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# A Primer on Demand Response and a Critique of FERC Order 745

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The debate about demand response in electricity markets has become far more complicated than it needs to be. The basic economic and legal concepts implicated by the debate are simple. They are, or should be, much easier to understand than the tens of thousands of pages of contentious testimony and comments submitted in Federal Energy Regulatory Commission (FERC) and state public utility commission (PUC) demand response proceedings suggest. My goal is to describe the applicable economic and legal principles in a manner that will make the debate broadly accessible to market participants, policy makers, and the general public.

## A. The Economics of Demand Response

The price of any good or service sold in a competitive market is determined by the intersection of the supply and demand curves.[2] The supply curve is determined by the marginal cost (MC) of the good or service.[3] MC is the cost of the last unit of the good or service produced.[4] For purposes of understanding the demand response debate, it may be easiest to think of MC with reference to an alternative but functionally identical definition. MC is the cost society saves by declining to produce the last unit of the good or service.[5]

In a competitive market, we can rely on market forces alone to yield an appropriate demand response to changes in conditions of supply or demand.[6] If the MC-

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[2] For a good description of the determinants of the performance of a competitive market, see Joel Dirlam & Alfred Kahn, Fair Competition Policy: the Law and Economics of Antitrust Policy 29-42 (1954).
[3] Richard Pierce & Ernest Gellhorn, Regulated Industries 26-38 (4th ed. 1999); Alfred Kahn, I The Economics of Regulation 63-87 (1970) .
[4] I Kahn, note 3, supra., at 65-70.
[5] Id. at 65-66.
[6] Id. at 66-67.

based price a customer confronts exceeds the value the customer places on the last unit the customer purchases, the customer will decline to purchase that unit. If we have taken the steps needed to equate marginal social cost (MSC) with marginal private cost (MPC), each customer's decision to purchase or not to purchase a unit maximizes social welfare, since each customer is basing its purchase decisions on its application of a social cost-benefit test that it is uniquely well-equipped to apply.[7]

For present purposes, I will assume that the MSC of making a unit of electricity available on a wholesale or retail market equals the MPC of that process. I will relax that assumption in section D. On that assumption, the customer receives the socially-optimal "reward" for declining to purchase any unit with a benefit that falls short of its MC-based price—a reward equal to the cost society avoids as a result of the customer's decision not to purchase a unit that it values less than the MC-based price of the unit. This is why we do not need to devise a system to "reward" customers for engaging in demand response in most markets. The savings the customer realizes as a result of its decision not to purchase a unit of a good or service is a "reward" for conservation that is precisely equal to the social value of that decision to conserve.

Many electricity markets do not replicate the performance of competitive markets, however, for two reasons. First, some of the functions that must be performed to deliver electricity to customers—mainly transmission and distribution—involve economies of scale so large that the owners of the assets that perform those functions have monopoly power.[8] When a producer has monopoly power, the prices it charges exceed MC.[9] In the

[7] Id. at 69.
[8] Richard Pierce, A Proposal to Deregulate the Market for Bulk Power, 72 Va. L. Rev. 1183, 1209-11 (1986).
[9] II Kahn, supra. note 3, at 113-23.

absence of government intervention of some type, that effect of monopoly power would, inter alia, reduce social value by inducing consumers to engage in too much conservation.

The existence of monopoly power both eliminates the natural tendency of a competitive market to induce optimal conservation and justifies government regulation. The US has long regulated both the wholesale and retail price of electricity. The existence of price regulation is the second reason why we can not be confident that electricity markets alone will yield optimal demand response. The methods we use to regulate the price of electricity often yield prices that diverge significantly from MC.[10] In some important contexts, regulated prices fall well short of MC. That creates a situation in which consumers have incentives to conserve too little in the absence of some other form of government intervention that offsets that incentive effect—e.g., an explicit "reward" for conservation in addition to the market-based "reward" the consumer gets as a result of a decision to decline to purchase a unit of electricity.

The divergence between MC-based prices and regulated prices, and the resulting failure to provide adequate incentives for demand response, can have serious adverse effects. The best single illustration of the potential adverse effects of that divergence is the California energy debacle of 2000.[11] During the spring of 2000, California experienced periodic blackouts and a 500 per cent increase in the wholesale price of electricity.[12] Those catastrophic events would not have occurred if government officials in California had taken account of the critical role of demand response in an electricity market. Instead, the California legislature imposed a freeze on the retail price of

[10] Pierce, supra. note 8, at 1204-05.
[11] See Richard Pierce, How Will the California Debacle Affect Energy Deregulation? 54 Ad. L. Rev. 389 (2002).
[12] Id. at 389.

electricity.[13] A price freeze eliminates all potential demand responses to a change in market conditions. When the supply of electricity in the wholesale market that is the source of the electricity that is sold in the California retail market declined, the price in the wholesale market increased, but the freeze on the retail price precluded retailers from passing that increase through to consumers. As a result, consumers had no incentive to reduce their purchases.

Without the retail price freeze, California consumers would have experienced the price increases that normally flow from a reduction in available supply and would have reduced their consumption accordingly. That, in turn, would have produced a new equilibrium in the wholesale market. The wholesale market would have cleared at a price somewhat higher than the price that existed before the reduction in the supply available in the wholesale market but the existence of demand response to the price increase would have served as a natural brake on the rate of increase in the retail price. In the absence of demand response to the changes in conditions in the wholesale market, the price in that market continued to spiral out of control.[14] Blackouts were the inevitable result of that failure to allow a demand response in the retail market to the increases in the price in the wholesale market.

The California debacle illustrates an important point that Louis Kaplow has made in some of his recent contributions to the antitrust literature. Market share alone can tell us nothing about whether a firm has market power, i.e., the power to increase market price by reducing the amount of a good or service it supplies.[15] If the demand for a

[13] Id. at 395.
[14] Id. at 397.
[15] Louis Kaplow, Market Share Thresholds: On the Conflation of Empirical Assessment and Legal Policy Judgments, forthcoming in 7 J. Comp. L. & Econ. (2011); See also Kahn, supra. .

product or service is completely price elastic, even a firm with 100% of the market has no market power.[16] Conversely, if the demand for a product or service is completely price inelastic, even a firm with only 1 per cent of the market can exercise market power.[17] The retail price freeze imposed by the California legislature created a market with completely price inelastic demand. A market with no potential demand response always performs poorly.[18] The likely effects of failure to provide any incentive to reduce retail demand in response to an increase in wholesale price include price spikes, shortages, and extreme vulnerability to market manipulation by suppliers in the wholesale market.

The California debacle also illustrates another important point. Both wholesale markets and retail markets should be designed to provide appropriate incentives for demand response. The failure to provide incentives for *any* demand response in the California retail electricity market had catastrophic results for the wholesale electricity market that serves California. It is easy to illustrate the converse of that phenomenon by reference to the natural gas market during the 1970s. Below-market ceilings on the price of natural gas at the wellhead (the wholesale market) eliminated incentives for purchasers to reduce their demand in response to increased prices. That, in turn, produced a variety of market distortions and attendant social costs that have been documented in the literature, e.g., prices far above market price for supplies that were not subject to wholesale price ceilings and shortages in retail gas markets that forced the closure of many factories and the layoff of millions of workers.[19] Thus, it is clear that failure to

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[16] Id. at ___.
[17] Id. at ___.
[18] Pierce, supra. note 11, at 397.
[19] Richard Pierce, Reconsidering the Roles of Regulation and Competition in the Natural Gas Market, 97 Harv. L. Rev. 345, 362-65 (1983); Richard Pierce, Natural Gas Regulation, Deregulation, and Contracts, 68 Va. L. Rev. 63, 65-86 (1982).

provide appropriate incentives for demand responses to changes in market conditions in a wholesale market can have severe adverse effects on any retail market served by that wholesale market, while failure to provide incentives for appropriate demand responses in a retail market can have severe adverse effects on the performance of the wholesale market that serves that retail market.

**B. The Vocabulary of the Demand Response Debate**

Participants in the demand response debate often use three terms that must be understood to understand the debate—"locational marginal price," "real-time pricing," and "negawatts." Locational marginal price (LMP) is a term that incorporates by reference an important characteristic of an electricity market. LMP recognizes that the cost of making a unit of electricity available for purchase can vary greatly by location.[20] During some periods of time, the transmission grid is constrained to such an extent that it can not support the combination of wholesale transactions that would yield the lowest cost supply of electricity to a particular location (or node) on the grid. The size of the transmission grid, coupled with the laws of physics, make the determination of LMP at any node complicated and dynamic, but it is easy to illustrate the phenomenon by assuming a simple grid with only two sources of electricity, 1 and 2, and two nodes, A and B, from which retailers purchase electricity.[21] Assume that the MC of source 1 is 5 cents, while the MC of source 2 is 10 cents. If there is enough capacity on the grid to allow electricity from source 1 to reach node A but not node B, the MC of electricity at node A is 5 cents while the MC of electricity at node B is 10 cents. Since price equals MC in a competitive market, it follows that the LMP at node A would be 5 cents and the

[20] William Hogan, Electric Transmission: A New Model for Old Principles, The Electricity Journal, vol. 6, no. 2, p.18 (1993).
[21] For a more realistic and more complicated illustration, see id. at 20-22.

LMP at node B would be 10 cents in a competitive wholesale market that is supported by a transmission grid with those characteristics. Thus, it is useful to refer to LMP as the equivalent of MC in a wholesale electricity market. Since the MC of electricity often varies significantly by location, we can be confident of getting an appropriate demand response to changes in market conditions only if we allow the price of electricity to vary by location.

Real-time pricing is a term that reflects another important characteristic of electricity markets. The MC of electricity varies greatly over time.[22] That follows from three characteristics of the market. First, the marginal cost of generating electricity varies greatly among generating units—from about 1 cent per kilowatt hour (KWH) to about 20 cents per KWH. Second, demand for electricity varies greatly over time—demand at 3 p.m. on a hot tuesday in august can be many times greater than demand at 3 a.m. on a balmy sunday in october. Third, electricity can not be economically stored. It must be consumed at the same time it is produced. Thus, it is useful to refer to real-time prices as synonymous with electricity prices based on MC. Since the MC of electricity varies significantly over time, we can be confident of getting an appropriate demand response to changes in market conditions only if we allow prices to vary significantly over time—real-time pricing.[23]

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[22] I Kahn supra. note 3, at 89-122.

[23] For good descriptions and discussions of real time pricing, see Zhen Zhang, Smart Grid in America and Europe, Pub. Util. Fort. vol. 149, no. 1 at p. 46 and no. 2 at p.32 (2011); Steven Andersen, Saving the Smart Grid, Pub. Util. Fort. vol. 149, no. 1 at p. 32 (2011); Ashley Brown & Raya Salter, Can Smart Grid Technology Fix the Disconnect Between Wholesale and Retail Pricing? Elec. J. vol. 24, no. 1, at p. 7 (2011).

Negawatt is a term that is sometimes used to refer to the economic equivalence of a unit of electricity saved and a unit consumed.[24] Participants in the demand response debate often assert that, since a negawatt is equivalent to a megawatt, it follows that someone who produces a negawatt should be rewarded in a manner equivalent to someone who produces a megawatt. That is true but the equation of negawatts and megawatts is also potentially misleading. Any consumer that forgoes purchase and consumption of a unit of electricity should be rewarded in an amount equal to the MC of the unit it declines to purchase, but any consumer that purchases electricity in a competitive market automatically receives exactly that reward in the form of a reduction in its cost of electricity. Thus, for instance, if the MC of a unit of electricity is 8 cents, and the consumer declines to purchase a unit at a price of 8 cents, the consumer receives a reward of 8 cents. That reward is equal to the cost society avoids as a result of the decision not to produce that unit of electricity.[25]

If the consumer is also rewarded by receiving a price of 8 cents per unit for producing a "negawatt," as some of the participants in the demand response debate urge, the consumer is rewarded at a total price equal to twice the MC of the unit of electricity it consumes.[26] The consumer both saves 8 cents and receives 8 cents. Thus, a system of pricing negawatts as if they are megawatts is premised on a math error that no first grader should make. 8 cents plus 8 cents is not 8 cents.

I have long been puzzled by the apparent inability of many smart people to understand that compensating some entity for producing a "negawatt" is inappropriate

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[24] For detailed discussion and analysis of negawatt acquisition programs, see Bernard Black & Richard Pierce, The Choice Between Markets and Central Planning in Regulating the U.S. Electricity Industry, 93 Colum. L. Rev. 1339, 1354-84 (1993).
[25] Id. at 1384-89.
[26] For detailed explanation of the double-counting effect, see id. at 1360-61.

and involves simple double counting. I suspect that this common error is attributable to the tendency of many people to focus only on the cost of electricity. It is certainly true that consumption of electricity imposes social costs, but the same is true of any other good or service. Consider the market for books, for instance. Books are made primarily of paper. Production of paper imposes significant social costs, as anyone who has knowledge of timbering and of the pulp and paper business well knows. Yet, an argument that we should treat producers of negabooks the same way we treat producers of books would not resonate with most audiences. I could not make much money trying to sell negabooks by claiming that they have the same value as books. When most people think of books, they initially think of their value to society rather than their cost to society. But, of course, negawatts also have value. Thus, for instance, I could not create this word file on my computer in my nicely lit office if it were not for megawatts.

Once you recognize that electricity is just like books, or any other product or service, it is easy to see why the argument that a negawatt producer should be rewarded in the same manner as a megawatt producer makes no sense. Like books, electricity is a good that can only be produced and consumed by incurring costs. Our goal in creating a properly functioning market for either electricity or books should be to implement a pricing system in which price equals MC.[27] If we accomplish that goal, a "producer" of negawatts or negabooks will be rewarded, in its capacity as a consumer, at an appropriate level, in the form of a cost saving equal to the value of the resources not used, every time it declines to purchase a unit of electricity or a book.

## C. Jurisdictional Complications

[27] Id. at 1384-89.

FERC has jurisdiction over wholesale electricity markets. It has been attempting to create competitive wholesale markets for twenty years.[28] It has not yet enjoyed complete success in that endeavor but it has the ability to address any remaining impediments to creation of competitive wholesale markets in every region[29] and, it is continuing to move in that direction.[30] As discussed in section A, a competitive market automatically provides appropriate incentives for demand response.[31]

Retail markets and wholesale markets are closely related in the context of demand response, however.[32] A retail market that creates inappropriate incentives for demand response can have adverse effects on the performance of a wholesale market, and vice versa. Unfortunately, the US allocates authority over the wholesale electricity market to one entity, FERC, and authority over retail electricity markets to fifty other entities, state PUCs. My description of the critical role played by the decision of California authorities to impose a retail price freeze in 2000 illustrates the potential for states to make decisions applicable to retail markets that have devastating effects on the performance of a FERC-regulated wholesale market.[33]

Fortunately, states rarely make decisions at the retail level that have such catastrophic effects on the performance of a wholesale market as did the California retail rate freeze decision of 2000. States have been reluctant, however, to implement retail

[28] For discussion of the initial FERC efforts, see Richard Pierce, The State of the Transition to Competitive Markets in Natural Gas and Electricity, 15 En. L. J. 323 (1994).
[29] For a discussion of the problems FERC has encountered and the current state of the FERC effort to create competitive wholesale markets in each region, see Richard Pierce, Completing the Process of Restructuring the Electricity Market, 40 Wake Forest L. Rev. 451(2005).
[30] In Order 745, FERC recognized the relationship between the competitive wholesale markets it is attempting to create and creation of incentives for efficient demand response. FERC Order 745, Docket No. RM10-17-000 at p. 9 (Mar. 15, 2011).
[31] Text at notes 2-7 supra.
[32] Text at notes 11-19 supra.
[33] Text at notes 11-14 supra.

regulatory regimes that yield optimal incentives for demand response by equating retail prices with MC.[34] The Department of Energy (DOE) has been urging states to implement real-time pricing. One obstacle is the high cost of the smart meters that are a prerequisite to implementation of real-time pricing. DOE has attempted to overcome that obstacle by providing grants to some states to subsidize programs to install smart meters.[35] Even with strong encouragement and partial funding from DOE, however, states have resisted federal efforts to persuade them to adopt real-time pricing. State consumer advocates and PUCs object to real-time pricing based in part of privacy concerns and in part on concerns that low income and elderly consumers will pay higher electricity bills as a result of their limited ability to shift their consumption from periods in which electricity is expensive to periods in which it is inexpensive.[36]

Real-time pricing would create appropriate incentives for demand response by confronting consumers with the reality that electricity costs much more per unit at times of peak demand than at times of slack demand. Studies have found that real-time pricing can reduce the total cost of electricity by about 12% by inducing consumers to reduce their demand at times of peak demand and to increase their demand at times of slack demand.[37] The resulting reduction in peak demand would allow total demand for electricity to be met with less generating capacity and, hence, at lower social cost.[38] Most consumers would benefit from real-time pricing because most would switch enough of their demand from high-priced periods of peak demand to low-priced periods of slack

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[34] The complicated debate with respect to implementation of real time pricing is discussed in detail in the sources cited in note 23 supra.
[35] DOE, Energy Secretary Chu Announces Five Million Smart Meters Installed Nationwide as Part of Grid Modernization Effort (June 13, 2011).
[36] See sources cited in note 23 supra.
[37] Zhen Zhang, supra. note 23.
[38] Id.

demand to realize large reductions in their total cost of electricity.[39] Unless consumer advocates and/or state PUCs change their attitudes, however, retail electricity prices will continue to be based on average cost instead of marginal cost.[40]

FERC has little ability to overcome the unfortunate reluctance of PUCs to adopt retail regulatory systems that provide optimum incentives for demand responses to changes in market conditions. FERC can, and should, take that reluctance into account in choosing and implementing a system of wholesale pricing that incorporates appropriate incentives for demand response. The unwillingness of state PUCs to implement real-time pricing creates a pricing pattern in which the retail price of electricity is well below MC during times of peak demand but in which the retail price exceeds MC at times of slack demand. This pattern of prices has the potential to distort the proper functioning of the wholesale market in one recurring situation—when a retail customer would be willing to reduce its demand if it confronted appropriate incentives but it is not willing to do so given the distorted incentives created by the absence of MC-based retail prices.

To illustrate this situation, imagine a large industrial or commercial consumer that would reduce its demand during periods of peak demand by 20% if it confronted an MC-based real-time price of 40 cents per kwh but that is not willing to reduce its demand during peak periods at the actual retail price it pays of 8 cents per kwh. Both the retail market and the wholesale market would perform better if the consumer could obtain a "reward" of 40 cents per kwh, rather than 8 cents per kwh, for reducing its demand by 20 per cent during periods of peak demand. FERC could address this problem effectively by implementing a pricing system in which such a retail customer is "rewarded" at the

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[39] Brown & Salter, supra. note 23.
[40] Andersen, supra. note 23.

wholesale level by receiving a price of 32 cents, the 40 cent MC of the units minus the amount of money (8 cents) the customer saves for each unit it declines to purchase during periods of peak demand. This method of pricing demand response is often referred to as LMP-G, where LMP is the marginal cost of making the unit of electricity available at the particular time and place at which the consumer receives delivery and where G is the retail price per unit the consumer would pay if it were to purchase the units it is willing to forego.[41]

Note that this mechanism automatically incorporates the high temporal and locational variability of the MC of electricity coupled with the unwillingness of most PUCs to reflect those variables in retail rates. Thus, for instance, the same consumer would not receive any extra "reward" in the form of payments from the wholesale market, for reducing its demand during periods of slack demand. During such periods, retail rates typically exceed MC. Thus for instance, if MC during a period of slack demand is 5 cents, and the customer pays a retail price of 8 cents, it is already being overcompensated by 3 cents per unit for reducing its demand during periods of slack demand.

### D. Complications Caused By Externalities

In section A, I explained why a competitive market automatically provides appropriate incentives for demand response,[42] but I added a potentially important qualification. A competitive market yields that salutary result only if marginal private cost (MPC) equals, or at least approximates, marginal social cost (MSC).[43] If MSC exceeds MPC by a significant amount, a competitive market will provide inadequate

[41] FERC Order 745, supra. note 30, at 24.
[42] Text at notes 2-7supra..
[43] Text at note 7 supra.

incentives for demand response. MSC exceeds MPC to the extent that there are social costs associated with an activity that are not borne by the private market participants that engage in the activity.[44] Government regulation requires electricity suppliers to internalize most of the social costs of generating and transmitting electricity.[45] Thus, for instance, electricity generators are required to implement elaborate and expensive pollution control technologies to minimize the adverse effects of most of the potential pollutants that are byproducts of the generation process.

There is one major exception to our use of regulation to require generators to internalize the social cost of electricity generation, however. We do not regulate effectively emissions of greenhouse gases. If you share my belief in the anthropogenic global warming hypothesis, emissions of carbon dioxide (CO2) attributable to use of hydrocarbons to generate electricity is causing changes in the earth's climate that have the potential for catastrophic effects, including the death of millions of people and the dislocation of hundreds of millions of people.[46] Given present technology, there is no way of reducing the emissions of CO2 that are a byproduct of the use of hydrocarbons to generate electricity.

Electricity generation accounts for 40 per cent of total US emissions of CO2.[47] We use hydrocarbons to generate 70 per cent of our total electricity supply.[48] The MSC of this part of our electricity supply is well above each generator's MPC. The most effective response to this problem would be to implement a form of government

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[44] I Kahn supra. note 3, at 193-95.
[45] Black & Pierce, supra. note 24, at 1389-98.

[46] Richard Pierce, Energy Independence and Global Warming, 37 Env. Law 595, 597-99 (2007).
[47] EPA, Inventory of Greenhouse Gas Emissions and Sinks: 1998-2008, at 2-15 (2010).
[48] DOE, Net Generation by Energy Source: Total (2011).

intervention that would require generators to internalize this social cost. Either a well-designed cap and trade system or a large carbon tax would have that effect.[49] With the social costs of climate change internalized to the private market participants that are imposing that cost on society, my general assertion that competitive markets automatically yield appropriate demand response incentives would continue to apply to US electricity markets. So far, however, Congress has declined to adopt either a cap and trade system or a carbon tax. In the absence of either of those measures, a competitive electricity market will yield inadequate incentives for demand response. Thus, the existence of large externalities could, in theory, justify implementing a system for rewarding suppliers of demand response, i.e., consumers that reduce the quantity of electricity they consume, in an amount in excess of the automatic reward they get in the form of reduced electricity bills.

It would be very difficult, however, to design and to implement a demand response program that would reflect that external cost in an acceptably accurate manner. CO2 emissions from generating plants vary from zero for carbon-free generators like nuclear power plants to a large number per unit of electricity for coal-powered plants. It is hard to imagine how we could incorporate externalities into a demand response program given that enormous variation in the magnitude of the externalities. Moreover, some consumers might choose methods of reducing their demand for electricity from the regulated wholesale electricity market that impose external social costs equal to, or in excess of, the external costs of providing electricity from the grid. Thus, for instance, some large industrial consumers might choose to use coal to generate their own electricity supplies. Any attempt to incorporate recognition of external social costs in a

[49] Pierce, note 46 supra., at 600-02.

demand response programs would have to account for both the high variability of the external social costs of electricity obtained from the regulated market and for the potential high external social costs of the measures consumers take to reduce their purchases from the market. It is not clear that any such system can be designed or implemented.

### E. The Applicable Legal Principles

Any method of attempting to improve on the demand response incentives of participants in wholesale electricity markets must be consistent with the requirement in the Federal Power Act that all rates must be "just, reasonable, and not unduly discriminatory."[50] The just and reasonable standard has existed in a variety of contexts for well over a century. Until 1944, courts believed that this statutory language required agencies to employ a particular methodology in setting rates.[51] That judicial attitude changed when the Supreme Court issued its 1944 opinion in Federal Power Commission v. Hope Natural Gas Co.[52] In that opinion the Court announced that, henceforth, it was the "end result" of the ratemaking process, rather than the methodology used, that determined the legality of the agency decision. *Hope* freed agencies to use a variety of ratemaking methods, but courts continued to believe that the just and reasonable standard had a discrete substantive content that a court could identify and enforce in reviewing agency ratemaking decisions. That judicial attitude changed when the Supreme Court issued its 1968 opinion in Permian Basin Rate Cases.[53] In that opinion, the Court announced that a court must uphold an agency's decision to authorize particular rates if

[50] 16 U.S.C. §824d.
[51] Pierce & Gellhorn, note 3 supra., at 83-113.
[52] 320 U.S. 591 (1944).
[53] 390 U.S. 747 (1968).

the rates fall within a "zone of reasonableness." The *Hope* and *Permian Basin* decisions reflected judicial recognition of some of the realities of the ratemaking process: it is as much art as science; both the factual predicates for a ratemaking decision and the effects of the rates set are subject to a large range of uncertainty; and, agencies must make compromises among competing goals when they set rates.[54]

After 1968, the tests courts applied in ratemaking cases gradually became a subset of the general test courts apply to other agency actions—a court must uphold an agency action as long as it is reasonable.[55] That general test, in turn, has three components: (1) the agency decision must be based on a reasonable interpretation of the applicable statute;[56] (2) the factual predicates for the agency action must be supported by "such relevant evidence as a reasonable mind might accept as adequate to support a conclusion;"[57] and (3) the agency must provide adequate reasons to explain each of the steps it took in its decisionmaking process.[58]

In the context of ratemaking through application of the just and reasonable statutory standard, the first two components of the reasonableness inquiry rarely present a problem for an agency. When a court rejects a ratemaking decision it usually does so by concluding that the agency action was arbitrary and capricious because of one or more flaws or gaps that the court detected in the agency's reasoning process. Courts reject about 30 per cent of agency actions on that basis.[59] Even when a court rejects an agency action as arbitrary and capricious, however, about half of the time the court allows the

[54] See generally Kahn, note 2 supra.
[55] Richard Pierce, What Do the Studies of Judicial Review of Agency Actions Mean? 63 Admin. L. Rev. 77 (2011); David Zaring, Reasonable Agencies, 96 Va. L. Rev. 135 (2010).
[56] Chevron v. NRDC, 467 U.S. 842-43 (1984).
[57] Universal Camera Corp. v. NLRB, 340 U.S. 474, 488 (1951).
[58] Motor Vehicle Manufacturers' Ass'n v. State Farm Mutual Automobile Ins. Co., 463 U.S. 29,43 (1983).
[59] Pierce, supra. note 55, at 83; Zaring, supra. note 55, at 177-78..

agency action to remain in effect in anticipation that the agency will be able to sustain the action on remand by correcting any gaps or flaws the court detected in the agency's reasoning process.[60]

**F. FERC Order 745**

It is always difficult to predict the results of judicial review of an agency action. The duty to provide adequate reasons for a decision is sufficiently malleable to yield different results depending on the entering attitudes of the judges who engage in the review process.[61] I believe it is likely, however, that a reviewing court will uphold FERC Order 745. If I were a member of the circuit court panel that was given responsibility to review that Order, I would vote to uphold the action through application of the basic principles of law and economics applicable to the ratemaking process.

In Order 745, FERC rejected the LMP-G method of determining the per unit payment a provider of demand response should receive.[62] FERC ordered the Regional Transmission Organizations (RTOs) and Independent Service Operators (ISOs) that operate each of the regional transmission grids to design and implement a system of compensation that has the potential to compensate a provider of demand response at LMP.[63] FERC added an important qualification to that requirement, however. A provider of demand response is entitled to receive compensation based on LMP only in circumstances in which payment of compensation based on LMP would satisfy a net benefits test. FERC instructed RTOs and ISOs to identify the hours in which payment of LMP provides net benefits to consumers by determining "when reductions in LMP from

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[60] I Richard Pierce, Administrative Law Treatise §7.13 (5th ed. 2010).
[61] Thomas Miles & Cass Sunstein, The Real World of Arbitrariness Review, 75 U. Chi. L. Rev. 761 (2008).
[62] FERC Order 745, note 30 supra., at 48.
[63] Id. at 38-39.

implementing demand response results in a reduction in the total amount consumers pay for resources that is greater than the money spent acquiring those demand response resources at LMP."[64] That will be the case only when the unit of generation that is avoided as a result of the demand response payment is so much more expensive than the cost of the demand response unit that the decrease in LMP multiplied by the remaining load would be greater than the cost of the demand response unit.[65]

If I had been a member of FERC at the time it issued Order 745, I would have joined Commissioner Moeller's dissenting opinion.[66] I agree with him that: (1) LMP rarely if ever is the correct measure of compensation for a unit of demand response;[67] (2) LMP-G is the correct measure in most circumstances;[68] and, (3) the net benefits test requires RTOs and ISOs to make a complicated and burdensome calculation that would not be needed if FERC had adopted the LMP-G measure of compensation.[69]

If I were instead a member of the circuit court panel that is assigned to review Order 745, however, I would uphold the Order on the basis that FERC provided reasoning adequate to support each step in its decisionmaking process. FERC rejected the LMP-G measure of compensation based in part on its belief that it "would result in an administrative burden of tracking retail rates for the multiple utilities, ESCOs and power authorities and create undue confusion for retail customers and administrative difficulties for state commissions and ISOs and RTOs."[70] I agree with Commissioner Moeller that the process of making the net benefits calculation is likely to be more confusing and

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[64] Id. at 41.
[65] Id. at 42.
[66] Dissenting Opinion of Moeller, Commissioner, in Docket No. RM10-17-000 (Mar. 15, 2011).
[67] Id. at 4, 7, 11.
[68] Id. at 4-5.
[69] Id. at 6.
[70] Id. at 50.

burdensome than the process of applying LMP-G, but I can not say that the Commission's contrary belief is unreasonable.

My strong belief that LMP is almost always the wrong measure to use to compensate providers of demand response is tempered by the Commission's adoption of a net benefits test that I suspect will allow for compensation based on LMP only in rare cases in which LMP is not much above the appropriate level of compensation. Moreover, FERC recognized and addressed explicitly the many ancillary concerns that surround any effort to provide compensation for demand response beyond the level provided by the market, e.g., it recognized the need to establish a reliable means of calculating and verifying the quantity of the demand response claimed by a customer that seeks compensation for a demand response.[71]

## Conclusion

I hope that we will reach the point at which there is no justification for adoption of any method of compensating demand response through means other than those provided automatically by the market for electricity. The conditions needed to reach that point are: (1) creation of a competitive wholesale market for electricity in every region; (2) implementation of a carbon tax or other means of increasing the price of consumption of hydrocarbons to the point at which the MSC of generating electricity approximates the MPC of generating electricity; and, (3) adoption of real time MC-based rates in all retail markets. Since we are well short of those conditions at present, I believe that FERC Order 745 offers the prospect of some marginal improvement in the performance of US electricity markets.

[71] FERC Order 745, note 30 supra., at 71-73.