

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

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The Energy Policy Act of 2005 requires the Federal Energy Regulatory Commission (“FERC”) to study demand response¹ as a means for energy end-users to regulate their energy use.² The debate surrounding implementation of demand response in U.S. electricity markets has become far more complicated than it needs to be. The basic economic and legal concepts implicated by the debate are simple. Those principles are, or should be, much easier to understand than the tens of thousands of pages of contentious testimony and comments submitted in FERC and state public utility commission (“PUC”) proceedings suggest.³ My goal in this perspective piece is to describe the applicable economic and legal principles of demand response in a manner that will make the debate comprehensible to market participants, policymakers, and the general public alike.

I. The Economics of Demand Response

The price of any good or service sold in a competitive market is determined by the intersection of its supply and demand curves.⁴ The supply curve is determined by the marginal cost (“MC”) of the good or service, where MC is the cost of the last unit of the good or service produced.⁵ For the purposes of understanding the demand-response debate, it may be easiest to consider an alternative but functionally identical defini-

tion: MC is the cost society saves by declining to produce the last unit of the good or service.⁶

In a competitive market, we can rely on market forces alone to yield an appropriate demand response to changes in supply or demand.⁷ If the MC-based price exceeds the value that the customer places on the last unit he intends to purchase, 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 whether to purchase will maximize social welfare; the customer will base his purchasing decisions on a social cost-benefit test that the customer is uniquely capable of applying.⁸

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. That assumption is relaxed in Part IV. On that assumption, the customer receives the socially-optimal “reward” for declining to purchase any unit with a benefit that falls short of the MC-based price—a reward equal to the cost society avoids as a result of the customer’s decision not to purchase. This explains why customers do not need a “reward” to engage in demand response in most markets. The savings the customer realizes as a result of his decision not to purchase a unit of a good or service is a “reward” precisely equal to the social value of that decision to conserve.

Many electricity markets, however, do not perform as competitive markets 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.⁹ When a producer has monopoly power, the prices it charges exceed MC.¹⁰ In the 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.¹¹

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1. Demand response may be defined as “[c]hanges in electric usage by end-use customers from their normal consumption patterns in response to changes in the price of electricity over time, or to incentive payments designed to induce lower electricity use at times of high wholesale market prices or when system reliability is jeopardized.” U.S. DEP’T OF ENERGY, BENEFITS OF DEMAND RESPONSE IN ELECTRICITY MARKETS AND RECOMMENDATIONS FOR ACHIEVING THEM: A REPORT TO THE UNITED STATES CONGRESS PURSUANT TO SECTION 1252 OF THE ENERGY POLICY ACT OF 2005, at xi (2006), available at <http://eetd.lbl.gov/ea/ems/reports/congress-1252d.pdf>.

2. Energy Policy Act of 2005, Pub. L. No. 109-58, § 1252(e)(3), 119 Stat. 594, 966 (2005).

3. See Demand Response Compensation in Organized Wholesale Energy Markets, 76 Fed. Reg. 16,658, 16,678–79 (Mar. 24, 2011) (to be codified at 18 C.F.R. pt. 35) (acknowledging “nearly 3,800 pages of comments, a subsequent technical conference, and the opportunity for additional comment” to proposed rulemaking, and providing a list of commenters).

4. For a good description of the determinants of the performance of a competitive market, see JOEL DIRLAM & ALFRED KAHN, FAIR COMPETITION: THE LAW AND ECONOMICS OF ANTITRUST POLICY 29–42 (1954).

5. See ALFRED E. KAHN, THE ECONOMICS OF REGULATION: PRINCIPLES AND INSTITUTIONS 63–87 (1970); RICHARD J. PIERCE, JR. & ERNEST GELLHORN, REGULATED INDUSTRIES IN A NUTSHELL 26–38 (4th ed. 1999).

6. KAHN, *supra* note 5, at 65–66.

7. *Id.* at 66–67.

8. *Id.* at 68–69. The limits of the usefulness of equating MSC with MPC in a model world are discussed below in Part IV. See *infra* notes 90–92 and accompanying text.

9. Richard J. Pierce, Jr., *A Proposal to Deregulate the Market for Bulk Power*, 72 VA. L. REV. 1183, 1188–89 (1986).

10. See KAHN, *supra* note 5, at 123.

11. See *id.* at 66–67.

Monopoly power both eliminates the natural tendency of a competitive market to induce optimal conservation and justifies government regulation.¹² The U.S. has long regulated both the wholesale and retail price of electricity.¹³

The second reason why we cannot be confident that electricity markets alone will yield optimal demand response is the existence of price regulation.¹⁴ The methods used to regulate the price of electricity often yield prices that diverge significantly from MC.¹⁵ Indeed, in some important contexts, regulated prices fall well short of MC.¹⁶ This discrepancy 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.¹⁷

The divergence between MC-based prices and regulated prices, combined with failure to provide adequate incentives for demand response, can lead to serious adverse effects. The single best illustration of such effects is the California energy debacle of 2000, when the state experienced periodic blackouts and more than a 500% increase in the wholesale price of electricity.¹⁸ 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.¹⁹ Instead, the California legislature imposed a freeze on the retail price of electricity.²⁰ A price freeze eliminates all potential demand responses to a change in market conditions.²¹ Thus, when the supply of electricity in the wholesale market declined, the wholesale price increased, but the price freeze precluded retailers from passing on that increase to consumers.²² As a result, consumers had no incentive to reduce their purchases.²³

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 reduction, in turn, would have produced a new equilibrium. The wholesale market would have settled at a price somewhat higher than before the reduction in the wholesale market supply,

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 wholesale market conditions, the price continued to spiral out of control.²⁴ 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.²⁵ If the demand for a product or service is completely price elastic, even a firm with 100% of the market has no market power.²⁶ Conversely, if the demand for a product or service is completely price inelastic, even a firm with only 1% of the market can exercise market power.²⁷ California’s retail price freeze effectively created a market with completely price inelastic demand.²⁸ A market that lacks potential demand response can be expected to perform poorly.²⁹ Failure to provide any incentive to reduce retail demand in response to an increase in wholesale price results in a host of adverse effects including price spikes, shortages, and extreme vulnerability to market manipulation by suppliers in the wholesale market.³⁰

The California debacle 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.³¹ The natural gas market during the 1970s and early 1980s illustrates the parallel phenomenon and problems resulting from *wholesale* market price restrictions.³² In that case, below-market ceilings on the price of natural gas at the wellhead (the wholesale market) reduced incentives for purchasers to reduce their demand in response to increased prices.³³ That, in turn, produced a variety of market distortions and attendant social costs, e.g., above-market prices

12. See *id.*; Pierce, *supra* note 9, at 1215–18 (explaining that because transmission of electricity is a classic natural monopoly, effective competition cannot exist without government regulation mandating equal access to transmission facilities).

13. See Pierce, *supra* note 9, at 1187–89.

14. See Richard J. Pierce, Jr., *How Will the California Debacle Affect Energy Deregulation?*, 54 ADMIN. L. REV. 389, 397 (2002).

15. See Pierce, *supra* note 9, at 1204–05.

16. See *id.*

17. See Richard J. Pierce, Jr., *The Past, Present, and Future of Energy Regulation*, 31 UTAH ENVTL. L. REV. 291, 303–04 (2011).

18. See Pierce, *supra* note 14, at 389.

19. See *id.* at 404–08.

20. *Id.* at 395.

21. See KAHN, *supra* note 5, at 66–67.

22. Pierce, *supra* note 14, at 397.

23. *Id.*

24. *Id.* at 395, 397.

25. See Louis Kaplow, *Market Share Thresholds: On the Conflation of Empirical Assessment and Legal Policy Judgments*, 7 J. COMPETITION L. & ECON. 243, 253–55 (2011); see also KAHN, *supra* note 5, at 66 (arguing that a firm’s power to increase market prices is subject to the voluntary decisions of consumers with respect to their preferences and relevant opportunity costs).

26. See Kaplow, *supra* note 25, at 247–48 (noting that under perfectly competitive conditions, there is no market power).

27. *Id.* at 256 (noting that competition policy aims to prevent monopolies by focusing on market power, not market share, because market power connotes the ability to profitably elevate price, regardless of market share).

28. Pierce, *supra* note 14, at 406.

29. *Id.* at 397.

30. *Id.* at 406–407.

31. *Id.* at 397.

32. See Richard J. Pierce, *Reconsidering the Roles of Regulation and Competition in the Natural Gas Market*, 97 HARV. L. REV. 345, 345 (1983).

33. *Id.* at 358.

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.³⁴ Thus, it is clear that failure to provide appropriate incentives for demand responses to changes in market conditions in a wholesale market can have severe adverse effects on retail markets served by that wholesale market. Likewise, 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.

II. The Vocabulary of the Demand-Response Debate

To understand the demand response debate, three terms should be introduced—"locational marginal price," "real-time pricing," and "negawatts." Locational marginal price ("LMP") incorporates by reference an important characteristic of electricity markets, namely that where the electricity is produced matters. LMP recognizes that the cost of making a unit of electricity available for purchase can vary greatly by location.³⁵ At certain times, the transmission grid may be constrained to such an extent that it cannot support the combination of wholesale transactions that would yield the lowest-cost supply of electricity to a particular location (or node) on the grid.³⁶ The size of the transmission grid, coupled with the laws of physics, make determining LMP at any given node complicated and dynamic. The phenomenon can be illustrated, however, by a simple grid with only two sources of electricity, 1 and 2, and two nodes, A and B, from which retailers purchase electricity in a competitive wholesale market.³⁷ Let us assume that the MC of source 1 is \$0.05 while the MC of source 2 is \$0.10. If the grid has enough capacity to allow electricity from source 1 to reach node A but not node B, the MC of electricity at node A is \$0.05 while the MC of electricity at node B is \$0.10. Because price equals MC in a competitive market, the LMP at nodes A and B would be \$0.05 and \$0.10, respectively.³⁸ Thus, it is useful to refer to LMP as the equivalent of MC in a wholesale electricity market. Because 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.³⁹

Real-time pricing is a term that reflects another important characteristic of electricity markets: the MC of electricity varies greatly over time.⁴⁰ That variability has three components. First, the MC of generating electricity varies

greatly among generating units.⁴¹ Second, demand fluctuates over time—demand at 3:00 p.m. on a hot Tuesday in August can be many times greater than at 3:00 a.m. on a balmy Sunday in October.⁴² Third, electricity cannot be economically stored and is instead consumed when produced.⁴³ Thus, it is useful to refer to real-time prices as synonymous with electricity prices based on MC. Because the MC of electricity varies significantly over time, an appropriate demand response requires allowing similar flexibility in prices—real-time pricing.⁴⁴

Negawatt is a term that is sometimes used to equate a unit of electricity saved to a unit consumed, i.e., a megawatt conserved.⁴⁵ Participants in the demand response debate often assert that because a negawatt is equivalent to a megawatt, someone who produces a negawatt, thus saving energy, should be rewarded in a manner equivalent to someone who produces a megawatt to be consumed.⁴⁶ That is true, but equating negawatts to megawatts can be misleading. A consumer who forgoes purchase and consumption of a unit of electricity should be rewarded in an amount equal to the MC of that unit. But in a competitive market, the consumer automatically receives exactly that reward in the form of a reduction in its cost of electricity.⁴⁷ Thus, for instance, if the MC of a unit of electricity is \$0.08 and the consumer declines to purchase that unit, he receives a reward of \$0.08. The reward is equal to the cost that society avoids by not having to produce that unit of electricity.⁴⁸

If the consumer is also rewarded with \$0.08 per unit for producing a negawatt, he will have received twice the MC of the unit of electricity consumed.⁴⁹ The consumer saves \$0.08 and receives \$0.08. Thus, pricing negawatts as if they were megawatts is premised on a mathematical error that no person should make. \$0.08 plus \$0.08 is not \$0.08.

I have long been puzzled by the apparent inability of many smart people to understand that compensating some entity

34. *Id.* at 362–65; Richard J. Pierce, Jr., *Natural Gas Regulation, Deregulation, and Contracts*, 68 VA. L. REV. 63, 67–72 (1982).

35. William W. Hogan, *Electric Transmission: A New Model for Old Principles*, ELECTRICITY J., Mar. 1993, at 18.

36. *See id.* at 22–25.

37. For a more realistic and more complicated illustration, see *id.* at 20–22.

38. *See* KAHN, *supra* note 5, at 66–67.

39. *See* Hogan, *supra* note 35, at 20–22.

40. KAHN, *supra* note 5, at 89–91.

41. Data collected by the U.S. Energy Information Administration show that the retail price of electricity for residential consumers across different states generally varies from about \$0.08 to \$0.18 per kilowatt-hour, with Hawaii as high as \$0.33 per kilowatt-hour. U.S. ENERGY INFO. ADMIN., DOE/EIA-0226 (2011/09), ELECTRIC POWER MONTHLY: SEPTEMBER 2011, at 118 tbl.5.6B (2011), available at http://205.254.135.7/electricity/monthly/current_year/sepember2011.pdf. Retail prices are based on operator revenue and take into account "energy charges, demand charges, consumer service charges, environmental surcharges, fuel adjustments, and other miscellaneous charges." *Id.* at 157–58.

42. *See* KAHN, *supra* note 5, at 91.

43. *See* Hogan, *supra* note 35, at 22–23.

44. For discussion of real-time pricing within the context of smart grids, see Steven Andersen, *Saving the Smart Grid*, PUB. UTIL. FORT., Jan. 2011, at 32; Ashley Brown & Raya Salter, *Can Smart Grid Technology Fix the Disconnect Between Wholesale and Retail Pricing?*, ELECTRICITY J., Jan./Feb. 2011, at 7; Zhen Zhang, *Smart Grid in America and Europe (Part I)*, PUB. UTIL. FORT., Jan. 2011, at 46; Zhen Zhang, *Smart Grid in America and Europe (Part II)*, PUB. UTIL. FORT., Feb. 2011, at 32.

45. *See* Bernard Black & Richard J. Pierce, Jr., *The Choice Between Markets and Central Planning in Regulating the U.S. Electricity Industry*, 93 COLUM. L. REV. 1339, 1354–1384 (1993), for a detailed discussion and analysis of negawatt-acquisition programs used by utilities to subsidize their customers for reduced energy consumption.

46. *Id.* at 1359–60.

47. *Id.* at 1354–55.

48. *Id.* at 1384–85.

49. For detailed explanation of the double-counting effect, see *id.* at 1360–61.

for producing a negawatt is inappropriate and involves simple double-counting.⁵⁰ 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,⁵¹ but the same is true of any other good or service. Consider the market for books, for instance. Books are made primarily of paper. Producing paper imposes significant social costs, as anyone familiar with the pulp-and-paper business well knows.⁵² 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. But, of course, megawatts of electricity also have social value. I could not save this article as a Word file on my computer in my nicely lit office if it were not for megawatts.

Having recognized 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.⁵³ If we accomplish that goal, a “producer” of negawatts (or negabooks) will, in his capacity as a consumer, be properly rewarded in the form of a cost savings equal to the value of the resources not used.

III. Jurisdictional Complications

FERC has jurisdiction over wholesale electricity markets.⁵⁴ Although the agency has been working towards creating competitive wholesale markets in electricity for twenty years,⁵⁵ it has yet to achieve complete success.⁵⁶ In Order 745, FERC refers to its continuing efforts to address impediments that remain to achieving that goal in every region.⁵⁷ In order

to understand the demand-response debate, it is important to consider the underlying federal–state relationship.

As discussed in Part I, a competitive market automatically provides the appropriate incentives for demand response.⁵⁸ Retail markets and wholesale markets that are not competitive can give rise to unwanted effects due to their close relationship in the context of demand response.⁵⁹ A retail market that creates inappropriate incentives for demand response can have adverse effects on the performance of a wholesale market, and vice versa.⁶⁰ Unfortunately, the United States allocates authority over the wholesale electricity market to FERC, and authority over retail electricity markets to fifty state PUCs.⁶¹ 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 that have devastating effects on a FERC-regulated wholesale market.⁶²

Fortunately, state control over retail markets has not usually led to such severe consequences as did the California “experiment.”⁶³ Yet, states have been reluctant to implement retail regulatory regimes that yield prices based on MC.⁶⁴ The U.S. Department of Energy (“DOE”) has been urging states to implement real-time pricing,⁶⁵ but one obstacle is the cost of converting to new technology.⁶⁶ DOE has attempted to overcome that obstacle by providing grants to subsidize installation of smart meters in some states.⁶⁷ Yet, even with strong encouragement and partial governmental funding, states have resisted real-time pricing.⁶⁸ Many consumers have expressed privacy concerns and concerns that their total electricity bills might increase.⁶⁹ Thus, for instance, elderly consumers are concerned that they have limited ability to shift their energy-consumption patterns. Without such a change their electricity bills might increase as a result of implementation of real-time pricing.

Real-time pricing would create appropriate incentives for demand response by confronting consumers with the reality that electricity costs significantly more per unit at times of peak demand than at times of low demand.⁷⁰ Studies indicate that real-time pricing can reduce the total cost of electricity significantly by encouraging consumers to reduce their peak-

50. *Id.* at 1360–61.

51. See Richard J. Pierce, Jr., *Energy Independence and Global Warming*, 37 ENVTL. L. 595, 597–99 (2007) (discussing the economic costs of global warming and proposing a global carbon tax to reduce the emissions from electricity producers that contribute to warming).

52. See, e.g., EPA, EPA/310/R-02-002, PROFILE OF THE PULP AND PAPER INDUSTRY 45–57 (2d ed. 2002) (detailing the types of air and water pollution produced by the pulp and paper industry), available at <http://www.epa.gov/compliance/resources/publications/assistance/sectors/notebooks/pulpasns.pdf>.

53. See Black & Pierce, *supra* note 45, at 1384–89.

54. See Federal Power Act, 16 U.S.C. § 824 (2006); see also Department of Energy Organization Act of 1977, 42 U.S.C. §§ 7171(a)–7172(a) (establishing FERC and transferring to it the functions of the Federal Power Commission).

55. For discussion of the initial FERC efforts, see Richard J. Pierce, Jr., *The State of the Transition to Competitive Markets in Natural Gas and Electricity*, 15 ENERGY L.J. 323 (1994).

56. 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 J. Pierce, Jr., *Completing the Process of Restructuring the Electricity Market*, 40 WAKE FOREST L. REV. 451 (2005).

57. See Demand Response Compensation in Organized Wholesale Energy Markets, 76 Fed. Reg. 16,658, 16,660 (Mar. 24, 2011) (to be codified at 18 C.F.R. pt. 35). In Order 745, FERC recognized the relationship between the competi-

tive wholesale markets it is attempting to create and creation of incentives for efficient demand response. See discussion *infra* Part VI.

58. See, e.g., KAHN, *supra* note 5, at 66–67.

59. See Pierce, *supra* note 14, at 397.

60. *Id.*

61. See Black & Pierce, *supra* note 45, at 1347–50.

62. See Pierce, *supra* note 14, at 394–401.

63. See *id.* at 389–90 (“Many of the states that had been following California’s lead have now abandoned their nascent efforts to deregulate their electricity markets.”).

64. See Brown & Salter, *supra* note 44, at 8–9 (discussing costs and benefits to the retail market associated with smart-grid technology).

65. Press Release, U.S. Dept’t of Energy, Energy Secretary Chu Announces Five Million Smart Meters Installed Nationwide as Part of Grid Modernization Effort (June 13, 2011), <http://energy.gov/articles/energy-secretary-chu-announces-five-million-smart-meters-installed-nationwide-part-grid>.

66. Andersen, *supra* note 44, at 33.

67. Press Release, U.S. Dept’t of Energy, *supra* note 65.

68. See Andersen, *supra* note 44, at 34.

69. *Id.* at 38.

70. See KAHN, *supra* note 5, at 87–96.

demand use.⁷¹ 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.⁷² Consumers would benefit on average from real-time pricing by adjusting their energy use to realize reductions in their total cost of electricity and make informed decisions on energy-efficient appliances.⁷³ Unless consumers and state PUCs are better informed and change their attitudes, however, convincing them to adopt real-time pricing will remain a challenge.⁷⁴

Due to FERC's limited authority, it has little ability to overcome the reluctance of PUCs to adopt retail regulatory systems that provide optimum incentives for demand response.⁷⁵ FERC can, and should, take state resistance 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 pattern in which the retail price of electricity is well below MC during times of peak demand but exceeds MC at times of slack demand.⁷⁶ This pattern 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 demand if it confronted appropriate price signals but is unwilling 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 twenty percent if confronted with an MC-based real-time price of \$0.40 per kilowatt-hour, but is unwilling to do so at the actual retail price of \$0.08 per kilowatt-hour that it currently pays. Both the retail market and the wholesale market would perform better if the consumer obtained a “reward” of \$0.40 per kilowatt-hour, rather than \$0.08 per kilowatt-hour, for reducing its peak demand.⁷⁷ FERC could address this problem effectively by implementing a pricing system in which such a retail customer is “rewarded” at the wholesale level by receiving a price of \$0.32, i.e., the \$0.40 MC minus the amount of money saved—\$0.08—for each unit of electricity it declines to purchase at peak demand.⁷⁸ This method of pricing demand response is often referred to as LMP-G, where LMP is the MC of making the unit of electricity available at the particular time and place at which the consumer receives delivery and G is the retail price per unit the consumer would pay if it were to purchase the units it is willing to forego.⁷⁹

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.⁸⁰ 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.⁸¹ During such periods, retail rates typically exceed MC.⁸² For example, if MC during a period of slack demand is \$0.05, and the customer pays a retail price of \$0.08, it is already being overcompensated by \$0.03 per unit for reducing its demand during periods of slack demand.

IV. Complications Caused By Externalities

In Part I, I explained why a competitive market automatically provides appropriate incentives for demand response with a potentially important qualification: a competitive market yields that salutary result only if MPC equals, or at least approximates MSC.⁸³ If MSC exceeds MPC by a significant amount, a competitive market will provide inadequate incentives for demand response.⁸⁴ 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.⁸⁵ Government regulation requires electricity-suppliers to internalize most of the social costs of generating and transmitting electricity.⁸⁶ 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.⁸⁷

There is one major exception, however: greenhouse gases such as carbon dioxide (“CO₂”), also a byproduct of electricity generation, are not regulated and are therefore not costs borne by electricity-generators.⁸⁸ This is true despite evidence that increasing amounts of greenhouse gases in the atmosphere are causing changes in the earth's climate that have the potential for catastrophic effects.⁸⁹ A serious debate is underway as to whether there is an economically effective way to reduce CO₂ emissions given present technology.⁹⁰

80. *See id.* at 16662–63.

81. *See id.*

82. *See* KAHN, *supra* note 5, at 89–90.

83. *See id.* at 68–69.

84. *See id.* at 110.

85. *See id.* at 94–95.

86. Black & Pierce, *supra* note 45, at 1389–90.

87. *Id.* at 1390.

88. *See id.* at 1397.

89. Pierce, *supra* note 51, at 598.

90. *See, e.g.*, MIT ENERGY INITIATIVE SYMPOSIUM, RETROFITTING OF COAL-FIRED POWER PLANTS FOR CO₂ EMISSIONS REDUCTIONS 10, 19–26 (Mar. 23, 2009) (surveying technologies able to reduce or capture CO₂ emissions and noting the view that “replacing all or even a large fraction of existing coal-fired power plants with new, clean, low-carbon technologies is not an economically viable option in the near term”), available at <http://web.mit.edu/mitei/docs/reports/meeting-report.pdf>; JEFFREY ANSPACHER, STEFAN OSBORNE & JULIAN RICHARDS, U.S. DEP'T OF COMMERCE, THE EFFECT OF CO₂ EMISSIONS REDUCTION ON THE U.S. ELECTRICITY SECTOR 2 (2011) (projecting that a seventeen percent decrease in CO₂ emissions by 2020 would increase electricity prices from about 16% to 25%), available at http://www.usitc.gov/research_and_analysis/documents/Effect_CO2_Emissions_Reduction_Electricity_Sector.pdf.

71. *See* Adrian Booth, Mike Greene & Humayun Tai, *U.S. Smart Grid Value at Stake: The \$130 Billion Question*, in MCKINSEY ON SMART GRID 4–9 (2010), available at http://www.mckinsey.com/en/Client_Service/Electric_Power_and_Natural_Gas/Latest_thinking/McKinsey_on_Smart_Grid.aspx.

72. *See id.* at 6.

73. ⁷⁴ *See id.*

74. *See* Andersen, *supra* note 44, at 38–39.

75. *See* Black & Pierce, *supra* note 45, at 1347–50.

76. *See* KAHN, *supra* note 5, at 96.

77. *See* Demand Response Compensation in Organized Wholesale Energy Markets, 76 Fed. Reg. 16,658, 16,660 (Mar. 24, 2011) (to be codified at 18 C.F.R. pt. 35).

78. *See id.*

79. *See id.* at 16668.

Electricity generation accounts for about forty percent of total U.S. emissions of CO₂.⁹¹ In 2010, fossil fuels generated seventy percent of our total electricity supply.⁹² Considering the adverse effects of CO₂ emissions on climate, the MSC of this part of our electricity supply is well above each generator's MPC.⁹³ The most effective response to this problem would be to implement a form of government intervention that would require generators to internalize this social cost through a well-designed cap-and-trade system or a large carbon tax.⁹⁴ With the social costs of climate change internalized by the private market participants that are passing on that cost to society, my general assertion that competitive markets automatically yield appropriate demand-response incentives would continue to apply to U.S. electricity markets. So far, however, Congress has declined to adopt either a cap-and-trade system or a carbon tax.⁹⁵ In the absence of either of those measures to force electricity producers to reflect a truer cost of electricity in their prices, a competitive electricity market will yield inadequate incentives for demand response. In theory, the existence of large externalities could justify implementing a system for rewarding consumers who reduce their electricity consumption; the reward could equal the difference between the automatic reward of reduced electricity bills and the amount of the externalized social costs saved by such reduction in consumption.

It would be very difficult to design and to implement a demand-response program that would reflect that external social cost in an acceptably accurate manner. The amount of CO₂ emissions released by electricity-generating plants vary by the fuel used, from carbon-free generators like nuclear power plants to carbon-intensive sources such as coal-fired plants.⁹⁶ This variation in CO₂ emissions corresponds to an array of externalities that would be hard to incorporate into a demand-response program. Moreover, some consumers might choose methods of reducing their electricity demand 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.⁹⁷ Thus, for example, 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 demand-response program would have to account for both the high

variability of the external social costs of electricity obtained from the regulated market and the potentially 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.

V. Applicable Legal Principles

Any attempt to increase demand-response incentives of participants in wholesale electricity markets must be consistent with the Federal Power Act requirement that all rates be "just and reasonable" and not unduly discriminatory.⁹⁸ This type of reasonableness standard has existed in a variety of contexts for well over a century.⁹⁹ Courts maintained that this statutory language required agencies to employ a particular methodology in setting rates until 1944, when the Supreme Court issued its opinion in *Federal Power Commission v. Hope Natural Gas Co.*¹⁰⁰ In that opinion, the Court announced that the "result reached" in the ratemaking process, rather than the methodology used, determined the legality of the agency decision.¹⁰¹ While *Hope* freed agencies to use a variety of ratemaking methods, agencies and courts continued to apply earlier court-derived standards in making and reviewing rate determinations.¹⁰² In the *Permian Basin Rate Cases*, the Supreme Court further held that a court must uphold an agency's decision to authorize particular rates if those rates fall within a "zone of reasonableness."¹⁰³

The *Hope* and *Permian Basin* decisions reflected judicial recognition of some of the realities of determining the proper rates in a particular market context: it is as much art as science; both the predicating facts and the resulting effects of rates are subject to a large range of uncertainty, and agencies must make compromises among competing goals when they set rates.¹⁰⁴

The standard that courts applied in reviewing agency electricity-rate determinations gradually became a subset of the general test that a court must uphold an agency action as long as it is reasonable.¹⁰⁵ In particular, courts continue to consider three components to assess reasonableness: (1) the agency decision must be based on a reasonable interpretation of the applicable statute;¹⁰⁶ (2) the factual predicates for the agency action must be supported by "substantial evidence," i.e., "such relevant evidence as a reasonable mind might accept as adequate to support a conclusion;"¹⁰⁷ and (3) the

91. EPA, EPA 430-R-10-006, INVENTORY OF GREENHOUSE GAS EMISSIONS AND SINKS: 1998–2008, at 3–10 (2010).

92. U.S. ENERGY INFO. ADMIN., DOE/EIA-0035(2011/08), MONTHLY ENERGY REVIEW 95 tbl.7.2a (2011) (reporting contribution of coal, petroleum, natural gas, and other hydrocarbon gas sources).

93. See SIR NICHOLAS STERN, STERN REVIEW: THE ECONOMICS OF CLIMATE CHANGE iii–viii (2007), available at http://webarchive.nationalarchives.gov.uk/+http://www.hm-treasury.gov.uk/d/Executive_Summary.pdf.

94. See Pierce, *supra* note 51 at 600–02.

95. See, e.g., America's Energy Security Trust Fund Act, H.R. 1337, 111th Cong. (2009) (proposing a carbon tax; referred to committee but never voted upon); American Clean Energy and Security Act of 2009, H.R. 2454, 111th Cong. (2009) (proposing a nationwide cap-and-trade scheme; passed by House of Representatives but never submitted to Senate vote).

96. See ANSPACHER, OSBORNE & RICHARDS, U.S. DEP'T OF COMMERCE, *supra* note 90, at 8; JOHN DEUTCH ET AL., THE FUTURE OF NUCLEAR POWER: AN INTERDISCIPLINARY MIT STUDY 18 (2003).

97. See KAHN, *supra* note 5, at 69.

98. 16 U.S.C. § 824d(a)–(b) (2006).

99. See PIERCE & GELLHORN, *supra* note 5, at 101–08.

100. *Id.* at 104–106.

101. Fed. Power Comm'n v. Hope Natural Gas Co., 320 U.S. 591, 602 (1944).

102. See PIERCE & GELLHORN, *supra* note 5 at 107.

103. *In re Permian Basin Rate Cases*, 390 U.S. 747, 767 (1968) (citing Fed. Power Comm'n v. Natural Gas Pipeline Co., 315 U.S. 575, 585 (1942)).

104. See generally DIRLAM & KAHN, *supra* note 4, at 35–45.

105. See Richard Pierce, *What Do the Studies of Judicial Review of Agency Actions Mean?*, 63 ADMIN. L. REV. 77, 79 (2011); David Zaring, *Reasonable Agencies*, 96 VA. L. REV. 135, 137 (2010).

106. *Chevron v. Natural Res. Def. Council*, 467 U.S. 837, 842–43 (1984).

107. *Universal Camera Corp. v. NLRB*, 340 U.S. 474, 477 (1951) (quoting *Consol. Edison Co. of N.Y. v. NLRB*, 305 U.S. 197, 229 (1938)).

agency must provide adequate reasons to explain each of the steps it took in its decision-making process.¹⁰⁸

In the context of ratemaking through application of the just-and-reasonable statutory standard, the first two components rarely present a problem for an agency.¹⁰⁹ When a court rejects a ratemaking decision it is often because of a flaw or gap in the agency's rationale that makes its actions arbitrary and capricious.¹¹⁰ Even when a court rejects an agency action as arbitrary and capricious, however, the court may allow the action to remain in effect if the agency appears able to correct the deficiencies identified on remand.¹¹¹

VI. FERC Order 745

Order 745 is FERC's final rule providing that demand-response resources used in wholesale energy markets that are organized by a regional transmission organization ("RTO") or independent system operator ("ISO") and determined to be cost-effective must be compensated at the market price of energy, i.e., the LMP.¹¹² It is difficult to predict the results of judicial review of an agency action. The reasonableness factors applied by courts are sufficiently malleable to yield different results depending on the viewpoints of the judges involved in the review process.¹¹³ That said, I believe it is likely that a reviewing court would uphold FERC Order 745, if challenged.

In Order 745, FERC rejected arguments that LMP-G should be used in determining the per unit payment a provider of demand response would receive.¹¹⁴ Rather, FERC ordered the RTOs and ISOs that operate each of the regional transmission grids to design and implement a system to compensate providers of demand response at LMP.¹¹⁵ FERC added an important qualification to that requirement, however; compensation based on LMP is only provided upon satisfying a net-benefits test.¹¹⁶ Specifically, FERC instructed RTOs and ISOs to determine the times at which demand-response resources are cost-effective, i.e., "when reductions in LMP from 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."¹¹⁷ 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 resulting decrease in LMP multiplied by the remaining load would be greater than the cost of the demand-response unit.¹¹⁸

FERC Commissioner Moeller declined to support Order 745 and explained his position in a dissent.¹¹⁹ His main objections to the rule were that (1) LMP rarely if ever is the correct measure of compensation for a unit of demand response;¹²⁰ (2) LMP-G is the correct measure in most circumstances;¹²¹ 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.¹²²

I agree with Commissioner Moeller's view and would have joined his opinion had I been a member of FERC. Yet, if I were instead a judge reviewing Order 745, I would uphold FERC's rule on the basis that the agency provided reasoning adequate to support each step in its decision-making process. FERC rejected the proposed LMP-G measure of compensation on the basis of its belief that LMP-G "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."¹²³ While I agree with Commissioner Moeller that the net-benefits calculation is likely to be more confusing and burdensome than applying LMP-G,¹²⁴ I cannot say that the FERC's contrary belief is unreasonable.

My strong belief that LMP is an inappropriate measure of compensation in most cases is tempered by FERC's adoption of a net-benefits test. I suspect that this approach will limit compensation based on LMP to rare cases in which LMP is not much above the appropriate level of compensation. FERC also recognized and explicitly addressed the many ancillary concerns to providing compensation for demand response beyond the level provided by the market, e.g., the need to establish a reliable means of calculating and verifying the claimed reduction in demand.¹²⁵

VII. Conclusion

I hope that we will reach the point at which there is no justification to adopt any method of compensating demand response through means other than those provided automatically by the market. The conditions needed to reach that point are: (1) creating a competitive wholesale market for electricity in every region; (2) implementing a carbon tax or other means of increasing the price of consumption of hydrocarbons to the point at which the MSC of generating elec-

108. *Motor Vehicle Mfrs.' Ass'n v. State Farm Mut. Auto. Ins. Co.*, 463 U.S. 29, 43 (1983).

109. See Pierce, *supra* note 105, at 83-86 (discussing court affirmance rates of agency decisions).

110. Studies show that courts reject about 30% of agency actions on the basis of inadequate justification. See *id.* at 82-84; see also Zaring, *supra* note 105 at 177-78 (discussing empirical results of agency review by the D.C. Circuit).

111. See 1 RICHARD J. PIERCE, JR., *ADMINISTRATIVE LAW TREATISE* § 7.13, at 688-89 (5th ed. 2010).

112. Demand Response Compensation in Organized Wholesale Energy Markets, 76 Fed. Reg. 16,658, 16,658-59 (Mar. 24, 2011) (to be codified at 18 C.F.R. pt. 35).

113. See generally Thomas Miles & Cass Sunstein, *The Real World of Arbitrariness Review*, 75 U. CHI. L. REV. 761 (2008).

114. Demand Response Compensation in Organized Wholesale Energy Markets, 76 Fed. Reg. at 16,658.

115. *Id.* at 16,671-72.

116. *Id.* at 16,671.

117. *Id.* at 16,666, 16,671.

118. *Id.* at 16,667.

119. *Id.* at 16,679-81.

120. *Id.* at 16,680.

121. *Id.* at 16,680-81.

122. *Id.* at 16,680.

123. *Id.* at 16,663.

124. *Id.* at 16,681.

125. *Id.* at 16,671-73.

tricity approximates the MPC; and (3) adopting real-time, MC-based rates in all retail markets. Considering that those conditions are not applicable at present, I believe that Order 745 offers the prospect of some marginal improvement in the performance of U.S. electricity markets.