs, it is a necessary element where the opportunity for efficiency gains exists.

- *Prices will proliferate as more new markets develop.* There has been a dramatic growth in the amount of price information and the types of goods and services being priced. This proliferation of prices indicates that market participants are finding ways to make transactions in the new energy markets. In general, more services being priced means that market forces are leading to creative strategies and innovation in goods and services, and indicate that the markets are functioning.

In developing performance indicators related to prices, an understanding of the complexity of prices and the transitional nature of the markets are essential. Applying a rigid set of standards to the evaluation of prices would not reflect these realities, because such standards cannot be designed in a way that fully anticipates how the markets and their pricing mechanisms will evolve. In order to be responsive and informed in its decisions, the Commission must instead develop the analytic methods which yield the most sophisticated understanding of specific markets at specific points in their development. These methods will vary according to the situation where they are applied.

Performance indicators in the area of price information, then, should show how the Commission succeeds in using price information to inform its decisions and thus affect external outcomes in the energy markets. Furthermore, these performance indicators should be tailored to reflect the important network-related characteristics of the energy markets.

In addition to presenting performance indicators that are directly tied to the Commission's mission and goals, this section also presents background material on prices. Such background material is really the raw data underlying more sophisticated analyses and is the starting point for research. The objective in presenting this information is to allow the Commission's customers a chance to evaluate the developing energy markets and to fulfill a basic public information responsibility. The price information in the background section is for reference purposes and is not a direct indicator of Commission performance. However, the very existence of these prices reflects the Commission's success at fostering competitive commodity energy markets and thereby also the basis for many newly-developing markets for related goods and services (as discussed in Section II, Commodity Markets and Section III, New Service Availability).

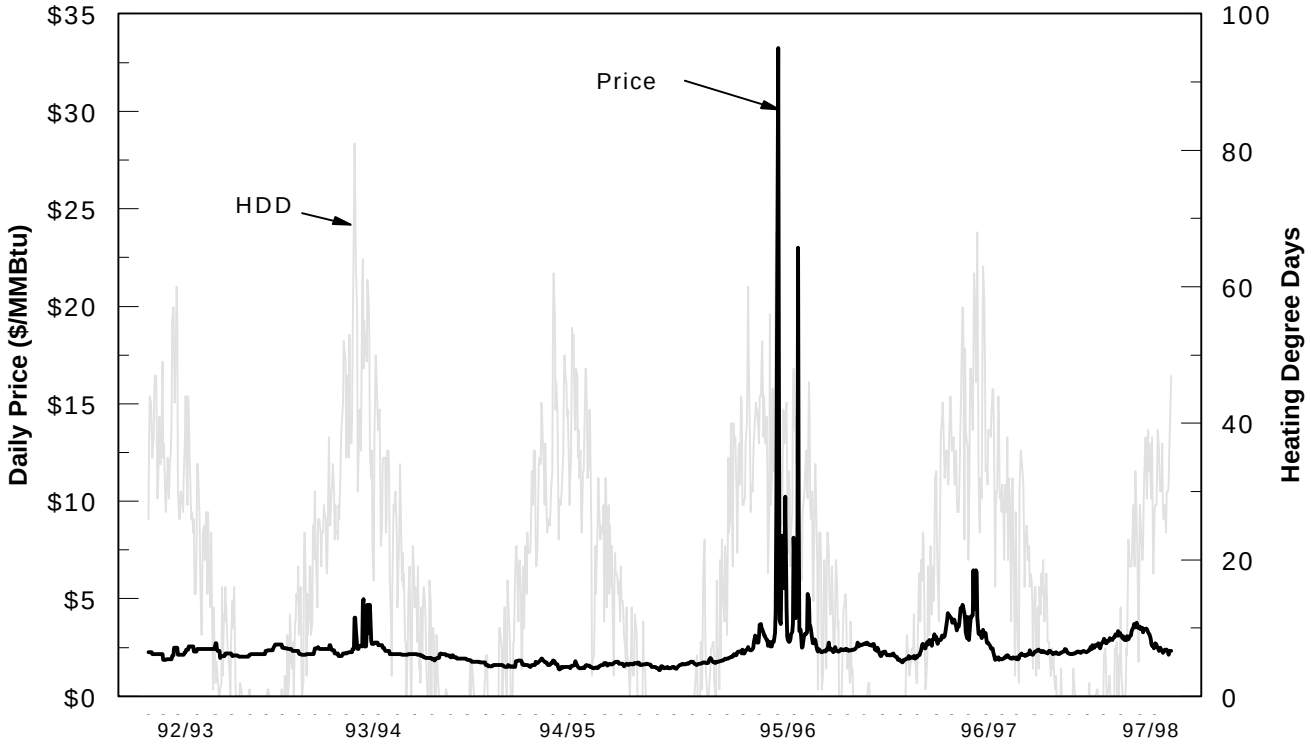
Performance Indicators: Examples

Performance indicators in the area of price information should reflect the main features of price behavior in network industries, and should show how the Commission uses price information to learn about the markets, identify problems, and make reasoned decisions. The examples of performance indicators in this section demonstrate several forms of analysis using price information as well as presenting background information in the form of selected price data series.

This example demonstrates some of the complex relationships between prices and physical events. Heating degree days reflect the need for space heating during cold weather, indicating how many degrees the mean temperature fell below 65 degrees for the day. For example, if a day's mean temperature were 45 degrees, there would be 20 degree days for that day. Their seasonal variation is apparent from the figure. The natural gas spot price appears to react to this seasonal variation in a number of distinct ways. First, note that there are some seasons in which the spot prices shows no apparent response

Natural Gas Spot Price vs Heating Degree Days

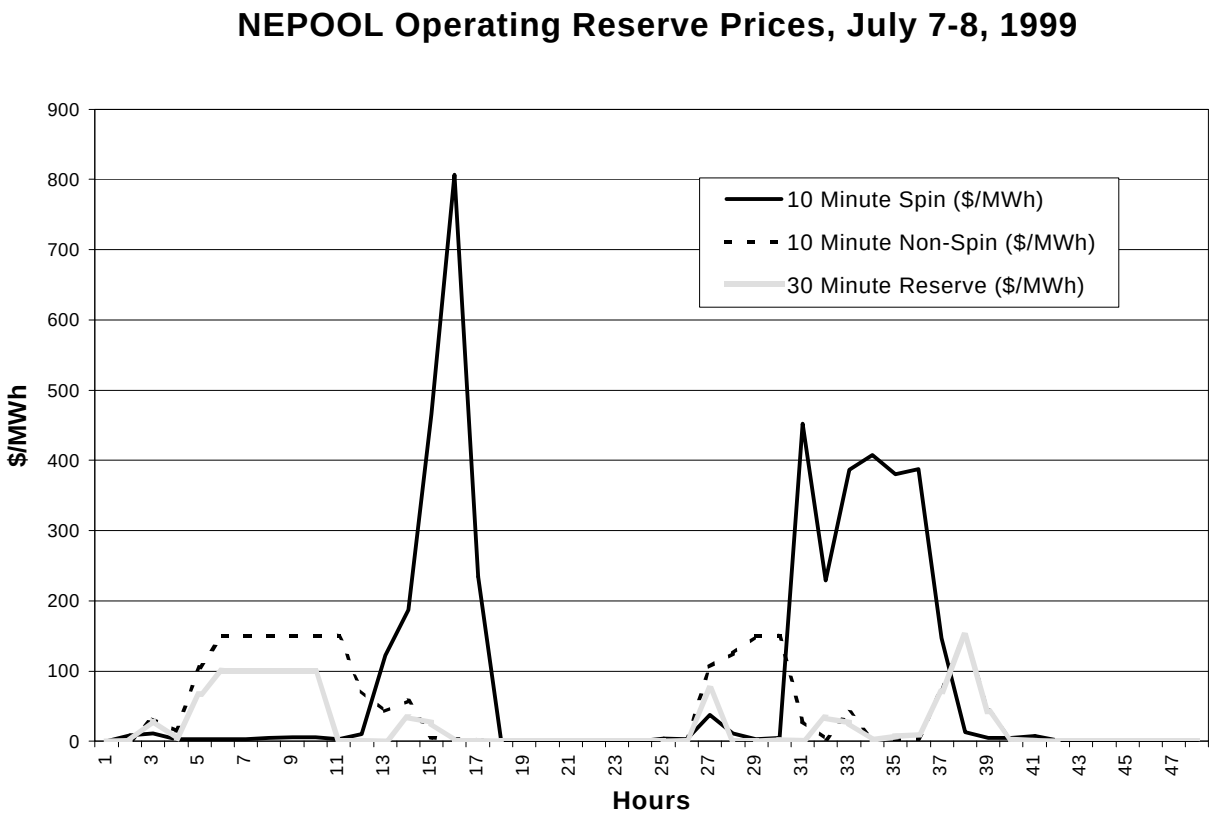
Chicago (LDCs and Large End Users)



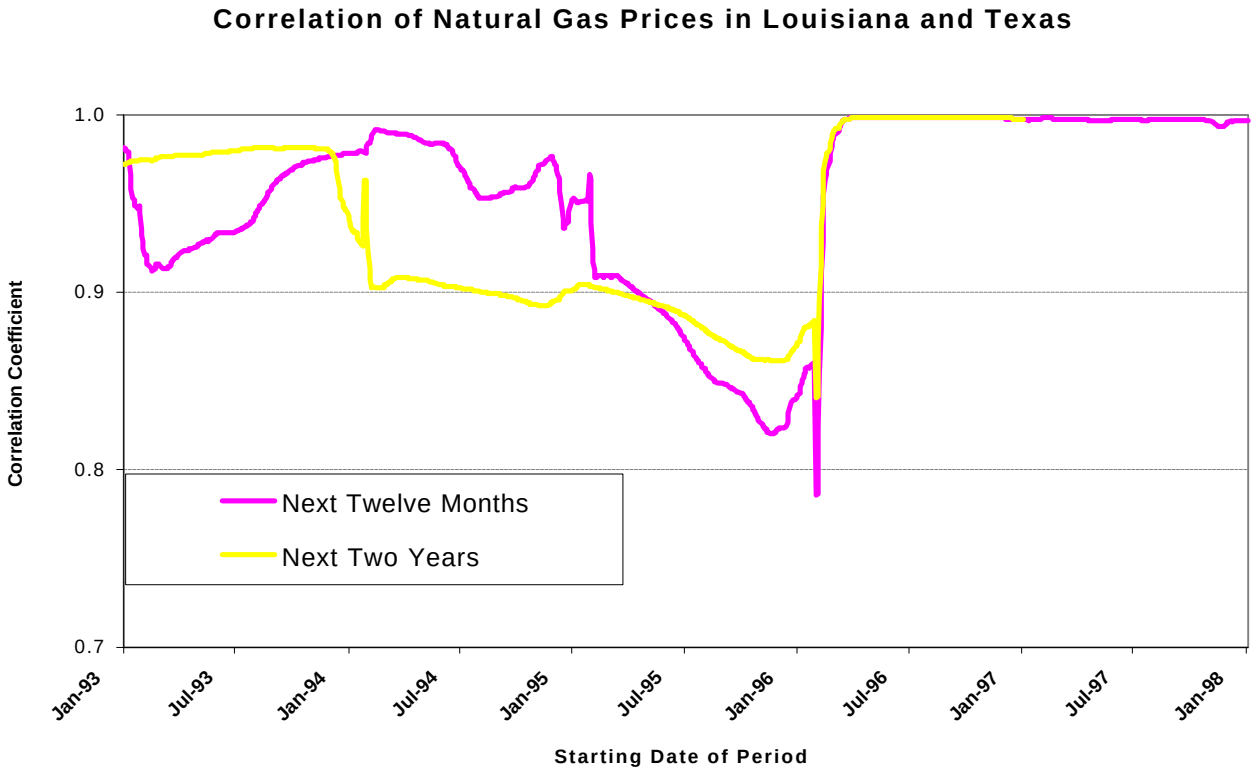
to the change in heating degree days. In some other years, there is an increase in the spot price (of roughly 100 per cent, or a doubling) which coincides with the maximum in heating degree days. But in one year, there is an even more dramatic increase in the spot price, which also coincides with that season's heating degree day maximum.

The explanation for this complex relationship between price and the weather calls upon several key elements. First, the fact that in some years the price does not react at all indicates that there are other factors which help to determine the spot price. These include demand for natural gas in other parts of the country, the adequacy of seasonal storage, and transportation availability. Second, the variety of responses in different years indicates the presence of threshold effects, in which the combination of factors determining the price can lead to rapid price changes (that is, the price response is not continuous or smooth). Such threshold effects are characteristic of network industries in which the transportation infrastructure can become constrained, or bottlenecked, leading to the isolation of portions of the market in which more expensive supply is required to meet demand. Third, the very large price response in one year may reflect inexperience on the part of market participants, as opposed to an underlying market imperfection which might warrant a change in policy.

An example of the Commission using price information to understand and identify an issue in an electric power market is shown below. The example is from the New England regional market for operating reserves. It is generally expected that for any specific generator, it costs more to provide reserves that can be used immediately than those that take time to access. In the New England market, the initial market design accepted bids for these operating reserve markets at the same time but then cleared each market sequentially. This, along with other incentives, allowed artificial shortages to emerge in some of the reserve markets. This can be seen in the figure below as periods in which types of reserve power that should be cheaper to produce were actually priced higher than other types of reserve power (10 minute spin), which should be more expensive. The appearance of this inefficient result in the reserve market indicated the need for institutional changes to head off similar events in the future.



The example below shows one way to measure the convergence of prices. Correlating the natural gas prices in neighboring states, it is evident that there was a dramatic change in early 1996. Before that period, the prices only loosely correlated, while after that period, the correlation increased and stabilized at a nearly perfect 1.0. This means that by 1997, if one knew the price of gas in Texas one essentially knew what the price should be in Louisiana. Efficient market arbitrage allows the prices to equilibrate at a rapid pace, without the need for intrusive regulatory action. However, in an efficient market these kinds of correlations will not always be perfect, since there will at times be constraints on the transportation system which will (and in fact should) lead to price divergences.



The following graphs show background information on electric power and natural gas prices by region, and futures prices for electricity at two trading hubs (Cinergy and Entergy).

(These graphs appear in the Appendix.)

V. Market Power

Developing competitive energy markets for the benefit of consumers depends on successfully addressing market power in all segments of the relevant energy markets, maintaining oversight of monopoly transportation networks, and pursuing a continuing set of activities to identify and address ongoing residual market power.

Background and Regulatory Context

The Commission's public interest mission is explicitly intended to encompass consumer protection and national economic well-being. In order to accomplish this mission, the Commission seeks to protect consumers from the exercise of market power in energy markets. Different market segments and service areas are prone to differing types and degrees of potential for the exercise of market power, and this in turn has implications for the Commission's role in identifying and addressing that potential.

Market power is defined as the ability to withhold capacity or services, to foreclose input markets, or to raise rival firms' costs in order to increase prices to consumers on a sustained basis without related increases in cost or value. In general, markets are subject to the exercise of market power through two basic mechanisms: explicit or tacit collusion among firms, and/or the presence of fundamental economic conditions for dominance by large firms which effectively exclude competitors. This second kind of market power development is known as natural monopoly, because the structure of the market itself creates incentives for market power to develop without the need for collusion.

It is important to note that the root cause of all market power (along with demand for the service) lies in barriers to the entry of competing firms into the relevant market. Both collusion and natural monopoly would not be possible if the presence of above-normal profits could attract new entrants, which would undercut the higher prices set by the firms exercising market power. Barriers to entry take two main forms: legal barriers and technical barriers. Legal barriers create the conditions for market concentration and collusion, while technical barriers create the conditions for natural monopoly. Both types of barriers to entry may exist in a single market, and in fact this has often been the case with Commission-jurisdictional energy markets.

Legal barriers include patents, which exclude other firms from specialized knowledge required to compete in the market; control via exclusive property rights over a necessary input such as an essential raw material (bauxite in aluminum production, for example); and exclusive government franchises. Legal barriers to entry may exist for valid reasons, leading to tradeoffs between fully competitive markets and other goals and therefore a continuing need for regulatory oversight of the market.

Technical barriers generally result from underlying technological or cost characteristics which result in large economies of scale; that is, costs decline as more of the relevant good or service is produced. Capital-intensive industries, including segments of the energy markets, are prone to technical barriers to entry and thus are often regulated to some degree.

The difference between how natural monopoly and collusion develop is that in a market with the conditions for natural monopoly, cost characteristics will tend to lead directly to dominance by a single firm with market power, while collusion occurs when multiple viable firms engage in non-competitive behavior while being protected (by legal barriers to entry) against new firms entering the market.

Collusion among firms in a market which could in principle be competitive is one means by which market power can develop. Firms sometimes collude explicitly, that is, come to agreements on price-fixing or other anti-competitive practices. More often, however, collusion is implicit. For example, an airline may raise prices to some degree in the hope that other airlines will do likewise, as opposed to undercutting the first firm's price and luring away customers. If an implicit bargain can be struck on the tradeoff between increases in price and relative market share for each firm, than implicit or tacit collusion may occur, resulting in the potential exercise of market power and losses to the consumer and to the economy as a whole.

Natural monopoly, on the other hand, can occur spontaneously due to the presence of technical barriers to entry (large economies of scale) in the relevant market. When such underlying economic conditions are present and production costs decrease with greater scales of production, a single firm will tend to gain more and more market share since it can charge a lower price than smaller firms. Once dominance has been achieved new firms can be excluded and the natural monopolist can still charge prices above its production costs, leading to the potential exercise of market power.

Market power, whether exercised through collusion or through dominance by a natural monopoly, must be addressed by legal and regulatory policy in order to protect consumers and promote economic efficiency. Because specific segments of the energy markets can be subject to both legal and technical barriers to entry, legal and regulatory policies appropriate to address both collusion and natural monopoly situations are needed in certain circumstances, even as the Commission seeks to reduce the need for regulation through the development of robust competitive markets whenever possible.

The Commission shares authority for addressing collusive practices with the Department of Justice, the Federal Trade Commission, and the Securities and Exchange Commission.

Collusion by firms in potentially competitive markets is the subject of most anti-trust law (beginning with the Sherman Anti-Trust Act of 1890) and related regulatory policy. The courts have confirmed that the Commission shares the responsibility for addressing collusive practices with other anti-trust agencies such as the Department of Justice, the Federal Trade Commission,

and the Securities and Exchange Commission. Natural monopolies, in contrast to collusive practices, generally require explicit regulatory strategies which seek to establish incentives for the natural monopolist to charge efficient prices, or to impose such prices in the form of regulated rates for goods and services.

The series of actions taken by the Commission in order to promote more competitive energy markets is fundamentally aimed at tailoring regulatory policy in ways which allow for as much competition as possible throughout all segments of the affected industries (see the discussions of regulatory context in section II, Commodity Markets, and Section III, New Service Availability, for more detail on the specific actions taken by the Commission).

The importance of unbundling in this context is that vertical separation and unbundled services allow for each market segment and service to be evaluated in terms of its specific characteristics, so that appropriate approaches can be applied by the Commission. Some markets are by nature more competitive than others, and although the benefits of competition should be fostered in as many markets as possible, there remain parts of energy markets which are subject to legal and/or technical barriers to entry. Potential market power in these market segments and service areas must be identified and addressed in an ongoing fashion, albeit through the most market-oriented set of policies that can be implemented.

In particular, the transportation networks for electric power, natural gas and petroleum can be regarded as natural monopolies. These networks are capital intensive and require highly specialized operating systems and expertise to maintain at acceptable levels of reliability. Legal barriers to entry also exist in these transportation networks. Because of these underlying factors, some type of regulatory oversight will be required in order to protect consumers and ensure that the benefits of more competitive market segments are realized. Current major Commission rulemakings – Order No. 2000 concerning electric power and Order No. 637 concerning natural gas – are intended to develop better approaches to continuing issues, including the potential for ongoing market power, in the transportation networks.

On the other hand, many segments and specific markets can and should be quite competitive, and in these markets the Commission is committed to fostering the fullest possible degree of competition. In these more competitive markets, the challenge now facing the Commission is one of reengineering its own policies and activities in a way which allows markets to function unimpeded, while developing appropriate market analysis tools to identify and address any remaining needs for Commission action. During the transition to more competitive markets, such needs may be extensive, as extremely difficult topics in market design, governance, and operation are taken up by market participants and public institutions.

The Commission is continuing to improve its policy regarding merger applications.

In addition to major rulemakings and market design decisions and approvals, the Commission must continue to advance its practice concerning merger applications. This is proceeding through continuing improvements in merger policy as reflected in the Merger Policy Statement issued in 1996, and through ongoing efforts to improve the filing process and the Commission's analytic capabilities in order to better understand and respond to specific mergers' effects on the potential for market power abuses. The Commission's merger policy is aimed at two objectives:

- allowing industry to restructure and adapt to changing market conditions; and
- not allowing that restructuring to work to the detriment of the evolving markets (i.e. lead to inefficient results, such as increased potential for the exercise of market power).

Developing Performance Indicators: Methods and Data

Performance indicators related to market power should be based on the Commission's ongoing efforts to understand and respond to the changing nature of the energy markets. Ideally, the Commission could show how its use of information and analysis informs appropriate decisions in merger filings, regional market structure oversight, and general rulemakings through the development and presentation of well-tailored performance indicators. Indicators may also allow for a continuing picture of the structure and levels of concentration in relevant markets, although this goal may be difficult to achieve due to the challenging nature of market definition.

Additionally, as analytic tools and information become more sophisticated, the Commission must continue to develop better tools and procedures to understand markets and identify and address ongoing market power issues. At the present time there are analytic tools at the Commission's disposal which, while resource-intensive, can be applied in certain circumstances when traditional means of analysis do not yield enough information or when interested parties have especially large stakes in the outcome of a decision.

In the area of market power, the Commission employs a variety of techniques to determine whether market power is present, and the degree of potential for market power going forward. These techniques vary to some extent depending on whether the issue at hand involves a merger filing, a filing concerning a regional market structure, filings for market-based generation of gas transportation or storage rates, or the general 'pulse-taking' or market analysis activities which inform the Commission of market conditions on a day-to-day basis. However, for the purposes of developing performance indicators it is more useful to discuss these methods and data requirements together; their application will of course depend on the context.

A useful distinction may be made between quantitative and non-quantitative methods, since the Commission employs both kinds of information gathering

and analysis. Non-quantitative methods are discussed first, followed by traditional quantitative analysis as presented in the Merger Guidelines, and finally the development of newer quantitative tools such as computer simulation modeling.

The Commission uses a number of non-quantitative methods to determine and understand the workings of the energy markets, especially the exercise of market power.

Non-quantitative methods. One of the principal means by which the Commission develops an understanding of market conditions, and specifically the potential exercise of market power, is through direct contact with customers. Every day the Commission hears from various firms, individuals, and institutions about what is going on in their markets. The information thus gathered is of immense value, and one of the Commission's ongoing challenges involves how to improve and systematize this set of information flows.

There are several primary channels of communication with outside parties, some of which are initiated by the parties and some by the Commission:

Comments. The comment process is arguably the most important source of information at the Commission's disposal during a specific decisional process. Comments are directly relevant to the issues at hand, and the commenting parties are aware that a decision is being considered, giving them a chance to influence the outcome. Hence important cases, and particularly major rulemakings, often attract hundreds of comments which comprise thousands of pages of information. If market power is an explicit part of the decision at hand, as it is in merger and regional market structure filings, then commenting parties provide the Commission extensive information on the parties' perceptions of market power, and in many instances evidentiary support for their perceptions.

Complaints. Formal complaints are another important source of information for the Commission, since they often contain specific complaints and evidence to back up those complaints. The Commission also established its Enforcement Hotline in 1987 with the specific intent of making it easier for market participants anywhere in the country to inform the Commission of problems they might be having, including instances of the exercise of market power. Complaints can be lodged regardless of the time or place and regardless of whether the Commission is considering a decision in the complaining parties' particular market.

Surveys. When the Commission seeks further information about a specific issue, it can develop and implement surveys to gather information from a broad set of its customers. Market power is an issue which the Commission is currently pursuing through a survey approach. Blanket survey authority from the Office of Management and Budget would allow the Commission to coordinate its survey activity and receive approval for specific surveys within ten days. The Commission is currently in the process of obtaining such

blanket survey authority, and expects to develop the methods for a market power survey in the near future.

Investigations. Another approach is to launch an investigation or audit into a specific problem such as a particular instance or instances of the exercise of market power. This can vary in complexity, time frame, and resources, running the gamut from a nonpublic investigation (one step beyond a Hotline complaint) to a formal inquiry in the nature of a full-scale Commission proceeding. Whatever the appropriate level of investigation, this is a major method by which the Commission educates itself about market conditions, and serves as a basis for informed market-related decision making by the agency.

In dealing with the information gathered by these methods, the Commission must develop ways to catagorize and evaluate what is essentially a collection of customer perceptions, with supplemental evidence that may be more or less detailed and more or less quantitative. Analytic approaches for handling this kind of information are now quite sophisticated and the Commission intends to pursue a more systematic approach to handling these information flows over time. This should create the opportunity to develop performance indicators that track how customer perceptions change over time, and make use of customer-provided evidence to track instances of market power.

Quantitative methods. In addition to the valuable information provided by direct contact with customers, the Commission is able to carry out extensive analysis of market power issues using reported data and a set of quantitative methods. These methods cannot tell the whole story by themselves, but are an essential part of understanding how changes can affect market concentration and the potential for market power.

There are several types of quantitative analysis which the Commission employs in this context. The Commission uses analytic techniques based upon the FTC/DOJ Merger Guidelines, and these techniques are the main approach taken by the Commission when analyzing merger filings. The Merger Guidelines also suggest the development of computer simulation modeling, and these models can be useful not only in merger filings but also in market structure analysis and the general development of the Commission's understanding of how the markets are working. The Commission also employs a market power analyses when determining requests for market-based pricing for electric wholesale power rates, gas storage rates and gas transportation, which can also serve overall Commission market analysis.

Quantitative analysis of market power relies on using the appropriate definitions of the relevant market.

All types of quantitative market power analysis depend critically upon appropriate definitions of the relevant market, in terms of the services being offered and geographic scope. This is an extremely complex and difficult step, and there are fundamental uncertainties and judgment calls involved. However, quantitative analysis offers insights which customer perceptions and evidence cannot provide, especially in the area of anticipating the effect of

changes on the potential for the exercise of market power. It is part of the Commission's responsibility to make a reasoned use of all of the information developed through all types of analysis.

Merger Guideline Analysis. The FTC/DOJ Merger Guidelines, as adopted by the Commission for use in merger analysis, lay out a detailed analytic approach. This consists of a five-step process:

1. Assess whether the merger would significantly increase concentration and result in a concentrated market, properly defined and measured.

2. Assess whether the merger, in light of market concentration and other factors that characterize the market, raises concern about potential adverse competitive effects.

3. Assess whether entry would be timely, likely and sufficient either to deter or to counteract the competitive effects of concern.

4. Assess any efficiency gains that reasonably cannot be achieved by the parties through other means.

5. Assess whether, but for the merger, either party would be likely to fail, causing its assets to exit the market.

In determining the likely impacts of a merger on market structure and the potential for market power, the Commission relies mainly on information provided by the merging parties and by intervening parties. This information in many cases includes extremely extensive quantitative data, customized models and other sophisticated analytic material. Additionally, in many cases the information is proprietary and company-specific. These factors make it difficult to rely directly upon merger case filings to develop performance indicators. However, it may be possible to generalize conclusions and make quantitative assessments of market concentration and the potential for market power using the analytic methods set out in the Merger Guidelines, thereby allowing for the development of meaningful performance indicators.

Market-Based Rates. Pipeline applicants for market-based storage or transportation rates must demonstrate that they cannot withhold services to increase and maintain prices above competitive levels or unduly discriminate among customers. In this context, a pipeline lacks significant market power if its customers have sufficient good alternatives, or if the Commission can mitigate the market power through appropriate conditions. In analyzing the pipeline's market power, the Commission:

- defines the product market (e.g., short-term storage, long-term firm transportation, *etc.*) and the geographic market;
- measures market share and concentration; and

- considers entry barrier and other relevant factors.

Similarly, an applicant for market-based electric wholesale rates must show that it does not dominate any relevant generation market, has no transmission market power, and has no control over other barriers to entry.

As with mergers, in market-based gas and electric proceedings, the Commission historically relies on information provided by the parties. However, the Commission's approach in this area supplies a source of quantitative assessments.

Newer simulation models. Over the past several years new types of models, and more effective computers, have enabled the Commission to deploy new analytic tools with many uses. The main types of models now in use are optimization models of the planning and operation of the relevant system, load flow models of the actual power flows on the electric transmission grid, and models of strategic firm behavior in network industries (based on principles of game theory). In recent years optimization models which are also load flow models have been made available. Increased computing power and advances in programming have enabled the Commission to work with models which present a reasonable level of detail and can assist in understanding market conditions, and the ways in which market power can affect costs and prices.

Simulation modeling of the electric power system has been used in recent merger cases, to highlight the role of vertical integration and the possibility of using control over the transmission grid to cut off competing supplies and force higher-cost plants to run. When conditioning merger cases, such detailed simulations can help the concerned parties and the Commission target mitigation measures at the facilities that make a difference, whether they are transmission facilities or generating plants. The details matter in network industries and simulation modeling can help to understand what changes when specific facilities are operated differently.

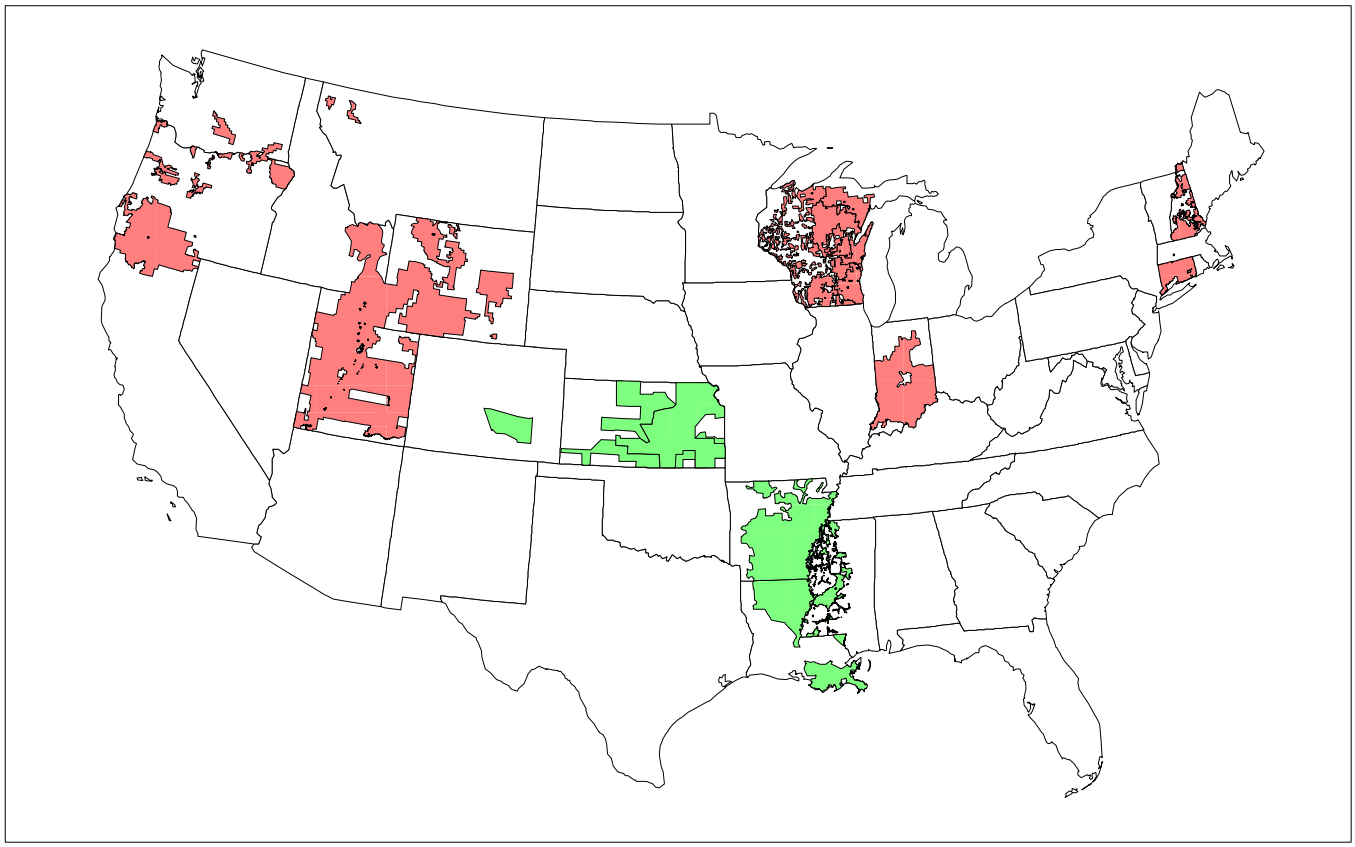
Ongoing issues raised by modeling include the suitability of the data which the Commission uses in modeling, and the degree to which results can be interpreted in their proper context. While modeling is potentially attractive in the context of developing performance indicators, a great deal of caution is advisable in the use and interpretation of results.

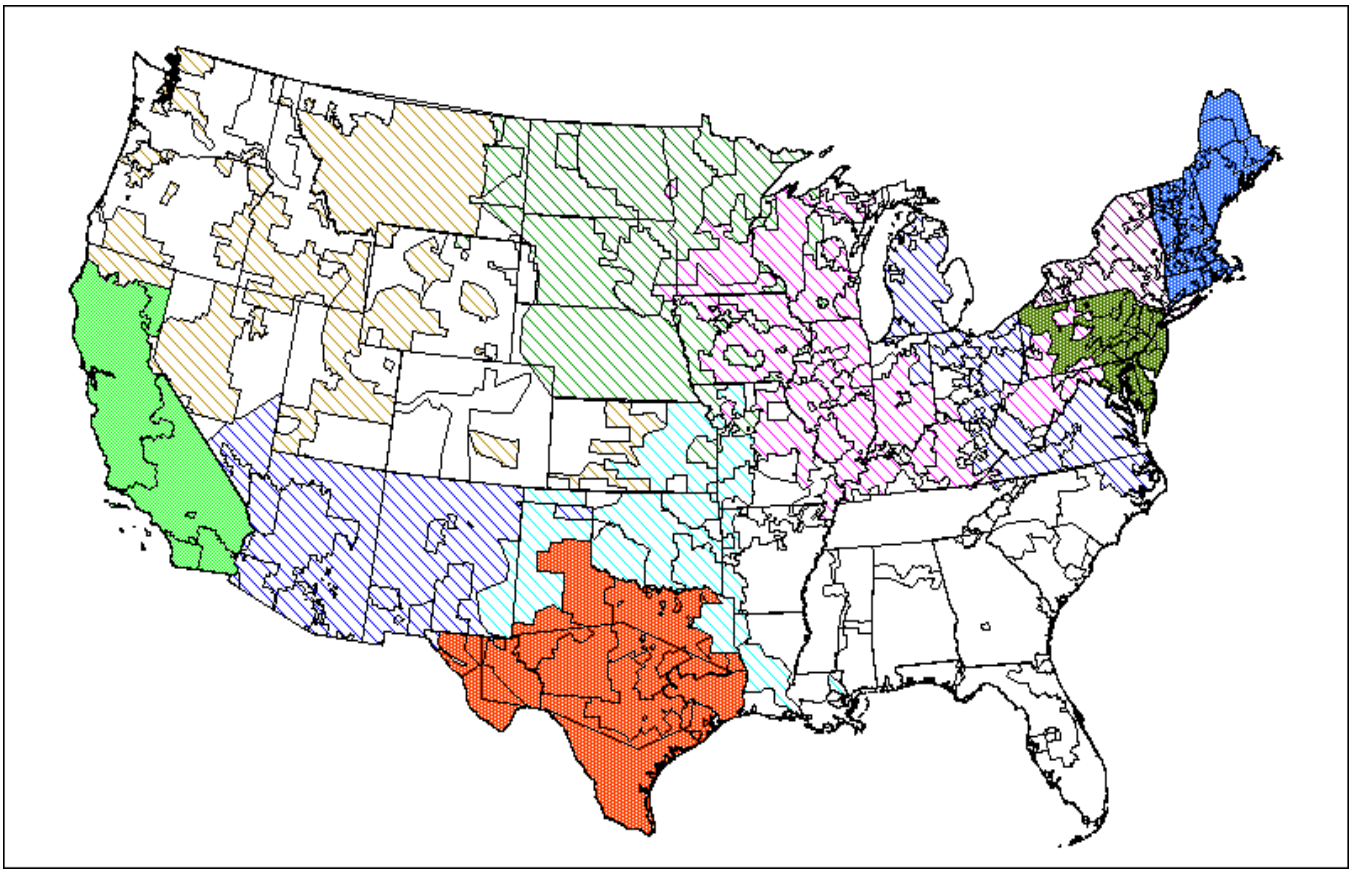
Performance Indicators: Examples

Performance measures in the area of market power should show how the Commission's actions affect relevant institutions and markets and lead to changes in the potential for the exercise of market power. As discussed previously, defining markets for the purposes of market power analysis is often done on a case-by-case basis in order to ensure that the proper services, suppliers, and scope of that particular market are applied. This makes it

difficult to develop market power analyses that are general enough to use as performance indicators.

One broad indicator, however, is the development of open access tariffs and independent system operators (ISOs) in electric power markets. Such tariffs allow other users to access a transmission system under the same rates, terms and conditions as the owner would receive, and make it more difficult to exercise market power by enabling access to competing commodity sources. Open access transmission tariffs were only available in a few parts of the nation as recently as 1991, prior to the passage of the Energy Policy Act. The following map shows the open access transmission tariffs in place at that time: By the beginning of 2000, ISOs were serving many of the same purposes for regions that open access transmission tariffs did for individual firms. They also allow for greater coordination of grid operations, better reliability and system expansion planning, more trust and credibility from customers, and elimination of rate pancaking. The Commission issued Order No. 2000 in 1999 to encourage the further development of ISOs and other types of regional transmission operators (RTOs) in all regions. The next map shows the status of ISOs across the nation as of October 1999 (operational institutions are shown in solid colors while anticipated institutions are crosshatched):





Appendix: Electric and Natural Gas Price Graphs

The following graphs show background information on electric power and natural gas prices by region, and futures prices for electricity at two trading hubs (Cinergy and Entergy).