[1] Commonwealth of Pennsylvania, Pennsylvania Public Utility Commission, Energy Efficiency and Conservation Program and EDC Plans, Docket No. M-2008-2069887 (Nov. 14, 2008), *available at* http://www.puc.state.pa.us/PCDOCS/1026558.doc.

[2]

demand response have the potential to enhance consumer welfare and increase economic efficiency at both the wholesale and retail levels. More efficient pricing, advanced metering, and improvements in the technology used to determine when (and how much) energy is consumed are all critical to the future performance of the power industry in Pennsylvania and in the United States as a whole. We commend the Pennsylvania Legislature and the PA PUC for taking initiatives on these important topics.

Although many of the specific questions posed by the PA PUC at the *en banc* hearing pertained to Conservation Service Providers, we agree with RESA that these questions must be framed in the context of empowering customers to manage their peak and overall loads. We encourage the PA PUC to center the Energy Efficiency and Conservation Program around providing customers with incentives and opportunities to better manage those loads. This comment describes several aspects of encouraging energy efficiency and conservation as a means to deliver consumer benefits. We believe that addressing the topics covered in this comment, either in the short term or during subsequent policy reviews, will benefit Pennsylvania's electric power customers and U.S. power customers in general.

The FTC encourages the PA PUC to employ dynamic electric power pricing and demand response to involve customers in addressing the power systems' most pressing problems. Well-designed dynamic pricing and demand response programs can enlist customers to help meet important challenges facing the power system by, for example:

- managing peak load;

Energy Conservation and Efficiency, and Demand Side Response" (Nov. 18, 2008), *available at* http://www.puc.state.pa.us/electric/pdf/EnBanc-DSR/Ttmy-RESA111908.pdf.

- ensuring that load never exceeds generation;
- keeping system costs down;
- reducing the need for ratepayers to pay to build, maintain, and operate peak-load generating facilities;
- pricing pollution into the time-varying cost of power, thereby encouraging customers to shift power demand to periods when the marginal plant is a low-cost, low-emissions generator (and away from periods when a less attractive plant is on the margin);
- making good use of the wind and solar generators being installed in response to environmental concerns, market forces, and Pennsylvania's renewable portfolio standard;
- complementing unpredictable, intermittent wind and solar generators with flexible demand rather than flexible supply, when flexible demand is more cost-effective; and
- facilitating the appropriate investment in and use of technologies by end-users, generators, and utilities, including plug-in vehicles and onsite generation when they are cost-effective.

Automation, feedback, and incentives can enable consumers to become partners in addressing all of these problems. The PA PUC has an important opportunity to give every

[3] *See*

III. Facilitating Demand Response and Dynamic Pricing, and Ending Regulatory Practices That Can Inhibit Demand Response

By facilitating the implementation of demand response and dynamic pricing in Pennsylvania, the PA PUC has an opportunity to reduce costs to ratepayers, increase reliability, and ease the integration of intermittent wind and solar resources. We encourage the PA PUC to seize this opportunity. Utilities may want to roll out dynamic pricing first as an attractive opt-in program. Once such a program has been reviewed and refined, and after it has satisfied thousands of customers for a few years, dynamic pricing could become the default option for all new accounts (and perhaps could serve as an opt-out rate for existing customers of provider-of-

[9] Traditional retail rates generally are time-invariant, *i.e.*, the rates do not depend on when the customer uses power, regardless of scarcity conditions and wholesale prices. Some traditional utility systems, however, include seasonal differences in rates that otherwise are time-invariant. Over time, changes in average wholesale prices can (and do) lead to adjustments in traditional retail rates. Such adjustments, however, involve substantial lags, and do not contemporaneously track the daily cycles in generation and transmission costs that produce fluctuations in wholesale prices.

[10] During critical peak periods, wholesale prices sometimes reach $1000/MWh or more. During off-peak periods, wholesale prices in some areas are as low as $20/MWh (or lower). For example, the California Independent System Operator is seeking authority to institute a price ceiling of $2500/MWh and a price floor of -$2500/MWh during the initial period of its revised nodal pricing system. Simulations suggest that nodal prices may fall below the proposed floor or

Traditional, fixed retail pricing also increases the volatility of wholesale prices, increases the risk of blackouts and brownouts, and raises the average costs of the electric power system. For example, during an unusual heat wave that drove temperatures above 100 degrees in Southern California in early September 2007, Southern California Edison reported that approximately 20,000 customers were subject to extended blackouts. It was estimated that 90 percent of those blackouts were due to peak demand that exceeded the capacity of local distribution equipment under such extreme temperatures. If retail prices had adjusted to reflect wholesale prices in real time, people would not have used power that they valued at less than its social cost.[11] As a result, there would have been a more efficient allocation of the limited amount of electricity in the short term, and power system suppliers would have had stronger incentives to build the efficient amount of generation, transmission, and distribution capacity.

Reliance on fixed retail prices poses major threats connected with two major new technologies. One of these technologies is electric vehicles, of either the plug-in hybrid or the all-electric variety. Time-invariant retail pricing does nothing to encourage plug-in hybrid customers to recharge during off-peak hours. If large numbers of plug-in vehicles recharge during peak demand periods, the power system will require the costly construction, maintenance, and operation of peakers and additional transmission and distribution capacity in order to maintain system reliability.[12]

[11] Electric power's social (opportunity) cost is the lesser of (1) the cost of building and running an electricity system large enough to prevent the blackout or (2) the cost at which other customers will reduce their consumption of electric power enough to prevent the blackout.

[12] Dynamic pricing encourages owners of plug-in hybrid and all-electric vehicles to shift the charging of their vehicles to periods in which low-cost power plants are on the margin.

The second major technology consists of wind and solar power and other forms of intermittent renewable generation. Many states have prescribed a “renewable portfolio standard” that requires a portion of generation to be from renewable energy sources. Pennsylvania’s renewable portfolio standard requires that 18 percent of the state’s energy come from renewable sources by 2020, including 0.5 percent from solar photovoltaic generation.[13] Once a technology such as wind or solar photovoltaic is in place, it is likely to be dispatched whenever it is available because the marginal cost of wind and solar photovoltaic is close to zero. With fixed retail prices, customers have no incentive to curtail their consumption when the wind dies down or clouds roll in. A lack of demand response forces fossil-fuel generators with higher marginal costs to produce more electricity. Without customer demand response, the costs of integrating intermittent, albeit environmentally attractive, power sources into the power system may be higher, as will the costs of reducing adverse environmental effects to mandated levels. Unpredictable, intermittent wind and solar generators require flexible complements to balance generation and load minute-by-minute. Dynamic pricing and demand response programs may offer a flexible demand complement that is more cost-effective than flexible supply.

Dynamic pricing is a collection of approaches, including real-time pricing and critical peak pricing, that allow retail prices to change on short notice in response to fluctuations in wholesale prices. Real-time pricing sets one retail price for each hour (or a smaller unit of time, such as quarter-hour or a five-minute segment) as a function of the spot market wholesale price.

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[13] Database of State Incentives for Renewables & Efficiency, *Pennsylvania Incentives for Renewable Energy*, *available at* http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=PA06R&state=PA&CurrentPageID=1.

Critical peak pricing is a simpler, dynamic (time-varying) pricing system. Typical critical peak pricing programs define peak and off-peak periods and specify a peak price that is higher than the off-peak price. These programs also allow utilities to designate about 1 percent of all hours

[14] Critical peak pricing schedules predetermined price periods and permits retail suppliers to declare a limited number of critical periods that invoke the critical price. Utilities choose to designate critical events when forecasted conditions are likely to cause electricity scarcity, system unreliability, or high wholesale prices. Under the program, customers are notified about critical events through automated phone calls, e-mails, or notification of a programmable communicating thermostat. Although critical peak pricing notification policies vary, typically customers are notified the day before the event that they need to adjust their thermostats by hand. Shorter notice is possible if a customer has a programmable communicating thermostat or a "gateway" system that automatically reduces his or her electricity consumption during critical periods.

Utilities commit in advance to the number of critical hours or events. This limit typically is about 1 percent of all hours, or about 15 events per year. Sometimes utilities commit to limits on the timing of critical events. For example, California's Statewide Pricing Pilot program called critical events only between 2:00 pm and 7:00 pm on weekdays. Sometimes critical peak pricing programs set forth conditions that will suffice to call a critical event. For instance, temperatures below freezing or exceeding 95 degrees Fahrenheit suffice for Gulf Power to trigger a critical event, while the California Statewide Pricing Pilot announced that any Stage 1 power emergency would trigger a critical event. Regarding the Gulf Power situation, *see* Gulf Power Co., "GoodCents Select: Advanced Energy Management Program," *available at* http://www.ewh.ieee.org/r3/nwflorida/presentations/01_19_06.ppt; regarding California, *see* Charles River Associates, "Impact Evaluation of the California Statewide Pricing Pilot" (Mar. 16, 2005), *available at* http://www.energy.ca.gov/demandresponse/documents/group3_final_reports/2005-03-24_SPP_FINAL_REP.PDF. In general, utilities also retain the flexibility to declare a critical event on any day on which they forecast high power costs or low system reliability, so long as such a declaration would not exceed the annual limit on the number of critical events they can call.

Five types of regulations are particularly likely to prevent or undermine demand response, efficient pricing, and conservation.[15] The first type includes regulations that forbid time-varying retail pricing. Time-invariant pricing subsidizes consumption when power is most costly and when increases in consumption are most likely to cause blackouts or other reliability problems. A second type of unproductive regulatory action is approval of perfunctory dynamic pricing schemes and implementation, which can lack measures to reduce the cost and risk of participation and also can suffer from inadequate design, testing, and implementation of communications, education, and marketing. These plans can be ineffective because they are based on an oversimplified view of customers' needs or suffer from underinvestment in marketing. A third type comprises regulations and ratemaking systems that penalize utilities financially if demand response increases between rate cases. The fourth type consists of regulations that allow utilities to discourage efficient customer investment in onsite generation by charging inefficiently high prices for standby service.[16] The fifth type includes regulation that deprives customers who want to offer demand response of the opportunity to customize their offers.

[15] The FERC Staff Report, *Assessment of Demand Response and Advanced Metering*, FERC Docket AD-06-2-000 (Aug. 2006), *available at* http://www.ferc.gov/legal/staff-reports/demand-response.pdf, also discussed a variety of regulatory barriers to demand response. Experience and research have continued to develop in this area since the release of this FERC Staff Report.

[16] Owning an onsite generator can increase a customer's responsiveness to prices by enabling the customer to substitute self-generated power for power from the grid when the costs of the latter exceed the costs of the former.

[17] State regulators, utilities, and researchers have gathered evidence about demand response programs that are effective and consequently tend to reduce the need to buy power when it is most expensive. Some demand response approaches, however, can entail significant costs that must be compared to their benefits in any evaluation of their effectiveness. For example, real-time prices encourage customers to reduce consumption during peak demand

[20] For a more extensive discussion of this subject, *see* Severin Borenstein, Center for the Study of Energy Markets, Univ. of Cal. Energy Inst., Working Paper #155, "Customer Risk from Real-Time Retail Electricity Pricing: Bill Volatility and Hedgability" (2006) (also published at 28:2 Energy J. 111 (2007)).

[21] Gulf Power Company, "GoodCents Select: Advanced Energy Management Program," *available at* http://www.ewh.ieee.org/r3/nwflorida/presentations/01_19_06.ppt; Dan York and Martin Kushler, "Exploring the Relationship Between Demand Response and Energy Efficiency: A Review of Experience and Discussion of Key Issues," American Council for an Energy-Efficient Economy, Report No. U052 (Mar. 2005),

"Demand Response Programs: New Considerations, Choices & Opportunities" (Jan. 2004), *available at* http://www.enertouch.com/info/Demand%20Response%20Programs.pdf; Kathryn Tholin, "Real-time Pricing for Illinois Consumers," Center for Neighborhood Technology/Community Energy Cooperative (Nov. 8, 2006), *available at* http://peaklma.com/new%20folder/documents/tholin.ppt#256,1,Real-time Pricing for Illinois Consumers.

[22] Charles River Associates, "Impact Evaluation of the California Statewide Pricing Pilot" (Mar. 16, 2005), *available at* http://www.energy.ca.gov/demandresponse/documents/group3_final_reports/2005-03-24_SPP_FINAL_REP.PDF; Ahmad Faruqui and Stephen George, "Quantifying Customer Response to Dynamic Pricing," 18:4 Electricity J. 53 (May 2005), *available at* http://www.enertouch.com/info/Quantifying%20Customer%20Response.pdf.

[23] Galen Barbose, Charles Goldman, and Bernie Neenan, "A Survey of Utility Experience with Real Time Pricing," Lawrence Berkeley Nat'l Lab., Paper LBNL-54238 (Dec. 1, 2004), *available at* http://repositories.cdlib.org/lbnl/LBNL-54238.

[24] We recognize, of course, that no practical new pricing system is likely to improve every customer's situation. Some users now pay less over the year than the marginal cost of supplying their power. Heavy users of peak-time power that cannot easily change the time of

- the way customers think about risks and price changes;
- program implementation; and
- marketing.

Although utilities' carefully implemented commercial programs have succeeded, others have failed to attract customers. One-third of available, commercial real-time pricing programs have zero participants.[25] Low participation often reflects inadequate implementation or promotion. Dynamic pricing programs tend to fail when they stem from a regulatory edict that the utility opposes and consequently implements with little attention to marketing, user friendliness, or other details crucial to attracting and retaining customers. Programs that exist only on paper squander opportunities to temper market power, to reduce distortionary regulation, and to save billions of dollars for customers. Thus, regulators need to look for ways to give utilities (and other firms offering these programs) the incentives and flexibility to devote resources to program implementation and refinement. Moving to dynamic pricing can benefit utilities, customers who choose dynamic pricing, and even customers who remain on time-invariant pricing.[26] Offering utilities a share of the benefits from dynamic pricing programs may be an appropriate way to offer them a stake in the programs' success.

Experience shows that many customers will not take action to change away from whatever rate the regulator establishes as the default. Regulators and utilities may wish to

[25] Barbose *et al.*, "A Survey of Utility Experience with Real Time Pricing," *supra* note 23.

[26] *See* Severin Borenstein and Stephen Holland, Center for the Study of Energy Markets, Univ. of Cal. Energy Inst., Working Paper #106R, "Investment Efficiency in Competitive Electricity Markets With and Without Time-Varying Retail Prices" (revised July 2003); Severin Borenstein, "The Long-Run Efficiency of Real-Time Electricity Pricing," *supra* note 18.

consider making dynamic pricing the default rate, as several states have already done with respect to large commercial and industrial customers.[27]

Residential and Small Commercial and Industrial Customers: The FTC staff researches how individual consumers understand marketing materials and mandatory disclosures. This research – as well as our experience with disclosure regulation – shows that people with legal, engineering, or policy analytic expertise often write materials that consumers have difficulty understanding.[28] Communications expertise, testing, and revision can improve dynamic pricing materials' effectiveness at attracting customers and equipping them to respond to dynamic prices.

Careful and innovative design of programs and marketing efforts are important. Well-designed residential dynamic pricing programs have gotten low sign-up rates, often on the order of 1 percent. Identifiable flaws in simplified customer decision-making patterns may bias customers against signing up for dynamic pricing programs described in straightforward but ill-chosen ways. Letzler describes these decision patterns and suggests the use of incentive-

[27] *See, e.g.*, Lisa Wood, "The New Vanilla: Why Making Time-of-Use the Default Rate for Residential Customers Makes Sense," Energy Customer Mgmt. (July/Aug. 2002); John Beshears, James J. Choi, David Laibson, and Brigitte C. Madrian, "The Importance of Default Options for Retirement Savings Outcomes: Evidence from the United States," in *Lessons from Pension Reform in the Americas* (2008).

[28] *See, e.g.*, James M. Lacko and Janis K. Pappalardo, Bureau of Econ., Fed. Trade Comm'n, "Improving Consumer Mortgage Disclosures: An Empirical Assessment of Current and Prototype Disclosure Forms" (June 2007), *available at* http://www.ftc.gov/os/2007/06/P025505MortgageDisclosureReport.pdf; James M. Lacko and Janis K. Pappalardo, Bureau of Econ., Fed. Trade Comm'n, "The Effect of Mortgage Broker Compensation Disclosures on Consumers and Competition: A Controlled Experiment" (Feb. 2004), *available at* http://www.ftc.gov/os/2004/01/030123mortgagefullrpt.pdf.

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implementation of dynamic pricing to ensure that, in the event the program leads to unanticipated changes in consumption patterns, there are not prolonged, important deviations from the rate of return and incentive scheme that the regulators set for the utility.

Unfortunately, many ratemaking systems make it unprofitable or risky for utilities to offer dynamic pricing.[34] Utilities that operate regulated, natural monopoly distribution systems for electric power often have been reluctant to offer dynamic pricing for electric power because they fear financial losses if consumption declines below the level for which they have planned[35] (and on which the regulated rates are based).[36] The restructuring of utilities' financial incentives

[34] In "The Long-Run Efficiency of Real-Time Electricity Pricing," *supra* note 18, Severin Borenstein estimates that universal implementation of real-time pricing could reduce the cost of operating the electric system by 5 to 10 percent. Total U.S. purchases of electricity were $342 billion in 2007 (*see* http://www.eia.doe.gov/cneaf/electricity/epm/table5_2.html), so universal deployment of real-time pricing could save between $17 billion and $34 billion. Those estimates do not take into account the potentially large benefits of making the system robust to unexpected events, such as the combination of poor hydroelectric conditions, natural gas supply problems, and a thriving economy that set the stage for California's crisis in the summer of 2000. Further, Borenstein and Holland show that putting some customers on real-time pricing benefits those customers who remain on time-invariant pricing, and that the first customers who switch to dynamic pricing have the greatest impact. *See* Borenstein and Holland, "Investment Efficiency in Competitive Electricity Markets With and Without Time-Varying Retail Prices," *supra* note 26.

[35] A similar revenue shortfall could occur if customers who are currently using an above-average proportion of their power during inexpensive periods – and are thus paying a cross-subsidy to other customers – were to flock to dynamic pricing but not change their consumption patterns. That dynamic pricing program would lower their bills by offering them a lower price for their off-peak consumption, which could reduce the utility's revenue. Utility executives who are worried about this problem may seek to set inefficient dynamic rates that recover their costs off-peak or may be inclined to oppose meaningful dynamic pricing. Decoupling can solve this problem by ensuring that the utility earns its regulated rate of return regardless of the quantity of power it sells during any time period.

[36] A switch from traditional, fixed retail prices to real-time retail prices can be engineered to cause or prevent shifts in costs among customer classes (*i.e.*, residential, commercial, industrial) because it does not facilitate arbitrage among classes or make it more difficult to determine the class to which a customer belongs. A move to real-time pricing typically will reduce cross-subsidies from customers with flat demand to those with "peaky" demand. For

[38] Dovra Bachrach, Sheryl Carter, and Sarah Jaffe, "Do Portfolio Managers Have an Inherent Conflict of Interest with Energy Efficiency?," 17:8 Electricity J. 52 (Oct. 2004).

[39] Residential onsite electric power generation (other than backup generators) currently consists primarily of solar cell arrays installed on rooftops. Hot water solar panels also are

that the incumbent electric utility considered onsite generation to be a competitive threat.[41] A potential policy concern in this situation is that a utility not covered by a revenue-decoupling arrangement may manipulate regulatory policies to impede socially efficient onsite generation to avoid financial losses by the utility. Environmental concerns and technological developments are transforming the characteristics of cost-effective generation technologies, making it particularly important to design technologically neutral regulatory approaches that enable emerging technologies to enter based on their merits.[42]

1. Nondiscriminatory Onsite Generation Policies

One scenario of concern involves onsite generators that are able to, and often do, operate full-time. Onsite gas turbines (*e.g.*, microturbines) and other technologies that typically run essentially nonstop are vulnerable to regulatory flaws that can differ from those that would discriminate against intermittent technologies, such as wind or solar onsite generation. The scenario starts with the recognition that customer interest in onsite generation depends on a variety of factors, such as fuel and equipment costs relative to the price of power obtained from the grid. Reliability preferences also are likely to be a factor. One potential problem for a

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[41] Fed. Trade Comm'n, Analysis of the Proposed Consent Order and Draft Complaint to Aid Public Comment in *DTE Energy Company and MCN Energy Group Inc.*, File No. 001 0067, *available at* http://www.ftc.gov/os/2001/03/dteanalysis.htm. For an example of government modeling the penetration of onsite generation, *see* Erin Boedecker, John Cymbalsky, and Steven Wade, "Modeling Distributed Electricity Generation in the NEMS Buildings Models" (2002), *available at* http://www.eia.doe.gov/oiaf/analysispaper/electricity_generation.html.

[42] Dynamic (ideally, real-time) pricing is a particularly important tool to create incentives for efficient investment in intermittent generation technologies (*e.g.*, wind and solar) and in technologies that store power or change load shapes. Real-time prices capture changing patterns of electricity scarcity or abundance and also harness market forces to help integrate technologies such as wind turbines, solar generation, plug-in hybrid vehicles, and other energy storage devices into the grid.

customer considering an onsite generation investment is that the customer occasionally may need to receive "standby" power from the utility (if, for example, the onsite generator has a mechanical breakdown or needs maintenance).[43] Utilities, which generally are allowed to charge special rates to such intermittent customers, can frustrate competitive inroads of onsite generation by charging inefficiently high prices for standby service. Supracompetitive standby rates exceed opportunity costs (including a market-based risk premium) and may provide utilities with a rate of return above the competitive level, or even above the short-term profit-maximizing price.[44] For example, the utility might set standby service charges so high that they offset any savings the customer might expect from generating power onsite. If the price of standby service exceeds the efficient price, some customers are likely to be deterred from undertaking efficient onsite generation projects and competing.

There may be a number of ways in which an incumbent utility could persuade the regulatory body to authorize a price for standby service that exceeds the efficient price and thus deters the entry of non-intermittent onsite generation. One key way to do so is to posit an unrealistic scenario in estimating the costs of providing such service – e.g., a situation in which all onsite generators simultaneously break down when demand from other utility customers is at its peak.[45] A utility should not be allowed to block the efficient entry of onsite generation by

[43] Most customers who invest in intermittent generation technologies such as wind and solar generation will need power from the grid on a regular basis.

[44] Such a strategy on the utility's part would be profit-maximizing solely by dint of its effect in preventing entry by competing onsite generators.

[45] Under this approach, the utility would claim the need to retain more generation capacity than necessary to maintain an acceptable level of reliability and would blame the excess costs on customers with onsite generation. In reality, the utility could reduce capacity reserves with an acceptable level of reliability, because it is extremely unlikely that onsite generators would simultaneously suffer mechanical breakdowns. James Mulligan, "The Economies of

positing an unrealistic scenario as the basis for setting the price of standby service.

Massed Reserves," 73 Am. Econ. Rev. 725 (1983); Walter Y. Oi, "Productivity in the Distributive Trades: The Shopper and Economies of Massed Reserves," in Zvi Griliches (ed.), *Output Measurement in the Service Sectors* 161 (U. of Chicago Press, 1992), *available at* http://nber15.nber.org/bookcv_chicago/9780226308852_web.pdf.

[46] By contrast, if a utility were unable to manipulate government regulatory proceedings in order to block entry by onsite generators, its only recourse in responding to the challenge of onsite generation might be to improve its service and reduce its costs and prices, just as incumbent suppliers respond to increased competition in other markets. Such improvements in economic performance would redound to the benefit of all electricity consumers.

discourage entry by onsite generation, because some onsite generation investments may be financially viable only if standby service is available in a limited form that costs less than unlimited standby service.[47] If the utility persuades the regulatory body to allow it to offer only "unlimited" – and thus more expensive – standby service, then competition from onsite generators that require nothing beyond limited (and less expensive) standby service might not develop.[48,49] One solution worth considering would be to put standby customers on the

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[47] For example, "as-available" standby service could be conditioned on whether power is readily available to serve the standby power customer at or below a pre-set wholesale price. Another variation on the theme would offer power at the real-time wholesale price plus a distribution charge (unless power was so scarce that the system was in an emergency status and running with reduced reserves). Another alternative to unlimited standby service could be standby service that is capped at a specific quantity. (A cooperative utility in Hawaii allows customers to specify the amount of standby service for which they are willing to pay. Under this tariff, the utility operates a circuit breaker (paid for by the customer) to ensure that the customer draws no more than the specified amount. *See* http://www.kiuc.coop/anne/IRP_public_site/Tariff/Rate_Rider%20S.pdf.) Both of these alternatives would involve lower costs for the utility – and presumably lower prices to the onsite generator – than unlimited standby service.

More generally, customers with onsite generation, like other customers, may have varying preferences for the reliability of their electric service. Many utilities offer lower prices to customers who will accept a lower level of reliability (known as "interruptible service"). The same range of reliability and price tradeoffs could apply to standby service.

[48] One form of alternative standby service involves the utility's supply of the additional power only if generation and transmission capacity are readily available. Some states require utilities to offer this type of contingent standby service, and to price it below the price of unlimited standby service. Contingent standby service is conceptually very similar to the "interruptible service" (referenced in note 47, *supra*) that is routinely offered to industrial and commercial customers at a rate lower than the rate for standard service. Under interruptible service, customers get a discount on all of their power in return for an agreement to waive their right to demand as much power as they want at the predetermined price.

[49] If the concern is limited to utilities' decisions to offer only one form of standby service, regulators may wish to evaluate the benefits and costs of requiring utilities to offer a choice among levels of standby service.

[50] So long as competition in the supply of standby service is feasible, maintaining such competition is a potentially attractive solution. If customers wanted (and were permitted) to buy standby capacity, presumably they could enter into arrangements under which other parties would build generators for this purpose, attach the new generators to the existing network (or a new network), and sell standby capacity under long-term contracts to willing buyers.

In light of the severity of the regulatory challenges, allowing entry and competition in the provision of standby service may well benefit customers more than attempts to regulate the price while blocking entry. If competition in the supply of standby service is not allowed, then a market power problem may be present that may be difficult to address with price regulation. Clearly the price has to be high enough for the seller to anticipate earning a normal rate of return. If there are economies of scale in the provision of standby capacity, however, marginal-cost pricing alone will not raise enough revenue. Moreover, a regulator that mandates standby service at a price that is set *ex ante* is forcing the utility to assume risks, which raises the to be amended to allow the currently prohibited entry of competing transmission facilities ("overbuilds").[52]

[52] If the concern is limited to utilities' decisions to offer only one form of standby service, regulators may wish to evaluate the benefits and costs of requiring utilities to offer a choice among levels of standby service.

[53] The challenge for regulators becomes complicated when a significant fraction of rates goes to pay costs that onsite generation does not affect. Onsite generation reduces fuel costs and variable operating and maintenance costs. Onsite generation can reduce fixed operating and maintenance costs by allowing facilities to be retired or by avoiding construction. When onsite generation avoids construction, it also avoids such facilities' fixed costs.

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[56] For a general discussion and framework for considering customization of demand response offers, *see* Electric Power Research Inst., *New Principles for Demand Response Planning* (Mar. 2002), EP-P6035/C3047,

temperatures.[57] Absent an ability to specify a maximum duration of refrigeration curtailment, however, the food store is unlikely to offer to postpone its cooling load.

A manufacturer with an energy-intensive batch process may be willing to offer demand response so long as it is given enough notice to complete safely the processing of the current batch or to postpone processing the next batch in an orderly manner.[58] Similarly, a manufacturer or retailer may be willing to consider bidding to supply demand response only if it is assured that there will be sufficient spacing between the instances when the system operator asks the firm to trim its consumption – spacing that may be necessary to meet the firm's existing obligations to supply its own customers or to maintain adequate inventories.

In the case of large commercial buildings, the magnitude of demand response offers may be contingent on the time of day when dispatch occurs, or on how early notice was provided of a pending dispatch of the building's offer to reduce power consumption.[59] During the early

[57] Not all load from refrigeration equipment is necessarily devoted to cooling of food. For example, display cases may also have heating elements that keep the doors from collecting condensation when the air is moist. Hence, demand response may involve no change in cooling of the food, but instead may involve turning off the anti-condensation heating elements for a period of time. The store might wish to avoid leaving condensation at higher levels for an extended period, but this would be less likely to raise health and safety concerns than decreasing refrigeration. Cal. Energy Comm'n, "Enhanced Automation Case Study 7: Lighting and Equipment Controls/Grocery Store" (2005), *available at* http://www.energy.ca.gov/enhancedautomation/case_studies/CS07_Albertsons_w2.pdf.

[58] Charles Goldman, Nicole Hopper, and Ranjit Bharvirkar (Lawrence Berkeley Nat'l Lab.) and Bernie Neenan and Peter Cappers (Utilipoint Int'l), "Estimating Demand Response Market Potential Among Large Commercial and Industrial Customers: A Scoping Study," Paper LBNL-61498, § 3.4.3 (Jan. 2007), *available at* http://www.energetics.com/electricity_forum_2007/pdfs/61498.pdf.

[59] Sila Kiliccote and Mary Ann Piette (Lawrence Berkeley Nat'l Lab.) and David Hansen (U.S. Dep't of Energy), "Advanced Controls and Communications for Demand Response and Energy Efficiency in Commercial Buildings" (Jan. 2006), paper for the *Second Carnegie Mellon Conference in Electric Power Systems: Monitoring, Sensing, Software and Its Valuation for the Changing Electric Power Industry*, *available at*

evening, residential demand rises for cooking, climate control, and lighting, while commercial flexibility also increases. Dispatch of demand response near the end of the business day could be larger and longer because occupancy of office buildings will be low at the time of the dispatch and natural cooling will help bring interior temperatures within acceptable limits before the next morning. Demand response by office buildings could be even larger and longer if the dispatch occurred just before a weekend. Early notice can facilitate larger dispatch at a subsequent time if the building is pre-cooled to the low end of the acceptable interior temperature range prior to the expected dispatch period, because pre-cooling reduces the need to air condition the building to stay within the acceptable zone during the dispatch period.

In general, the PA PUC, Conservation Service Providers, PJM Interconnection, and Midwest ISO may wish to consider a wide range of customized demand response specifications, so long as the benefits are likely to exceed the costs of administering the customized offers. The PA PUC also may wish to urge FERC, PJM Interconnection, and Midwest ISO to consider ways to ensure that wholesale markets can accommodate the range of innovative, customer-friendly varieties of demand response that Conservation Service Providers may develop.

IV. Conclusion

We commend the PA PUC for seeking to increase demand response and energy efficiency. Dynamic pricing and demand response programs can be powerful tools to empower customers to help manage peak and overall load. Good programs can empower customers to manage load shapes to enhance reliability, reduce peaking costs, and complement unpredictable, intermittent generators with a combination of flexible demand and flexible supply. Advanced metering that both provides energy consumption data to customers and allows dynamic pricing is

http://www.osti.gov/energycitations/servlets/purl/889248-7DjwKn/889248.PDF.

a key facilitating technology. This comment has recommended that the PA PUC: (1) encourage real-time or other dynamic pricing programs that increase economic efficiency; (2) urge utilities to design and market dynamic pricing programs that appeal to customers; (3) eliminate regulatory provisions that financially penalize power suppliers if they facilitate efficient dynamic pricing; (4) offer fair standby pricing policies for customers with onsite generation investments; and (5) advocate for demand response bid flexibility.