BEFORE
THE PUBLIC UTILITIES COMMISSION OF OHIO

In the Matter of the Commission's Review of Time-Differentiated and Dynamic Pricing Options for Retail Electric Services.	))))	Case No. 12-150-EL-COI

COMMENTS
BY
THE OFFICE OF THE OHIO CONSUMERS' COUNSEL

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I. INTRODUCTION

On January 11, 2012, the Public Utilities Commission of Ohio ("PUCO" or "Commission") opened an investigation into "the pricing options available to consumers for competitive retail electric service."[1] The PUCO sought comments regarding price offerings by both electric distribution utilities ("EDUs") and competitive retail electric service ("CRES") providers.[2]

The January Entry stated the Commission's general intent to examine three major issues. The Commission sought comments on alternative pricing options, information that would help customers compare and select between different retail pricing options, and the need to plan and implement programs to educate customers regarding pricing options.[3]

The January Entry also stated more specific questions related to pricing options for customers. The Commission noted that it is "not at this time seeking comments on

[1] Entry at 1, ¶(1) (January 11, 2012) ("January Entry").

[2] Id., ¶(2).

[3] Id. at 1-2, ¶¶(2), (3), and (5).

whether to expand the deployment of advanced metering infrastructure."[4] Also, consumer privacy and cyber security issues are the subject of other dockets opened by the Commission.[5]

In response to the issues raised in the January Entry, the Office of the Ohio Consumers' Counsel ("OCC"), on behalf of the residential customers of Ohio's EDU, submits these Comments. Separate sections deal with the general regulatory framework in Ohio under which pricing options are made available to electric customers, general policy matters, and responses to the Commission's more specific questions.

II. PRICING OPTIONS AND OHIO'S LEGAL FRAMEWORK

A. Regulation of EDU Standard Service Offers

The PUCO Entry seeks comments about the types of services and programs that should be offered by EDUs and CRES providers with respect to pricing options,[6] but the issues for these different types of service providers are different. The PUCO has jurisdiction over rate design for standard service offer ("SSO") rates. Even under SSO rates determined by means of a market rate offer ("MRO"), bid prices, "*as prescribed as retail rates by the commission*, shall be the electric distribution utility's standard service offer . . . ."[7] Time varying pricing, the subject of the Commission's January Entry, can be such retail rates as determined by the Commission. But CRES providers are not subject

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[4] Id. at 2, ¶(6).

[5] Id. at 4, ¶(8).

[6] Id. at 1, ¶(2) ("electric distribution utilities . . . and/or competitive retail electric service providers should offer pricing options for all consumers with advanced or interval meters").

[7] R.C. 4928.142(C) (emphasis added).

to the SSO provisions of R.C. 4928, and their rates for generation service are not regulated by the Commission.

Despite the regulatory authority to determine SSO rate design, some SSO rates approved in the post-S.B. 221 era *removed* elements that send customers price signals that reflect the burden placed by each on the electric generation system. For example, the Commission initially agreed with the OCC and other parties regarding the desirability of maintaining demand components in rates for large customers that were demand-metered in areas served by the FirstEnergy EDUs.[8] Those demand components were subsequently removed from rates, and remain absent from rates charged by the FirstEnergy EDUs during the current electric security plan ("ESP"). This change towards simpler rates that do not use information from more advanced meters occurred despite a Commission Order for the current ESP period that states the advantages of "[e]xpanding the availability of and enabling consumers to take full advantage of dynamic and time-differentiated pricing options [as] essential for efficient markets and meeting State policy objectives."[9]

Also, the FirstEnergy EDUs stopped collecting load data from their interval meters that were assigned to residential customers, and simplified their residential rate classifications as well as their rates.[10] This loss of rate components, ironically, has

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[8] *In re FirstEnergy's ESP I Case*, Case No. 08-935-EL-SSO, Order at 23 (December 19, 2008) ("[T]he Commission agrees that the issues raised by various intervenors regarding the inclusion of demand components in the generation rate design must be addressed. To that end, the Commission finds that FirstEnergy should work with Staff, and other stakeholders, to develop a means of transitioning FirstEnergy's generation rate schedules to a more appropriate rate structure which takes into consideration of [sic] time-varying generation costs of serving different customers . . . and, where adequate metering is available, provides customers with time-differentiated and dynamic pricing options.").

[9] *In re FirstEnergy's ESP II Case*, Case No. 10-388-EL-SSO, Order at 35 (August 25, 2010). State policy favors, among other matters, "[e]ncouraging innovation and market access for cost-effective supply- and demand-side retail electric service including . . . time-differentiated pricing and implementation of advanced metering infrastructure." R.C. 4928.02(D).

[10] *In re FirstEnergy's All-Electric Case*, Case No. 10-176-EL-ATA, Order at 10 (May 25, 2011).

blunted Ohio's efforts towards the more efficient use of electricity -- a major theme of S.B. 221 that was enacted in 2008.[11] Time-varying pricing offers, the subject of this docket, would help reverse the trend towards simple kilowatt-hour charges for customers' electric generation service.[12]

B. CRES Offers of Time Varying Prices

Some CRES providers may choose to offer the types of rate designs and services that the PUCO discusses, particularly once advanced metering infrastructure ("AMI") deployment makes available customer-specific data to the customer and his/her chosen supplier.[13] A more critical issue with respect to CRES providers is access to customer-specific data from advanced metering systems. Lacking data from interval meters, retailers must rely on generic class load profiles to predict the usage patterns of their customers, and there is no way to distinguish customers with favorable or unfavorable load shapes. Under conventional metering, there is no way for a retailer to offer rates that reward customers for improving their load shapes.[14]

AMI, where deployed, has the ability to provide actual load profiles for an individual customer that can be used to determine how that customer would be affected

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[11] See R.C. 4928.61, *et seq*.

[12] The OCC has pointed out the confusion between the cost of acquiring power and energy in an auction and the cost of serving a customer. See, e.g., *In re FirstEnergy's All-Electric Case*, Case No. 10-176-EL-ATA, Order at 10 (May 25, 2011).

[13] AMI deployment would include advanced metering installation that records customer energy usage on short increments of time.

[14] The National Energy Marketers Association provided comments to this effect before the DC Public Service Commission in Formal Case No. 1056, June 4, 2010, at http://www.dcpsc.org/edocket/docketsheets_pdf_FS.asp?caseno=FC1056&docketno=210&flag=D&show_result=Y.

by different rate design options. With access to these data through their retail customers,[15] CRES providers may find an advantage in offering dynamic and/or Time-Of-Use ("TOU") rate designs to customers with favorable load shapes as well as to customers with the motivation to improve their load shapes. [16]

To the extent that regulated EDUs begin offering dynamic or TOU rates, CRES providers may have the incentive to make similar rate offerings. Indeed, CRES providers are beginning to offer time-differentiated rate designs where AMI has been deployed.[17] For this process to work effectively in Ohio, it may be necessary for the PUCO to adopt a protocol for sharing AMI data with authorized third party providers of electricity that is simple and straightforward while protecting sensitive customer-specific data. Both Texas and California have adopted policies for distribution utilities to provide data to third party suppliers as authorized by customers, with implementation currently in progress.[18]

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[15] Customer-specific usage data collected by the EDU can be shared with a third party such as a CRES provider at the customer's discretion. R.C. 4928.10(G).

[16] The Stipulation filed in Duke's smart grid case refers to time differentiated pricing. *In re Duke Smart Grid Case*, Case No. 10-2326-GE-RDR, Stipulation, Paragraphs III a. and b. (February 24, 2012).

a. Duke Energy Ohio will conduct an educational workshop for all interested parties and specifically interested competitive retail electric service (CRES) providers wherein the Company will provide and share its insights and learning related to the Company's two years of experience offering time differentiated rates. The Company will continue to conduct workshops for CRES providers and interested parties twice a year during the course of SmartGrid deployment so long as there is interest in doing so. The first educational workshop shall take place at the Commission offices on or before November 1, 2012.

The Company will provide CRES providers the necessary billing system functionality to offer CRES customers time differentiated rates consistent with its existing supplier tariff beginning January 1, 2013. Duke Energy Ohio shall provide a quarterly update to the Collaborative on the status of implementing the necessary billing functionality.

[17] Examples include Texas (Direct Energy, TXU Energy, and Reliant) and Pennsylvania (Direct Energy).

[18] Smart Meter Texas is finalizing its processes for supporting authorized third parties. See http://www.puc.state.tx.us/industry/projects/electric/34610/34610.aspx. In July 2011, the California PUC adopted AMI data access, privacy, and security policies, including provisions for third party access. See http://www.emeter.com/smart-grid-watch/2011/california-puc-adopts-consumer-data-access-and-privacy-rules-for-smart-meters/. The PUCO opened a docket on the subject of the conditions under which data might be released to third parties. *In re Review of Consumer Privacy Protection*, Case No. 11-277-GE-UNC.

III. GENERAL POLICY

A. Customer Choice

In customer choice jurisdictions where generation has been divested, the direction in which Ohio seems headed, the EDU typically procures generation and transmission services to serve the load of its default customers who are not served by CRES providers. Potential suppliers for the EDU's default service likewise receive little or no information about the load shapes of the loads they hope to serve. The bids of potential default service suppliers, therefore, tend to include little or no temporal variation in prices, even where such variation is encouraged in the bidding process.

The deployment of AMI offers the potential to introduce temporal variation in prices for both CRES providers and bidders to supply default service such as Ohio's standard service offer ("SSO"). CRES providers could gain access to customer-specific load-shape data through their customers, potentially enabling them to offer attractive variable rate options to interested customers.

For potential suppliers of the utility's SSO, AMI could provide a treasure trove of new information about customer class and sub-class load shapes and how customers generally respond to prices and other stimuli. SSO solicitations could be conducted in a manner that enables potential suppliers to tailor their bids to reward customer response to price signals. Under this approach, an SSO supplier would have an incentive to offer rates that include variable price signals to consumers. The PUCO may want to inquire further into whether SSO bidders should be required to include temporal differentiation in their bids and reflect wholesale price variation consistent with PJM's Price Responsive Demand ("PRD") initiative, assuming that this initiative is approved by the Federal Energy Regulatory Commission ("FERC"). Assuming FERC approval, PJM's PRD initiative should provide further incentives for both CRES providers and potential SSO suppliers to offer variability in their prices.

In general, AMI and variable pricing can contribute to a more robust competitive retail electricity market in Ohio. The availability of hourly data on customer load shapes could revolutionize the types of pricing available as CRES providers and potential SSO suppliers seek to maximize value in the retail electricity marketplace.

B. Low-Income Programs

Low-income customers and other vulnerable customer groups should be considered in any design and implementation of variable rates for residential customers.[19] Vulnerable customer groups with special needs include senior citizens and the disabled. Dynamic pricing may work to the disadvantage of seniors and disadvantaged populations who are less able to respond to price signals than the residential population at large.[20] However, the matter should be studied, including review of evidence that low-income customers and seniors, for example, respond to price signals and have load profiles where variable pricing can provide benefits (addressed later in these Comments).

C. Disconnection for Non-Payment

While disconnection for non-payment relate more to the infrastructure associated with AMI than to pricing, they could have implications for larger policy questions related to pricing. Advanced meters typically include functionality to remotely connect and disconnect customers. The ability to disconnect a customer at the push of a button could easily be misused by utilities as a means of reducing uncollectibles and arrearages,

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[19] State policy includes "[p]rotect[ion of] a-risk populations." R.C. 4928.02(L).

[20] Alexander, Barbara R., "Dynamic Pricing? Not So Fast! A Residential Consumer Perspective," in *The Electricity Journal* (July 2010).

thereby placing low-income and other vulnerable populations at a disadvantage relative to present circumstances.[21]

Ohio's EDUs are subject to restrictions regarding disconnections of residential service for non-payment.[22] The maintenance and enforcement of such rules and related billing dispute protections should be maintained to prevent any increase in unjustified disconnections for non-payment.[23]

D. Implications of Dynamic/TOU Pricing for Emerging Markets

1. Plug-In Electric Vehicles

Dynamic pricing and TOU options have the potential to reduce battery charging costs and thus promote customer ownership of and benefits from plug-in electric vehicles ("PEVs"). The prerequisite to a customer's ability to save money on dynamic pricing and TOU options is the ability to primarily schedule charging during off-peak hours. This scheduling requires sufficient battery capacity and adequate charging speed to enable flexible scheduling of charging. For example, a PEV that is constantly on the verge of running out of energy must be charged frequently and at all times of the day; in contrast, a PEV that needs charging only once a day can be charged overnight. Another important feature is automatic scheduling of charging so that the owner can simply plug in the PEV at any time but have the charging done when energy prices are low. This feature is common in PEVs to date.[24]

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[21] AARP, et al, *The Need for Essential Consumer Protections: Smart Metering Proposals and the Move to Time-Based Pricing*, August 2010, p. 16, at http://www.nasuca.org/archive/White%20Paper-Final.pdf.

[22] Ohio Adm. Code 4901:1-18.

[23] See "Encouraging State Legislatures and State Public Utility Commissions to Institute Programs to Reduce the Incidence of Disconnection of Residential Gas and Electric Service Based on Nonpayment," National Association of State Utility Consumer Advocates ("NASUCA") Resolution 2011-1.

[24] http://www.nissanusa.com/digital-brochures/brochures/nissan.leaf.2012.enus/index.html

Given that PEV owners have flexibility and convenience in timing and managing charging, they can save money on dynamic or TOU prices. The amount of potential savings is highly dependent on the available rate options. For typical critical peak pricing ("CPP") or peak time rebate ("PTR") programs in the U.S. today, the potential savings is very small because those programs are generally in effect less than 100 hours per year. TOU programs generally offer higher savings because they are in effect year-round, with PEV charging costs on TOU prices as little as 20 percent of such costs on flat rates.[25] Hourly pricing may offer the greatest potential savings because a PEV could be programmed to charge automatically when day-ahead prices are the lowest. However, this result depends upon the specific rate design.

2. Smart Appliances

Smart appliances are those that can be programmed locally (at the appliance) or remotely (via communications) to control the timing of operation. Customer benefits from smart appliances are greatest only when the customer has dynamic or TOU pricing and can realize savings from time-shifting electricity use. Because dynamic or TOU pricing results in the greatest financial benefit to energy customers, such pricing also promotes market adoption of smart appliances.

The first potential benefit of such appliances is achieved through reducing the total use of electricity. One estimate, for smart thermostats in combination with home sensors, is for 28 percent savings.[26] This benefit is independent of whether the customer's pricing plan is a flat or dynamic tariff.

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[25] http://www.ev-review.com/nev7-13-11-1.htm

[26] Jiakang Lu *et al.*, "The Smart Thermostat: Using Occupancy Sensors to Save Energy in Homes," Proceedings of the 8th ACM Conference on Embedded Networked Sensor Systems, 2010.

The second potential benefit is shifting load from peak to off-peak times and realizing savings on a dynamic or TOU price plan. Achieving these savings has the same prerequisites as those for PEVs: the loads must be capable of being shifted from a customer needs standpoint as well as from a technology standpoint. Examples of loads that can be shifted are HVAC, refrigeration, laundry, water heaters, and variable activities such as cooking and home or building maintenance. HVAC systems can pre-cool or pre-heat buildings to lessen usage during the peak hours. Refrigerators can be controlled so as to allow temperatures to rise by two or three degrees during peak times, then return to normal temperature; also, defrosting and ice-making can be limited to off-peak times. Washers, dryers, and dishwashers can be loaded then set for later operation off-peak. Electric water heaters can be easily controlled with timers.

Thermostats and electric water heaters are two of the few appliances that are easy to automate. Thermostats are relatively inexpensive and relatively easy to install. One smart thermostat is available from a major retailer for under $100 and can be installed by many homeowners.[27] Timers for water heaters are inexpensive, though installation is not as simple.

Most other appliances require changes to internal controls in order to make them "smart." Examples include dishwashers, washing machines, dryers, and refrigerators. Even for relatively significant operating savings, it is generally not cost-effective to replace such appliances with smarter versions before their natural end of life. However, because the cost difference between a smart and a "dumb" appliance can be small,

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[27] http://www.greentechmedia.com/articles/read/cheap-wifi-thermostats-arrive-at-home-depot/

consumers have a strong incentive to select the smart appliance where they can achieve savings from dynamic or TOU pricing.

3. Solar Photovoltaics

Dynamic or TOU prices generally promote photovoltaic installation because photovoltaic production tends to be greatest during the peak hours.[28] Accordingly, if solar power is reimbursed at higher rates during the peak hours, the system is generally more cost-effective. The amount of benefit to the customer also depends upon the solar production compared to the premise consumption. For example, if consumption is higher than production during the peak hours, then customers may actually see less benefit on TOU prices than on flat prices – and higher overall bills.[29]

E. Data Potentially Available to Allow CRES Providers to Offer Additional Pricing Options

For customers with AMI meters, interval data is potentially available to CRES providers to offer dynamic and TOU pricing. At the most basic level, the data enables billing on dynamic and TOU pricing by recording usage by time of consumption. The data also enables CRES providers to realize savings in the wholesale markets since they only have to pay for the actual consumption profile of their customers, not the class average. These savings can then be passed on to consumers, providing the motivation for switching to such prices in the first place.

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[28] The availability of dynamic or TOU prices could support the State alternative energy standard that contains a specific solar electricity REC procurement requirement. R.C. 4928.64(B).

[29] Jacqueline Zee, "Fixing an Unintended Flaw: Mandatory Time-of-Use Rates Hindering the California Solar Initiative," McGeorge Law Review, Vol. 39, 2008.

A potentially practical way for EDUs to make available customer-specific data to CRES providers is to provide the data via the Green Button standard described later in these Comments.

IV. COMMENTS ON SPECIFIC PUCO ISSUES

The more specific issues identified in the PUCO January Entry are summarized as follows:

A. What pricing options should be offered to consumers with AMI meters?

B. Should EDUs offer two-part dynamic pricing to consumers with AMI meters?

C. Are there specific dynamic pricing or TOU forms that should be offered to consumers with AMI meters?

D. Should the Commission support field tests by EDUs and/or CRES providers of dynamic pricing or TOU, information feedback, or enabling technology?

E. What barriers are there to competitive retailers offering dynamic pricing to consumers with AMI meters?

F. How should consumers be educated about dynamic pricing or TOU?

G. Should there be a standardized approach to help consumers compare retail pricing options, such as an online bill-to-compare calculator, and how should consumers be informed of such options?

Each issue is commented upon in turn below.

A. Pricing Options

Residential customers should be provided the option of being subject to dynamic/ TOU pricing or conventional pricing. U.S. national policy, as adopted in the Energy Policy Act of 2005, calls for offering "time-based" rates to customers "upon customer request."[30] In implementing the Smart Grid Investment Grants contained in the American Resource and Recovery Act of 2009, the Department of Energy specified that any project receiving funding for AMI must also include a dynamic pricing option.[31] Various states are supporting or requiring utilities that deploy AMI to also include dynamic or TOU pricing options in their deployment programs. These include California, Delaware, Maryland, Nevada, Idaho, Illinois, and Pennsylvania.[32]

1. Default Dynamic Pricing

Implementing variable pricing is not an up-or-down decision. It is inevitably a long process with numerous decision points along the way. Choosing appropriate pricing methods requires a balance of theoretical and practical considerations, both by decision-makers and all the stakeholders involved, and the outcomes will likely be shaped by real-world experience along the way.

Whatever rate designs might be made available to customers, an important decision for regulators to make is the selection of the default pricing method. The chosen default pricing regime will likely vary among customer classes or sub-classes, or even by size of customer load, and the choice could be altered over time. The default pricing method is the one to which each standard service offer (SSO) customer will be assigned initially, so it will serve as a reference point against which to compare other pricing options available from the incumbent EDU as well as pricing options available from

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[30] Energy Policy Act of 2005 amendment to the Public Utilities Regulatory Policies Act Section 111(d)(14).

[31] DE-FOA-0000058 amendment to special instructions for funding applications, Part IV, paragraph 4, page 22.

[32] See, e.g., California PUC Decisions 09-03-026 and 11-07-056; Delaware PSC Order No. 8094; Idaho PUC Order No. 32466; PUC Nevada Decision on July 30, 2010 in combined docket 10-02009, 10-03022, and 10-03023; Maryland PSC Order No. 83531 in Case No. 9208; Pennsylvania Act 129; and Illinois HB 3036.

CRES providers.[33] And because customer choices can be "sticky" (i.e. resources must be expended to change existing positions), the vast majority will likely be served under this rate (at least initially).

The choice of default price may be seen as politically risky by regulators and utilities. Any change from the status quo could pose a significant downside risk for poor decisions or outcomes and limited upside opportunity in the form of increased consumer satisfaction or utility profits. Accordingly, the starting point for any rate selection is usually the current design, and most commissions approach the pricing question as an examination not of the best rate design, but of the best next step in an incremental process of continual improvement. Variable pricing programs for residential customers are generally on an opt-in basis, with the exception of Ontario's TOU pricing and peak time rebates being deployed in Maryland and California.

In this environment, the regulator's selection of the default pricing method involves a tradeoff of effectiveness versus practicality. The most effective pricing methods for influencing customer behavior are unlikely to have the most initial customer appeal because they require the customer to take some risk in order to have the opportunity to achieve larger benefits. However, a decision to adopt a low-risk pricing method could mean foregoing greater benefits for consumers.

Peak-time rebate (PTR) has appeal as a default dynamic price for several reasons:

- There is no risk of higher bills for the customer;
- There is no need to worry about "winners" and "losers," since there are no "losers" under PTR;

[33] In most dynamic pricing regimes, the default pricing method is not mandatory, in that a customer has the ability to opt for a different pricing method, perhaps including the option to remain on traditional flat rates. Furthermore, under Ohio's retail choice policy, a customer has the option to leave the EDU's SSO for an unregulated rate offered by a CRES provider.

- The customer remains on its existing tariff;
- PTR has demonstrated positive customer response to peak events; and
- Educating customers about the opportunity to save under PTR is simple and straightforward.

Yet, choosing PTR as the default pricing method arguably would produce far fewer benefits to consumers than price-based methods such as CPP, real time pricing ("RTP"), and TOU. Rebates, despite their immediate consumer appeal, have been demonstrated to be less effective than price signals as a means toward inducing customer behavior.[34]

Critical peak pricing is often advocated as a default pricing method, at least for residential and small commercial customers, and has been adopted by the California PUC as the default for all commercial customers.[35] Real-time pricing, in comparison to CPP, is perceived as a "tough sell" to all but the most sophisticated customers, as most customers prefer not to worry about hourly changes in electricity prices. CPP is widely accepted as a means of inducing a significant customer response to prices during declared peak events. Indeed, a temporary five-fold increase in rates is capable of getting the attention of many customers. As such, CPP is an effective approach to reflecting grid conditions in customers' rates in near real time, at least for roughly 100 hours each year. Unless it is overlaid with a TOU rate, however, CPP does not induce customers to curtail or shift their peak usage except during particular days when peak load events are declared.

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[34] In the PowerCentsDC pilot, for example, customers on the PTR rate curtailed summer peak loads by 13 percent, compared to 33 percent for customers on the CPP rate – i.e. 61 percent less.

[35] http://docs.cpuc.ca.gov/PUBLISHED/NEWS_RELEASE/114096.htm

In comparison to CPP, TOU pricing offers the advantage of a pre-arranged schedule for when peak and off-peak prices are in effect.[36] Customers always know in advance which periods they may wish to avoid high usage, and they can schedule certain activities when prices are known to be low. In this way, TOU pricing may be an easier adjustment for consumers than dynamic rates like CPP and RTP.[37] However, TOU lacks the ability to respond to real-time grid conditions, thus limiting its value to grid operators. An overlay of TOU with CPP can offer the advantages of both pricing methods, at the risk of seeming more complicated for consumers.

Uncertainty about the bill impacts for individual consumers is something of a stumbling block for CPP, RTP, and TOU. Each has the potential to increase customer bills, especially those whose loads are "peakier" than average. If one assumes no customer response to variable pricing, then roughly half of customers would be "instant winners," and the other half would be "instant losers." While customer response to variable pricing can dramatically increase the number of winners, "losers" are unlikely to be eliminated entirely.[38] Presumably, however, customers adversely affected by *default* variable pricing would have the ability to opt out or switch to a CRES provider offering a more favorable rate scheme.[39]

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[36] Strictly speaking, TOU does not require deployment of advanced metering infrastructure, as long as meters have multiple registers to accommodate different rates at different times.

[37] TOU may be well suited for charging of plug-in electric vehicles as well as encouraging solar PV generation, since rate differentials are in place every day.

[38] See Faruqui, Ahmad, "The Power of Dynamic Pricing," in *The Electricity Journal*, April 2009 at 52-53.

[39] Over time, customers who decline to be served under any variable pricing mechanism may have to pay higher rates as a result. Assuming such customers' loads are peakier than average, suppliers will find them more expensive to serve. With data available on individual customers' load shapes, suppliers may be more motivated to reflect such differences in their rate offerings.

2. Staged Implementation

Without AMI, it is difficult to predict which customers would be winners or losers under variable pricing methods (not including PTR, which by definition has no losers). Absent AMI, a given customer's load shape can only be surmised from the characteristics of the home and its occupants. This creates a conundrum for EDUs and regulators contemplating alternative default pricing options. It is difficult to convince customers about the benefits of variable pricing with great uncertainty about bill impacts.

To help the customer make an affirmative decision on the "least cost" rate, the new rate option could be offered with a one year "hold harmless" provision accompanied with education on the actions the customer might undertake to enjoy additional savings. Once a year's worth of customer-specific data becomes available, the EDU could provide the customer with an assessment of his/her bill impacts under CPP, TOU, RTP, etc. reflecting actual load profile and differing assumptions about customer response to price signals.

The Commission rules currently require electric utilities to have an approved tariff on file for any demand, load, or time differentiated rate programs offered to certain residential customers.[40] When a customer qualifies under more than one rate schedule, utilities should inform the customer, upon the customer's request, about the most appropriate rate schedule that would apply to the customer's circumstances.[41] This requirement should be made widely known to customers as part of implementation plans.

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[40] Ohio Adm. Code 4901:1-09-03.

[41] See, e.g., Tariffs of The Cleveland Electric Illuminating Company, Original Sheet 4, Page 4 of 24, Paragraph V(A) ("When two or more alternative rate schedules are applicable to the same class of service, the Company, upon request, will assist a customer in selecting an appropriate rate schedule to be applied."). See generally cases related to a complaint filed by White Plastics Company, Inc. *In re Complaint of White Plastics Company*, Case No. 83-650-EL-CSS, Order at 11 (September 25, 1984) ("when a customer who is

California requires that utilities provide a bill comparison tool.[42] Figure 1 shows the results for a sample, actual Pacific Gas & Electric customer. Presumably, 50 percent or more of customers could be told that they should save under variable pricing, as long they maintain or improve their past electricity use patterns. Presumably, CRES providers could provide the same type of information, provided they are given permission to access an individual customer's data.

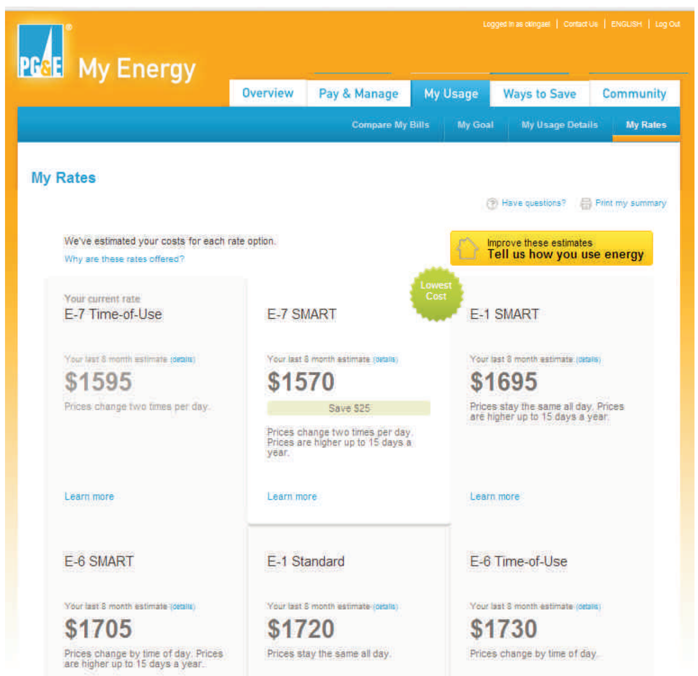

Figure 1: Output from PG&E rate comparison tool for actual customer.[43]

Compared to PTR, implementation of some type variable pricing as a default method is likely to require a multiple steps over a period of time. Lawrence Berkeley

eligible for more than one rate makes an inquiry about its electric bills, C&SOE has a duty to tell that customer about the existence of the alternate rate and the circumstances under which that alternate rate might become more favorable to the customer").

[42] http://docs.cpuc.ca.gov/pwestublished/FINAL_DECISION/140369.htm

[43] http://www.pge.com.

National Laboratory ("LBNL") advisors on the subject of implementing CPP and other types of variable pricing ask questions like:

- How do we transition customers from existing flat and tiered rates to a dynamic rate?
- How do we educate customers regarding both the opportunities and risks?
- Will technologies be available so customers can automate their response?
- What can we do to identify and mitigate potential adverse bill impacts before they create problems?

LBNL consultant Roger Levy lays out a step-by-step process designed to ease the transition to dynamic pricing, including customer education, shadow bills with transitional PTR, and bill protection mechanisms.[44] These and other questions regarding deployment of dynamic pricing were explored in depth at a May 2011 meeting of the Mid-Atlantic Distributed Resources Initiative ("MADRI") (where the PUCO is a member).[45]

California's residential CPP programs include "bill protection." This allows customers to enroll in CPP for the first year and experience how it works and the results, but get a refund of any higher total annual bill amount at the end of the year.

Regardless of the strategy, customer communications are a key element of the transition. Each of the avenues of customer contact should be examined as to its ability to support notifying customers of available rate options and educating them regarding the implications of choosing such options. In PowerCentsDC, the following were used:

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[44] See Levy, Roger, "Building Smarter Customers," Smart Grid Technical Assistance Project, Lawrence Berkeley National Laboratory, at http://sites.energetics.com/madri/meetings_2011.html.

[45] See King, Chris, "Experience with Dynamic Pricing Deployment," eMeter Strategic Consulting at http://sites.energetics.com/madri/meetings_2011.html.

letters, brochures, in-person group meetings, websites, email subscriptions of energy usage data and bill-to-date, door hangers following meter installation, and bill inserts.[46]

In Arizona, over a third of residential customers are on voluntary opt-in time-of-use rates at Salt River Project and Arizona Public Service, the state's two largest utilities. Much of this success has been achieved by introducing new customers to pricing options when they call to establish service at a new premise. During these calls, the utility representatives explain the pricing options available and help customers decide which option is most attractive. Despite its substantial cost, the two Arizona utilities have found the approach to be cost-effective. The specific circumstances in Ohio need to be examined. In particular, only consumers with AMI meters could be offered variable pricing, requiring call center representatives to know, by address, whether an advanced meter has been activated.

3. Pilots

Pilots or field tests of variable pricing methods may be a useful approach in certain circumstances. Dynamic pricing applications have been widely studied through pilot programs operated in virtually every part of the country (Ohio included) and all over the world. Based on a survey of two dozen pilot programs testing 109 dynamic pricing applications, The Brattle Group's Ahmad Faruqui concludes that the results are broadly consistent and predictable.[47]

So much is known about how customers respond to price signals that it is not necessary for every utility to run its own pilot to test customer price response before

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[46] *PowerCentsDC Program Final Report*, Sept. 2010, reported at: http://www.powercentsdc.org/

[47] Faruqui, Ahmad, Ph. D., "Dynamic Pricing & the Fine Art of Hesitation," Harvard Energy Policy Group, September 23, 2011.

deciding how to proceed. Yet there may be good reason to field test different kinds of delivery mechanisms, enabling technologies, bill protection mechanisms, and customer education/engagement strategies as a company goes forward with variable pricing. This is particularly true if little or no experience with such methods exists. Such experimentation is consistent with the "transition plan" approach for implementing dynamic rates recommended by LBNL.

4. Implementation Options for Dynamic and TOU Pricing

a. Metering and Communications

In general, AMI systems are capable of recording interval data hourly or more frequently. This makes it possible to implement CPP, PTR, hourly pricing, or TOU pricing of various types. This would include two-part dynamic prices. For dynamic pricing – CPP, PTR, hourly – the utility also requires a system to send notifications to customers, generally via automated phone calls, emails, or text messages. Utilities generally do not have such notification systems. For hourly pricing, utilities also need to be able to retrieve market prices and post them on a website for viewing by program participants.

Enabling technologies enhance customer response to dynamic or TOU prices. The AMI systems in use by Ohio's utilities can generally be used to send control signals through AMI meters to devices for automated response. However, doing so requires that the proper back-office software be in place, and that the firmware in the AMI meters be of the proper version. Another option is using broadband or other communications, the approach used in PowerCentsDC and other pilots. Doing so requires the proper back-office software and interfaces to these communications networks. Additional investigation is needed to determine whether and how specific enabling technology can be supported by Ohio's EDUs.

b. Billing

Most electric utilities have two billing systems, one for a small number of large commercial and industrial customers, and another for the mass market of small commercial and residential customers. The former typically supports less than 0.5 percent of a utility's total customer base, with the latter supporting the remainder. The former typically support multiple pricing options, including different forms of dynamic or TOU pricing. The latter typically do not.

Utilities wishing to implement dynamic or TOU pricing for mass market customers generally have two options. The first is to upgrade, replace, or modify the current mass market billing system. The second is to acquire a software application that can calculate the billing determinants for dynamic or TOU pricing customers, then pass those to the utility's existing mass market billing system. This second approach has been used in many dynamic or TOU pricing pilot programs, including the PowerCentsDC program.[48] The second also is the approach being used in the first large-scale dynamic pricing program, SDG&E's PTR program going into effect in summer 2012.[49] In contrast, the first approach has been used for large scale residential TOU programs, including those at Toronto Hydro, Arizona Public Service, and Salt River Project.

[48] Final report at http://www.powercentsdc.org.

[49] SDG&E, Personal communication to Chris King, March 13, 2012.

The Commission should consider additional information about the specific capabilities of Ohio's EDUs in order to determine which rate designs are compatible with their billing systems.

c. Prepayment Service

The PUCO Entry refers to "pre-paid" options associated with variable rates.[50] Prepayment is a policy option that could be enhanced by the deployment of AMI technology. Prepayment may provide value to certain customers and harm others, irrespective of the PUCO's policies toward dynamic or TOU pricing. Although the availability of prepayment has no direct bearing on time varying pricing, a few comments are offered on this topic.

Few U.S. jurisdictions offer prepayment service, though such service is common internationally. As of 2009, approximately 10 million households received prepaid electric service in nearly 40 countries.[51] Countries with high levels of prepaid electric service include South Africa, New Zealand, and the United Kingdom.

There are significant differences in the rate of disconnections in different jurisdictions. For example, in the U.K., 2,800 customers were disconnected for non-payment in 2010,[52] compared to 586,000 for California's investor owned utilities in the same year.[53] This is a disconnection rate of 0.004 percent in the U.K., versus 4.7 percent for California. In addition, in California, the disconnection rate for low-income customers was higher, at 5.5 percent. However, additional analysis is needed to

[50] January Entry at ¶(2).

[51] R.W. Beck, "Prepaid Electric Service," March 2009.

[52] Ofgem, "Domestic suppliers' social obligations: 2010 annual report," Report 78/11, June 15, 2011.

[53] Division of Ratepayer Advocates, "Status of Energy Utility Service Disconnections in California," March 2011.

understand the various factors at play and the role prepayment service has in the disparities between disconnection rates in different jurisdictions.

B. Two-Part Dynamic Pricing

In two-part dynamic pricing, a portion of the usage is charged at non-time-varying prices, while the remainder is charged at time-varying prices. The one example of such a pricing system of which the OCC is aware is in use by Georgia Power Company. That Company provides a two-part real-time pricing program, an option available to customers with peak demands above 500 kW. This option appears to be highly popular for customers in the specified class (with approximately 80 percent of eligible customers participating), and has been in place for approximately 20 years.[54]

Importantly, marketing of Georgia Power Company's two-part dynamic pricing program consists of in-person visits by account executives to the large commercial and industrial customers that are eligible for the tariff. The account executives explain all of the program details and processes to potential participants and obtain signed contracts if the customer decides to participate. The customers have a good understanding of the prices and program features. No known implementations of two-part dynamic pricing have occurred with residential consumers, and the marketing features in Georgia Power Company's tariff program are impractical for such customers.

C. Specific Dynamic and TOU Pricing Forms

1. Experiences with Pricing Forms

Over 100 experiments have tested a wide range of time-based pricing options: time-of-use, critical peak pricing/peak day pricing, peak time rebates, and hourly

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[54] Steven Braithwait and Ahmad Faruqui, "The Choice Not to Buy: Energy Savings and Policy Alternatives for Demand Response," Public Utilities Fortnightly, March 15, 2001.

pricing.[55] There are fewer, though significant, cases of such programs being made widely available to residential customers. TOU pricing is widely available on an opt-in basis to residential consumers with AMI meters in Arizona, California, Georgia, Pennsylvania, and Texas.[56] Residential TOU pricing is widely available on an opt-out basis in Australia (Victoria), Canada (Ontario), and Italy. Critical peak pricing is widely available in California and France.[57] Residential hourly pricing is widely available in Illinois.[58]

Customers in pilot programs routinely express satisfaction with well designed dynamic or TOU pricing programs, such as in the PowerCentsDC program.[59] In a recent national survey, 73 percent of Americans stated a willingness to participate in TOU programs.[60] For opt-in programs, those at Arizona Public Service and Salt River Project (in Phoenix) illustrate likely saturation rates. Both programs have been in place for over three decades and have achieved similar participation rates of approximately 35 percent each.[61]

2. Policy Implications for Stakeholder Groups

a. Residential Customers

Above all, the impact of dynamic pricing on a residential customer will depend on that customer's individual load profile. It would also be affected by the ability and willingness of the customer to curtail or shift load during peak periods. For many

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[55] Ahmad Faruqui and Jenny Palmer, *Op. cit.*

[56] Specific companies include Arizona Public Service, Salt River Project, Pacific Gas & Electric, Georgia Power, TXU Energy, Reliant, and Direct Energy.

[57] Electricite de France's Tempo price plan.

[58] Illinois SB 1705, 2006.

[59] Final report at http://www.powercentsdc.org.

[60] Zpryme, "The New Energy Consumer," May 2011.

[61] Arizona Public Service Co., personal communication, September 21, 2007.

customers, dynamic and TOU pricing provide an opportunity for significant savings both by reducing peak usage and by reducing consumption generally.

Any residential customer will have an opportunity to reduce her/his bill under dynamic or TOU pricing by reducing usage during peak periods when prices are high (or when peak time rebates are available). Responding to price signals requires some awareness on the part of the customer of when prices are high and what opportunities they have to reduce usage. It is important to recognize that a customer with a favorable load profile (i.e. less "peaky" than average) could benefit from dynamic or TOU pricing without responding to price signals at all. Customer response to price signals can be enhanced through enabling technologies such as smart thermostats, in-home displays that can automate or simplify customer action.

Implementation of dynamic or TOU prices can impact customers in two different ways. The first is the distribution based on revenue neutral rate designs and the assumption of no response by customers. Such designs are calculated so that a customer, on average, will pay the same bill on the dynamic or TOU price as on the otherwise applicable rate (in Ohio, the SSO). As Figure 2 shows, such prices result in a distribution around an average savings of zero, with half of participating customers saving money and half paying higher bills – assuming participation is random across the population. Figure 2 is a typical distribution, but the exact distribution would depend, of course, on the details of the dynamic or TOU pricing adopted.

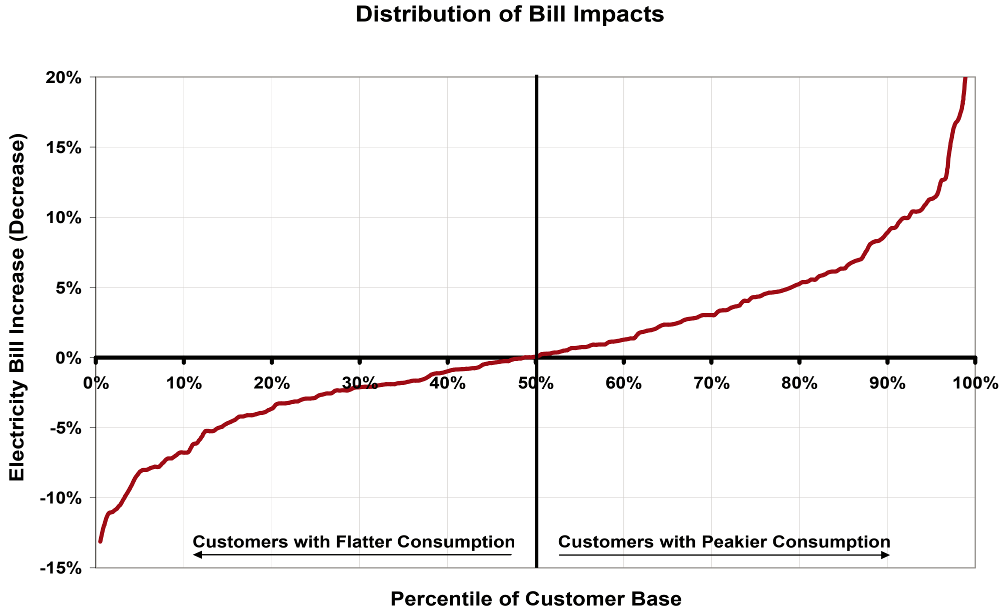

Figure 2: Distribution of savings and higher bills on switch to a dynamic or TOU pricing program with no load shifting; customers above the line are paying more.[62]

A second level of impact occurs when customers shift or reduce load in response to variable prices, and the results can be quite dramatic. Whereas 50 percent of customers save without any change in usage, over 90 percent may save in a well-designed program once changes in usage are taken into account. Figure 3 shows the savings for customers on CPP and PTR rates in the PowerCentsDC program, where 91 percent of participants saved after shifting load.

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[62] The Brattle Group, *Quantifying the Benefits of Dynamic Pricing,* E-Forum of the New Mexico State University, April 17, 2008.

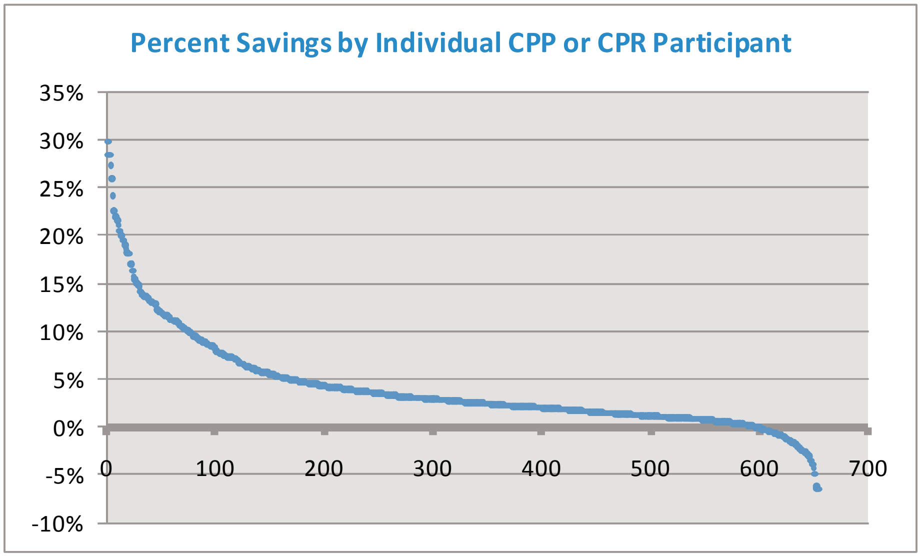

Figure3: Distribution of CPP and CPR (PTR) participant bill savings on smart prices as a result of peak load reduction. Each dot represents an individual participant's net loss or savings. Those above the line paid less. The X axis is the customer number, from 1 to about 650.[63]

Variable pricing is likely to accelerate customer interest in new technologies such a smart appliances, behind-the-meter generation such as solar photovoltaics ("PV"), and PEVs. Each of these technologies is equipped to take advantage of TOU and dynamic pricing options.

Of course there is a variety of variable pricing methods. Each will affect residential customers in different ways, and each offers advantages and disadvantages:[64]

> *Time-of-use (TOU) pricing* involves charging customers variable rates according to a pre-arranged schedule, usually involving two or more tiered rates by time of day (some utilities offer seasonal differentials). TOU rates are not considered "dynamic" in that they do not have the ability to change as grid conditions might warrant. However, TOU rates can be overlaid upon a truly dynamic rate structure such as critical peak pricing. TOU offer the

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[63] *PowerCentsDC Program Final Report*, Sept. 2010, at http://www.powercentsdc.org/.

[64] A useful summary of the attributes of different variable pricing methods is found in Flaim, Theresa, "Dynamic Pricing in a Smart Grid World," Smart Grid Technical Assistance Project, Lawrence Berkeley National Laboratory, at http://sites.energetics.com/madri/meetings_2011.html.

advantage of certainty to the customer, but is disadvantaged by its inability to respond to real-time grid conditions.

Real-time pricing (RTP) or *hourly pricing (HP)* involves a continuously variable rate that reflects the cost of power in wholesale electricity markets at any given time, arguably the "truest" form of dynamic pricing. The volatile nature of RTP tends to limit its acceptance to residential and small commercial customers. For customers who are willing to accept this volatility risk, however, RTP may offer the greatest value over a long-term period, since suppliers need not charge a hedge premium to cover the cost of providing stable rates. RTP may be advantageous for certain niche applications such as solar PV generation and electric vehicle charging.

Critical peak pricing (CPP) is a tiered rate design driven by real-time grid conditions and costs. When the grid is stressed and wholesale prices are high, a "peak period" event is declared which causes the customer's rate to increase sharply, perhaps five-fold. Peak events are typically limited to 60-100 hours per year and a prearranged time period, e.g., 2:00 – 6:00 pm. In exchange for these very high peak period rates, customers are typically given a reduced rate for all other hours of the year as an offset. Thus, a customer with an average load profile who does not respond to CPP prices may see no change in his/her annual cost of electricity, while a customer who responds to peak prices should pay less. A disadvantage if CPP is that it does not induce customer response outside of peak events (i.e., approximately 8700 hours per year). Some providers have addressed this concern by overlaying a TOU rate on top of a CPP rate.

Peak time rebate (PTR) or *Critical peak rebate (CPR)* involves no change in rates but rather uses a promised rebate to incent customer response during the "peak period." Customers remain on their exiting rate (either flat or TOU) and respond only if they choose to seek a rebate. Unlike CPP and RTP, the customer has no risk of a higher bill. However, customer savings is generally less that with CPP, as is customer response to peak events. Awarding rebates requires calculation of an individual "customer baseline" which can be problematic in some cases. Also, a retailer must find a source of funds for the rebates, which may require availability of compensation from electricity markets. Lacking a true price signal, PTR's impact on customer response is minimal. On the other hand, PTR has the advantage of being "all carrot and no stick" which makes it initially appealing to consumers. PTR is sometimes suggested as a transitional step to a more potent pricing method such as CPP.

Two-part dynamic pricing is a variation on the above pricing methods whereby a customer purchases capacity in advance to serve as a hedging or insurance component as suggested in the PUCO Entry at (6)(b). A customer on PTR, CPP or RTP would choose how much capacity to reserve in advance for serving its load, thereby setting a baseline against which customer response is measured. For PTR this approach avoids the baseline calculation problem since the customer has already purchased its own baseline. When combined with a dynamic price (such as CPP or RTP), this capacity subscription would form a two-part dynamic rate with the baseline portion fully hedged. Two-part dynamic pricing may have intuitive appeal to rate design experts, but the willingness of consumers to subscribe to fixed capacity in advance is unknown.

The prospect of TOU and dynamic pricing implementation has raised a number of concerns for residential customers.[65] Of particular concern is the possibility that pricing implementation would be mandatory rather than providing residential customers options by means of voluntary programs. Other concerns include the impact of dynamic pricing on low-income consumers and other vulnerable customer groups, privacy and cyber-security issues, and consumer education.[66]

b. Low-Income Customers

Low-income customers and other vulnerable customer groups may require particular attention in the design of variable rates for residential customers. Customer groups with special needs include senior citizens and the disabled. The Commission should be careful to consider sub-groups of customers that may be particularly vulnerable

[65] See, e.g., "Smart Grid Principles of the Association of State Utility Consumer Advocates," NASUCA Resolution 2009-03, Principle 11 (June 30, 2009) ("the implementation of Smart Grid should not lead to mandatory dynamic pricing of electricity usage for residential and small commercial customers").

[66] AARP, et al, *The Need for Essential Consumer Protections: Smart Metering Proposals and the Move to Time-Based Pricing*, August 2010, at http://www.nasuca.org/archive/White%20Paper-Final.pdf.

under dynamic pricing (e.g. less able to respond to price signals than the residential population at large).[67] There is evidence that low-income customers and seniors, for example, respond to price signals in largely the same way as residential customers generally. Program design options can be used to make dynamic pricing more accessible to special populations of customers.

In the District of Columbia, the PowerCentsDC pilot included a large sub-sample of low-income customers among participants. Low-income participants reduced peak loads by 11 percent, only slightly less than the 13-percent response for all participants in the peak-time rebate program.[68] The DC pilot results were typical, according to a survey of pilot results by the Institute for Electric Efficiency,[69] with some pilots programs producing greater responses than DC's and others lower.

Some research shows that low-income customers generally tend to have more favorable load profiles than residential customers generally.[70] Higher income customers with larger homes tend to consume more electricity, particularly during system peak conditions when air conditioning loads are dominant (see Figure 4). Low-income customers, in comparison, tend to have less "peaky" load shapes. Thus, a low-income customer is more likely than the average customer to benefit from dynamic pricing, even before responding to price signals. Figure 5 shows this for CPP and Figure 6 for PTR. Arguably, AMI and dynamic pricing provide an opportunity to overcome an implicit

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[67] See Alexander, Barbara R., "Dynamic Pricing? Not So Fast! A Residential Consumer Perspective," in *The Electricity Journal*, July 2010

[68] *PowerCentsDC Program Final Report*, Sept. 2010, at http://www.powercentsdc.org/.

[69] Faruqui, Ahmad, Sanem Sergici, and Jennifer Palmer, *The Impact of Dynamic Pricing on Low Income Customers*, Institute for Electric Efficiency, September 2010.

[70] Faruqui, *op. cit*.

subsidy of larger, higher income homes by lower income customers under traditional flat rates. The extent to which this is true for Ohio's utilities requires further examination.

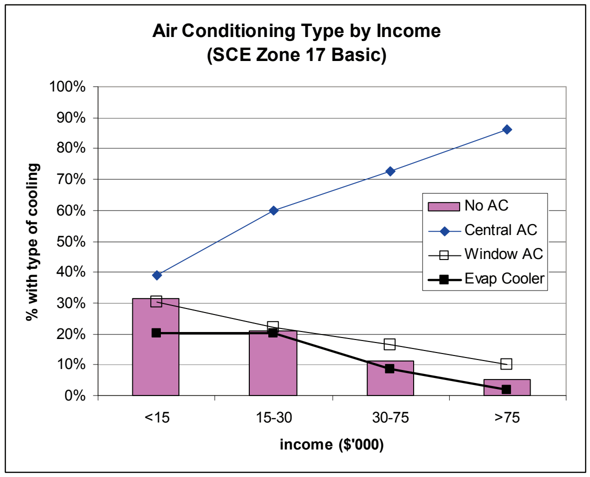

Figure 4: Distribution of air conditioning type by income level for Southern California Edison customers.[71]

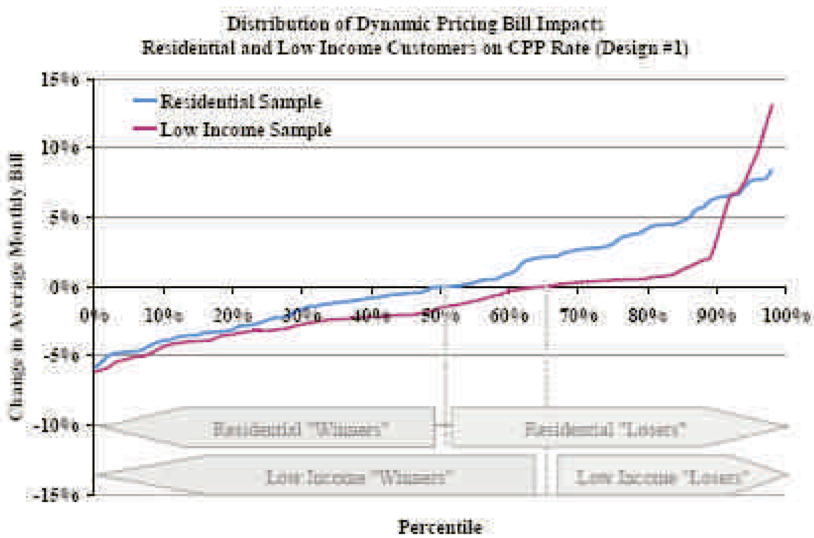

Figure 5: Distribution of low income and general residential customers on a revenue neutral CPP price, before load shifting. Those above the line paid more.[72]

[71] JBS Energy, Inc. "Economic and Demographic Factors Affecting California Residential Energy Use," September 2002.

[72] Faruqui, *op. cit*.

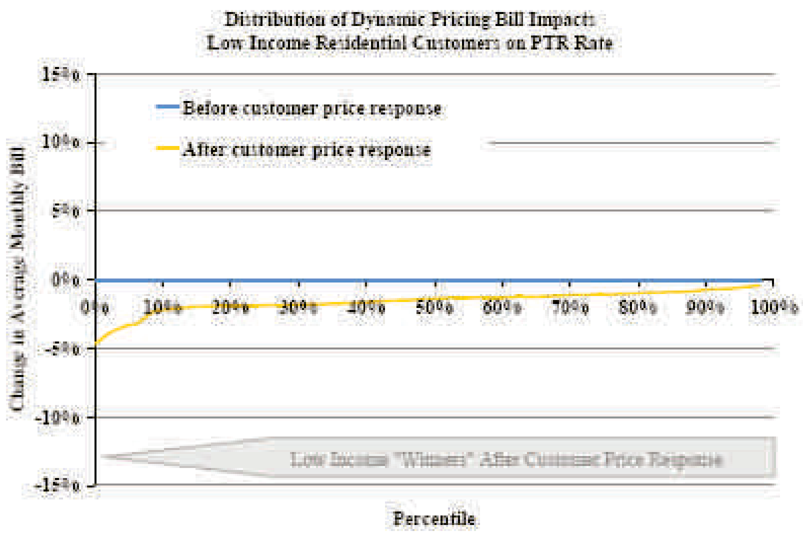

Figure 6: Distribution of low income customers on a revenue neutral PTR price, before and after load shifting. Those above the line paid more.[73]

To the extent that low-income customers and other vulnerable customer groups have limited ability to respond to price signals, program designs may need to be altered. For instance, low-income customers could be offered PTR instead of other pricing options since there is no down-side risk to the customer under this option.[74]

A carefully designed TOU program may be a cost effective way to help reduce electric costs specifically associated with the Percentage of Income Payment Plan Plus ("PIPP") program. Currently, low-income customers are eligible to pay a percentage of their monthly household income as an electric payment rather than the actual cost of electric service. The difference between the actual cost of electricity and the PIPP payment accrues as a debt to the customer and the utilities are made whole through a

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[73] Faruqui, *op. cit*.

[74] Participants in the PowerCentsDC pilot were randomly assigned to RTP, CPP and PTR. An exception was made for low-income customers, who were all assigned to PTR in order to avoid the risk that some might experience higher bills. See http://www.powercentsdc.org/.

Universal Service Fund ("USF")[75] rider paid by all customers on their electric bills. To the extent that the actual cost of electricity can be reduced through a TOU rate design layered with a PTR, individual PIPP customers would benefit by accruing fewer arrearages while all customers would benefit from reductions in the USF.[76] An effective bill design could enhance the effectiveness of the TOU/PTR combination by helping low income customers reduce usage. [77] Also, under circumstances where the PIPP customer load is bid out as a separate tranche in an EDU's SSO auction, the bid could reflect a TOU/PTR pricing to obtain a lower price response from bidders.

c. Clean Energy

The environmental implications of dynamic and TOU pricing depend on many factors. Curtailing peak usually has positive environmental effects because it slightly reduces overall consumption. In contrast, shifting peak loads could have positive or negative impacts on power plant emissions, depending on a utility's or region's generation mix, particularly regarding the type of fuel that is "on the margin" at any given time. Even if variable pricing results in reduced power consumption, it could adversely affect emissions by altering power plant operations and investment decisions. System-specific factors make it impossible to generalize about how customer response to

[75] R.C. 4928.51.

[76] According to the PIPP Plus Metrics Data collected by the PUCO, there were 322,538 electric PIPP Plus customers in December 2011.

[77] This rate option for PIPP customers could be implemented once Ohio specific empirical data demonstrated that low-income PIPP customer are more likely than the average customer to benefit from dynamic pricing, even before responding to price signals.

dynamic or TOU pricing will increase or decrease the environmental footprint of electricity usage.[78]

Yet there are numerous reasons why variable pricing could produce environmental benefits. The advent of "smarter" metering technologies and pricing methods are undoubtedly helping to empower consumers to make choices about their use of electricity in ways that are likely to produce environmental benefits. A recent global study of around 100 pilot programs found that increased energy usage feedback results in an average total consumption reduction of 5.1 to 8.7 percent (see Figure 7). Many consumers are becoming more attuned to the relationship between their decisions about electricity use and what shows up on their monthly utility bill. Increased customer awareness of ways to reduce energy bills, coupled with enabling technologies such as smart thermostats that can "talk" to smart meters, reduce electricity's environmental impact.

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[78] For a detailed discussion on this topic, see Nemtzow, David, Dan Delurey, and Chris King, "The Green Effect: How demand response programs contribute to energy efficiency and environmental quality," in *Public Utilities Fortnightly*, March 2007.

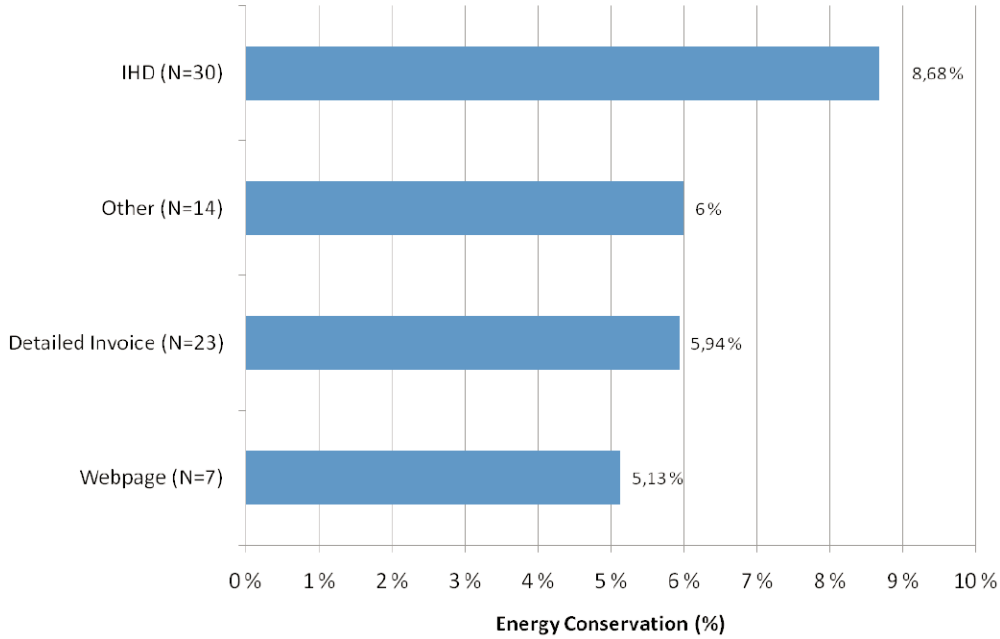

Figure 7: Total consumption reduction in response to more detailed energy consumption information.[79]

In the long run, dynamic variable pricing should be expected to spur emerging technologies such as distributed generation (DG) and plug-in electric vehicles (PEVs). Solar photovoltaic generation, whose maximum output often has high coincidence with utility system peaks, has obvious advantages in a rate design regime that reflects real-time grid conditions. Likewise, PEVs should get a boost once vehicle charging can be accomplished at low off-peak rates – something that is beginning to occur today.

While generation from solar and other renewable will generally displace polluting fossil-fired generation, the environmental impacts of PEVs are more complicated. PEV charging could increase the need for fossil generation, or it could provide an economic opportunity for surplus wind power generation, particularly at night. To the extent that PEV charging might result in increased emissions from power plants, they would be

[79] VaasaETT, "The potential of smart meter enabled programs to increase energy and systems efficiency: a mass pilot comparison," October 2011.

offset by reduced automotive emissions. At a macro level, the Pacific Northwest National Laboratory has estimated substantial energy and CO_2 benefits from AMI deployment, in conjunction with renewables and other elements of the Smart Grid (Figure 8). Once again, the actual environmental impacts will be situation-specific and are difficult to generalize.

Emissions-Reduction Mechanism Enabled by Smart Grid		Energy Savings, 2030 (billion kWh)		Avoided CO_2 Emissions, 2030 (Tg CO_2)	
		Low	High	Low	High
1	Continuous Commissioning of Large Commercial Buildings	2	9	1	5
2	Reduced Line Losses (Voltage Control)	4	28	2	16
3	Energy Savings Corresponding to Peak Load Management	0	4	0	2
4	Direct Feedback on Energy Usage	40	121	22	68
5	Accelerated Deployment of Energy Efficiency Programs	10	41	6	23
6	Greater Integration of Renewables	--	--	19	37
7	Facilitation of Plug-in Hybrid Electric Vehicles (PHEVs)	--	--	10	60
	Total	56	203	60	211

Figure 8: Energy savings and carbon emission reductions from the Smart Grid.[80]

d. Economic Development

The prospect of dynamic and TOU rates will have implications for Ohio's economy. Among industries that are likely to benefit from variable pricing are demand-side energy services, IT sales (like smart thermostats and in-home displays), appliance sales, PEV sales, and solar energy development. Competition in the retail electricity

[80] Pacific Northwest National Laboratory, "The Smart Grid: An Estimation of the Energy and CO_2 Benefits," Report PNNL-19112, January 2010.

sector is likely to be enhanced as CRES providers are given new opportunities to distinguish their products.

To the extent that customers reduce or modify their electricity use patterns, there could be impacts on energy production both inside and outside Ohio. Reduced energy imports would be a positive benefit for the state.

All of the above are difficult to predict without further study and more specifics about the nature of any rate design changes.

D. Field Tests

There have been over 100 experiments with a full variety of dynamic and TOU pricing options, many of which included enabling technologies.[81] Similarly, there have been over 100 experiments with energy information feedback (multiple types).[82] Nevertheless, there are two reasons that the PUCO may wish to support additional field tests. The first would be if there is a fundamentally different pricing, information, or technology option that would be placed into service by one or more Ohio EDUs. The second is to use field tests as a means of gaining broader acceptance among consumers, utilities, and stakeholders for more extensive availability of a particular dynamic or TOU pricing option, information option, or enabling technology.

E. Barriers to Pricing by Competitive Retailers

CRES providers have no legal barriers to offering dynamic pricing or TOU. However, they face three important obstacles.

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[81] Ahmad Faruqui, *Op. cit.*

[82] VaasaETT, *Op. cit.*

1. Metering

The advanced metering must be in place at the customer's premises before dynamic pricing or TOU rates can be offered to customers. A closely associated barrier is the implementation of smart metering on a scale that is sufficient to make investments and efforts (e.g. marketing) worthwhile for CRES providers.

2. Billing Systems

CRES providers must also have billing systems – or access to EDU billing systems – that support dynamic or TOU pricing. Most electric utilities have two billing systems, one for a small number of large commercial and industrial customers, and another for the mass market of small commercial and residential customers. The former typically supports multiple pricing options, including different forms of dynamic or TOU pricing. The latter "mass" system typically does not.

3. Customer Education

CRES providers may only be able to offer dynamic or TOU pricing options to customers after significant educational efforts, both general regarding advanced pricing options and specific to the CRES provider's business and offerings. Much of the general educational effort and engagement would take place through EDU systems. For example, the EDUs send out the bills and bill inserts. A common education approach is CRES use of a consumer engagement website. While not a major expense, the cost is not insignificant. Utilities that have achieved excellent results with customer education and engagement have used a variety of channels and have provided information in clear and simple language. Good programs have included letters, brochures, bill inserts, online data, email and text notifications, and in-person meetings.[83] A key strategy in good programs is to utilize only those channels that can be delivered cost-effectively in scale. Consumer engagement is discussed further elsewhere in these Comments.

Customers must also be convinced by the specific CRES provider to switch to a dynamic or TOU price plan (marketing). The most effective solution to this barrier is likely to be a good price comparison tool, which is also discussed elsewhere in these Comments.

4. Experience with Barriers

Competitive retailers are offering dynamic or TOU prices in other states. In Texas, Reliant and TXU Energy offer TOU prices and have found no insurmountable barriers. Figure 9 shows a weekly email sent by Reliant to its TOU customers. Direct Energy offers a "Free Power Day" plan in Pennsylvania that allows customers to select either Sunday or Monday for free electricity.[84] But barriers have apparently kept participation rates in available plans low. Accurate figures are difficult to obtain because retailers in competitive markets are not normally required to disclose their participation levels.

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[83] See, e.g., PowerCentsDC Program, final report available at: http://www.powercentsdc.org (referenced later in these Comments).

[84] http://directenergy.gesc.com/Products/DisplayPrices.aspx?sc=RES&state=PA&etc=PLE&gtc=&Esco=DER&z=&a=&webpromo=

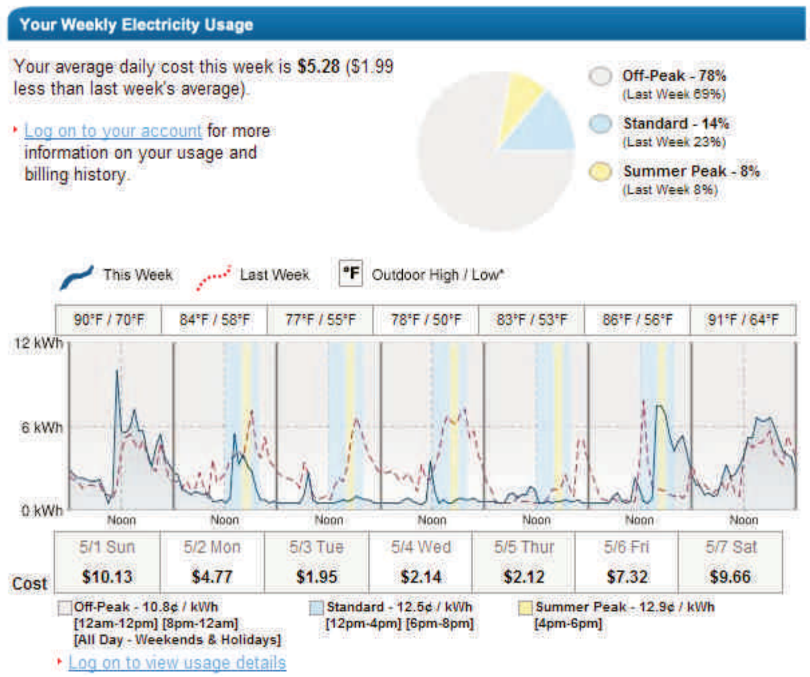

Figure 9: Weekly email report sent to Reliant TOU customers.

F. Customer Education and Engagement Strategies

Utilities that have achieved excellent results with customer education and engagement have used a variety of channels and have provided information in clear and simple language. One example was the PowerCentsDC program in Washington DC that included letters, brochures, bill inserts, online data, email and text notifications, and in-person meetings.[85] A key strategy in that program was to utilize only those channels that could be delivered cost-effectively in scale.

Toronto Hydro also mounted a successful educational effort for its customers. Toronto Hydro developed a transition strategy to teach customers first about smart meters, then their usage data, and then how their bills would change under opt-out TOU

[85] Final report available at http://www.powercentsdc.org.

prices. Toronto Hydro preceded its smart meter installations with customer letters, then explained the meters in person – by means of installer contact with the customer – or left a door hanger. The utility set up a website such that after the meters were installed, customers could log in and see their energy information. That information included bill comparisons to show the estimated effect on bills after the switch to TOU prices, which was scheduled for several months after the meters were installed.

In engaging customers during and after its smart meter installations, San Diego Gas & Electric took what it calls a "customer-centric view," including the following elements:[86]

- Improve communications from customer feedback.
- Have subject experts available to answer questions and educate customers.
- Use every touch point to build trust with customers.
- Address every complaint at the highest level of program management .
- Coordinate smart meter communications with other utility initiatives, such as energy efficiency, demand response, and low income programs.

All three of these utilities received industry awards for having successful consumer engagement strategies.

The "Green Button" initiative, mentioned in the workshop hosted by the PUCO, can be important to engaging customers. The term is used for a subset of an industry standard called the Energy Service Provider Interface, which was approved by the North

[86] SDG&E, "Smart Meter Technical Advisory Panel Update," May 17, 2010.

American Energy Standards Board in 2011.[87] All three major California utilities (Pacific Gas & Electric, San Diego Gas & Electric and Southern California Edison) went live with Green Button on their websites in January 2012, and 22 utilities in 21 states have committed to going live in April 2012.[88]

A customer using Green Button logs into the utility's website, clicks on the Green Button, and can download up to 13 months of detailed electricity usage data. Generally the information provides 15-minute or hourly interval data, but systems work for monthly data as well. Consumers control their own data and who else may access that data, thus alleviating many privacy concerns.

By itself, the data provided to the Green Button customer has virtually no use. But application developers are expected to step forward and provide interesting uses for the customer data. With such applications, consumers should be able to perform some or all of the following:

- Receive an immediate comparison of how optional time-of-use rate plans will affect their bills.
- See a breakdown of their energy usage by appliance.
- Calculate their potential savings and payback for installing insulation.
- Join an energy game to rack up savings points (SDG&E conducted a "Biggest Energy Saver" program, and the application is being made available by the developer for any customer whose utility has Green Button.).

[87] http://www.naesb.org/ESPI_Standards.asp

[88] http://www.bizjournals.com/prnewswire/press_releases/2012/01/26/CG42867

- Calculate the costs and return on investment for installing photovoltaic panels.

Several other utilities are reportedly considering whether to add Green Button to their websites. American Electric Power recently announced that it will participate in the Green Button initiative.

G. Standardized Comparisons

Little standardization of price comparison tools has taken place in the U.S. or internationally. Many of the tools have problems, although tools based on actual customer consumption data have fewer problems. Some examples of price comparison tools are discussed below.

One common area of comparisons is in competitive retail markets. Figure 10 shows a price comparison tool provided for Texas consumers by the State of Texas. The tool illustrates the complexity of providing such a tool, for example, by seeing how the numerous tabs across the top indicate various options above and beyond the options already shown explicitly. The example also reveals how such a tool can be flexibly utilized. The top-listed offer in the sample below – as designated by the price for electricity for a user of 1,000 kWh - is a specially designed rate that has a steep discount for usage between 800 and 1200 kWh, but much higher prices at other times (see Figure 11).

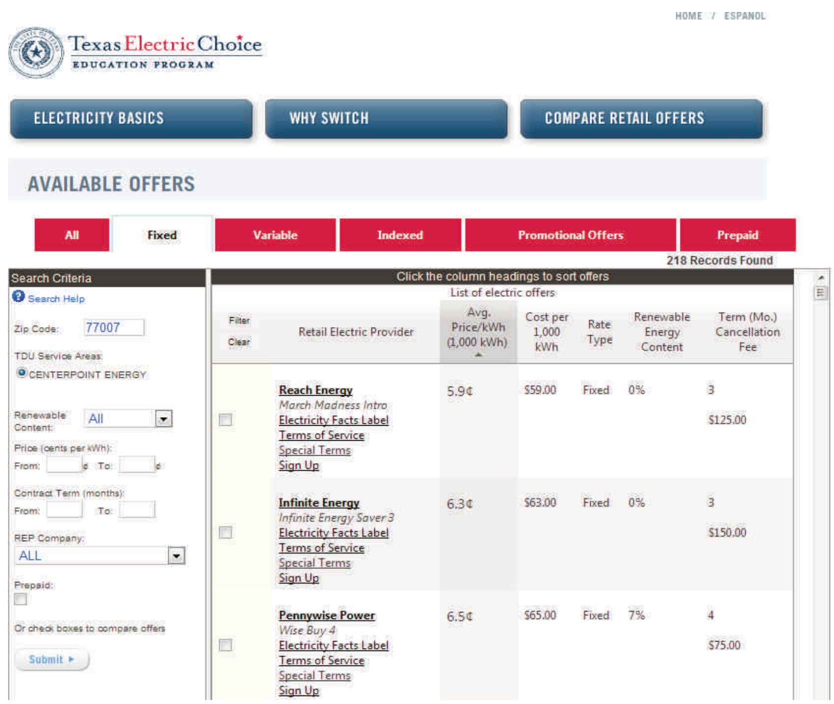

Figure 10: Texas retail competition comparison site.

Electricity Price	**Average Monthly Usage**	**500** kWh	**1000** kWh	**2000** kWh
	Average Price per kWh:	**0.134**	**0.059**	**0.104**

We'll bill you 9.4¢ per kWh and $19.95 base charge per invoice, when monthly total kWh usage is > 800 kWh and < 1200 kWh in a Bill Cycle you'll get a promotional .055 discount per kWh, the above price disclosure is an example based on an energy price including transmission, distribution and monthy base/meter charges.

	500 kwh	1000 kwh	2000 kwh
Energy Charge	$0.0940 per kWh	$0.0940 per kWh	$0.0940 per kWh
Base Charge	$19.95 per bill	$19.9500 per bill	$19.9500 per bill
Bill Cycle Energy Charge Discount		-0.055 per kWh	

The average price also includes applicable surcharges as established by the Public Utility Commission of Texas (PUCT) for your TDSP. This price excludes applicable taxes and TDU underground Facilities and Cost Recovery Charges (see your TDU's tariff for list of cities.)

Figure 11: Price details for apparent "low-cost" provider on Texas choice site.

Another example, which provides better results, is provided by a program in the United Kingdom (see Figure 12). The tool asks for the existing tariff and average monthly bill for the customer. This makes the results much more precise. However, most customers probably do not know their existing tariff – there are over 4,000 in effect for residential consumers in the UK to choose from – and most probably do not have good knowledge of their average monthly bill.

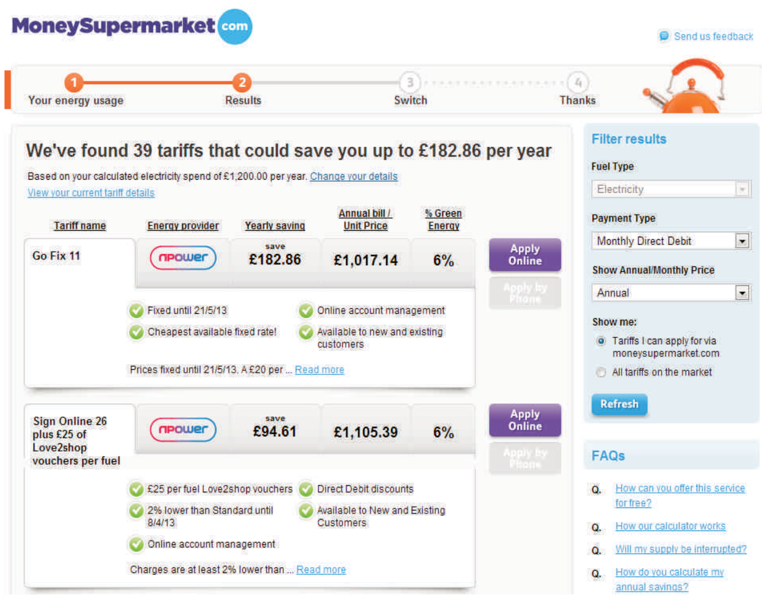

Figure 12: Price comparison tool available to UK electricity shoppers.

The best price comparison tools are those that use actual customer-specific data. In California, the utilities are required to provide such tools. At Pacific Gas and Electric, price comparisons are available once a customer has nine months of interval data. Figure 13 shows the results for a real Pacific Gas & Electric customer. To perform this comparison, the customer logs in and clicks on the “My Rates” tab to see the results.

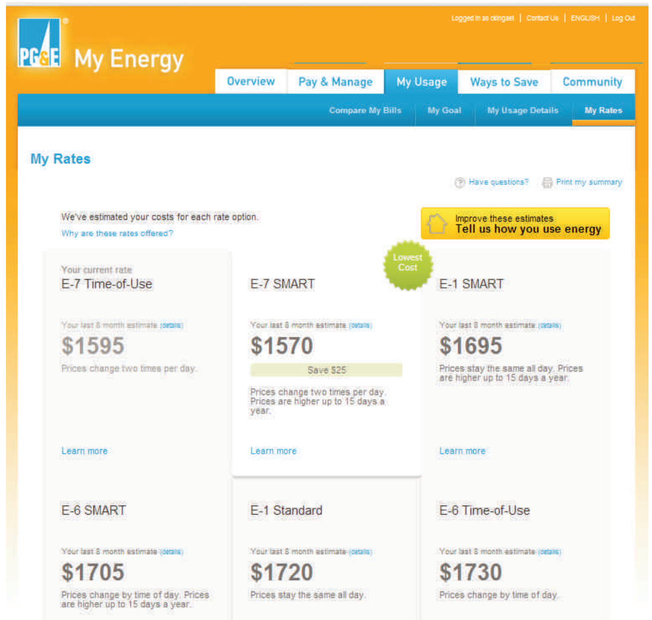

Figure 13: Output from PG&E rate comparison tool for actual customer.

V. CONCLUSION

The Office of the Ohio Consumers' Counsel submits these Comments in an effort to be engaged in the process of discussing pricing options for residential and other electric utility customers. An exchange of views on such options is important to clear up misconceptions and examine the perspectives of stakeholders in Ohio's regulatory framework.

Respectfully submitted,

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CERTIFICATE OF SERVICE

I hereby certify that a copy of these Comments was served on the persons stated below, via electronic transmission, this 11th day of April 2012.

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