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DEMAND RESPONSE'S THREE GENERATIONS: MARKET PATHWAYS AND CHALLENGES IN THE MODERN ELECTRIC GRID

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Through a historical analysis spanning nearly five decades, this Article provides a comprehensive discussion of how demand response (reductions in electricity consumption in response to grid emergencies or price signals) has become both a growing resource on the electric grid and a policy trailblazer in the grid's ongoing transformation. The discussion centers on three separate generations of efforts to promote demand-side measures in the electric grid, dating to the 1960s and oriented chronologically around important events in the electric power industry.

Demand response has been a test bed of important regulatory principles like frameworks for interactivity with the grid, the role of third parties and new business models, and the split of regulatory jurisdiction between states and FERC. For this reason, the Article introduces and discusses the concept of "market pathways"—experiences learned from combinations of technology advances, regulatory innovations, and judicial and regulatory proceedings that tested demand response's legitimacy and implementation. These pathways, the Article claims, now form a significant part of the foundation for overhauling the electric grid to accommodate all distributed energy resources, not simply demand response. Thus, the Article concludes, demand response is important for the long-term, iterative regulatory strategies that promoted it, viewed against the context of the electric power industry's ever changing overall regulatory and policy landscape.

The Article concludes with an examination of "demand response 3.0." This is the current industry landscape in which the green light for innovation and experimentation, combined with further advances in technology and the rise of sophisticated distributed energy resources (including energy storage, distributed solar PV, and others), have prompted policymakers to steer the electric grid towards a modernized, two-way, participatory system.

This Article concludes that the lessons learned from decades of demand-side participation in the grid will be useful in blazing a policy path toward a participatory grid, and applies these strategies and principles to guide future policymaking.

INTRODUCTION

This Article's aim is two-fold. First, it explains something that once would have seemed wholly improbable about demand response—the electric power industry's term for reductions in electricity consumption in response to grid emergencies or price signals.[1] Demand response is something that the industry has more or less shunned since its inception, economists often find suboptimal, and consumers do not yet seem to truly understand or want. Yet, despite all that, it is now both a growing resource on the electric grid and a policy trailblazer in the grid's ongoing transformation. Second, it describes how the principles and lessons learned in the nearly fifty-year history of demand-side measures in the electric grid, including the fifteen years since demand response began to participate as a resource in the nation's organized wholesale markets, inform the ongoing transformation of this staid industry.

The electric power sector is undergoing an upheaval unparalleled in its history.[2] A wide range of technologies and

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[1] FERC v. Elec. Power Supply Ass'n, 136 S. Ct. 760, 767 (2016).

[2] James J. Hoecker & Douglas W. Smith, *Regulatory Federalism and Development of Electric Transmission: A Brewing Storm?*, 35 ENERGY L.J. 71,

business models are bringing rapid change to an industry not generally known to have an appetite for it.[3] Distributed energy resources are playing a larger role in meeting demand and stabilizing the grid.[4] Consider this (hardly exhaustive) list: "A variety of emerging distributed technologies—including flexible demand, distributed generation, energy storage, and advanced power electronics and control devices—are creating new options for the provision and consumption of electricity services."[5] This has prompted states and the federal government to consider grid modernization, which promises a radically different electric grid than that of past decades and extensive changes to the monopoly business models of utilities that have dominated the grid for over a century. Some efforts have involved installation of physical devices to overhaul the grid, and some have come in the policy arena where regulators and other policymakers seek to make the electric grid cleaner, more efficient, and more reliable.

At this inflection point in the grid's arc, demand response has been a focal point for deciding momentous policy questions, including those addressed in the 2016 Supreme Court decision *Federal Energy Regulatory Commission v. Electric Power Supply Association* ("*FERC v. EPSA*").[6] That decision upheld the Federal Energy Regulatory Commission ("FERC") rule, Order 745,[7] which

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73 (2014) ("The electricity industry has changed in fundamental ways . . . never contemplated by the drafters of the FPA.").

[3] For discussions of industry transformation, see MIT ENERGY INIT., UTILITY OF THE FUTURE viii (2016), https://energy.mit.edu/wp-content/uploads/2016/12/Utility-of-the-Future-Full-Report.pdf; EDISON ELEC. INST., DISRUPTIVE CHALLENGES: FINANCIAL IMPLICATIONS AND STRATEGIC RESPONSES TO A CHANGING RETAIL ELECTRIC BUSINESS (2013), www.eei.org/ourissues/finance/documents/disruptivechallenges.pdf.

[4] *See generally Distributed Energy Resources*, ELEC. POWER RESEARCH INST., http://www2.epri.com/Our-Work/Pages/Distributed-Electricity-Resources.aspx (last visited May 12, 2016).

[5] MIT ENERGY INIT., *supra* note 3, at viii.

[6] 136 S. Ct. 760, 767 (2016).

[7] Demand Response Compensation in Organized Wholesale Energy Markets, 76 Fed. Reg. 16,657, 16,659 (Mar. 24, 2011) (codified at 18 C.F.R. pt. 35) [hereinafter Order 745]. For contemporaneous analysis of demand response and Order 745, see Joel B. Eisen, *Who Regulates the Smart Grid? FERC's Authority over Demand Response Compensation in Wholesale Electricity Markets*, 4 SAN

required that demand response be compensated at the full energy market price.

This Article argues that demand response has taken center stage in the grid modernization debate *precisely because* it was overlooked for decades. Persistently knocking at the industry's door, it struggled for years to gain full acceptance and participation in electricity markets. Finally, after fifteen years of remarkable progress, it is significantly closer to that goal. Thus, demand response is important for the long-term, iterative regulatory strategies that promoted it, viewed against the context of the electric power industry's ever changing overall regulatory and policy landscape.

As a result of this decades-long evolution, demand response continues to grow into an even more valuable grid resource, and the lessons learned along the way are useful in blazing a policy path toward a two-way, participatory electric grid.[8] These "market pathways"—experiences learned from combinations of technology advances, regulatory innovations, and judicial and regulatory proceedings that tested demand response's legitimacy and implementation—now form a significant part of the foundation for overhauling the grid to accommodate distributed energy resources. With demand response, we have been working out the bugs for fifteen years, although much more work is still required.

Demand response alone did not (and will not) change the electric grid. But *how* demand response transformed from an afterthought to a valuable grid resource, particularly through FERC's efforts, matters greatly. It has established important principles that others can and will use in promoting energy storage, electric vehicles, and distributed solar as they are improving and impacting the grid in ever increasing amounts. Significant questions have been asked repeatedly and addressed through policy

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DIEGO J. CLIMATE & ENERGY L. 69 (2013) [hereinafter Eisen, *Who Regulates the Smart Grid?*]; Richard J. Pierce Jr., *A Primer on Demand Response and a Critique of FERC Order 745*, 102 GEO. WASH. U. J. ENERGY & ENVTL. L. 102 (2011).

[8] Shelley Welton, *Clean Energy Justice*, COLO. L. REV. (forthcoming 2016) (discussing attributes of a "participatory grid").

development and tests of those policies. Moreover, the Supreme Court has upheld important elements of the path. *FERC v. EPSA*, and, by extension, the Court's support for other FERC demand response policies, validates electric grid transformation and experimentation, not simply the single agency rule at issue in the case.

Part I begins with two threshold matters: addressing the confusion about what demand response is, and discussing demand response's benefits for a modern grid. Then, Part II transitions to the 1970s, when the providers of demand-side resources began a long battle to be treated comparably with generation in the electric grid. As such, *FERC v. EPSA*'s ratification of comparability was no mean feat. As Part II discusses and Part III elaborates further, its proponents have constantly had to defend the proposition that demand reductions ("negawatts") were things, and that they should be treated the same as "megawatts." Part III then discusses FERC's efforts to put demand response on a level playing field with generation in organized wholesale markets. An important component of this policy development is FERC's recognition and support of participation by third-party entrepreneurs competing with utilities with different business model characteristics and the Supreme Court finally sanctioning this experimentation. FERC's efforts have resulted in tremendous progress, although there is still suboptimal demand response participation.

As this Article's title suggests, to organize the disparate elements of this story, it is useful to speak of three generations of demand-side measures with specific combinations of technologies and policies encouraging demand-side participation. This Article terms these demand response 1.0, 2.0, and 3.0, respectively, and orients them chronologically around important events in the electric power industry that influenced demand-side participation. These events include the enactment of the federal energy statutes of the 1970s, the utility industry restructuring of the late 1980s and early 1990s, and the growth of wholesale electricity markets in the 2000s. Part II discusses the first generation of demand-side measures after the enactment of federal energy statutes encouraged it. It shows that demand response techniques are not a creature of the Internet age, although "demand response 1.0" is a bit of a misnomer because that term did not come into vogue until the 2000s. Still, Part II uses the term to illustrate continuity in policy themes, as the early years show the persistence of debates that have recurred for decades. Part II concludes with a discussion of retrenchment from mandated demand-side management programs, and lower spending, in the industry's restructuring of the 1990s.

Part III begins when industry participants and observers first conceived of "demand response": the California electricity crisis of 2000-2001 and its aftermath. Demand response's second generation features the emergence and growth of competitive wholesale markets, sparked by transformational FERC Orders. Part III traces how demand response programs evolved in the wholesale markets for the next fifteen years, discusses barriers that inhibited participation, and analyzes FERC Orders developed to address those barriers. Part III concludes with *FERC v. EPSA*'s holding that demand response can at times have as much value as power and can trade at market rates. Finally, after nearly fifty years, the notion of a level playing field for demand side resources has been ratified, if not always achieved yet in practice. *FERC v. EPSA* would be important for this reason alone, even if it had not also confirmed a tectonic shift in our understanding of electricity federalism whose ramifications may last for decades.[9]

Part IV then turns to "demand response 3.0," the current landscape in which the green light for innovation and experimentation, combined with further advances in technology and the rise of sophisticated distributed energy resources (including energy storage, distributed solar PV, and others) have prompted more market opportunities. There may eventually be distribution-level markets, as contemplated in proceedings such as

[9] Articles discussing this significant development include: Joel B. Eisen, *Dual Electricity Federalism Is Dead, But How Dead and What Replaces It?*, 8 GEO. WASH. J. OF ENERGY & ENVTL. L. 3 (2017) [hereinafter Eisen, *Dual Electricity Federalism Is Dead*]; Joel B. Eisen, *FERC v. EPSA and the Path to a Cleaner Electricity Sector*, 40 HARV. ENVTL. L. REV. F. 1 (2016) [hereinafter Eisen, *FERC v. EPSA*]; Jim Rossi, *The Brave New Path of Energy Federalism*, 95 TEX. L. REV. 399 (2016).

New York's landmark Reforming the Energy Vision effort.[10] Part IV continues with a discussion of lessons learned and observations about how they may translate to this rapidly evolving landscape.

The Court has now settled the issue of demand response's importance as a grid resource. However, there is still a suboptimal amount of it in electricity markets. There is no organic demand for using less electricity. Progress to more demand-side participation in the grid takes place against a backdrop of hostility, so programs can be derailed by those adversely affected by incentives for demand response. Opposition from entrenched players, particularly incumbent utilities and generators of electricity and their allies, can slow progress. In fact, opponents have made arguments against it for decades, such as the jurisdictional claim that *FERC v. EPSA* finally resolved. The relationship between the states and the federal government is complicated by the presence of demand response programs at both levels, requiring difficult discussions and complex coordination.

Thus, improving technologies alone is insufficient, and policy support has been indispensable to demand response's success, as is the case for other distributed energy resources. Working out the rules for participation has required considerable tinkering and iteration, and the path of progress has hardly been straight. Progress has always depended upon the presence of visionary state and federal regulators who see the need for innovation. When policy support has lagged, especially at major inflection points in the industry's evolution, so too has demand-side participation. Even as new market opportunities develop, but are just emerging and beginning to be defined, this suggests progress may take much longer and be less linear than one might gather from the current enthusiasm. On the other hand, considering that demand response emerged from the shadows to become a major factor in the grid's evolution, it would seem that almost anything is possible.

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[10] *Reforming the Energy Vision*, N.Y. DEP'T OF PUB. SVC., http://www3.dps.ny.gov/W/PSCWeb.nsf/All/CC4F2EFA3A23551585257DEA007DCFE2?OpenDocument (last visited Feb. 21, 2017).

I. DEMAND RESPONSE AND THE ELECTRIC GRID, EXPLAINED

To begin this decades-long story, we must first address a threshold matter: what is demand response? Without an understanding of the electric grid and its complexities, this term has no meaning. Paying a customer to *not* buy a product has no analogue outside of the electric power industry, not to markets for pears, clothing, or furniture.[11] Companies that do this would eventually go out of business, and demand response has always been viewed as something that "seems to run counter to the normal operation of markets."[12] And there is another problem. It has understandably been tough to tell what demand response is. One article observes that it "can mean many different things to many different people."[13] The two words are exceedingly opaque, and it does not help that "demand response" encompasses about a dozen different strategies to reduce consumption, none of which is easily suggested by the name.[14] This Part begins by clarifying this confusion, and then segues into a discussion of demand response's benefits to the modern grid.

A. So . . . What Exactly Is Demand Response?

At its core, demand response involves a utility (or someone else) paying a customer to buy less of something (electricity) that customer needs, day in and day out. One early form of demand response was "interruptible" rates, or lower prices offered in return

[11] James Bushnell et al., *When It Comes to Demand Response, Is FERC Its Own Worst Enemy?*, 22 THE ELECTRICITY J. 9, 11 (2009) ("[T]he notion that consumers must pay and make decisions based on a real-time price is a fact of life in all industries without explicit price regulation.").

[12] Cliff Rochlin, *The Alchemy of Demand Response: Turning Demand into Supply*, 22 THE ELECTRICITY J. 10, 11 (2009).

[13] Stuart Schare & Brett Feldman, *A New Era of Demand Response*, POWER ENGINEERING (Aug. 21, 2015), http://www.power-eng.com/articles/print/volume-119/issue-8/features/a-new-era-of-demand-response.html.

[14] Michael Panfil, *How the Electricity World has Changed: Demand Response and the Story of this Clean Energy Resource* (Apr. 24, 2015), https://medium.com/@EDFEnergyEX/how-the-electricity-world-has-changed-cdb4e56b9b24#.q4p89oqwy.

for the utility's right to "call" (demand usage reductions) at specific times. Decades ago, utilities would pick up the phone and call on altruistic commercial and industrial customers "to cut load in an ad hoc fashion, working their phones to find good corporate citizens willing to turn off non-essential lighting, motors or other equipment."[15] Here is the origin of "call" to refer to an occasion of demand reduction. Interruptible rates enshrined this custom as utility policy, giving these customers power up to a baseline at the standard rate, and power above that at a reduced rate.[16]

Another early form was "direct load control" programs, in which utilities used simple one-way radio communications employed during system emergencies or times of high electricity prices.[17] The utility sent a signal, and receivers affixed to the participating appliances either "shed" demand (turned off the machines) or ran the appliances on shorter cycles. A typical program could involve the use of a switch to shut off participating residential consumers' air conditioning units for part of some hours during peak periods in return for a monthly flat fee.[18] The customer could not control this simple on-off process; switching happened automatically (hence the "direct" moniker[19]), and utilities had full control. In return, customers typically received financial

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[15] Douglas W. Caves et al., *The Cost of Electric Power Interruptions in the Industrial Sector: Estimates Derived from Interruptible Service Programs*, 68 LAND ECON. 49, 52 (1992).

[16] *Id*.

[17] PETER CAPPERS ET AL., LAWRENCE BERKELEY NAT'L LAB., MARKET AND POLICY BARRIERS FOR DEMAND RESPONSE PROVIDING ANCILLARY SERVICES IN U.S. MARKETS 23 (2013).

[18] Jon Wellinghoff & David L. Morenoff, *Recognizing the Importance of Demand Response: The Second Half of the Wholesale Electric Market Equation*, 28 ENERGY L.J. 389, 394 (2007). The compensation was not tied to the demand reduction's value. Former FERC Chairman, Jon Wellinghoff, noted that, "As these programs were structured, consumers did not see real time wholesale price signals, nor were consumers compensated for the full value they contributed to the system by shedding load." *Id*.

[19] G. Heber Weller, *New Wave of Direct Load Control: Update on DLC Systems, Technology*, ELECTRIC LIGHT & POWER (July 1, 2011), http://www.elp.com/articles/powergrid_international/print/volume-16/issue-7/features/new-wave-of-direct-load-control-update-on-dlc-systems-technology.html.

incentives. Programs usually had design features that restricted how often the utility could call events, how long each event could last, and so forth.[20] This form of obtaining demand reductions from specific devices such as air conditioners, water heaters, and pool pumps is still widely used.[21]

Now, for some more contemporary forms of demand response. FERC recently brought attention to what it called a shining new example of the electric grid's transformation.[22] In it, the utility Southern California Edison is teaming up with innovator darling Nest, and is going to pay the consumer to "use less energy when everyone else is using more."[23] The "Rush Hour Rewards" program uses the Nest thermostat, and now that little "smart" orb on the wall is also a cash cow. In industry-speak, Rush Hour Rewards is a "peak time reward" program. At the most critical times when the utility needs it, customers get a rebate on their bill for reducing consumption.[24] Rush Hour Rewards is a form of "dynamic pricing," the collective term for the acronym soup of programs that change flat rate pricing for consumers.[25]

In other industries, we would call this "pricing," since the "dynamic" response would follow from the consumer's sensitivity

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[20] CAPPERS ET AL., *supra* note 17, at 23.

[21] U.S. DEP'T OF ENERGY, BENEFITS OF DEMAND RESPONSE AND RECOMMENDATIONS FOR ACHIEVING THEM xix (2006).

[22] FED. ENERGY REG. COMM'N, ASSESSMENT OF DEMAND RESPONSE AND ADVANCED METERING 34 (2016) [hereinafter FERC DR-AM 2016].

[23] *Rush Hour Rewards*, NEST, https://nest.com/energy-partners/southern-california-edison/ (last visited Feb. 21, 2017).

[24] Jeff St. John, *Inside Nest's 50,000-Home Virtual Power Plant for Southern California Edison*, GREENTECH MEDIA (Sept. 14, 2016), https://www.greentechmedia.com/articles/read/inside-nests-50000-home-virtual-power-plant-for-southern-california-edison. Customers also receive a one-time payment at enrollment.

[25] FERC DR-AM 2016, *supra* note 22, at 19. Dynamic pricing techniques include real-time pricing, critical peak pricing, variable peak pricing, and time-of-use rates (although the last of these is sometimes not included because it is administratively set ahead of time). Time-of-use rates typically split electricity prices into peak prices and off-peak prices. Critical peak pricing is similar but adds a critical peak component invoked during system emergencies or periods of high wholesale prices. Real-time pricing is, as the name implies, a variable rate, generally on an hourly basis.

to prices. This is such an intuitive feature of competitive markets that many economists would prefer the use of dynamic pricing in place of any other form of demand response. Pass through wholesale costs, have consumers pay the true price of electricity, and they will do all the demand responding anyone would ever need.[26] But electricity markets are unique, because wholesale costs cannot be passed directly to consumers, the vast majority of whom still have fixed electric rates set by public utility commissions ("PUCs"). Dynamic pricing is a chimera, painfully slow to be adopted over the past several decades and still far from ubiquitous for a wide variety of reasons, including a lack of political acceptability.[27]

Part III discusses the type of demand response at issue in *FERC v. EPSA*: bidding of demand reductions in organized wholesale markets administered by "independent system operators" ("ISOs") and "regional transmission organizations"

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[26] Bushnell et al., *supra* note 11, at 10–11 (calling this a "simple but elusive step").

[27] Numerous studies have evaluated the barriers to more widespread uptake of dynamic pricing. For a snapshot see ANNIKA TODD, PETER CAPPERS & CHARLES GOLDMAN, LAWRENCE BERKELEY NAT'L LAB., RESIDENTIAL CUSTOMER ENROLLMENT IN TIME-BASED RATE AND ENABLING TECHNOLOGY PROGRAMS (2013), https://emp.lbl.gov/sites/all/files/lbnl-6247e.pdf; PETER CAPPERS, ANNIKA TODD & CHARLES GOLDMAN, LAWRENCE BERKELEY NAT'L LAB., SUMMARY OF UTILITY STUDIES (2013), https://emp.lbl.gov/sites/default/files/lbnl-6248e.pdf; Paul L. Joskow & Catherine D. Wolfram, *Dynamic Pricing of Electricity*, 102 AM. ECON. REV. 381 (2012), http://faculty.haas.berkeley.edu/wolfram/Papers/AEA%20DYNAMIC%20PRICING.pdf; Ahmad Faruqui & Sanem Sergici, *Household Response To Dynamic Pricing of Electricity-A Survey of the Experimental Evidence* (2009), https://www.hks.harvard.edu/hepg/Papers/2009/The%20Power%20of%20Experimentation%20_01-11-09_.pdf; NICOLE HOPPER, CHARLES GOLDMAN & BERNIE NEENAN, LAWRENCE BERKELEY NAT'L LAB., DEMAND RESPONSE FROM DAY-AHEAD HOURLY PRICING FOR LARGE CUSTOMERS (2006), https://emp.lbl.gov/sites/all/files/report-lbnl-59630.pdf; CHUCK GOLDMAN ET AL., LAWRENCE BERKELEY NAT'L LAB., DOES REAL-TIME PRICING DELIVER DEMAND RESPONSE? A CASE STUDY OF NIAGARA MOHAWK'S LARGE CUSTOMER RTP TARIFF (2004), https://emp.lbl.gov/sites/default/files/report-lbnl-54974.pdf.

("RTOs"),[28] the operators of our regional grids. These bids often come through market intermediaries called "aggregators" or "curtailment service providers" ("CSPs") that act as intermediaries, gathering demand reductions from individual sources into larger blocks and then offering them into the wholesale markets.[29] They contract with retail customers who wish to participate in the markets, often because the customers could not do so directly, due to minimum size restrictions and other limitations discussed below. CSPs bid demand reductions from individual commercial, industrial, and residential customers into the markets, sometimes aggregating smaller demand reductions into one block. A rudimentary example of how this works in practice is the "movie theater" program described in an early report.[30] The CSP ConsumerPowerline aggregated all of the tenants within an apartment complex in its demand response program. As the report noted, "[i]f they are notified, the tenants are given free passes to the local movie theater as long as they agree to turn off all non-essential equipment in their apartments when they leave. The movie theater stamps the tickets as further verification that customers participated."[31]

What do these techniques have in common? Whether a residential consumer takes part in Rush Hour Rewards or contracts with a CSP for demand reductions bid into a market, the end result is the same: reduce consumption and get paid for it.[32] FERC

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[28] Seven regional grid operators operate markets and "serve over one-half of the nation and provide two-thirds of the nation's electricity." Joel B. Eisen, *FERC's Expansive Authority to Transform the Electric Grid*, 49 U.C. DAVIS L. REV. 1783, 1793 (2016) [hereinafter Eisen, *FERC's Expansive Authority to Transform the Electric Grid*]. The wholesale markets are described in depth in Emily Hammond & David B. Spence, *The Regulatory Contract in the Marketplace*, 69 VAND. L. REV. 141 (2016). For purposes of this Article, there is no practical difference between ISOs and RTOs, and the term "RTOs" will be used to refer to grid operators generally. Grid operator names including "ISO," such as "New York ISO," will also be used.

[29] *See* Eisen, *Who Regulates the Smart Grid?*, *supra* note 7, at 74.

[30] *See* DAVID KATHAN, NAT'L ASS'N OF REGULATORY UTIL. COMM'RS, POLICY AND TECHNICAL ISSUES ASSOCIATED WITH ISO DEMAND RESPONSE PROGRAMS 48 (2002).

[31] *Id.*

[32] U.S. DEP'T OF ENERGY, *supra* note 21, at 17.

defines demand response as: "Changes in electric usage by demand-side resources 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."[33] You, the consumer, are "responding": changing your electricity consumption. There is considerable debate, by the way, about whether you are temporarily doing so, that is, simply "time shifting" your usage to a different time of day, or actually conserving electricity.[34]

There are considerable differences among demand response programs. What you are responding to can take one of two different forms. In "emergency" programs, the grid needs you to reduce demand because it is too stressed: an emergency (supply constraint or high prices) requires immediate cutbacks.[35] In "economic" programs, you participate voluntarily to receive payments in the markets. How you respond can differ, too: your reduction can be mandatory or voluntary. In a direct load control program, the consumer has agreed in advance to reduce demand if the utility determines that a specific triggering event occurs. In an aggregator's economic demand response program, the consumer may set a program on a device such as the Nest (these days, often with an app of some sort) with settings that accept a request for demand reductions sometimes and reject them at others (if, for

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[33] *Reports on Demand Response & Advanced Metering*, FED. ENERGY REGULATORY COMM'N, https://www.ferc.gov/industries/electric/indus-act/demand-response/dem-res-adv-metering.asp (last updated Feb. 6, 2017).

[34] This concern has been recognized since the advent of demand-side techniques. ROCKY MOUNTAIN INST., DEMAND RESPONSE: AN INTRODUCTION 1 (2006), http://www.swenergy.org/data/sites/1/media/documents/publications/documents/Demand_Response_White_Paper.pdf ("For example, a large customer may switch from grid-supplied electricity to backup generators, when called to do so by the utility."); Steven Nadel & Howard Geller, *Utility DSM: What have we learned? Where are we going?*, 24 ENERGY POL'Y 289, 294 (1996) ("Load management programmes shift electric loads from one period to another (typically from peak to off-peak periods) but generally do not reduce electricity use.").

[35] *See* U.S. DEP'T OF ENERGY, *supra* note 21, at 9.

example, the temperature rises above a set point). The incentive for reducing demand can be a flat payment, a reduced electricity rate, or something else, perhaps an agreement with an aggregator to be paid whenever you reduce demand. Demand response programs differ on other variables, too. As discussed below, programs vary based on who controls the demand reduction (a utility, aggregator, or grid operator), which types of customers are involved (residential or commercial and industrial customers[36]), and how quick the response is expected.[37]

Most discussions group this bewildering variety of techniques into a few broad categories for simplicity's sake.[38] It is common to separate dynamic pricing and incentive-based programs.[39] Of course, dynamic pricing builds in an "incentive" for reductions—if you use less, you pay less—but the industry convention is to use "incentive-based" to refer to other programs.[40] This Article uses a

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[36] This distinction matters because commercial and industrial customers have typically been more likely to have access to relevant technologies and, therefore, have historically accounted for the lion's share of demand response to date. U.S. DEP'T OF ENERGY, *supra* note 21, at 17 ("The decision-making process may be somewhat different for residential and small commercial customers, who may have a less formalized notion of their usage needs and budget than for large commercial or industrial facilities that may include energy costs as part of a specific operating budget.").

[37] U.S. DEP'T OF ENERGY, *supra* note 21, at 15 ("Demand response options can be deployed at all timescales of electricity system management . . . and can be coordinated with the pricing and commitment mechanisms appropriate for the timescale of their commitment or dispatch.").

[38] *See id.* at xii. For a slightly different taxonomy, see STEVEN D. BRAITHWAIT & KELLY EAKIN, EDISON ELEC. INST., THE ROLE OF DEMAND RESPONSE IN ELECTRIC POWER MARKET DESIGN 2 (2002) ("The report groups demand response mechanisms into three generic categories–dynamic pricing, interruptible and voluntary load reductions, and customer provision of ancillary services. We focus primarily on markets for energy, rather than ancillary services, and draw distinctions among three types of the second category of load reduction programs: traditional load management programs, utility energy buy-back programs, and ISO/RTO sponsored demand bidding programs.").

[39] *See* U.S. DEP'T OF ENERGY, *supra* note 21, at xii; FERC DR-AM 2016, *supra* note 22, at 19 n.85 ("Incentive-based demand response programs include direct load control, interruptible, demand bidding/buyback, emergency demand response, capacity market, and ancillary service market programs.").

[40] *See* U.S. DEP'T OF ENERGY, *supra* note 21, at xii.

simplified terminology to further subdivide incentive-based programs between those conducted by utilities and by the wholesale markets, to recognize an important distinction between the two—the former are administered by the states and the latter by RTOs[41]—and to spotlight two distinctly different market opportunities for demand response: the wholesale markets and potential new markets to be administered by utilities at the state level.

I use "utility demand management" to refer to utility-based programs. In the 1970s, "load management" encompassed techniques available to a utility to reduce demand, that is, interruptible rates and DLC.[42] Today, utilities administer these and other more sophisticated programs. Somewhat confusingly, some today refer to *all* demand response as load management because that is what it does: manage "load" (the industry word for demand).[43] I use "demand management" to refer to all utility demand response programs, including those that might be more interactive than traditional load management, and I distinguish these from "wholesale market programs."

From the beginning, demand response has included all three categories—dynamic pricing, utility demand management, and wholesale market programs—even though they differ considerably from one another in design and function. Energy efficiency measures, while also aimed at reducing electricity consumption, are not included. This recognizes that some demand-side measures can give grid operators flexibility to achieve balance between supply and demand, but others cannot. Energy efficiency does not produce the sort of immediate demand reductions a market needs.[44]

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[41] *See, e.g.*, Order 745, *supra* note 7, at 16,660 ("While a number of states and utilities are pursuing retail-level price-responsive demand initiatives based on dynamic and time-differentiated retail prices and utility investments in demand response enabling technologies, these are state efforts, and, thus, are not the subject of this proceeding.").

[42] *See, e.g.*, Nadel & Geller, *supra* note 34, at 294.

[43] *See* ROCKY MOUNTAIN INST., *supra* note 34, at 1.

[44] *See* CHARLES GOLDMAN ET AL., LAWRENCE BERKELEY NAT'L LAB., COORDINATION OF ENERGY EFFICIENCY AND DEMAND RESPONSE ES-1 (2010), https://emp.lbl.gov/sites/all/files/report-lbnl-3044e.pdf.

There is a potentially complementary relationship between the two, although they are provided and measured differently so coordination is necessary to achieve maximum co-benefits.[45] If you add insulation to your house to improve its efficiency, for example, your home's improved performance might make you more willing to respond to a call to cut consumption immediately.[46] But merely installing the insulation would not affect supply and demand in a wholesale market *right now*.

B. Demand Response's Benefits For The Electric Grid

Demand response is a helping hand when the grid needs it. Think of it as the grid's WD-40: put some here, a little there, and things work better. In its WD-40 role, demand response is valuable in many different ways to the grid.[47] You might shift electricity use to non-peak hours, eliminating the need for power plants to start during the small number of hours that demand peaks each year. When you choose to respond to higher prices and reduce demand, this may result in reduced marginal costs of electricity because higher-cost plants would not be "dispatched" (sent by the system operator to meet demand). Demand response programs may also lead to reductions in usage if peak consumption is eliminated rather than shifted, so it matters how you respond; if commercial and industrial customers start polluting "behind the meter" generators, this negates the benefits.[48]

Looking prospectively, demand response programs can help meet future anticipated demand and avoid the unnecessary expense of building new power plants. Demand "peakedness" requires grid operators to have power plants on hand to meet peak demand, which leads to oversupply of generating capacity that demand response can help ameliorate. RTOs increasingly rely on regional

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[45] *See generally* Steven Nadel, *Demand Response Programs Can Reduce Utilities' Peak Demand an Average of 10%, Complementing Savings from Energy Efficiency Programs*, ACEEE BLOG (Feb. 9, 2017, 3:58 PM), http://aceee.org/blog/2017/02/demand-response-programs-can-reduce.

[46] KATHAN, *supra* note 30, at 8.

[47] *See generally* U.S. DEP'T OF ENERGY, *supra* note 21 (discussing demand response's many benefits).

[48] KATHAN, *supra* note 30, at 40.

planning processes and capacity mechanisms[49] to decide whether new power plants are needed. Factoring demand response into these models can lead to construction of fewer new plants. Demand response can also help to provide ancillary services. These are special services that keep the grid in balance, such as reserves to provide power on short notice, where demand response can substitute for power plants that run offline. And demand response bids into wholesale markets compete with those of generators and can help mitigate their market power.[50]

Finally, demand response is an important element of the transition to a clean energy economy. It increases grid reliability when used as a balancing resource for wind and solar power.[51] As more distributed energy resources are integrated to the grid, demand response will be more useful in stabilizing it. The "distinctive characteristics" of distributed energy resources "highlight the importance of facilitating programs and technologies like demand response and energy storage to help manage steep generation ramping needs to meet net electricity load."[52]

So it is good to have more of this WD-40 around. That is great, but far from the final word. Demand response is hardly anyone's idea of the most exciting resource in a transformed electric grid. It is not "clean energy" (being not energy at all), or a splashy new thing that people want, like an electric vehicle that goes 300 miles on one charge or a Tesla Powerwall that can store all your homemade power. As I have said before, no one is stampeding an Apple store at midnight to buy smart thermostats.[53] It is just eating

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[49] An example of a capacity market is PJM's "Reliability Pricing Model." *See infra* notes 175-178 and accompanying text.

[50] DOUG HURLEY ET AL., REGULATORY ASSISTANCE PROJECT, DEMAND RESPONSE AS A POWER SYSTEM RESOURCE: PROGRAM DESIGNS, PERFORMANCE, AND LESSONS LEARNED IN THE UNITED STATES 13 (2013).

[51] Joel B. Eisen, *Distributed Energy Resources, Virtual Power Plants, and the Smart Grid*, 7 U. HOUS. ENVTL. & ENERGY L. AND POL'Y J. 191, 201–05 (2012) [hereinafter Eisen, *Distributed Energy Resources*].

[52] FERC DR-AM 2016, *supra* note 22, at 23; Schare & Feldman, *supra* note 13.

[53] Joel B. Eisen, *Smart Regulation and Federalism for the Smart Grid*, 37 HARV. ENVTL. L. REV. 1, 15 (2013) [hereinafter Eisen, *Smart Regulation and Federalism for the Smart Grid*]. Sales of all smart thermostats are growing, but

your spinach, so to speak, but getting paid for it. And more people prefer chocolate to spinach.

Thus, demand response's beneficial role in the grid does not come close to telling the full story of how it came to be at the center of today's grid modernization efforts. If everyone in the industry had recognized its importance from the start, no policies would have been needed to encourage it. But that was not the case. So, to begin to understand demand response's importance, we need to go back to the 1970s, when it was hardly anything at all.

II. DEMAND RESPONSE 1.0: THE RISE AND FALL OF "DEMAND-SIDE MANAGEMENT"

The path of demand-side participation in the grid has not been a linear upward trajectory. This Part discusses the first generation of demand-side participation in the grid, spanning from the 1970s to early 2000s. "Demand-side management" ("DSM"), the umbrella term for all demand-side measures, began modestly in the 1970s, had its heyday in the 1980s and 1990s, and fell off significantly during the move to retail competition in the electric industry in the late 1990s and early 2000s, to recover somewhat later. As discussed more fully in Part III, "demand response" arose in the early 2000s after the fall off in demand-side measures contributed to a catastrophe in California.

But before this, there was little to no demand response for many decades in the electricity industry.

A. *Demand Response "0.0": Little Demand-Side Participation*

Like much of contemporary energy law and policy, demand-side measures have their origins in the energy crises of the 1970s. Think of the era before then as "demand response 0.0." There was "little urgency"[54] for measures to reduce consumer electricity

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Nest itself is struggling. Mark Bergen, *With $340 Million in Revenue, Nest is Underperforming, and its Future at Google is at Risk*, RECODE.NET (Mar 30, 2016, 5:19 PM EDT), http://www.recode.net/2016/3/30/11587388/nest-2015-sales-budget.

[54] STEVEN BRAITHWAIT ET AL., EDISON ELEC. INST., RETAIL ELECTRICITY PRICING AND RATE DESIGN IN EVOLVING MARKETS 43 (2007),

demand. Utilities considered the idea of paying their customers to cut back their consumption to be preposterous.[55] They did not need to. Costs of generating electricity were low, and going lower all the time as improving economies of scale made it cheaper to build new plants and generate more electricity. Postwar prosperity brought the convenience of the "all-electric home." The "Live Better Electrically" campaign that promoted it, with then-actor Ronald Reagan as its notable spokesman, was "[o]ne of the most effective mass marketing home campaigns of all time."[56] The industry mascot Reddy Kilowatt promoted more uses of electricity.[57] The California utility PG&E had this pithy slogan: "Don't Be A Dishwasher, Buy One."[58]

It was an era of coziness between PUCs and the (mostly) vertically integrated utility companies that they regulated. Cost-of-service ratemaking's familiar "throughput incentive"[59] encouraged capital spending on new power plants, as costs incurred could be recovered from ratepayers with relatively few limitations. There was no incentive to reduce demand, which would reduce profits.[60] Utilities sold power, and their customers bought it. As late as 1981,

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http://eei.org/issuesandpolicy/stateregulation/Documents/Retail_Electricity_Pricing.pdf.

[55] BRETT D. STEELE & THEO BREITENSTEIN, THE HISTORY AND EVOLVEMENT OF ELECTRICAL PEAK LOAD CONTROL SYSTEMS IN EUROPE AND THE U.S. 2 (2010), http://emacx.com/documents/TheHistoryandEvolvementofElectricalPeakLoadControlSystems_002.pdf (terming this notion "absurd").

[56] *Live Better Electrically: The Gold Medallion Home Campaign*, WASH. DEP'T OF ARCHAEOLOGY AND HISTORY PRES., http://www.dahp.wa.gov/live-better-electrically-the-gold-medallion-electric-home-campaign (last visited Mar. 14, 2017).

[57] *About Reddy Kilowatt*, REDDYKILOWATT.ORG, http://www.reddykilowatt.org/about/ (last visited Feb. 22, 2017).

[58] Stephen P. Reynolds & Jane F. Christopherson, *Public Policy and Price Per kWh*, 26 CAL. MGMT. REV. 83, 84 (1984).

[59] Harvey Averch & Leland L. Johnson, *Behavior of the Firm Under Regulatory Constraint*, 52 AM. ECON. REV. 1052 (1962).

[60] JOSEPH ETO, LAWRENCE BERKELEY NAT'L LAB., THE PAST, PRESENT, AND FUTURE OF U.S. UTILITY DEMAND-SIDE MANAGEMENT PROGRAMS 4–5 (1996), https://emp.lbl.gov/sites/all/files/39931.pdf; STEELE & BREITENSTEIN, *supra* note 55, at 2.

Clark Gellings, one of the originators of the term "DSM," described venturing behind a customer's electric meter as going into "forbidden territory."[61]

Even though they were shunned, strategies to reduce electricity demand did exist. Decades earlier, "engineers and utilities debated alternative pricing regimes that included charges at times of high demand and time-of-day differentiated rates."[62] Basic demand-side measures were around, if not used widely. As the noted industry analyst Ahmad Faruqui put it, "[d]irect load control of certain residential appliances such as water heaters and air conditioners and interruptible and curtailable rates for commercial and industrial customers" existed before 1970.[63] In 1968, Detroit Edison started the first DLC program.[64]

But measures to reduce demand were not more widely adopted, because utilities were largely uninterested in them. For quite a few utilities, that antipathy[65] persists to this day and informs discussions about demand response.

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[61] Shmuel S. Oren, *Demand Response: An Historical Perspective and Business Models for Load Control Aggregation*, Feb. 1, 2010, at slide 5 (citing Clark W. Gellings, *Demand-side Load Management: The Rising Cost of Peak-Demand Power Means that Utilities Must Encourage Customers to Manage Power Usage*, 18 IEEE SPECTRUM 49 (Dec. 1981)).

[62] EXEC. OFFICE OF THE PRESIDENT, INCORPORATING RENEWABLES INTO THE ELECTRIC GRID 26–27 (2016), https://obamawhitehouse.archives.gov/sites/default/files/page/files/20160616_cea_renewables_electricgrid.pdf.

[63] Ahmad Faruqui, *The Rediscovery of Demand-Side Management*, slide 6 (2011), http://www.brattle.com/system/publications/pdfs/000/004/439/original/The_Rediscovery_of_Demand-Side_Management_Faruqui_Jan_19_2012.pdf?1378772105.

[64] FED. ENERGY REGULATORY COMM'N, ASSESSMENT OF DEMAND RESPONSE AND ADVANCED METERING 23 n.26 (2011), https://www.ferc.gov/legal/staff-reports/2010-dr-report.pdf [hereinafter FERC DR-AM 2010].

[65] STEELE & BREITENSTEIN, *supra* note 55, at 3 (noting "hostile utility industry attitudes towards conservation and load curtailment [that] slowly started to change" in the 1970s).

B. The 1970s and 1980s: Reducing Demand Becomes More Common

In the 1970s, outright hostility to demand-side measures softened when three significant trends coincided and changed the future of demand-side participation in the grid. Since then, federal and state programs and initiatives have encouraged reduced electricity consumption and improved energy efficiency.

1. Three Trends Catalyze Attention to the Demand Side

The rapid growth of residential air conditioning, beginning in the mid-1950s and accelerating into the 1970s and 1980s,[66] changed the demand curve for utilities.[67] They now had peaks in demand during the middle of the day and needed extra power plants to meet that peak demand. These extra "peaking" plants would not be used for the rest of the year.[68] It made sense to find some way to shift usage outside the utility's peak hours, to reduce costs and the need for new plants.

Also, the cost of both fuel and new power plants escalated. In the mid- to late-1970s and early 1980s, building new power plants (particularly nuclear plants) became more expensive.[69] The unexpected high costs of nuclear plants, combined with the growing societal awareness of the impacts of nuclear power generation and opposition to new plants, led to plant cancellations and adverse impacts on utility profitability.[70] After the Arab oil

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[66] MAXIMILIAN AUFFHAMMER, REPORT #3: THE RELATIONSHIP BETWEEN AIR CONDITIONING ADOPTION AND TEMPERATURE 3 (2011), https://yosemite.epa.gov/ee/epa/eerm.nsf/vwAN/EE-0573-01.pdf/$file/EE-0573-01.pdf (noting that "in 1955 the residential air conditioner penetration in the United States was below 2% nationally" but "[a] quarter of a century later that fraction had risen to 50%, with half of those households having installed central air-conditioning units."); Wellinghoff & Morenoff, *supra* note 18, at 393 ("Nationally, the presence of air conditioning in new single-family homes increased from 49% in 1973 to 89% in 2006.").

[67] Wellinghoff & Morenoff, *supra* note 18, at 393.

[68] *Id.*

[69] *See, e.g.*, Reynolds & Christopherson, *supra* note 58, at 85–86 (detailing cost increases for the California utility PG&E).

[70] *See, e.g.*, Richard A. Epstein, *Jersey Central Power & Light Co v Federal Energy Regulatory Commission: Robert Bork on Public Utility Rate*

embargo of 1973, fuel prices went up and so too did electricity prices,[71] which, to an extent not seen before, prompted new attention to "energy independence" and caused customers to cut back on their demand.[72]

In addition, the burgeoning environmental movement brought increasing attention to the externalities of electricity generation. The rise of environmentalism brought more participation and contention to ratemaking proceedings,[73] and promoted a new ethic of using less instead of building more. Cutting consumption became virtuous. President Jimmy Carter wore a sweater in the White House and urged Americans to conserve energy.[74] And there was increasing academic interest in an electricity future that was not all about Reddy Kilowatt. In 1978, MIT Professor Fred Schweppe described a "homeostatic" electric grid in which supply and demand balanced at equilibrium.[75] Schweppe and other scholars saw a future in which both supply (power plants) and cutting back demand contributed to this balance. He proposed the use of price signals, market mechanisms, and communication technologies to prompt cuts in demand when necessary to achieve this balance.[76]

Regulation—and Lochner v New York, 80 U. CHI. L. REV. DIALOGUE 193 (2013).

71 U.S. ENERGY INFO. ADMIN., AVERAGE RETAIL PRICES OF ELECTRICITY, 1960-2011, https://www.eia.gov/totalenergy/data/annual/showtext.php?t=ptb0810 (showing increases in nominal electricity prices in the 1970s after stable prices had prevailed before then).

72 RICHARD F. HIRSH, TECHNOLOGY AND TRANSFORMATION IN THE AMERICAN ELECTRIC UTILITY INDUSTRY 126–27 (1989).

73 *See, e.g.*, Reynolds & Christopherson, *supra* note 58, at 88 (listing ten groups "to name only a few" that had "sprung up" to intervene in utility proceedings in California).

74 Peter Dykstra, *President Jimmy Carter Tried to Change the Path of America's Energy Future with His 'Crisis of Confidence' Speech, Delivered 35 Years Ago Monday. Here's Why it Didn't Work*, THE DAILY CLIMATE (July 15, 2014), http://www.dailyclimate.org/tdc-newsroom/2014/07/carter-crisis-speech-anniversary (describing the "crisis of confidence" speech).

75 MIT ENERGY INIT., *supra* note 3, at 35.

76 *Id.*

For most of the 1970s, however, demand-side programs could best be described as "modest."[77] In 1979, less than 30 percent of investor-owned utilities had interruptible rate programs.[78] And there was a "wink wink agreement"[79] that utilities would not interrupt their customers,[80] so these programs merely established a lower default rate for commercial and industrial customers that demanded these rates for continuing to purchase power.[81] Dynamic pricing experiments began in several utilities in the mid-1970s.[82] In 1975, the Federal Energy Administration, the forerunner of the DOE, conducted sixteen rate demonstration projects.[83] It was not until the 1980s, though, that any utility would start a dynamic pricing program in earnest.

2. *PURPA and the Growth of DSM*

During the 1970s, federal statutes established a national policy of encouraging efficiency and conservation, and prodded utilities into action. The core statute involving utilities was the Public Utility Regulatory Policies Act of 1978 ("PURPA").[84] Utilities began to seriously conduct DSM programs by the end of the decade,[85] as state PUCs acted to empower electric utilities to recover costs associated with DSM programs in keeping with PURPA's mandate encouraging DSM investments. A significant

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[77] ETO, *supra* note 60, at vii.

[78] Caves et al., *supra* note 15, at 51 (discussing a 1987 study by the Electric Power Research Institute).

[79] STEVE ISSER, ELECTRICITY RESTRUCTURING IN THE UNITED STATES: MARKETS AND POLICY FROM THE 1978 ENERGY ACT TO THE PRESENT 31 (2015).

[80] HURLEY ET AL., *supra* note 50, at 19; DANIEL F. KOHLER & BRIDGER M. MITCHELL, RESPONSE TO RESIDENTIAL TIME-OF-USE ELECTRICITY RATES 6 (1983) (citing a report by the Peak Load Management Alliance observing that, "[M]any utilities rarely if ever interrupted these customers. So with the rate discount, such programs evolved more for purposes of economic development than for load management.").

[81] CAPPERS ET AL., *supra* note 17, at 12.

[82] KOHLER & MITCHELL, *supra* note 80, at v.

[83] *See id*. (discussing the results from several of these projects).

[84] Public Utility Regulatory Policies Act of 1978, Pub. L. No. 95–617 (1978) (codified at 16 U.S.C. §§ 2601–2645 (2012)) [hereinafter PURPA].

[85] Eric Hirst et al., *The Future of DSM in a Restructured U.S. Electricity Industry*, 24 ENERGY POL'Y 303, 303 (1996).

number of utilities adopted programs with measures to encourage customers to reduce electricity usage through improvements to efficiency and increased conservation.[86]

PURPA's demand-side provisions, set forth in Title I, aimed to encourage conservation of energy supplied by electric utilities, optimal efficiency of electric utility facilities and resources, and equitable rates for electric consumers. PURPA did not mandate that utilities undertake specific actions but instead encouraged the states to adopt regulatory policies.[87] It set forth six specific federal standards for utilities' services and rates: (i) rates should reflect the actual cost of electric power generation and distribution; (ii) rates should not decline with increases in electric power use unless the cost of providing the power decreases as consumption increases; (iii) rates should reflect the daily variations in the actual cost of electric power generation; (iv) rates should reflect the seasonal variations in the actual cost of electric power generation; (v) rates should offer a special "interruptible" electric power service rate for commercial and industrial customers; and (vi) each electric utility must offer load management techniques to their electric consumers that will be practicable, cost effective and reliable, as determined by the state public utility commission.[88] State PUCs were required to consider whether adopting these standards would further PURPA's objectives.

"Demand-side management" emerged in the early 1980s as the umbrella term for energy efficiency, conservation programs, and initiatives aimed at reducing electricity demand.[89] Broadly speaking, DSM programs can be divided into seven categories: (1) information provision; (2) technical strategies such as energy audits; (3) financial assistance for adoption of energy-efficient technologies; (4) "direct or free installation of energy-efficient technologies;" (5) performance contracting, "in which a third party contracts with both the utility and a customer and guarantees

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[86] Nadel & Geller, *supra* note 34, at 291–94 (describing typical programs).
[87] PURPA § 111.
[88] PURPA § 111(d)(1)–(6).
[89] As Ahmad Faruqui notes, the "DSM" term was invented in 1983 at an industry workshop. Faruqui, *supra* note 63, at 8.

energy performance"; (6) load management; and (7) dynamic pricing.[90] Thus, although they sound similar, "demand-side management" and "demand response" are different, as the latter encompasses only the last two on this list.

Another federal statute promoting DSM was the Energy Policy Act of 1992 ("EPAct 1992"), which encouraged "integrated resource planning" ("IRP"). IRP has two components: an assessment of future electric needs, and a plan to meet the projected future needs. It is "integrated" because it evaluates both traditional supply side resources (building new power plants and transmission lines) and demand-side resources (energy efficiency and demand response) in making decisions about how best to meet projected future electric energy needs.[91] By explicitly adding consideration of demand-side resources to utility planning, IRP aimed to change the traditional pattern of building more supply to meet projected demand. EPAct 1992 amended PURPA to add three new standards for state consideration, two of which were the use of IRP and the encouragement of DSM investments by making them as profitable as supply-side investments.[92] This latter statutory standard requires that state regulators link a utility's rates and recovery of its costs to its performance in implementing cost-effective DSM programs.[93] Spurred by the statutory requirement, a number of state PUCs adopted IRP to modify the process of regulating the supply of electricity provided by electric utilities.[94]

DSM programs grew rapidly in the 1980s, as state regulators responded to the PURPA mandate and provided incentives for utilities. A 1982 survey found a "virtual stampede," as 72 percent of U.S. utilities had conservation programs and two-thirds had load

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[90] ETO, *supra* note 60, at 2.

[91] RACHEL WILSON & BRUCE BIEWALD, REGULATORY ASSISTANCE PROJECT, BEST PRACTICES IN ELECTRIC UTILITY INTEGRATED RESOURCE PLANNING 2 (2013), http://www.raponline.org/wp-content/uploads/2016/05/rapsynapse-wilsonbiewald-bestpracticesinirp-2013-jun-21.pdf.

[92] Energy Policy Act of 1992, Pub. L. No. 102-486, § 115, 106 Stat. 2776, 2803 (codified as amended in 16 U.S.C. § 2621(d)(8) (2012)).

[93] 16 U.S.C. § 2621(d)(8).

[94] WILSON & BIEWALD, *supra* 91, at 3.

management programs;[95] half had been established since 1980.[96] By 1993, electric utility DSM programs reached $2.7 billion of utility spending, or about one percent of U.S. utility revenues.[97] Notably lagging, however, were dynamic pricing programs. California's utility PG&E started a real-time pricing program in the mid-1980s,[98] which was largely unsuccessful due to its design. Two other utilities (Niagara Mohawk and Georgia Power) started more robust programs in the late 1980s and early 1990s.[99] Even today, only a few dynamic pricing programs are successful.[100] Overall, little progress has been made in signing up residential customers.[101]

3. *The Decline of DSM In Restructuring*

Demand-side programs experienced a sharp reversal of fortune when program mandates were swept away in the late 1990s. The chief culprit was the introduction of partial competition into the utility industry, known as "restructuring."[102] Restructuring was prompted by advances in technology, regulatory initiatives promoting competition in the industry,[103] the emergence of new, nonutility (or "merchant") generators, and societal and economic arguments for ending utilities' monopolies, at least for electricity

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[95] CHRISTOPHER FLAVIN, WORLDWATCH INST., ELECTRICITY'S FUTURE: THE SHIFT TO EFFICIENCY AND SMALL-SCALE POWER 85 (1984); *see also* Wellinghoff & Morenoff, *supra* note 18, at 394 (describing the rise of load management programs in the mid 1980s and early 1990s).

[96] FLAVIN, *supra* note 95, at 85.

[97] ETO, *supra* note 60, at vii.

[98] BRAITHWAIT ET AL., *supra* note 54, at 44.

[99] *Id.*

[100] DAN YORK & MARTIN KUSHLER, AM. COUNCIL FOR AN ENERGY-EFFICIENT ECON., EXPLORING THE RELATIONSHIP BETWEEN DEMAND RESPONSE AND ENERGY EFFICIENCY iv (2005) (observing that, "With a few noteworthy exceptions, only a few [dynamic pricing programs] have achieved significant absolute or relative impacts in terms of load reductions achieved.").

[101] Severin Borenstein, *Effective and Equitable Adoption of Opt-In Residential Dynamic Electricity Pricing* 1 (National Bureau of Econ. Research, Working Paper No. 18037, 2012).

[102] ETO, *supra* note 60, at 1.

[103] *See generally* ISSER, *supra* note 79, at 152–207; Joel B. Eisen, *Regulatory Linearity, Commerce Clause Brinksmanship, and Retrenchment in Electric Utility Deregulation*, 40 WAKE FOREST L. REV. 545, 549–51 (2005).

generation. The story of retail and wholesale restructuring has been studied extensively,[104] and I will not repeat it here. Retail choice had incomplete success and outright failure in some states, which led to a balkanized system today where some states enable customers to choose their electricity generator, but most do not.[105]

The fate of DSM programs during this time period is also well known. Proponents feared that the programs would suffer the ax in a more competitive environment.[106] If utilities were required to pay for them, and their upstart competitors were not, price-elastic customers would presumably switch,[107] so utilities argued that they should not bear the programs' costs.[108] The result was predictable. Spending on utility DSM peaked in the early 1990s,[109] but after that, utility support waned, and total spending on DSM programs declined by almost half between 1993 and 2001.[110] States repealed

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[104] ISSER, *supra* note 79, at 233–74, for example, evaluates the rise and fall of competition in California. *See also* David B. Spence, *Can Law Manage Competitive Energy Markets?*, 93 CORNELL L. REV. 765, 779–81 (2008).

[105] U.S. ENERGY INFO. ADMIN., STATUS OF ELECTRICITY RESTRUCTURING BY STATE, http://www.eia.gov/electricity/policies/restructuring/restructure_elect.html (last visited Feb. 21, 2017).

[106] Hirst et al., *supra* note 85, at 304.

[107] *Id.* at 305; ELEC. ENERGY MKT. COMPETITION TASK FORCE, REPORT TO CONGRESS ON COMPETITION IN WHOLESALE AND RETAIL MARKETS FOR ELECTRIC ENERGY, PURSUANT TO SECTION 1815 OF THE ENERGY POLICY ACT OF 2005 97 (2006) (observing that this was particularly true when distribution utilities were required under restructuring laws to maintain "provider of last resort" offerings to ensure service to all customers).

[108] *See* ISSER, *supra* note 79, at 192; Nadel & Geller, *supra* note 34, at 290.

[109] *See* Hirst et al., *supra* note 85, at 304.

[110] RICHARD COWART, REGULATORY ASSISTANCE PROJECT, EFFICIENT RELIABILITY: THE CRITICAL ROLE OF DEMAND-SIDE RESOURCES IN POWER SYSTEMS AND MARKETS v–vi (2001). Meanwhile, unfortunately, the contribution of utility-sponsored demand-side management programs (DSM) to meeting the nation's load growth needs has been in decline. In the early 1990's, utility DSM programs saved a total of 29,000 MW at a cost of about three cents per kWh saved. Despite this generally solid record of success, since the passage of the Energy Policy Act and the national move to retail electric competition, utility-sponsored DSM programs have been cut back sharply. Total utility DSM spending has declined by about fifty percent since 1993.

IRP requirements.[111] The federal government's treasure trove of energy data, the Energy Information Administration, stopped keeping track of DSM spending after 2001.[112]

The decline of DSM illustrates how opponents of demand-side programs can modify their arguments to suit the times. DSM spending cratered because it was a burden to utilities that hobbled their ability to compete with market entrants who were not required to carry out these programs. It was the advent of competition, not DSM's inherent merits, which prompted the decline.

III. DEMAND RESPONSE 2.0: THE ADVENT AND GROWTH OF "DEMAND RESPONSE"

This Part begins with yet another reversal, this time in the opposite direction: the growth of demand response programs in wholesale electricity markets after the California electricity crisis of 2000-2001. Since then, wholesale market programs have evolved, and FERC Orders have attempted to put demand response on a comparable footing with generation in these markets,[113] yet barriers to demand response participation persist.

Just as utility DSM spending was dropping off, events in California intervened. The state's electricity crisis was centered on the aborted move to electricity competition. There were numerous

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As one example of this trend, New York utilities' energy efficiency spending "was cut by about 75% in the mid-1990's." *Id*. at 15; *cf*. Wellinghoff & Morenoff, *supra* note 18 (demand reduction programs also "dropped off").

[111] WILSON & BIEWALD, *supra* note 91, at 3.

[112] U.S. ENERGY INFO. ADMIN., ELECTRIC UTILITY DEMAND SIDE MANAGEMENT - ARCHIVE, http://www.eia.gov/electricity/data/eia861/dsm/ (last visited Feb. 28, 2017).

[113] As noted throughout this Article, demand response cannot receive the exact same treatment as electricity generated from power plants, because it involves different kinds of resources. Regulatory treatment that attempts to achieve comparability often results in different market rules for the two types of resources. *Infra* Part III; for a specific recent example, see Indep. Mkt. Monitor for PJM v. PJM Interconnection, LLC, 155 FERC ¶ 61,059 (Apr. 21, 2016) (denying a Market Monitor's complaint, and upholding different offer caps for generation and demand response), https://www.ferc.gov/whats-new/comm-meet/2016/042116/E-5.pdf.

structural problems with California's design for retail competition, resulting in tremendous economic pressure on both consumers and the state's utilities.[114] One of the many problems was a disconnect between wholesale and retail energy markets. When prices in the state's new wholesale electricity market spiked as a result of a confluence of factors that some called a perfect storm,[115] there was no safety valve. Dynamic pricing, then as now, was not widespread,[116] so retail customers paid fixed rates[117] that could not be easily adjusted upward to relieve the price squeeze.

There was no other effective form of demand reductions to relieve market pressure.[118] At the time, all three of California's major investor-owned utilities had interruptible rate programs, but they had rarely been used.[119] This situation changed dramatically during the crisis. Utilities issued more frequent calls to reduce demand from interruptible customers.[120] The number escalated into 2000,[121] when power prices spiked. Customers refused these demands and then balked at paying penalties imposed on them for refusing.[122]

A. *The Ascent of "Demand Response"*

As was noted at the time, "Competitive wholesale markets . . . resemble the sound of one hand clapping. They are often

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[114] For a detailed discussion of this, see ISSER, *supra* note 79, at 233–74. *See also* Pac. Gas & Elec. Co. v. FERC, 373 F.3d 1315, 1317 (D.C. Cir. 2004) ("In 2000, wholesale prices for electricity in California increased dramatically and resulted in the now-infamous California energy crisis.").

[115] ISSER, *supra* note 79, at 233. The factors included high demand, market manipulation, and, as discussed *infra*, the lack of effective demand response.

[116] CAL. ENERGY COMM'N, LOAD AS A RELIABILITY RESOURCE IN RESTRUCTURED ELECTRICITY MARKETS 32 (2003).

[117] BRAITHWAIT ET AL., *supra* note 54, at 5.

[118] CAL. ENERGY COMM'N, *supra* note 116, at 32.

[119] *Id*. As Isser observes, demand response programs were created during the crisis, but did not blunt the impacts of the shortages. *See* ISSER, *supra* note 79, at 254.

[120] CAL. ENERGY COMM'N, *supra* note 116, at 32.

[121] The programs were called five, two, and thirteen times in 1998, 1999, and 2000, respectively. *Id.*

[122] *See* HURLEY ET AL., *supra* note 50, at 21; *see also* CAL. ENERGY COMM'N, *supra* note 116, at 28; STEELE & BREITENSTEIN, *supra* note 55, at 4.

inefficient and not fully competitive, in part because retail-customer loads do not participate in these markets."[123] Studies demonstrated this, showing that a small amount of grid WD-40 would have reduced California's spiking wholesale prices considerably.[124] The availability of real-time pricing for commercial and industrial customers could have reduced peak demand in California by 2.5% and wholesale market prices by 24%.[125] Another report estimated that if demand could have been reduced by 5% it would have cut wholesale prices in half.[126]

In the early 2000s, at roughly the same time as California's market was melting down, the nation's grid operators and their wholesale markets were rapidly emerging.[127] With the advent of the wholesale markets, the goals of demand-side programs needed to shift.[128] The urge to avoid repeating the California debacle led to a "near-universal" sentiment that wholesale markets needed some

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[123] Wellinghoff & Morenoff, *supra* note 18, at 391 (quoting HIRST & KIRBY, *infra* note 126, at v).

[124] Wellinghoff & Morenoff, *supra* note 18, at 395 (quoting BRAITHWAIT & EAKIN, *supra* note 38) ("[E]ven modest amounts of demand response can lead to significant reductions in wholesale prices at times of capacity constraints.").

[125] Steven Braithwait & Ahmad Faruqui, *The Choice Not to Buy: Energy Savings and Policy Alternatives for Demand Response*, 139 No. 6 PUB. UTIL. FORTNIGHTLY 48, 53 (Mar. 15, 2001).

[126] ERIC HIRST & BRENDAN KIRBY, EDISON ELEC. INST., RETAIL-LOAD PARTICIPATION IN COMPETITIVE WHOLESALE ELECTRICITY MARKETS v fig. S-1 (2001); *cf.* Wellinghoff & Morenoff, *supra* note 18, at 395–96 (noting that President Gordon van Welie observed that cutting demand five percent in ISO-New England would save $580 million annually).

[127] ISSER, *supra* note 79, at 208–16. Pennsylvania-New Jersey-Maryland Interconnection ("PJM"), for example, became an ISO in 1997 and an RTO in 2002. Pennsylvania-New Jersey-Maryland Interconnection, 81 F.E.R.C. ¶ 61,257 (1997), *order on rehr'g and clarification*, 92 F.E.R.C. ¶ 61,282 (2000); PJM Interconnection, L.L.C., 101 F.E.R.C. ¶ 61,345 (2002).

[128] Steven M. Brown, *DSM/Load Management Evolves into Demand Response*, ELEC. LIGHT & POWER (Mar. 1, 2002), http://www.elp.com/articles/powergrid_international/print/volume-7/issue-2/features/dsm-load-management-evolves-into-demand-response.html (noting that "many view demand response as the new, possibly more politically correct name for demand side management," while acknowledging and describing its differences).

form of demand-side participation;[129] that was "undeniable."[130] "Demand response" emerged as the umbrella term for techniques using demand reductions to balance supply and demand in wholesale markets[131] or balance a utility's system, referring to "all customer changes in actions or behaviors that introduce price elasticity *into the wholesale market* or that can be used to increase system reliability."[132] In part, this was also a re-branding. Being mandated to do DSM programs was not something utilities wanted to hear in 2002.[133]

This inflection point in the industry's transformation marked the first uses of the term "demand response." By summer 2001, four grid operators had demand response programs.[134] Reports from 2001 and 2002[135] evaluated demand response's value to markets. FERC and the DOE held a "Demand Response Conference" in 2002, and also in 2002, FERC stated that the "Standard Market Design" (SMD)—a bold attempt to standardize the wholesale markets[136]—would include a starring role for demand response. "Demand response," FERC observed in its working paper that evolved into the proposal, "is essential in

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[129] BRAITHWAIT ET AL., *supra* note 54, at 2; *cf.* MICHAEL PANFIL & JAMES FINE, ENVTL. DEFENSE FUND, PUTTING DEMAND RESPONSE TO WORK FOR CALIFORNIA 7 (2015) (observing that demand response was "conceived as a power system resource to provide emergency response and peak load management during California's energy crisis").

[130] Wellinghoff & Morenoff, *supra* note 18, at 402.

[131] Bushnell et al., *supra* note 11, at 11 (observing in 2009 that, "demand response has represented a specific paradigm for integrating the consumption decisions of certain types of customers into wholesale electricity markets. This paradigm involves identifying a potential *reduction* in consumption and treating that reduction as the service provided.").

[132] KATHAN, *supra* note 30, at 2 (emphasis added).

[133] Schare & Feldman, *supra* note 13.

[134] KATHAN, *supra* note 30, at 3.

[135] *Id.* at 8 (discussing a 2002 report of the Peak Load Management Alliance on demand response); *see also* Braithwait & Faruqui, *supra* note 125. Faruqui, *supra* note 63, at 12 refers to this as the origin of the "second generation" of DSM as will this Article.

[136] The SMD rulemaking proposal was Remedying Undue Discrimination Through Open Access Transmission Service and Standard Electricity Market Design, 67 Fed. Reg. 55,451 (Oct. 15, 2002). ISSER, *supra* note 79, at 326–28 (discussing SMD's features and development).

competitive markets to assure the efficient interaction of supply and demand."[137] But SMD met its Waterloo soon thereafter for a host of reasons mostly unrelated to demand response.[138] Introducing and encouraging demand response would be left to individual grid operators.

B. Evolution of Wholesale Market Programs (2001-2009)

Throughout the 2000s, the RTOs evolved frameworks to govern the treatment of demand response in their wholesale markets, which was complicated by several factors, including that the markets had been established and designed for purchases and sales of large blocks of power. As barriers to demand response participation persisted, Congress and FERC acted to address them, with FERC requiring RTOs to reshape their programs to accommodate demand response. Meanwhile, entrepreneurs entered the picture and the role of aggregation grew, with new firms providing demand response to individual utilities and to the wholesale markets as intermediaries.[139]

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[137] Fed. Energy Regulatory Comm'n, Standardized Transmission Service and Wholesale Electric Market Design 6 (Mar. 15, 2002) (working paper); *cf.* NSTAR Servs. Co., 92 F.E.R.C. ¶ 61,065 (2000) (showing awareness, two years earlier, of the adverse impacts of the "lack of demand responsiveness" in the ISO-New England markets, in an order imposing a bid cap). With numerous references to how grid operators would change their rules to incorporate demand response, the proposal made clear that FERC intended to set the "right pricing signals for investment in transmission and generation facilities, *as well as investment in demand reduction*" with markets that "treat demand resources on an equal footing with supply." Remedying Undue Discrimination Through Open Access Transmission Service and Standard Electricity Market Design, 67 Fed. Reg. 55,452 paras. 3, 15 (Aug. 29, 2002) (to be codified at 18 C.F.R. pt. 35) (emphasis added); *see also* BRAITHWAIT & EAKIN, *supra* note 38, at 1 (noting that the SMD proposal determined that, "the issue is not *whether* demand response should play a role in market design, but *how* to incorporate demand response into the standard market design on an equal footing with generation resources in order to achieve effective market performance."); KATHAN, *supra* note 30, at 8.

[138] U.S. GOV'T ACCOUNTABILITY OFF., ELECTRICITY MARKETS: CONSUMERS COULD BENEFIT FROM DEMAND PROGRAMS, BUT CHALLENGES REMAIN 3 (2004); *see also* ISSER, *supra* note 79, at 327–28 (discussing the "widespread backlash" against the SMD proposal).

[139] HURLEY ET AL., *supra* note 50, at 21.

Some caveats are needed to better frame this discussion. First, we might use the more precise term "demand response in organized wholesale energy markets" (as FERC does[140]) to focus on markets administered by RTOs, as bilateral wholesale transactions take place outside of these markets.[141] For the sake of brevity, the remainder of this discussion uses "wholesale markets" to mean those conducted by RTOs. Second, a minority of electric customers is in areas that do not have these organized markets (such as most of North Carolina, for example[142]) and are served in large part by traditional vertically integrated investor-owned utilities.[143] Some utilities in these areas have adopted demand management programs.[144] Utility-sponsored demand response can

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140 Order 745, *supra* note 7; *cf.* HURLEY ET AL., *supra* note 50, at 24 (making a similar distinction).

141 ELECTRIC MKTS. RES. FOUND., COMPETITION IN BILATERAL WHOLESALE ELECTRIC MARKETS: HOW DOES IT WORK? 3 (Feb. 2016), https://www.hks.harvard.edu/hepg/Papers/2016/Bilateral%20Markets%20White%20Paper%20Final.pdf.

142 *Electric Industry*, N.C. UTIL. COMM'N, http://www.ncuc.commerce.state.nc.us/industries/electric/electric.htm (last visited Feb. 28, 2017) (NCUC regulates rates of the states' three investor-owned utilities); JONAS MONAST ET AL., ILLUMINATING THE ENERGY POLICY AGENDA: ELECTRICITY SECTOR ISSUES FACING THE NEXT ADMINISTRATION 2 (2016) (showing FERC map of RTO territories with part of eastern North Carolina in PJM).

143 U.S. DEP'T OF ENERGY, *supra* note 21, at xvii ("[D]emand response is viewed and evaluated differently in regions with ISO- or RTO-managed organized spot markets than in regions with vertically integrated utilities with a monopoly franchise. Vertically integrated utilities internalize and pass through all of their energy production, transmission and distribution costs, so they (and their regulators) take a long-term view and evaluate demand response against the alternative of building (or buying) new generation. Thus, utilities with retail monopolies evaluate and measure demand response benefits primarily in terms of avoided capacity costs over the long run. In contrast, regions with organized wholesale markets have active energy trading opportunities with transparent market clearing prices (and in four of the seven ISO/RTO regions, no comparable capacity market), so they tend to evaluate demand response benefits primarily in terms of time-varying energy and capacity values in competitive markets. This view frames demand response benefits in the short run, and tends to understate long-term benefits.").

144 HURLEY ET AL., *supra* note 50, at 25. An example is the "Smart Hours" program of Oklahoma utility OG&E, https://oge.com (last visited Apr. 8, 2017).

benefit a utility in numerous ways even where demand reductions are not bid into wholesale markets,[145] for example, potentially allowing deferral of new power plant costs.[146] FERC has no jurisdiction over these programs.[147]

Moreover, in states within grid operators' footprints, customers can take part in wholesale market programs, *and* in programs offered by utilities. There is overlap between the programs, as, for example, in regions such as PJM, a utility can use demand reductions in the programs it conducts to meet its own obligations[148] to provide capacity.

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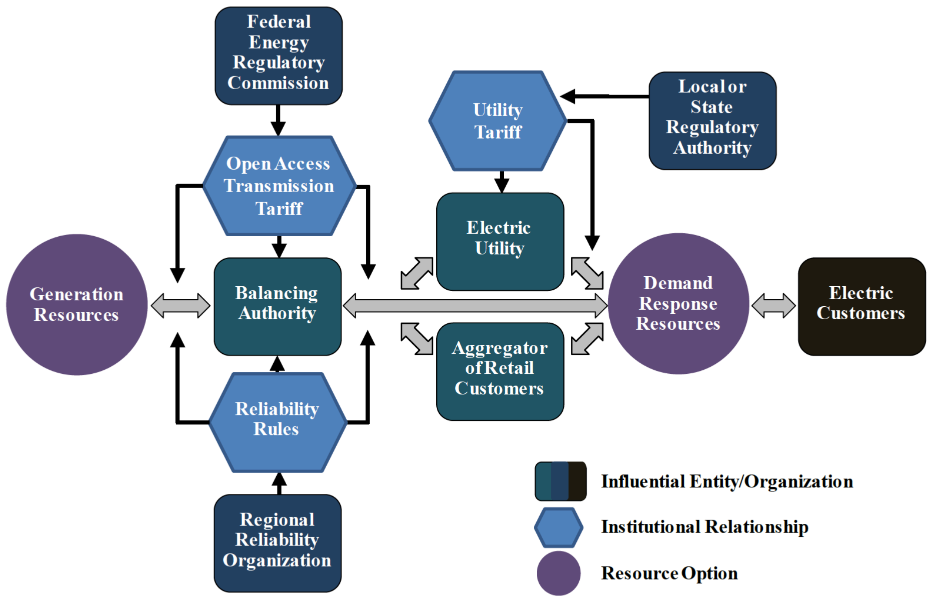
145 HURLEY ET AL., *supra* note 50, at 25.

146 Katie Fehrenbacher, *How Alphabet's Nest Helps Utilities Cope with Summer Heat Waves*, FORTUNE (Aug. 29, 2016), http://fortune.com/2016/08/29/alphabet-nest-thermostat-summer/ (describing SCE's strategy of investing in demand response and storage as a result of losing a source of fuel to its peaking natural gas plants).

147 HURLEY ET AL., *supra* note 50, at 25.

148 PJM INTERCONNECTION, LLC, LOAD MANAGEMENT PERFORMANCE REPORT 2009/2010 4 https://www.pjm.com/~/media/markets-ops/dsr/load-management-performance-report-2009-2010.ashx (last visited Feb. 21, 2017).

The following graphic depicts the myriad of entities involved in utility demand management and wholesale market programs:[149]



Adapted from Cappers et al. (2012)

Figure 1: Entities and organizations that influence relationships between resources and the bulk power system

RTOs administer both emergency and economic demand response programs.[150] Also, they typically have as many as three distinctly different types of wholesale markets, and demand response participates differently into each type. These markets are:

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[149] CAPPERS ET AL., *supra* note 17, at 4. A color version of Figure 1 can be found online at http://ncjolt.org/.

[150] Order 745, *supra* note 7, at 16,660; PETER CAPPERS ET AL., DEMAND RESPONSE IN U.S. ELECTRICITY MARKETS: EMPIRICAL EVIDENCE 11–14 (2009) (describing programs as of 2009).

(1) *Energy*: In an energy market, utilities and other load-serving entities[151] purchase electricity for delivery within the next hour or a day ahead. Demand response resources have participated in energy markets to substitute for electricity sold at the market price, as discussed in *FERC v. EPSA*.

(2) *Capacity*: Some, but not all RTOs, have developed "capacity" markets to provide additional incentives for new power plant construction. A capacity market is a forward-looking market, in which participants commit to serve future demand with new generating capacity.[152] Thus, a bid in a capacity market is essentially a standby promise that demonstrates the bidder's ability to deliver electricity in the future to meet demand. These markets focus on "installed capacity"—resources a utility or other load-serving entity must have available to serve customers—either by owning and operating power plants or by purchasing capacity in the market. Demand response participates in these markets by substituting for other forms of capacity. In the PJM region, for example, a mandatory commitment to be available as needed to reduce demand is most frequently compensated in the capacity market.[153]

(3) *Ancillary services*: These markets compensate providers of "regulation" (an industry term of art for keeping grid frequency in balance) and several different types of reserve services that enable the reliable transmission of electricity.[154] Ancillary service markets

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[151] A "load-serving entity" is an entity that "secures energy and Transmission Service (and related Interconnected Operations Services) to serve the electrical demand and energy requirements of its end-use customers." N. AM. ELEC. RELIABILITY CORP., STATEMENT OF COMPLIANCE REGISTRY CRITERIA Appx. 5B (2015), http://www.nerc.com/FilingsOrders/us/RuleOfProcedureDL/Appendix_5B_RegistrationCriteria_20150319.pdf.

[152] *See generally* Joseph Bowring, *Capacity Markets in PJM*, 2 ECON. OF ENERGY & ENVTL. POL'Y 47 (2013).

[153] MONITORING ANALYTICS, LLC, 2016 QUARTERLY STATE OF THE MARKET REPORT FOR PJM: JANUARY THROUGH SEPTEMBER 255 (2016), http://www.monitoringanalytics.com/reports/PJM_State_of_the_Market/2016/2016q3-som-pjm-sec6.pdf.

[154] Eisen, *Distributed Energy Resources, supra* note 51, at 203.

still have comparatively little demand response participation,[155] but demand response can increasingly help provide services such as frequency regulation.[156]

Wholesale market programs have always faced criticism as an inefficient way station to dynamic pricing, being perennially susceptible to the argument that dynamic pricing would be more efficient.[157] Yet if "the most important barrier to demand response in wholesale markets is the lack of dynamic pricing,"[158] then we need wholesale market programs if we are to have any demand-side participation at all for quite some time to come.[159] Moreover, unlike wholesale market programs, grid operators cannot implement dynamic pricing. Only state PUCs can do that, as it directly changes retail rates,[160] and they have been reluctant to act. In recognition of this, some commentators who are skeptical about demand response accept wholesale market programs if they are properly limited.[161]

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[155] The reasons for this are discussed at length in JASON MACDONALD ET AL., LAWRENCE BERKELEY NAT'L LAB., DEMAND RESPONSE PROVIDING ANCILLARY SERVICES: A COMPARISON OF OPPORTUNITIES AND CHALLENGES IN THE US WHOLESALE MARKETS (2012).

[156] FERC's Order 755 changed the policies for pricing of frequency regulation service. Frequency Regulation Compensation in the Organized Wholesale Power Markets, 76 Fed. Reg. 67,260 (Oct. 20, 2011). *Infra* notes 272–282 and accompanying text (discussing barriers addressed by this pricing policy).

[157] *See, e.g.*, WILLIAM W. HOGAN, DEMAND RESPONSE COMPENSATION, NET BENEFITS AND COST ALLOCATION: PRELIMINARY COMMENTS 6 (2010), http://lmpmarketdesign.com/papers/Hogan_DR_Tech_Conf_091310.pdf.

[158] KATHAN, *supra* note 30, at 41.

[159] That the need for wholesale market programs is apparent due to the lack of dynamic pricing has been recognized for well over a decade, suggesting the obvious: it might be another decade or more before this is not the case. BRAITHWAIT & EAKIN, *supra* note 38, at 4 ("The current environment of largely regulated retail prices and little dynamic pricing arguably creates an apparent need for ISO/RTO market intervention to encourage some form of demand response.").

[160] KATHAN, *supra* note 30, at 2; *cf.* Wellinghoff & Morenoff, *supra* note 18, at 413 (noting that when FERC intervened in the California crisis, "it stated that 'State regulators have the most significant authorities to encourage demand reduction measures.'").

[161] Pierce, *supra* note 7.

1. RTOs' Demand Response Programs and the Role of Aggregators

By summer 2001, four RTOs had demand response programs: in addition to California, these included ISO-New England, New York, and PJM Interconnection.[162] In 2001, FERC accepted PJM's proposed Load Response Program[163] with an Emergency Option and Economic Option.[164] Also in 2001, the New York ISO began an emergency-based program (the Emergency Demand Response Program), and an economic program in its energy market (the Day-Ahead Demand Bidding Program).[165] Since 1999, New York ISO had in place the ICAP-SCR (Installed Capacity-Special Case Resources) program, which allowed participants to be designated "Special Case Resources" if they had the ability to reduce demand when called.[166] As utilities and load-serving entities could use these resources to meet their installed capacity requirements, this was (and is today)[167] a true capacity market. As noted below, these programs have been supplemented since then by other markets in the various regions.

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162 KATHAN, *supra* note 30, at 3.

163 *Id*. at 8; Wellinghoff & Morenoff, *supra* note 18, at 402.

164 KATHAN, *supra* note 30, at 18.

165 COWART, *supra* note 110, at 15 (discussing the origins of these programs as a result of studies indicating constrained electricity supplies in New York. FERC's approval of the New York ISO programs drew a jurisdictional objection similar to that which would be made later against Order 745: demand reductions involved retail customers and fell within state PUC jurisdiction.); JASON R. SALMI KLOTZ, FERC POLICY ON DEMAND RESPONSE AND ORDER 719 3 (2009), http://www.gridwiseac.org/pdfs/forum_papers09/klotz.pdf.

166 *Demand Response Programs*, N.Y. INDEP. SYS. OPERATOR, http://www.nyiso.com/public/markets_operations/market_data/demand_response/index.jsp (last visited Feb. 22, 2017).

167 In its most recent filing with FERC about program information and statistics, the New York ISO describes the EDRP, DADRP, and its other programs. *See generally* N.Y. INDEP. SYS. OPERATOR, ANNUAL REPORT ON DEMAND RESPONSE PROGRAMS (2016) http://www.nyiso.com/public/webdocs/markets_operations/market_data/demand_response/Demand_Response/Reports_to_FERC/2017/NYISO%202016%20Annual%20Report%20on%20Demand%20Response%20Programs_Final.pdf [hereinafter ANNUAL REPORT ON DEMAND RESPONSE PROGRAMS].

RTOs' programs differ widely in their designs of such features as timing of notification of demand reductions and pricing[168] and payment, although some features are common to most programs. As an example, the New York ISO emergency-based program offered customers willing to curtail demand on two hours' notice payments based on the higher of LMP or 50 cents per kWh. By 2002, this program had nearly 1500 MW enrolled. Calls in emergency programs are event-driven, taking place on relatively few days of the year (usually summer peak demand days[169]). The New York ISO economic program enabled retail customers to participate directly in the day-ahead electricity market by submitting bids of demand reduction to compete with generation, but was far less popular than the emergency-based program, due to a confusing design and other issues.[170]

The overwhelming majority of demand reductions in the program's first year came from actual load reductions, but as much as 15% of the reductions were offset by commercial and industrial participants using on-site generators, mostly diesel. Over time, this would lead to criticism of demand response as neither reducing demand (but simply shifting it to other times or generation sources) nor reducing pollution. Also, there was little to no direct participation by retail customers in these programs.[171] Instead, as a 2002 report observed, the participants were utilities, other load-

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[168] KATHAN, *supra* note 30, at 51.

[169] *See, e.g.*, PJM INTERCONNECTION LLC, SUMMARY OF PJM-INITIATED LOAD MANAGEMENT EVENTS 1991-PRESENT, http://www.pjm.com/markets-and-operations/demand-response.aspx (last visited Feb. 21, 2017) (summarizing days in each year on which demand response was called, spanning back to 1991).

[170] KATHAN, *supra* note 30, at 41. This is also true today in New York ISO. ANNUAL REPORT ON DEMAND RESPONSE, *supra* note 167, at 4, 5 (showing that EDRP and ICAP-SCR have 1266.7 MW of capacity enrolled, compared to 106.5 MW in ancillary services markets). Other regions have comparable figures, as discussed more fully below in the context of barriers to demand response participation. For example, 99% of PJM demand response is emergency demand response. MONITORING ANALYTICS, LLC, 2016 QUARTERLY STATE OF THE MARKET REPORT, *supra* note 153, at 255.

[171] KATHAN, *supra* note 30, at 41. Many factors contributed to this, including a lack of enabling technologies such as smart meters, as discussed more fully below for programs throughout the decade.

serving entities, and aggregators (the CSPs discussed above).[172] The New York ISO was an early innovator in allowing aggregators to participate in its programs, permitting CSPs to participate without being licensed to sell electricity.[173] One-quarter of the participants in New York's demand response programs in 2001 were CSPs.[174]

In recent years, CSPs' aggregation, measurement, and verification capabilities have improved greatly, through more widespread deployment of enabling technologies such as "smart meters," advanced communications protocols, and intelligent devices such as programmable thermostats. In the Internet age, stamped movie receipts are not necessary for measurement and verification, either. The increasing ability to aggregate resources can give RTOs more reliable and controllable reductions for a longer time period, and spread out the risk of customers not curtailing demand when called.[175]

Some oppose this form of aggregation as inefficient.[176] Utilities could fulfill this role,[177] and indeed they would appear to be "natural aggregators for ISO demand response programs"[178] due to their direct interaction with their customers and established systems for interacting with the wholesale markets. On the other hand, utilities sell electricity, so their incentives to bid aggregated blocks of demand reductions into wholesale markets are limited.[179]

[172] *Id.* at 16.
[173] *Id.*
[174] *Id.*
[175] Eisen, *Distributed Energy Resources, supra* note 51, at 203–05.
[176] For example, in his comments on FERC's 2008 demand response rule, Order 719, discussed in more detail below, industry economist Robert Borlick stated that, "ARCs [aggregators of retail customers] are not the best means for promoting demand response resources." Wholesale Competition in Regions with Organized Electric Markets, 73 Fed. Reg. 64,100, 64,101 (Oct. 28, 2008) (codified at 18 C.F.R. pt. 35.28 (2012)) [hereinafter Order 719].
[177] In PJM markets, for example, they are explicitly allowed to do so. PJM INTERCONNECTION, LLC, PJM MANUAL 11: ENERGY & ANCILLARY SERVICES OPERATIONS 17 (Rev. 86, Feb. 1, 2017), http://www.pjm.com/~/media/documents/manuals/m11.ashx (explaining that PJM Members can be CSPs).
[178] KATHAN, *supra* note 30, at 47.
[179] *Id.* at 47.

Independent firms whose primary business is providing demand response have stronger financial incentives than utilities to grow.[180] Larger firms such as EnerNOC, Comverge, and Viridity have sophisticated business models, providing services to certain industries or market segments, and developing demand response solutions for residential customers, although this market is still small. And they can compete on price and offer more services of value to customers.[181]

In the mid-2000s, market opportunities for demand response began to take off. In particular, the implementation of capacity markets[182] led to an increase in demand response participation.[183] For example, the PJM capacity market, the Reliability Pricing Model (RPM[184]) began in 2007.[185] The RPM is administered in a series of auctions that occur during a three-year period before the delivery of electricity.[186] The PJM Manual for the capacity market spells out a detailed set of requirements that resources must meet. Some requirements are performance characteristics for demand response, such as the ability to respond within two hours if called.[187] Payments are guaranteed monthly. The guaranteed

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[180] HURLEY ET AL., *supra* note 50, at 60.

[181] KATHAN, *supra* note 30, at 47–48.

[182] FERC DR-AM 2010, *supra* note 64, at 47 (noting that before the advent of capacity markets, "demand response resources must rely on bilateral contracts that may not provide the price transparency necessary to ensure that these resources are fairly compensated and to encourage additional provision of capacity by new demand response resources").

[183] PJM INTERCONNECTION, LLC, LOAD MANAGEMENT PERFORMANCE REPORT 2009/2010, *supra* note 148 (discussing the rise in demand response performance after the advent of the RPM).

[184] PJM INTERCONNECTION, LLC, CAPACITY MARKET (RPM), http://www.pjm.com/markets-and-operations/rpm.aspx (last visited Feb. 21, 2017). The requirement to purchase capacity is known as the "capacity obligation." *Id*.

[185] PJM Interconnection, LLC, 117 FERC ¶ 61,331 (2006) (approving the RPM).

[186] PJM INTERCONNECTION, LLC, RPM BASE RESIDUAL AUCTION FAQS, http://www.pjm.com/~/media/markets-ops/rpm/rpm-auction-info/rpm-base-residual-auction-faqs.ashx (last visited Feb. 21, 2017).

[187] PJM INTERCONNECTION, LLC, PJM MANUAL 18: PJM CAPACITY MARKET 60–63 (Rev. 36, Dec. 22, 2016), https://www.pjm.com/~/media/documents/manuals/m18.ashx.

revenue stream and increasing ability of CSPs to meet PJM's requirements led to a surge in DR capacity market participation by the end of the decade. In turn, this made up the lion's share of PJM demand response activity.[188]

While capacity market participation increased, participation in ancillary services markets increased more slowly, and is still small today.[189] PJM added an ancillary services demand response program in 2006; the Midwest ISO and New York ISO did so in 2008.[190] There are several different types of ancillary services and different technical requirements for each. As an example, CSPs in the PJM RTO today offer demand response in "synchronized reserve" and "frequency regulation" markets. Reserve resources respond to contingency events, such as the loss of a large generator or transmission line; one tier of PJM's "synchronized reserves" product, for example, requires reserves capable of responding within 10 minutes.[191] Frequency regulation refers to quick adjustments made to keep the grid in frequency balance. Resources that provide these adjustments must be available nearly immediately on a grid operator's signal.[192] Traditionally, only power plants provided these services,[193] but today as technologies

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[188] *See, e.g.*, MONITORING ANALYTICS, LLC, 2016 QUARTERLY STATE OF THE MARKET REPORT, *supra* note 153, at 255.

[189] *Id.* (showing a synchronized reserve made up 0.5% of PJM demand response activity in 2015).

[190] N.Y. Indep. Sys. Operator, Inc., 112 FERC ¶ 61,283 (2005); Midwest Indep. Transmission Sys. Operator, Inc., *order on reh'g*, 123 FERC ¶ 61,297 (2008); Cal. Indep. Sys. Op., 116 FERC ¶ 61,274 (2006); PJM Interconnection, LLC, 114 FERC ¶ 61,201 (2006).

[191] PJM INTERCONNECTION LLC, PJM MANUAL 11: ENERGY & ANCILLARY SERVICES OPERATIONS 83 (Rev. 86, Feb. 1, 2017), http://www.pjm.com/~/media/documents/manuals/m11.ashx (last visited Feb. 21, 2017) [hereinafter PJM MANUAL 11]; *see* HURLEY ET AL., *supra* note 50, at 44 (describing reserves generally).

[192] PJM MANUAL 11, *supra* note 191, at 65 (stating that there is a requirement for being able to follow an automatic generation control (AGC) signal); HURLEY ET AL., *supra* note 50, at 45.

[193] CAPPERS ET AL., *supra* note 17, at vii.

improve, and, in particular, as demand response becomes more automated,[194] it is capable of providing many of these services.[195]

With these and other developments came more opportunities for CSPs, such as the ability to bid into multiple markets, often simultaneously with the same resource. However, barriers to participation persist today. The next section discusses the wide range of barriers that have been identified and addressed over the course of the past fifteen years.

2. *Barriers To Demand Response Participation*

Despite promising developments, during the first half of the 2000s there was suboptimal demand response participation in wholesale markets,[196] and even now there is little residential participation.[197] FERC has estimated potential reductions in peak demand of up to 20%,[198] but concluded that only a fraction of this potential has been realized. There are many different reasons for this underperformance, including economic, regulatory and technological barriers. To understand the policies implemented in the foundational FERC Orders on demand response, it is necessary to understand these barriers.

From the outset, because demand response is fundamentally different from generation,[199] it struggled to find a level playing

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[194] *Id.* at 23; Marc Frincu et al., *Enabling Automated Dynamic Demand Response: From Theory to Practice*, http://saimacs.github.io/pubs/2015-eenergy-group.pdf (discussing challenges in building automated demand response systems). Automating demand response is of particularly keen interest to aggregators because without it, "[t]he process of sending and aggregating the responses from multiple parties is notoriously cumbersome and time consuming." Scott Neumann et al., *How to Get More Response from Demand Response*, 19 THE ELECTRICITY J. 24, 28 (2006).

[195] HURLEY ET AL., *supra* note 50, at 45.

[196] *Id.* at 22.

[197] *Id.* at 11; PANFIL & FINE, *supra* note 129, at 7 (stating that demand response has "primarily attracted large industrial, agricultural and commercial consumers").

[198] FED. ENERGY REG. COMM'N, A NATIONAL ASSESSMENT OF DEMAND RESPONSE POTENTIAL x at Fig. ES-1 (2009).

[199] *See* COWART, *supra* note 110, at 37 ("The focus of most decision-makers on supply-side solutions to meet load growth and reliability needs is perhaps a

field in wholesale markets designed to trade power. The markets' "supply-centric focus"[200] created numerous obstacles. As a 2002 report indicated, "designing demand response programs that work within the supply-based ISO structures has been a challenge."[201] Each year since 2006, as required under the Energy Policy Act of 2005, FERC has identified barriers to greater demand response participation in wholesale markets in its annual reports on advanced metering and demand response programs.[202] A 2013 report by researchers at the Lawrence Berkeley National Laboratory ("LBNL") on demand response[203] created a useful taxonomy to study these barriers in more depth, dividing them into six categories.

The first category involves threshold barriers, in which the RTO explicitly excludes demand response from participating altogether.[204] An example is a market rule that disallows demand response participation in an ancillary services market, as in the ISO-New England RTO regulation market as recently as 2013.[205] The reasons for this might be an RTO's judgment that demand response cannot technically provide the service, even if others such as researchers who study demand response believe this is not accurate.[206] Some RTOs also prohibited aggregators from providing specific individual ancillary services, further narrowing market opportunities.[207]

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natural product of the manner in which franchises and electricity markets have evolved."); KATHAN, *supra* note 30, at 34.

[200] HURLEY ET AL., *supra* note 50, at 22.

[201] KATHAN, *supra* note 30, at 9–10.

[202] EPAct 2005 section 1252(e)(3) required FERC to prepare an "an annual report, by appropriate region, that assesses demand response resources." FERC has prepared this report - the Assessment of Demand Response and Advanced Metering - each year since 2006. The most recent report is FERC DR-AM 2016, *supra* note 22.

[203] CAPPERS ET AL., *supra* note 17, at 33–47, lists fifteen pages' worth of individual specific barriers in tabular form.

[204] The report terms these "[b]arriers associated with Bulk Power System Service Definitions." CAPPERS ET AL., *supra* note 17, at ix; *see also* HURLEY ET AL., *supra* note 50, at 22.

[205] CAPPERS ET AL., *supra* note 17, at 10.

[206] *See generally id.*

[207] HURLEY ET AL., *supra* note 50, at 11.

Next, once a demand response resource is eligible to participate in the market, it must meet that market's performance-based rules.[208] RTOs' rules for bidding specify performance parameters that can restrict demand response participation.[209] Performance criteria can be defined in terms that only a power plant could meet, such as an ancillary services market rule that required "100 MW of unloaded, on-line capacity from a large fuel-burning generator" instead of the more neutral "100 MW of response that can be delivered within 10 minutes."[210] Another typical barrier is a minimum size threshold. Often, energy markets have minimum bids of 1 MW for aggregated bids and 100 Kw for individual participants, which is a far larger amount than smaller customers can provide.[211] Aggregation can overcome this by combining demand reductions from individual customers into larger blocks. However, market rules can sometimes make it difficult for aggregators to participate.[212] Proving that rule barriers persist today, a controversial "pay for performance" rule is currently the subject of litigation in the D.C. Circuit.[213] This rule prevents demand response from achieving the highest level of payment in

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[208] CAPPERS ET AL., *supra* note 17, at 9 (terming these "Attributes of Performance").

[209] *Id.* at 11–12 ("In defining the performance attributes required to provide certain bulk power system services in ISO/RTO jurisdictions . . . ISO/RTOs have included rules and requirements that may limit the pool of eligible demand response resources to provide AS (e.g., limitations on resource size, the ability to aggregate multiple small resources, geographic boundaries of aggregation, and symmetric response capabilities).").

[210] COWART, *supra* note 110, at 49 (discussing this with respect to ancillary services markets).

[211] KATHAN, *supra* note 30, at 47.

[212] For an example of a barrier applying to aggregators see Order 719, *supra* note 176, at 64,118 ("[E]fforts to aggregate small retail loads have not been successful primarily due to the requirement that every small resource in an aggregated group meet the same registration, measurement and verification standards as large generators.").

[213] Advanced Energy Mgmt. All. v. PJM Interconnection, L.L.C., No. 16-1234 (D.C. Cir.).

the PJM capacity market unless it can perform for the entire year, which seasonal demand response resources cannot do.[214]

Technology barriers also pose problems.[215] The well-known one is the need for smart meters, which are indispensable[216] to widespread demand-side participation (in the residential sector, in particular) because precise timing of demand reductions is essential.[217] States have been inconsistent over the years in providing incentives for utilities to install smart meters. Traditional regulatory principles require utilities to justify novel investments by showing that their benefits exceed the costs. Regulators may disallow cost recovery if they are not convinced of smart meters' net benefits.[218] Even today, smart meter deployment, while increasing, is not uniform across the nation, and just over 40% of electricity customers have them.[219]

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[214] Under this, the PJM requires that resources must be "capable of sustained, predictable operation, and are expected to be available and capable of providing energy and reserves when needed throughout the entire Delivery Year." PJM INTERCONNECTION, LLC, SEASONAL CAPACITY RESOURCES SENIOR TASK FORCE, SEASONAL RESOURCES & RESOURCE AGGREGATION UNDER CP 3 (Apr. 4, 2016), http://www.pjm.com/~/media/committees-groups/task-forces/scrstf/20160404/20160404-item-05-education-session.ashx (last visited Feb. 22, 2017). Aggregations of seasonally available resources such as residential air conditioning demand would be ineligible. Bentham Paulos, *Green Groups Challenge PJM's Capacity Performance Rules*, POWER (July 11, 2016), http://www.powermag.com/green-groups-challenge-pjms-capacity-performance-rules/.

[215] CAPPERS ET AL., *supra* note 17, at 10 (defining these "Enabling Infrastructure Investments").

[216] The need for smart meters for effective demand response has been identified for many years. *See, e.g.*, KATHAN, *supra* note 30, at 39; *cf.* Eisen, *Smart Regulation and Federalism for the Smart Grid, supra* note 53, at 10 (discussing the potential benefits of smart meter deployment).

[217] KATHAN, *supra* note 30, at 44; BIPARTISAN POL'Y CTR., POLICIES FOR A MODERN AND RELIABLE U.S. ELECTRIC GRID 50 (2013).

[218] Eisen, *Smart Regulation and Federalism for the Smart Grid, supra* note 53, at 17–18 (discussing a case in which the Maryland PSC initially disallowed cost recovery); MIT ENERGY INIT., *supra* note 3, at 140.

[219] Smart meter deployment tripled between 2010 and 2012, primarily as a result of the stimulus law of 2009 (American Recovery and Reinvestment Act), which provided partial federal government funding for utilities to deploy them.

FERC has described more technology barriers, including the lack of standardization in the interface between the demand response providers and the market, measurement and verification challenges,[220] and challenges of telemetry requirements that demand response providers found difficult and expensive to meet.[221] Technologies with two-way communication capabilities are important for demand response, to allow for near-real-time verification of demand reductions. Yet there has been little standardization in interoperability standards for smart meters until recently.[222] This "can create implicit barriers" to demand response participation.[223]

The process of setting standards started after a provision of the 2007 Energy Independence and Security Act called for a collaborative, federally coordinated standard-setting process, with leadership from the National Institute of Standards and Technology to produce standards adopted by FERC.[224] Today, this effort has transitioned to the private sector.[225] FERC's 2013 Order 676-G,

American Recovery and Reinvestment Act, Pub. L. No. 111–5, 123 Stat. 115 (2009); FERC DR-AM 2016, *supra* note 22, at 3. At present, 40% of U.S. consumers have smart meters, but the extent of deployment varies widely by state. FERC DR-AM 2016, *supra* note 22, at 4.

[220] Measuring the baseline from which to gauge demand reductions—how much demand has the incentive reduced?—has been a challenging issue for years. KATHAN, *supra* note 30, at 29–30; Bushnell et al., *supra* note 11, at 13.

[221] Telemetry refers to near instantaneous metering and transfer of electricity consumption data to system operators. FED. ENERGY REG. COMM'N, ASSESSMENT OF DEMAND RESPONSE AND ADVANCED METERING 81 (2012) [hereinafter FERC DR-AM 2012]. For a discussion of telemetry requirements as a barrier to demand response, see Order 719, *supra* note 176.

[222] *See generally* Eisen, *Smart Regulation and Federalism for the Smart Grid, supra* note 53. *See also* FERC DR-AM 2012, *supra* note 221, at 49 (describing a "Lack of Uniform Standards" as an important issue).

[223] CAPPERS ET AL., *supra* note 17, at 9.

[224] Eisen, *Smart Regulation and Federalism for the Smart Grid, supra* note 53, at 39–42 (discussing the inception and activities of the Smart Grid Interoperability Panel (SGIP)). The statutory mandate to develop standards was contained and described in the Energy Independence and Security Act of 2007, Pub. L. No. 110-140, § 1305 (2007); *see* FERC DR-AM 2010, *supra* note 64, at 15–16 (discussing the provision).

[225] The SGIP is now a private sector organization. SGIP, http://www.sgip.org/ (last visited Feb. 21, 2017).

adopting measurement and verification standards of the North American Energy Standards Board, is an example of a recent order addressing the standards challenge.[226] An important measurement challenge is calculating exactly how much demand has been reduced —which requires establishment of a baseline to compare against actual meter readings. RTOs used differing methodologies to come up with these numbers,[227] and for years there has been no standard method of calculating baselines.

Another type of barrier - economic barriers - includes two subcategories. The first is "revenue availability": is market compensation sufficient to provide incentives for demand response participation? The highest-profile example of this, of course, is the situation Order 745 aimed to correct: the payment of less than the full energy market price to a demand response provider. The second type of economic barrier is "revenue capture," or how market payments are made, and whether they arrive with enough certainty to support investment costs and provide an adequate return on investment. In the energy market, for example, a CSP receives the fluctuating energy market price. In the capacity market, by contrast, the CSP typically receives a consistent monthly payment in return for reducing demand during a small number of hours each year, and some ancillary services markets also offer a consistent payment. Not surprisingly, this predictability of payment (together with the ability to bid into multiple markets) has been a major factor in CSPs' success.[228]

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[226] Standards for Business Practices and Communication Protocols for Public Utilities, Order No. 676-G, 156 FERC ¶ 61,055 (2013).

[227] FERC DR-AM 2010, *supra* note 64, at 48; HURLEY ET AL., *supra* note 50, at 60. RTOs are working toward more effective measurement and verification of demand reductions. *See, e.g.*, N.Y. Indep. Sys. Op., Inc., 155 FERC ¶ 61,243 (2016) (FERC approval of revisions to M&V protocols for demand response in New York ISO); FERC DR-AM 2016, *supra* note 22, at 22 (describing this order).

[228] HURLEY ET AL., *supra* note 50, at 64 describes the profitability scenario for a CSP:

> However, like any business, there are upfront capital costs. For demand response aggregators, the costs of setting up the business, telemetry and metering requirements, and ongoing interactions with so many customers may be substantial. The business won't work without a

Finally, state regulators and legislatures have created barriers to demand response providers' participation in wholesale markets. An example discussed more fully below is licensing and other requirements specifying the conditions under which aggregators can engage with customers.[229] Beyond these obstacles, there are procedural barriers (any reforms must be adopted through complex RTO governance procedures[230]) and non-market barriers, including an overall level of consumer resistance to efforts to cut back electricity usage.

As FERC has noted, there is a lack of effective communication about demand response[231] and considerable challenges relating to customer engagement.[232] This topic is worth a full treatment in its own right and beyond the scope of the discussion here. As a general matter, as noted above, demand response is not something consumers inherently want.[233] Consumer characteristics such as knowledge, awareness, and motivation often influence the success of a demand response program.[234] However, while education and communication can help ameliorate this, they alone are insufficient

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> robust investment case. As such, the growth of demand response has been strongest where a steady monthly payment is available, and where multiple streams of revenue are present to support different types of loads and different types of customers.

Id.

[229] Eisen, *Who Regulates the Smart Grid?, supra* note 7, at 84.

[230] CAPPERS ET AL., *supra* note 17, at 9. *See* E4 THE FUTURE, REGIONAL ENERGY MARKETS: DO INCONSISTENT GOVERNANCE STRUCTURES IMPEDE U.S. MARKET SUCCESS? (July 2016), https://e4thefuture.org/the-future-of-net-metering-utilities-and-solar-companies-align/ (describing the different governance mechanisms employed by RTOs).

[231] FERC DR-AM 2012, *supra* note 221, at 49 (discussing the complexities of the RTOs' various governance processes).

[232] An effort to address these challenges is the Smart Grid Consumer Collaborative. Smart Grid Consumer Collaborative, http://smartgridcc.org/ (last visited Feb. 21, 2017).

[233] Constantine Gonatas, *A Buyer's Market*, 149 No. 5 PUB. UTIL. FORTNIGHTLY 8 (May 2011) ("[A] true barrier exists for residential, many commercial and even large institutional customers: indifference and lack of focus on energy conservation.").

[234] U.S. DEP'T OF ENERGY, ELECTRICITY ADVISORY COMM., CONSUMER ACCEPTANCE OF SMART GRID (June 2013), http://energy.gov/sites/prod/files/2013/06/f1/Weedall.pdf.

because consumers are not universally receptive to information about the benefits of demand response.[235] External influences, such as energy prices and the market availability of relevant technologies, also affect a program's success.

3. The Federal Response: Statutory Encouragement and Order 719

Both major omnibus energy policy acts of the 2000s contained provisions designed to encourage demand response. Section 1252(f) of the Energy Policy Act of 2005 states that it is the policy of the United States to encourage "time-based pricing and other forms of demand response, whereby electricity customers are provided with electricity price signals and the ability to benefit by responding to them . . . ."[236] In recognition of the barriers to demand response, it further provides that "deployment of such technology and devices that enable electricity customers to participate in such pricing and demand response systems shall be facilitated, and unnecessary barriers to demand response participation in energy, capacity and ancillary services markets shall be eliminated."[237] The Energy Independence and Security Act of 2007 required the Commission to perform a national assessment of demand response potential and develop a national action plan,[238] and, as noted above, called for the development of technical standards.[239]

In 2007, FERC held three technical conferences designed to assess whether barriers to demand response prevented the achievement of just and reasonable rates in the wholesale

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[235] Eisen, *Who Regulates The Smart Grid*, *supra* note 7, at 71; KATHAN, *supra* note 30, at 39.

[236] Energy Policy Act of 2005, Pub. L. No. 109-58, § 1252(f) (2005).

[237] *Id*.

[238] Energy Independence and Security Act of 2007, Pub. L. No. 110-140, § 529 (2007). FERC issued this plan in 2010. FED. ENERGY REG. COMM'N STAFF, NATIONAL ACTION PLAN ON DEMAND RESPONSE (2010), http://www.ferc.gov/industries/electric/indus-act/demand-response/dr-potential.asp.

[239] *Supra* notes 221–223 and accompanying text.

markets.[240] The result was Order 719, promulgated in 2008, which required RTOs to make four different reforms. As noted above, participation in ancillary services markets was lagging.[241] To address and rectify this situation, Order 719 required RTOs to accept bids from demand response resources in ancillary services markets, on a basis comparable to other resources, as long as they were technically capable of doing so.[242] This would require considerable adjustments to RTOs' existing market rules. RTOs were not required to establish new markets[243] for this purpose, but were required to make tariff changes to bring fast acting, flexible demand response resources into existing energy imbalance, reserves, and regulation markets.[244]

Order 719's second reform required RTOs to "eliminate, during a system emergency, certain charges to buyers in the energy market for voluntarily reducing demand."[245] These specific charges are known as "uplift" or "deviation charges,"[246] and apply when a buyer in the energy market takes less electric energy than it scheduled ahead of time to take in the real-time market. This causes costs, for example, "cost of extra generators committed after the close of the day-ahead market to serve anticipated load, if those costs are not recovered from sales of energy at real-time LMPs."[247] The methods of determining and allocating these costs penalized demand response resources that could respond during emergencies. This is an example of the sort of fine-tuning iteration required to accommodate demand response in a market that is not designed to accommodate it.

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[240] Order 719, *supra* note 176, at 64,101 (highlighting FERC's statement (as it has in numerous other contexts involving improvements to the wholesale electricity markets): "Improving the competitiveness of organized wholesale markets is integral to the Commission fulfilling its statutory mandate to ensure supplies of electric energy at just, reasonable and not unduly discriminatory or preferential rates.").

[241] CAPPERS ET AL., *supra* note 17, at 20.

[242] Order 719, *supra* note 176, at 64,101.

[243] *Id.* at 64,107.

[244] *Id.*; CAPPERS ET AL., *supra* note 17, at 2.

[245] Order 719, *supra* note 176, at 64,103.

[246] *Id.* at 64,112.

[247] *Id.* at 64,112 n.133.

Order 719's third reform required RTOs to permit aggregators to bid demand response on behalf of retail customers directly into the organized markets, on the principle that allowing aggregation of small retail loads into larger blocks of demand reductions would reduce a barrier to demand response participation.[248] At the time, two RTOs did not allow aggregation,[249] even though it was successful elsewhere.[250] The Order set forth ten criteria for an aggregator to meet. Importantly, FERC addressed a "state veto" issue. On the one hand, many commenters believed aggregators should not be able to bid into wholesale markets without the express permission of state regulators.[251] They argued that blanket permission by FERC would interfere with utility demand management programs, place an undue burden on PUCs (for example, if a PUC did not want aggregators to participate in the state, it would have to take individual action to veto them[252]), and raise new concerns about federal and state jurisdiction by overriding states' historical control over firms doing business there. On the other hand, some commenters argued that giving states a veto would hamper demand response participation in wholesale markets.[253] In the end, Order 719 provided, "The market rules shall allow bids from an ARC unless this is not permitted under the laws or regulations of [the] relevant electric retail regulatory authority."[254]

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[248] *Id*. at 64,119.

[249] KLOTZ, *supra* note 165, at 1 (the two were the Midwest ISO and CAISO). The Midwest ISO complied with this requirement in 2012. FERC DR-AM 2012, *supra* note 221, at 39–40.

[250] Order 719, *supra* note 176, at 64,116 ("[A]llowing ARCs to enter wholesale energy markets has been successful in PJM, ISO New England, and NYISO.").

[251] *Id.* at 64,116 (comments of utility company Ameren); *id.* at 64,116 (illustrating comments of National Rural Electric Cooperative Association, arguing "that if the Commission does not require explicit permission from the relevant authority, ARCs would effectively be allowed to cherry-pick the best load response resources out of existing LSE demand response programs").

[252] *Id.* at 64,117 (reflecting views of commenters on this issue).

[253] *Id.* at 64,118 (highlighting comments of Wal-Mart).

[254] *Id.* at 64,119.

Order 719's fourth reform required RTOs to modify their rules governing price formation during periods of operating reserve shortage to allow the market-clearing price during periods of operating reserve shortage to more accurately reflect the true value of energy.[255] In particular, RTOs had adopted bid caps that did not allow market prices to increase over those limits during periods of shortage. This caused underestimation of demand response's value at those times when it was providing demand reductions.[256]

RTOs have submitted filings to comply with Order 719 since 2009,[257] but the barriers identified still persist. FERC's 2010 report on demand response, for example, noted that commenters to it "contended that the ISOs and RTOs continue to impose offer parameter requirements that do not adequately recognize the different characteristics of demand response and traditional generation resources and, therefore, do not provide for comparable treatment of demand response resources as required by Order No. 719."[258] Identification and changes to rules inhibiting demand response bids in ancillary services markets continue to this day, nearly a decade after Order 719.[259]

The relationship between states and demand response aggregators continues to be complex. Some states still bar aggregators, particularly in the Midwest ISO footprint.[260] Others have conditioned CSP activities on receiving prior approval from the PUC, as in the case of Indiana, where state utility regulators claimed this provision was necessary because "allowing retail customers to aggregate demand response for sale through PJM 'would at least partially bypass' the IURC's oversight of the retail

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[255] *Id.* at 64,101.
[256] *Id.* at 64,124.
[257] *See, e.g.*, PJM Interconnection, L.L.C., 139 FERC ¶ 61,057 (2012) (approving PJM's filing to comply with Order 719's price formation requirement).
[258] FERC DR-AM 2010, *supra* note 64, at 46.
[259] CAPPERS ET AL., *supra* note 17.
[260] *Id.* at 25 (citing states such as Wisconsin that have prohibited the operation of aggregators).

market."[261] Indiana's restriction was challenged successfully in the D.C. Circuit on procedural grounds.[262]

The Indiana decision highlights the tension in allowing customers to enroll with CSPs, and, by extension, larger issues relating to empowering third parties to compete with incumbent utilities. By reducing demand through a firm not regulated as a public utility, the customer uses less electricity, thereby purchasing less of it from her utility and forcing the utility to rethink its rate design. This "bypass" issue has been recognized since the inception of wholesale market programs,[263] as has a related issue: the prospect of competition for customers between utilities and CSPs for demand response customers.[264] As it encourages wholesale market programs, FERC is often cautioned against jeopardizing utility demand management programs.[265]

C. *Demand Response in the Wellinghoff Era (2009-2014)*

For all the attention demand response received in the 2000s, it was still "tough sledding"[266] until Jon Wellinghoff became FERC's Chair in 2009. In Wellinghoff's five years as FERC's Chair, he accelerated the agency's focus on demand response and other efforts to incorporate distributed energy resources into the bulk power system.[267] He personally championed demand response

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[261] Ind. Util. Regulatory Comm'n v. Fed. Energy Regulatory Comm'n, 668 F.3d 735 (D.C. Cir. 2012).

[262] *Id*.

[263] KATHAN, *supra* note 30, at 52.

[264] CAPPERS ET AL., *supra* note 17, at 25.

[265] An example of this is in Order 719, *supra* note 176, at 64,132, where the American Public Power Association "cautions the Commission, as it seeks to remove barriers to demand response resources, not to unintentionally endanger existing and planned demand response and energy efficiency programs at the retail level."

[266] Hannah Northey, *Grid Evolves, and FERC Isn't Just For Energy Wonks Anymore*, GREENWIRE (Mar. 18, 2014) (quoting lawyer Terry Black, former head of the Sustainable FERC Project of the Natural Resources Defense Council).

[267] *Id*.; *see also* Eric Wesoff & Jon Wellinghoff, *Departing FERC Chairman: A Day in the Life of the Grid*, GREENTECHMEDIA (May 30, 2013), https://www.greentechmedia.com/articles/read/Jon-Wellinghoff-Departing-FERC-Chairman-A-Day-in-the-Life-of-the-Grid.

participation in the wholesale markets,[268] and under his watch, FERC issued two important Orders to further encourage participation, including Order 745 (the controversy over which landed in the Supreme Court) and Order 755.

1. FERC Order 755 and Demand Response in Regulation Markets

Before FERC's Order 755, issued in 2011, the almost instantaneous response needed for resources providing frequency regulation was largely provided by power plants that could meet RTOs' requirements for acting so quickly.[269] RTOs differ in their frequency regulation products. Some offer only one product; others compensate for the ability to increase output quickly (known as "regulation-up") or decrease it quickly ("regulation-down").[270] Some forms of demand response can act more quickly than conventional power plants can start,[271] and could therefore be less expensive and more efficient in providing frequency regulation.[272] However, RTOs' compensation methods, generally speaking, had not recognized this, adopting technical parameters that discouraged demand response participation.

In response, FERC adopted a two-part compensation method for all resources that provide regulation service. It required all

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[268] For example, in a law journal article, Wellinghoff and his co-author (who later became FERC's General Counsel) advocated for comparable treatment of demand response and supply. Wellinghoff & Morenoff, *supra* note 18. Wellinghoff practices what he preaches in his new capacity as the Chief Policy Officer of solar company SolarCity. *See* Press Release, *SolarCity Appoints Jon Wellinghoff Chief Policy Officer*, SOLARCITY (Apr. 7, 2016), http://www.solarcity.com/newsroom/press/solarcity-appoints-jon-wellinghoff-chief-policy-officer.

[269] Frequency Regulation Compensation in the Organized Wholesale Power Markets, 76 Fed. Reg. 67,260, 67,261 (Oct. 31, 2011) (codified at 18 C.F.R. pt 35) [hereinafter FERC Order 755].

[270] ZHI ZHOU ET AL., ARGONNE NAT'L LAB., SURVEY OF U.S. ANCILLARY SERVICES MARKETS 1 (2016).

[271] An aggregator can accomplish this by having some customers increase and some decrease load, following the signal. CAPPERS ET AL., *supra* note 17, at 24.

[272] Todd Griset, *FERC Order 755 Promotes Energy Storage*, PRETIFLAHERTY (Dec. 21, 2011) http://energypolicyupdate.blogspot.com/2011/12/ferc-order-755-promotes-energy-storage.html.

ISO/RTOs to modify their tariffs to provide for a two-part payment to frequency regulation resources and pay all resources that clear the regulation market a uniform capacity payment and a performance payment based on the accuracy of response to system control signals.[273] This latter requirement directly tied compensation to the speed and accuracy of response. Therefore, it promoted storage technologies such as batteries and flywheels,[274] and forms of demand response that can provide a fast and flexible resource capable of providing the frequency regulation service.[275]

RTOs have responded to Order 755 by changing market rules to compensate resources that can respond to a fast signal.[276] While these markets are small,[277] they are an increasingly important venue for energy storage to participate in wholesale markets,[278] as well as demand response that can meet the applicable technical

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[273] FERC Order 755, *supra* note 269, at 67,283.

[274] *PJM Leads the US Fast-Frequency Regulation Market*, ENERGY STORAGE UPDATE (Apr. 20, 2015), http://analysis.energystorageupdate.com/market-outlook/pjm-leads-us-fast-frequency-regulation-market.

[275] CAPPERS ET AL., *supra* note 17, at 20–21. An example of an aggregator firm's multifaceted strategy to use demand response to meet this requirement is described in Jeff St. John, *Viridity, Enbala Try Negawatts to Balance Pennsylvania's Grid*, GREENTECHMEDIA (Nov. 23, 2011), https://www.greentechmedia.com/articles/read/viridity-enbala-try-negawatts-to-balance-pennsylvanias-grid.

[276] Bolun Xu et al., *A Comparison of Policies on the Participation of Storage in U.S. Frequency Regulation Markets* (Feb. 16, 2016) (unpublished paper) (on file with Cornell University), https://arxiv.org/pdf/1602.04420.pdf (discussing the regulation markets' structures in each RTO).

[277] To date, the PJM market accounts for the majority of demand response and energy storage participation in regulation markets. *PJM Leads the US Fast-Frequency Regulation Market*, *supra* note 274; Katherine Tweed, *Faster Frequency Regulation Triples in PJM*, GREENTECHMEDIA (Nov. 8, 2013), https://www.greentechmedia.com/articles/read/faster-frequency-regulation-triples-in-pjm. The total amount of demand response participating in the regulation market averaged 16 MW in 2015. JAMES MCANANY, PJM INTERCONNECTION, LLC, 2015 DEMAND RESPONSE OPERATIONS MARKETS ACTIVITY REPORT 11 (2016), https://www.pjm.com/~/media/markets-ops/dsr/2015-demand-response-activity-report.ashx. The largest market segment was water heaters, making up 42% of confirmed registrations. *Id*.

[278] *See generally* Amy L. Stein, *Reconsidering Regulatory Uncertainty: Making a Case for Energy Storage*, 41 FLA. ST. U. L. REV. 697 (2014).

requirements. And, as more distributed energy resources are added to the grid, the need for flexible demand response resources to provide frequency regulation will only increase.[279]

2. FERC Order 745 and Demand Response in Energy Markets

Order 745 focused on the wholesale energy markets. In 2011, when it was issued after numerous rounds of comments and two technical conferences, there was significantly more demand response participation in capacity markets than in energy markets.[280] FERC believed one reason for this was the level of compensation offered to demand response, which it set out to correct. Order 745 concluded that demand response can provide benefits similar to generation resources, and required wholesale energy markets[281] to pay the same market price for demand response as for electricity generation. In addition, Order 745 included a requirement that RTOs establish a "net benefits test" to provide payments to demand response only when energy prices were above a specified threshold.[282]

Among the many objections to Order 745, two issues attracted considerable attention: the propriety of the compensation level set in Order 745, and FERC's authority to issue the Order in the first place.

a. The Appropriate Compensation Level: LMP or "LMP – G"?

In 2011, compensation levels for demand response in the energy market varied significantly among RTOs. Some paid demand response the full market price in the energy market, known as the "locational marginal price" ("LMP"), but others did not. At the time of Order 745, PJM paid demand response

[279] Eisen, *Distributed Energy Resources, supra* note 51, at 202–05.

[280] Steve Isser & Bob King, *The Price Is Right?,* 153 No. 12 PUB. UTIL. FORTNIGHTLY 14, 17 (2015).

[281] Thus, Order 745 did not apply to emergency demand response markets, but only to economic participation in energy markets. Order 745, *supra* note 7, at 16,659.

[282] *Id*. at 16,666-67; Eisen, *Who Regulates the Smart Grid?, supra* note 7, at 86 (describing the test requirement).

providers the LMP, less the generation and transmission portions of the retail rate.[283] This formula came to be known as "LMP – G." FERC believed this was inadequate to prompt demand response participation, claiming that if decreased demand had the same effect on power markets as increased supply, and if supply was paid the market price, then demand response should also be paid the full LMP.

This position was extremely controversial. "[N]umerous commenters" agreed with FERC that negawatts and megawatts were comparable, in other words that, "an increment of generation is comparable to a decrement of load for purposes of balancing supply and demand in the day-ahead and real-time energy markets."[284] Some even went further and argued that demand response could sometimes be "superior" to generation.[285] These commenters focused on demand response's benefits, and the belief that incentive compensation could stimulate innovation in demand response technologies and business models.[286] Others strenuously disagreed, arguing that demand response was not the equivalent of generation,[287] and that customers would respond to being paid to curtail demand by moving generation "behind the meter," negating the benefits.[288]

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[283] Order 745, *supra* note 7, at 16,660.

[284] *Id*. at 16,661.

[285] *Id*.

[286] Eisen, *Who Regulates the Smart Grid?, supra* note 7, at 100–01 (describing other benefits for RTOs). Even opponents of Order 745 acknowledged this "infant industry" argument. *See, e.g*., HOGAN, *supra* note 157, at 4.

[287] HOGAN, *supra* note 157, at 2–3. Even after *FERC v. EPSA* upheld Order 745, Professor Hogan continued to stress that he believed "megawatts" and "negawatts" were different. William Hogan, *Demand Response: Getting The Prices Right*, 154 No. 3 PUB. UTIL. FORTNIGHTLY 20 (Mar. 2016) ("Another way to think about the 'negawatt' model is 'reselling something I haven't purchased.' As in: 'I was thinking about subscribing to *Public Utilities Fortnightly*, but I decided not to; please send me a check.' This is quite different from 'I paid for my subscription but decided to cancel; please send me a check.'").

[288] *See, e.g*., JAMES BUSHNELL ET AL., MKT. SURVEILLANCE COMM. OF THE CAL. ISO, OPINION ON ECONOMIC ISSUES RAISED BY FERC ORDER 745: DEMAND RESPONSE COMPENSATION IN ORGANIZED WHOLESALE ENERGY MARKETS 2–3 (2011) http://www.caiso.com/2b97/2b97a0bb6ef70.pdf.

Harvard Professor William Hogan (the originator of the LMP concept), and groups including the Electric Power Supply Association that represented power generators which stood to lose market share as a result of Order 745,[289] argued that those offering demand response into wholesale markets already received a benefit: the retail rate savings associated with the energy they did not consume.[290] As a result, paying full LMP was considered "double-counting" and overcompensation to the demand response provider,[291] unless the retail rate for generation (G) was subtracted out (that is, demand response was paid at LMP – G) to account for the benefit associated with not consuming.[292] FERC Commissioner Moeller supported this view in his dissent to Order 745, arguing that payments at full LMP were subsidies to demand response providers that violated FERC's statutory obligation to ensure just, reasonable and non-discriminatory rates.

The "LMP – G" argument was criticized by those who claimed that demand response providers were not "merely reselling electricity in a purely financial transaction"[293] and that pure market efficiency was not the only consideration motivating Order 745. As one analysis put it, "[t]he primary error made by the supporters of what has come to be styled 'LMP – G' was to equate the opportunity cost of the customer with the lost value of electricity consumption, ignoring other costs and considerations."[294]

b. Jurisdictional Objections

The argument that FERC did not have the authority under the Federal Power Act ("FPA") to promulgate Order 745 was over a

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[289] ROBERT KING ET AL., SOUTH-CENTRAL PARTNERSHIP FOR ENERGY EFFICIENCY AS A RESOURCE, THE DEBATE ABOUT DEMAND RESPONSE AND WHOLESALE ELECTRICITY MARKETS 21 n.46 (2015).

[290] *See, e.g.*, William W. Hogan, Implications for Consumers of the NOPR's Proposal to Pay the LMP for All Demand Response 5 (May 2010) (unpublished manuscript), http://lmpmarketdesign.com/papers/Hogan_EPSA_NOPR_051210.pdf.

[291] Order 745, *supra* note 7, at 16,663; KING ET AL., *supra* note 289, at 16–17.

[292] Hogan, *supra* note 290; Pierce, *supra* note 7. *See* Eisen, *Who Regulates The Smart Grid?, supra* note 7, at 73 n.18 (discussing this argument).

[293] Isser & King, *supra* note 280, at 16.

[294] KING ET AL., *supra* note 289, at 17.

decade in the making. Fifteen years earlier, as wholesale market programs were in their infancy and California was in crisis, several industry trade associations claimed that these programs impermissibly intrude on state PUCs' regulatory turf. Under the FPA, FERC regulates sales of electric energy at wholesale.[295] Transactions in negawatts, the associations claimed, did not involve sales, as "neither 'energy' nor 'contract rights to a defined [quota] of energy' chang[e] hands."[296] If consumers were to cut back on their electricity use, that decision was for state regulators to make, not FERC.

That argument would recur in *FERC v. EPSA*, but it would change shape somewhat in the interim. At one point before 2011, FERC (and Chairman Wellinghoff, in a law review article)[297] claimed that demand response involved a sale that it could regulate. As there was no "energy" being sold, but instead a promise to curtail using it, FERC eventually recognized that it would be unsuccessful to pursue that argument, and did not rely on it in Order 745.[298]

Now, opponents switched their focus, honing in on demand response's impacts on customers. In particular, they claimed that any setting of rates for any transaction in which retail customers take part is the exclusive province of the states. Several commenters noted on the Order 745 proposal that it is "within the purview of retail regulatory authorities to take into account local policies and concerns, and the types of demand response being offered, when determining the appropriate compensation level."[299] The California PUC sought clarification that FERC was not attempting to regulate retail rates.[300] This, of course, would later be

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[295] Federal Power Act, 16 U.S.C. §824(b)(1) (2012).

[296] Wellinghoff & Morenoff, *supra* note 18, at 406; KATHAN, *supra* note 30, at 9.

[297] Wellinghoff & Morenoff, *supra* note 18.

[298] Eisen, *FERC's Expansive Authority to Transform the Electric Grid, supra* note 28, at 1796 n.61.

[299] Order 745, *supra* note 7, at 16,674.

[300] *Id.*

the basis of the D.C. Circuit's holding that Order 745 directly regulates the retail market.[301]

How was setting pricing levels in the wholesale market *retail* rate regulation? Demand response presents a "thorny conundrum" in that

> [I]t looks like decisions by retail electricity customers to use less power, in which case the states regulate it as part of their historical jurisdiction over retail sales of electricity. However, it is also a means for improving reliability of the wholesale markets and achieving other benefits, in which case FERC could regulate it.[302]

Order 745's opponents pointed to the direct link between wholesale market programs and retail rates. CSPs would not be regulated as public utilities, and they could take actions in the wholesale markets that would affect retail rates without the ability for PUCs to control them. As the Illinois Commission stated:

> [A]ny non-zero payment to a demand response resource reduces the revenues to generators under the state regulatory authority. The result is a leakage of money to an entity outside of the state's regulatory authority. Therefore, retail rates to all customers may need to be increased in order to recover the costs to generators that would have otherwise been recovered through the purchase of electricity, but instead went to the payment of a demand response resource.[303]

PUCs would have other forms of recourse in this scenario. For example, they could increase the rates demand response customers paid for the electricity they consume, which would make wholesale market programs less attractive by reducing the total compensation.[304] Other commenters pointed out that if the real issue FERC was trying to address is the lack of dynamic pricing,

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[301] *Infra* notes 310–312 and accompanying text.
[302] Joel Eisen*, D.C. Circuit Vacates FERC Smart Grid "Demand Response" Rule*, LEGAL PLANET (May 30, 2014), http://legal-planet.org/2014/05/30/guest-blogger-joel-eisen-d-c-circuit-vacates-ferc-smart-grid-demand-response-rule/.
[303] Order 745, *supra* note 7, at 16,675.
[304] *Id.*

paying full LMP in wholesale markets would not accomplish that.[305] As noted above, dynamic pricing has been so slow in coming that this objection rang a bit hollow.

To all of this, FERC had an argument at the ready: it was setting compensation levels in wholesale markets, not engaging in retail rate setting, and it would not refrain from issuing Order 745 because it might impact the states.[306] There is an obvious intersection between actions FERC takes in the wholesale markets and actions taken by the states, as the states had just articulated.[307] But FERC was acting in the domain it controls, with its charge under the FPA to ensure that rates charged for energy in wholesale energy markets are "just, reasonable, and not unduly discriminatory or preferential."[308] Citing to Order 719, FERC stated that it was only deciding what happened in the wholesale markets, and that it had authority over demand response's compensation level "because it directly affects wholesale rates."[309] Some, prefiguring this eventual holding of *FERC v. EPSA*, agreed that "the FPA gives the Commission broad authority to correct market flaws, including compensation for demand response."[310]

3. The Impact of Order 745 and the D.C. Circuit Opinion

Immediately after Order 745, demand response participation rates in wholesale energy markets increased. In PJM, for example, participation rates were much higher in 2014 than in 2011,[311]

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[305] *Id.*

[306] *Id.* at 16,676.

[307] *Supra* note 9 and accompanying text (articles discussing this intersection and its ramifications for electricity federalism).

[308] Order 745, *supra* note 7, at 16,676.

[309] *Id.*

[310] *Id.* at 16,677. Others claimed FERC could not set the wholesale compensation level at LMP – G because that would be retail rate setting. *Id*. at 16,675.

[311] PJM INTERCONNECTION LLC, 2012 ECONOMIC DEMAND RESPONSE PERFORMANCE REPORT: ANALYSIS OF ECONOMIC DR PARTICIPATION IN THE PJM WHOLESALE ENERGY MARKET AFTER THE IMPLEMENTATION OF ORDER 745 7 Fig. 1 (2013), http://www.pjm.com/~/media/markets-ops/dsr/20150701-order-745-impact-on-economic-dr.ashx.

although they still lagged in capacity market participation considerably.[312]

EPSA and four other electricity industry associations promptly filed a petition against Order 745 in the D.C. Circuit. The resulting opinion of a divided three-judge panel in May 2014[313] left no doubt from the outset where it stood. It vacated Order 745 in its entirety, agreeing with the petitioners that demand response is a retail market phenomenon, beyond the scope of FERC's authority because it was "encroaching on the states' exclusive jurisdiction to regulate the retail market."[314] The majority opinion stated that, "Demand response—simply put—is part of the retail market. It involves *retail* customers, their decision whether to purchase *at retail,* and the levels of *retail* electricity consumption."[315] FERC had authority to regulate practices affecting the wholesale market, provided it was not "directly regulating a matter subject to state control, such as the retail market."[316] Because FERC had done just that, it could not proceed with Order 745.

Ignoring over a century of doctrine construing the principle limiting agency jurisdiction over "practices affecting rates" to those practices directly and significantly doing so,[317] the majority opinion further rejected FERC's claim of authority as having no boundaries. If it thought it would impact the wholesale markets, FERC might even reach out and regulate the "steel, fuel, and labor markets."[318] That there were well known checks on FERC's authority that would preclude it from doing this went completely unnoticed in the majority opinion, which barreled forth to its

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[312] PJM INTERCONNECTION, LLC, 2014 DEMAND RESPONSE OPERATIONS MARKETS ACTIVITY REPORT 13 (2015), https://www.pjm.com/~/media/markets-ops/dsr/2014-demand-response-activity-report.ashx.

[313] Elec. Power Supply Ass'n v. FERC, 753 F.3d 216 (D.C. Cir. 2014), *rev'd and remanded*, FERC v. Elec. Power Supply Ass'n, 136 S. Ct. 760 (2016).

[314] *Id*. at 218.

[315] *Id.* at 223.

[316] *Id.* at 222.

[317] Eisen, *FERC's Expansive Authority to Transform the Electric Grid*, *supra* note 28, at 148–51 (discussing the origins and development of this doctrine, including its articulation in Cal. Indep. Sys. Operator Corp. v. FERC, 372 F.3d 395 (D.C. Cir. 2004)).

[318] *Elec. Power Supply Ass'n*, 753 F.3d at 221.

conclusion that wholesale energy market demand response programs overstepped FERC's authority. For good measure, the majority found that even if it were to assume that FERC had jurisdiction over demand response, it would overturn Order 745's setting of the compensation level at full LMP as arbitrary and capricious.[319]

Judge Edwards, in his dissent, observed that, "The task for this court, of course, is not to divine from first principles whether a demand response resource subject to *Order 745* is best considered a matter of wholesale or retail electricity regulation. Rather, our task is one of statutory interpretation within the familiar *Chevron* framework."[320] Applying *Chevron*, he found that, "FERC's explanation of its jurisdiction under the Federal Power Act is straightforward and sensible."[321]

D. The Aftermath, and then the Supreme Court Speaks

The D.C. Circuit opinion endangered demand response participation in all wholesale markets. If FERC had no jurisdiction over demand response in the energy markets, it presumably had no authority to allow it in capacity or ancillary services markets, either.[322] Indeed, following that logic, the utility FirstEnergy filed a complaint with FERC immediately after the D.C. Circuit's decision, stating that demand response should be excluded from all wholesale markets.[323] That would have harmed CSPs far more,[324]

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[319] *Id.* at 224–25.
[320] *Id.* at 226–27.
[321] *Id.* at 232.
[322] Peter Cappers & Andy Satchwell, *Considerations for State Regulators and Policymakers in a Post-FERC Order 745 World*, ELECTRICITYPOLICY.COM (Feb. 2015), https://www.electricitypolicy.com/articles/7784-considerations-for-state-regulators-and-policymakers-in-a-post-ferc-order-745-world.
[323] Robert Walton, *The Biggest Threat to Demand Response? It May Not Be the Order 745 Ruling*, UTIL. DIVE (Oct. 21, 2014), http://www.utilitydive.com/news/the-biggest-threat-to-demand-response-it-may-not-be-the-order-745-ruling/323998/.
[324] The D.C. Circuit's decision "threatened to disable [demand response], with serious implications for consumers as well as DR suppliers." Anne Hoskins & Paul Roberti, *The Essential Role of State Engagement in Demand Response*, 40 HARV. ENVTL. L. REV. F. 14, 16 (2016).

because (as noted above) the vast majority of demand response participation at the time was in the capacity markets. One need look no further than PJM, which, attempting to respond to the uncertainty over FERC's authority, made controversial changes to its compensation model in the capacity market for demand response after the D.C. Circuit decision.[325] One year later, it observed a ten percent drop in demand response participation.[326]

A number of states,[327] environmental groups,[328] and scholars[329] disagreed with the D.C. Circuit's central contention that FERC lacked the authority under the FPA to issue Order 745. The Supreme Court concurred, in Justice Elena Kagan's opinion for a six-Justice majority that upheld Order 745's central requirement of paying full LMP to demand response in the wholesale energy markets.[330] The Court stated that regulating demand response fell comfortably within FERC's authority over "practices" affecting wholesale rates if rates are "directly" affected.[331] It rejected the D.C. Circuit's argument that demand response was to be left to the states, concluding that it directly impacted wholesale rates because bidding demand reductions into wholesale markets changes wholesale prices.[332] As the Court stated, "[w]holesale demand

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[325] PJM INTERCONNECTION LLC, THE EVOLUTION OF DEMAND RESPONSE IN THE PJM WHOLESALE MARKET (2014), http://www.pjm.com/~/media/library/reports-notices/demand-response/20141007-pjm-whitepaper-on-the-evolution-of-demand-response-in-the-pjm-wholesale-market.ashx (describing the changes).

[326] MONITORING ANALYTICS, LLC, 2016 QUARTERLY STATE OF THE MARKET REPORT, *supra* note 153, at 255.

[327] Illinois, Maryland, Pennsylvania and several other states supported FERC, as did various state administrative agencies. Joint States' Reply Brief On the Merits, FERC v. Elec. Power Supply Ass'n, 136 S. Ct. 760 (2016) (No. 14-840); Brief For the State of Illinois *et al.,* As Amici Curiae, FERC v. Elec. Power Supply Ass'n, 136 S. Ct. 760 (2016) (No. 14-840).

[328] Amicus Curiae Brief of Conservation Law Foundation *et al.* In Support of Petitioners, FERC v. Elec. Power Supply Ass'n, 136 S. Ct. 760 (2016) (No. 14-840).

[329] Amicus Curiae Brief of Energy Law Scholars In Support of Petitioners, FERC v. Elec. Power Supply Ass'n, 136 S. Ct. 760 (2016) (No. 14-840).

[330] *Elec. Power Supply Ass'n*, 136 S. Ct. at 767.

[331] *Id*. at 773–75.

[332] *Id*. at 776.

response is all about reducing wholesale rates; so too the rules and practices that determine how those programs operate."[333] The Court concluded, "[i]t is hard to think of a practice" that has a more direct impact on wholesale rates,[334] as distinguished from activities that have "indirect or tangential impacts" on wholesale markets. With this distinction, the D.C. Circuit's "parade of horribles" argument, that FERC could regulate the steel or labor markets if it so chose if Order 745 stood, was correctly swept away into history.[335]

Notably, the Court rejected the contentions about trampling on state regulatory authority that had prevailed in the D.C. Circuit. Order 745 was not invalid just because it impacted PUCs' rate setting functions; that did not foreclose FERC from acting.[336] Finally, the Court upheld Order 745's compensation approach, finding that FERC "engaged in reasoned decisionmaking," and "selected a compensation formula with adequate support in the record, and intelligibly explained the reasons for making that choice."[337]

The long-term ramifications of *FERC v. EPSA* for developing markets for demand response are discussed more fully below. In the short term, it was an obvious boost to demand response, and forestalled the attacks on the other regulatory efforts FERC had taken to promote it. As one observer noted, "FERC orders in recent years ha[ve] resulted in the opening of additional electricity markets to [demand response]; and it was these newly opened markets for services such as capacity, frequency regulation and response, reactive power, and other so-called 'ancillary services' that were ultimately at risk."[338] Moreover, the ratification of FERC's broad authority under the "practices affecting rates"

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[333] *Id*.
[334] *Id*. at 775.
[335] *Id*. at 774.
[336] *Id*.
[337] *Id*. at 784.
[338] Todd Olinsky-Paul, *Supreme Court Upholds FERC Action on Demand Response*, RENEWABLE ENERGY WORLD (Jan. 27, 2016), http://www.renewableenergyworld.com/ugc/articles/2016/01/supreme-court-upholds-ferc-action-on-demand-response.html.

language empowered FERC to consider even more ambitious policy and market development efforts, such as efforts currently underway to consider carbon pricing in the wholesale markets.[339]

The validation of Order 745's compensation approach was a watershed moment for demand-side participation in the electric grid. The objections to demand response being a thing at all, and the struggle for treatment on par with supply, evaporated. Finally, after decades of doubt, demand response was valued as a system resource, and explicitly put on the same footing as supply in the grid.

IV. DEMAND RESPONSE 3.0: NEW MARKETS . . . AND NEW CHALLENGES

Even after the green light from *FERC v. EPSA*, however, much of demand response's potential is still untapped, or "ignored."[340] Yet with the Supreme Court's upholding of FERC's rules, and increasingly promising technologies and development of standards, it does seem that attention to it is popping up everywhere. Two exciting developments at the heart of this third generation of demand response are increasingly automated technologies that allow for more flexible demand response resources, and the contemplation of new opportunities for putting a value on the ability for resources behind the meter to provide that flexibility to the electric grid.

One important avenue for demand response to be valued more highly is being developed at the distribution level of the electricity system. This part of the system is undergoing rapid change, with much of it seemingly aimed at being more disaggregated and

[339] Eisen, *FERC's Expansive Authority to Transform the Electric Grid*, *supra* note 28, at 1786; *see* NEW ENGLAND POWER POOL, INTEGRATING MARKETS AND PUBLIC POLICY, http://nepool.com/IMAPP.php (illustrating the ongoing effort by stakeholders to develop a carbon price for the ISO-New England RTO).

[340] Krysti Shallenberger, *Predictions 2017: What the New Year Will Bring for Demand-Side Management*, UTIL. DIVE (Jan. 4, 2017), http://www.utilitydive.com/news/predictions-2017-what-the-new-year-will-bring-for-demand-side-management/433332/ (quoting James McPhail, CEO, Zen Ecosystems, "Most of the market that could benefit from demand response programs and energy management systems has been ignored.").

reliant on distributed energy resources. Several states are radically reforming their state regulatory processes to accelerate DER integration into the grid and accomplish other goals such as reducing greenhouse gas emissions. These states contemplate a future in which the regulated utility (and a variety of third parties with which it interacts, through regulatory structures designed for the purpose) enables customer choice through advanced distribution system planning and networking. Eventually, some, such as New York, contemplate adopting new market structures such as trading platforms that would provide greatly enhanced opportunities for DER to provide grid services.

This Part begins with a discussion of the changing technical nature of demand response, and its role in the rapidly evolving ideas about transforming the electricity distribution system to add new market opportunities, describing proceedings and specific projects that are at the vanguard of change. While these new opportunities are extremely promising, the prospect of their success must be evaluated against the principles and lessons learned from the fifty-year history of demand-side participation in the electric grid, as discussed in the second section of this Part.

A. *Flexible Technologies and New Market Opportunities*

The very nature of demand response is shifting before our eyes. Technically, the early forms of demand response were one-dimensional sources of flexibility (demand reductions controlled by a utility with limited customer involvement), and typically limited in when and how often they were required to provide demand reductions. A demand response resource receiving a capacity payment, for example, might only be called a few times each year. Now, technologies such as energy storage batteries, grid-connected electric vehicles,[341] and remotely controlled water

[341] Mark Detsky & Gabriella Stockmayer, *Electric Vehicles: Rolling over Barriers and Merging with Regulation*, 40 WM. & MARY ENVTL. L. & POL'Y REV. 477, 480–81 (2016) (discussing policy needs for EV grid integration).

and space heaters[342] offer the potential to reduce demand more frequently, perhaps in real time.

The smart, Internet-connected grid appears to be fast approaching.[343] With the rise of advanced control hardware and software and other technologies, and standards for the exchange of information, demand response can be more increasingly thought of as an automatically responsive grid resource. Residential demand response, which remains modest in participation compared to reductions from commercial and industrial customers, is "poised for expansion if regulators put in place the right policies to help it grow."[344] For example, "bring your own thermostat" programs being tested now[345] can allow consumers to program settings from a smartphone or tablet and automatically offer their demand reductions to utilities and markets. The value of this sort of demand response is in its fast-acting nature and its ability to decrease or increase demand flexibly on a much more frequent basis, perhaps as often as every day.[346]

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[342] Thirty five states now have water heater load control programs. FERC DR-AM 2016, *supra* note 22, at 23. *See also supra* note 277 and accompanying text (discussing grid-connected water heaters as a resource in the PJM regulation market).

[343] MIT ENERGY INIT., *supra* note 3, at 36 (noting that, "Though only now beginning, these changes could become commonplace in ten years and could lead to a power system that Thomas Edison would not have recognized.").

[344] Robert Walton, *The Value of Less: Quantifying the Benefit of Peak Demand Savings*, UTIL. DIVE (Nov. 4, 2015), http://www.utilitydive.com/news/the-value-of-less-quantifying-the-benefit-of-peak-demand-savings/408565/.

[345] NAVIGANT RESEARCH, BRING YOUR OWN THERMOSTAT DEMAND RESPONSE (2016), https://www.navigantresearch.com/research/bring-your-own-thermostat-demand-response (describing pilot BYOT programs).

[346] Michael Kanellos, *Demand Response? Try Demand Management*, GREENTECHMEDIA (June 9, 2010), https://www.greentechmedia.com/articles/read/demand-response-try-demand-management ("Instead of curbing power three to ten hours a year, demand management companies could take control of air conditioners and other devices for 50 hours a year or more with smaller dips in power curtailment over a far wider base . . . ."). *See also* Eisen, *Distributed Energy Resources*, *supra* note 51, at 205–08 (describing this "virtual power plant" concept and a pilot project by the San Antonio utility CPS Energy).

This evolution to having much more automated and customizable programs and expanded potential market segments is exciting. To date, however, compared to existing emergency and economic demand response programs, these programs are in their infancy, or as FERC describes it, "in the minority and generally lacking."[347] On the other hand, "[t]his dynamic is starting to change and additional market opportunities are beginning to be created for demand response to provide additional value."[348] States, in particular, have begun ambitious efforts to put in place policies and goals that will help grow the market for demand response.

Notably, a handful of PUCs have embarked on comprehensive grid modernization proceedings, taking a view of the grid that calls for a broader portfolio of resources to meet the demands of the future, and a corresponding resilience in the system. These efforts recognize that the grid as a whole is changing rapidly. Over the past several years, renewable energy resources have made up a significant portion of new capacity additions.[349] Distributed energy resources—including solar PV, electric vehicles and energy storage—are connecting to the grid in ever-growing numbers. Accommodating these developments has prompted the states to take action,[350] and may tip the scale in favor of more experimentation with markets for distributed energy resources, including demand response. In today's parlance, there might be more value streams for monetizing demand response, as it may be more useful to the grid in balancing increases in distributed energy

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[347] FERC DR-AM 2016, *supra* note 22, at 33; Schare & Feldman, *supra* note 13.

[348] FERC DR-AM 2016, *supra* note 22, at 33.

[349] U.S. ENERGY INFO. ADMIN., SOLAR, NATURAL GAS, WIND MAKE UP MOST 2016 GENERATION ADDITIONS (Mar. 1, 2016), http://www.eia.gov/todayinenergy/detail.cfm?id=25172 (including chart that shows that solar and wind make up more that 2/3 of scheduled capacity additions for 2016, and that, "2016 will be the first year in which utility-scale solar additions exceed additions from any other single energy source").

[350] *See generally* William Boyd & Ann E. Carlson, *Accidents of Federalism: Rate Design and Policy Innovation in Public Utility Law*, 63 UCLA L. REV. 810 (2016) (discussing numerous state policy experiments).

resources,[351] or providing other services to local distribution systems.

States including California, Illinois, Maryland, New York, Massachusetts, and Hawaii have begun proceedings aimed at reconsidering the roles and responsibilities of utilities. In New York, for example, the Public Service Commission began the Reforming the Energy Vision process in 2014, aimed at eventually refashioning the state's utilities as market platform providers for distributed energy resources.[352] In these states, there is emerging consideration of how markets may be organized to better coordinate generation (both conventional and distributed sources) and demand response in the distribution system, where organized markets do not yet exist. These markets, for example, would enable consumers to offer demand response to help coordinate the influx of large numbers of disparate types of resources on the grid.

These emerging state policies suggest a more integrated role for demand response in planning and management of the distribution system.[353] Distribution level markets would address different systems than the wholesale markets, and compensate for different services provided. An example of such a service would be the use of solar PV with smart inverters to supply voltage and reactive power regulation services on a distribution feeder line, which some believe it can do more quickly than traditional sources of power correction on distribution lines.[354] Reducing demand at times of system stress can also help "avoid expensive distribution infrastructure upgrades otherwise needed to meet those peaks."[355] Thinking about the structure of markets to create business opportunities at the distribution level for demand response to

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[351] *See* MIT ENERGY INIT., *supra* note 3, at 265–306 (including chapter on "Understanding the Value of Distributed Energy Resources").

[352] *See* Eisen, *Dual Electricity Federalism Is Dead, supra* note 9, at 13–16 (discussing the REV proceeding).

[353] *See* Schare & Feldman, *supra* note 13.

[354] Michael Zuercher-Martinson, *Smart PV Inverter Benefits for Utilities*, RENEWABLE ENERGY WORLD (Jan. 30, 2012), http://www.renewableenergyworld.com/articles/print/pvw/volume-3/issue-6/solar-energy/smart-pv-inverter-benefits-for-utilities.html.

[355] N.Y. Pub. Svc. Comm'n v. N.Y. Indep. Sys. Operator, 158 FERC ¶ 61,137 (Feb. 3, 2017).

provide services such as these remains very new, and it has not yet been determined how such markets will operate.

A pioneering use of market techniques involving demand response is the "Brooklyn-Queens Neighborhood Program" of the New York utility Consolidated Edison (ConEd).[356] In this program, ConEd is relying on demand response and other "non-wires" alternatives to building new infrastructure in Brooklyn and Queens in New York City.[357] In August 2016, ConEd held a demand response auction as part of this program, with ten offers accepted totaling 22 MW of demand response by 2018.[358] Adding demand response to its system in this fashion allows ConEd to defer over $1 billion in substation construction and other investments.

More will be needed to capitalize on distribution level demand response market opportunities. Regulatory frameworks should create opportunities, define services to be provided in such a way that demand response can participate, and establish institutional structures that put demand response on a level playing field with generation. This will require the involvement of distribution utilities, which have been active players in the state grid modernization proceedings. New York has chosen the distribution utilities to operate the distribution system and serve as platform providers. This will require focused attention in the development of market structures to ensure that demand response is adequately compensated.

Besides this, there will be an increasing need for coordination and integration of these new distribution level market opportunities with the existing wholesale markets. The two will intersect in significant ways,[359] as the New York ISO recently described in a

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[356] *The Neighborhood Program*, CON EDISON, https://www.coned.com/en/save-money/rebates-incentives-tax-credits/the-neighborhood-program (last visited Feb. 28, 2017).

[357] Robert Walton, *The non-wire alternative: ConEd's Brooklyn-Queens pilot rejects traditional grid upgrades*, UTIL. DIVE (Aug. 3, 2016), http://www.utilitydive.com/news/the-non-wire-alternative-coneds-brooklyn-queens-pilot-rejects-traditional/423525/.

[358] FERC DR-AM 2016, *supra* note 22, at 30.

[359] This is not precluded by the FPA. *See generally* Eisen, *Dual Electricity Federalism Is Dead, supra* note 9 (discussing the Supreme Court's ratification

"roadmap" document describing means for integrating new distribution level markets with its wholesale markets.[360] An important issue, among others, that may recur frequently during this coordination process is that demand response could simultaneously provide a distribution level service (e.g., feeder relief, say) and a wholesale level service (e.g., frequency regulation in an ancillary services market).[361] It will be important to ensure that these opportunities are aligned, through proper design of distribution market rules and alignment with existing wholesale market rules, to avoid hampering demand response participation.[362]

These, and a myriad of other challenges, await the states as they move forward. Although some challenges are new, others are not. Demand response has been a crucible for testing important principles about the grid's future, and that tells us much about the likelihood of success of the ongoing grid modernization efforts. Numerous economic, technical, and regulatory issues have been addressed extensively in an iterative process spanning decades, and it is worthwhile to pause and consider just what has been accomplished.

B. Lessons Learned Over the Past Fifty Years

In light of these new opportunities for demand response, we return to the question originally posed above: when you sign up for Rush Hour Rewards, or a CSP bids your demand reductions into a wholesale market, how does that *help change our one-way grid*?

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of a new era of electricity federalism in which federal and state regulators can address an activity concurrently). *Cf.* Felix Mormann, *Clean Energy Federalism*, 67 FLA. L. REV. 1621, 1627 (2016) (noting that scholars are beginning to discuss an energy federalism model "that would treat federal and state jurisdiction not as independent or mere substitutes but, instead, as interdependent and complementary").

[360] *See generally* N.Y. INDEP. SYS. OPERATOR, DISTRIBUTED ENERGY RESOURCES ROADMAP FOR NEW YORK'S WHOLESALE ELECTRICITY MARKETS (Jan. 2017), http://www.nyiso.com/public/webdocs/markets_operations/market_data/demand_response/Distributed_Energy_Resources/Distributed_Energy_Resources_Roadmap.pdf.

[361] *Id.* at 25.

[362] *Id.*

Consider this (hardly unique) statement: demand response can "help transform our electricity system from a one-way, centralized power network where customers passively receive electricity to a two-way flow of information where people regularly contribute to system operations."[363] That word "help" is doing an awful lot of work here, and the full extent of just how much is hardly obvious[364] unless one is aware of the decades-long evolution of demand response.

Think back to Rush Hour Rewards, or aggregations of retail customers into a block of demand reductions for sale into a spinning reserve market. In the humble act of choosing to cut back your consumption and getting paid for it, you are selling something to the utility or market: the reduction in your electricity demand. If it seems that you are simply refraining from consumption and not "selling" anything that argument was made for years and then *FERC v. EPSA* soundly rejected it, full stop. You are selling negawatts. There have been significant and strenuous arguments about their value, as we have seen. However, they must have *some* value; otherwise, SCE or a CSP wouldn't pay you for them.

You are selling the utility something it wants, getting paid for your forbearance, and yet still are buying power from it. This is profound. Demand response fundamentally changes the way you interact with a utility:[365] a customer (you) can be both a buyer (of power) and a seller (of demand reductions). You, in today's

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[363] PANFIL & FINE, *supra* note 129, at 7.

[364] It would be a sage indeed who could divine from "demand response" any notion that it plays a central role in the grid's future. Panfil, *supra* note 14 ("The name 'demand response'--which would surely raise eyebrows at a PR firm--doesn't do much to convey meaning or do justice to the importance of the concept it represents.").

[365] *See, e.g.*, Larry Plumb, *GreenGov Dialogue on Demand Response: the Future of Awesome?* ITIC (Mar. 1, 2013), https://www.itic.org/news-events/techwonk-blog/greengov-dialogue-on-demand-response-the-future-of-awesome ("[T]he reason customers might come to see demand/response as awesome is different. For customers, demand/response is about changing their relationship to how they use electricity.").

popular term, are a "prosumer" as well as a consumer.[366] In a transaction with a CSP to aggregate your demand reductions into a biddable block, there is already a two-way exchange of resources. More demand response means more of these transactions.

Perhaps eventually, with the advent of the state level grid modernization proceedings and further efforts in the wholesale markets by FERC, we could have a full two-way grid. Researchers and scholars are studying and piloting the building blocks of a "transactive energy" system: a true two-way grid with markets for electricity products and services, and decentralized control of the grid relying on distributed resources to provide the requisite flexibility.[367] What would be exchanged on it and how its structure would look would be very different from trading in demand response negawatts. Advanced technologies allow for contemplation of a multidirectional grid, where prosumers can sell more services back to the grid than demand reductions from their buildings, solar systems, or vehicle fleets. One example that has been studied for years is "vehicle-to-grid" (V2G): using an electric vehicle's battery as a storage device and enabling the owner to sell some of its charge back to a utility or CSP when the grid needs that small amount of power.[368] Even though there are more electric vehicles and associated infrastructure is developing,[369] V2G is still

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[366] *See* Joel B. Eisen & Felix Mormann, *Free Trade in Electric Power* __ UTAH L. REV. (forthcoming 2017); *see also* Sharon Jacobs, *The Energy Prosumer*, 43 ECOLOGY L.Q. 519 (2017).

[367] *See* Eisen & Mormann, *supra* note 366; *see generally* GRIDWISE ARCHITECTURAL COUN., GRIDWISE TRANSACTIVE ENERGY FRAMEWORK VERSION 1.0 (2015).

[368] George R. Parsons et al., *Willingness to Pay for Vehicle-to-Grid (V2G) Electric Vehicles and Their Contract Terms*, 42 ENERGY ECON. 313 (2014) (describing the vehicle-to-grid concept and the results of an experiment that "the V2G concept is most likely to help EVs on the market if power aggregators operate either on pay-as-you-go basis (more pay for more service provided) or provide consumers with advanced cash payment"). *But see,* Zachary Shahan, *Tesla CTO JB Straubel On Why EVs Selling Electricity To The Grid Is Not As Swell As It Sounds*, CLEAN TECHNICA (Aug. 22, 2016), https://cleantechnica.com/2016/08/22/vehicle-to-grid-used-ev-batteries-grid-storage/ (criticizing V2G on the basis that it "doesn't make economic sense," but supporting the idea of dynamic charging).

[369] Detsky & Stockmayer, *supra* note 341.

a long way off. There are many more needs for a full two-way grid, such as a legal framework that would promote the trading of resources.

The concept of a two-way exchange of resources, however, is on its way to full validation as a result of the evolution of demand response policies. In addition, the promotion of demand response done by third parties has enshrined the concept of competition to utilities and generators in wholesale markets,[370] even though those markets were established for a completely different purpose. This supports an idea that is critical to the grid's future. Consumers can trade in wholesale electricity markets through registered intermediaries, which are not utilities and have different business models and economic incentives.

Thus, *FERC v. EPSA* validated business model competition in the electric grid, even if the precise legal issue was not framed that way, and even if full third party participation is hardly universal today. Notably, this progress came in the face of vigorous opposition from incumbent participants in the system that argued against it. Sellers and the intellectual titans responsible for designing those markets argued against letting demand response in, because they believed it was not power and, thus, could not be treated the same way. They lost that argument. By acknowledging CSPs, and approving an incentive meant in part to help them, the Court has encouraged more market competition by companies that do not generate electricity. This may be one of *FERC v. EPSA*'s most important accomplishments.[371]

With the green light given to experimenters, it is exciting to speculate about the possibilities. Consider how momentous *that* may turn out to be. Still, as the history of demand response suggests, things tend to move slowly in this industry. This is not smartphones with immediate "disruption" potential.[372] Advanced

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[370] Panfil, *supra* note 14 ("Instead of allowing utilities to operate as natural monopolies with little competition to speak of, the new market will enable innovative entrants and resources to play.").

[371] Eisen, *FERC v. EPSA*, *supra* note 9; Jim Rossi & Jon Wellinghoff, *FERC v. EPSA and Adjacent State Regulation of Customer Energy Resources,* 40 HARV. ENVTL. L. REV. F. 23 (2016); Hoskins & Roberti, *supra* note 324.

[372] Eisen & Mormann, *supra* note 366.

technologies can be an important element of change, and, indeed at times, are an obvious prerequisite to change, as in the case of smart meters. But as we have seen in the fifteen-year history of demand response in the organized electricity markets, technology alone does not drive immediate institutional change. Answers will take much longer than the time scale of recent innovations in technology. The basic questions have been asked for decades, but institutional change has not followed as swiftly.

As the discussion above demonstrates, throughout its history demand response has found it difficult to achieve a level playing field in markets designed to trade power. It is "something different–not quite efficiency, not quite supply," but treated as "a load-modifying resource that is sometimes paid as though it were a supply resource."[373] Because demand response is not power, market rules have had to be created or aligned over time to make it viable. FERC's support in rules such as Orders 719, 745, and 755 has been essential to enable greater participation of demand response. And most recently, it issued a proposed rule to promote storage in the organized wholesale markets and suggest that RTOs look to California's DER aggregation proposal to knock down more barriers preventing distributed resource participation in wholesale markets.[374]

There is no reason to believe that this active policy support will be any less essential in the states' grid modernization proceedings. Indeed, given that the results might include complete transformations of the role of distribution utilities, it is even more

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[373] DAN DELUREY, THE WEDGEMERE GRP., DEMAND RESPONSE: THE ROAD AHEAD 2 (2015), http://wedgemere.com/wp-content/uploads/2016/01/Evolution-of-DR-Final-Report.pdf.

[374] Electric Storage Participation in Markets Operated by Regional Transmission Organizations and Independent System Operators, 81 Fed. Reg. 86,522 (Nov. 30, 2016); Julian Spector, *FERC Proposes to Open Up Wholesale Markets for Energy Storage and Aggregation,* GREENTECHMEDIA (Nov. 18, 2016), https://www.greentechmedia.com/articles/read/ferc-proposes-to-open-up-wholesale-markets-for-energy-storage (noting the potential for this proposed rule to boost storage and demand response participation in the wholesale markets). *See* Eisen & Mormann, *supra* note 366 (proposing a new trading paradigm for electricity with this FERC rule (assuming it becomes a final rule) as a building block).

unlikely that demand response would find acceptance without policy support.[375] Mandates and market rule reforms by the states will be a central component of expanding demand response's reach. And some more lessons from the history of encouraging demand response participation in the organized wholesale markets will be significant here as well. There will be geographic differences in how fast conditions change. Throughout demand response's history, market experiments have not been uniform across the nation and have been more successful in certain individual regions and markets than others. That variability is likely to continue for some time. Policies are iterative in their nature; note that FERC's Orders acted to address problems in each of the three different categories of markets as specific barriers were identified and addressed. Again, we would expect that sort of policy development activity at the state level.

Finally, prompting recalcitrant actors to accept demand-side participation and conceptualizing demand response's role at times of momentous industry transformations has always required the presence of visionary regulators who have combated the forces tending to inertia. As the need for policy innovation presents itself now in a different setting, those familiar with the history of demand response will articulate more forcefully for its inclusion in the grid of the future. Change in this industry is always difficult, and, as *FERC v. EPSA* suggests, powerful interests still remain aligned against the full incorporation of demand response resources. Distribution utilities are entrenched monopolies that are unlikely to face their demise anytime soon.[376] With the assistance of groups representing power generators, they can (and do) portray demand response as inefficient or unwanted.[377] And consumers still

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[375] HURLEY ET AL., *supra* note 50, at 11.

[376] Panfil, *supra* note 14 ("Now it's not yet time to signal that *FERC v. EPSA* means utilities are about to fall down the rabbit hole of the vaunted death spiral. Nothing about it directly undoes the stranglehold of incumbent utilities on distribution of electricity (serving it to you) just yet.").

[377] THOMAS STANTON, REGULATORY ASSISTANCE PROJECT, ELECTRIC RESTRUCTURING DANGER: WE COULD WIND UP WHERE WE'RE HEADED 17 (2002) ("Knowing the political power wielded by public utilities, I am tempted to conclude . . . that only utilities can request that regulators implement the reforms needed to allow DER to compete fully and fairly, in service of the

have not overwhelmingly pushed for more of it. Thus, as exciting as it is to think of the networked future for the grid—and even the potential for legal frameworks that could leap well beyond what the states are doing today[378]—one should get comfortable in thinking of years, rather than months, and settle in for the long haul.

CONCLUSION

"What's past is prologue," Shakespeare wrote.[379] So it is here, as the lessons of five decades of promoting demand-side participation in the grid inform the future. Even as transformative change is everywhere in the electric grid, optimism and enthusiasm for how fast things will change must be tempered by the realities of the grid. The enormous potential of demand response has been recognized for decades, but we still have nowhere near as much of it as we could, and technology alone will not guarantee industry disruption. The technological change since the 1970s is impressive, but it has always outstripped institutional change, and change in this industry takes time. Progress will not be linear. There will be advances and setbacks.

Demand response is not a new invention. Its basic concepts have been understood for decades. And as for the connectedness that everyone believes is on the horizon, we have been talking about "smart homes" since the 1980s.[380] Yet there have been important changes since then for demand response, which has demonstrated that it can serve as a reliable and economic resource for wholesale markets and has finally been recognized as a system resource on par with generation.

This Article has described the "market pathways" that brought us to the present day, and that (combined with other technology and regulatory innovations) might lead to a radically different

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public interest. Market newcomers face an uphill battle for getting their issues attended to by legislatures and regulators alike. As long as utilities fight against DER reforms, it will be difficult.").

[378] Eisen & Mormann, *supra* note 366.

[379] WILLIAM SHAKESPEARE, THE TEMPEST, act 2, sc. 1.

[380] Oren, *supra* note 61, at slide 7.

electric grid in the years to come. And so, instead of being ignored, compared to building new power plants, demand response has become something else entirely: a vanguard of this new electric grid, a spark for entrepreneurs and pilot projects, and a test bed of important regulatory principles like frameworks for interactivity with the grid, the role of third parties and new business models, and the split of regulatory jurisdiction between states and FERC.

Decades from now, "demand response" won't exist in its current forms. No one today uses a "Hush-a-Phone," the rudimentary voice silencing device for telephones of the 1920s through 1950s.[381] But everyone takes it as a given that they can use phone lines for private benefit without the phone company's consent, a principle decided in the seminal case involving that widget. So even if we don't have demand response in the long-term, we may well remember that FERC's Orders, *FERC v. EPSA*, state policies, and other initiatives made a very different electric grid possible.

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[381] Hush-A-Phone v. United States, 238 F.2d 266 (D.C. Cir. 1956); *see* Joel B. Eisen, *An Open Access Distribution Tariff: Removing Barriers to Innovation on the Smart Grid*, 61 UCLA L. REV. 1712 (2014) (analogizing this case to pioneering legal precedents involving demand response and the Smart Grid).