BEFORE

THE PUBLIC UTILITIES COMMISSION OF OHIO

In the Matter of the Commission's Review	)	
of Time-Differentiated and Dynamic	)	Case No. 12-150-EL-COI
Pricing Options for Retail Electric	)	
Services.	)	April 11, 2012

COMMENTS BY DISTRIBUTED ENERGY FINANCIAL GROUP, LLC

Distributed Energy Financial Group, LLC ("DEFG") is a specialized management consulting firm in the energy sector since 2003. DEFG is focused on energy consumers and the innovative technologies, products and solutions which are driving changes in markets.

DEFG primarily works on customer strategy, offering & program design, marketing and communications, customer services, and regulatory. The management team has extensive experience with regulated and competitive retail energy markets, working with 30+ utilities, 20+ retail energy suppliers, and the leading technology companies in the space.[1]

With broad exposure to both utility and retail marketer efforts across the country around innovative program design, and customer communication and engagement, and extensive consumer and market research to reference, we would like to provide informed answers to the following questions presented by the Public Utilities Commission of Ohio.

(6)(c) *Are there specific forms of dynamic or time-differentiated pricing which should be offered to different groups or classes of consumers who have the requisite metering?*

RESPONSE: Pre-paid energy should be considered as a voluntary option enabled by smart metering and infrastructure.

Nearly all U.S. energy consumers currently receive an energy bill at the end of the month with no real or temporal linkage between consumptive behavior and cost. Prepaid electricity service, or a "pay-as-you-go" option offered by a utility or energy supplier, is voluntary and requires the customer to prepay or pay upfront for electricity before using the service. Prepaid electricity service enabled by smart grid moreover is a billing option with the potential for a consistent feedback loop delivered via SMS, email, web, in-home display, or possibly a combination of these channels. The consistent information flow provides consumers the opportunity to monitor their usage and credit balance, thus linking dollars and energy usage in close-to-real time.

[1] See DEFG management team at: http://www.defgllc.com/content/about_us_/team.asp.

The facts show real potential for a substantial consumer base to use and value prepaid electric service. There is a line of sight to customers using less energy and saving money, and high customer satisfaction due to increased flexibility, convenience and control.

Drivers for Customer Satisfaction

DEFG's Prepay Energy Working Group[2]—now in its third consecutive year—has researched trends and levels of consumer satisfaction across different prepaid industries. The Working Group conducted a national consumer survey in late 2010 to test consumer perceptions and expectations related to a variety of prepaid services and products, and examine the potential for voluntary prepaid electricity options offered by local utilities to customers. The 2010 survey revealed prepayment as an option for a variety of products and services that had in fact become mainstream.[3]

Americans are increasingly using prepayment in many forms, such as reloadable debit cards, transit cards, healthcare, wireless service plans, etc., and moreover, they were satisfied. In fact, once consumers used a form of prepayment, they were likely to continue using it, to try it for other services and products, and to recommend it to their network of family and friends. The findings pointed to "ease" and "convenience" as the drivers behind customer satisfaction with various prepayment options.[4]

Prepaid services are often framed as a low income option, especially within the utility sector. However, as many low income consumers value the option to better manage their cash/ credit, so too would other consumer segments. Prepaid electric service aligns with bill payment, budget and lifestyle preferences for certain customer segments.

While still a nascent offering in most U.S. jurisdictions, prepaid electricity shows promise for high satisfaction among the consumers that choose it. DEFG (via Russell Research) conduct approximately 900 online interviews in November 2011 to test customer awareness and acceptance of prepaid electricity offerings in Texas and Arizona, the two states with the largest base of U.S. consumers currently on a prepaid electricity plan.

The survey results indicate that consumers strongly correlate prepaid electricity with increased control and management, and the potential to use less energy and save money. [5] The top reasons consumers would enroll in a prepaid electric service plan are: "control over energy costs and budget" (46 percent), "prefer to pay for energy as you use it" (37 percent), and "want to reduce energy use and monitor closely" (32 percent). When asked for one word to describe prepaid electric service, "convenient" was mentioned the most by

[2] *The Prepay Energy Working Group* is managed by DEFG LLC and consists of market participants (utilities, energy retailers, metering and software vendors) and a pro-bono advisory panel of regulators and consumer advocates. Member interacts on a regular basis, and all research efforts and deliverables are put through an iterative process and thoughtful discussion prior to public release.

[3] The results and key findings from the 2010 national survey were published in EcoPinion Survey Report No. 9, "Is Prepay the Way? Consumer Perceptions of Prepay in the Utility Sector." (Jan. 2011).

[4] *Id*.

[5] EcoPinion Survey Report No. 12, "Prepay Energy's Pathway to Consumer Satisfaction and Benefits: Survey Results from Texas and Arizona." (Feb. 2012).

far. Other terms mentioned at lower levels were: "interesting," "easy" and "savings." (For top-line findings, analysis and additional survey findings, see DEFG's EcoPinion Survey Report No. 12, "Prepay Energy's Pathway to Consumer Satisfaction and Benefits: Survey Results from Texas and Arizona,"at Attachment A, p.7)

Prepaid electricity service should be viewed as a platform for energy management and pricing options – a daily bill pay conversation that is transactional (dollars and cents), relevant (focused on saving energy to manage bills), and actionable (today's information could result in impacts on tomorrow's conversation).

Energy Conservation Impact

While all customers are motivated to some extent to reduce their energy bills, customers on prepaid service have the ability to react to a feedback loop. Generally speaking, in a feedback loop, a controller adjusts controlled behavior to make the output from a system equal to desired state. [6] With a behavioral feedback loop, the following elements are present:

- Evidence – information about the system must be measurable
- Relevance – the information must be presented in a context that is relevant to the individual
- Consequence – the information must help the customer understand how actions will affect outcome
- Action – the customer must have the ability to change the necessary behavior

Prepaid service providers in the U.S. and abroad have realized an energy consumption impact, with Salt River Project in Arizona and the Oklahoma Electric Cooperative reporting an average decrease in usage by prepaid customers of 12 percent per household.[7]

While there is an established link between prepaid service and a conservation effect, it is not well understood or documented. Accordingly, the Prepay Energy Working Group commissioned Dr. Michael Ozog[8] in late 2011 to propose a methodology to measure the impact of prepaid service on energy consumption, and has plans to test the methodology in 2012 by modeling and analyzing usage data provided by Oklahoma Electric Cooperative. (For further detail, see DEFG's Series of Regulatory Choices, No. 7, "A Method for Estimating the Conservation Effects of Energy Prepayment," Nov. 2011, at Attachment B, p.31)

[6] Goetz, Thomas. "Harnessing the Power of Feedback Loops." Wired Magazine, June 19, 2011.

[7] *Paying Upfront: A Review of Salt River Project's M-Power Prepaid Program*. EPRI, Palo Alto, CA: 2010. 1020260, and Buck, Jonna. "Prepaid Service Benefits: A Co-op and its Customers." Utility Automation, May 2008.

[8] Michael Ozog, Ph.D. has worked in the energy and water industries for over 15 years specializing in econometric modeling, demand forecasting, discrete-choice modeling, risk management and program evaluation. He is a recognized expert in the area of energy efficiency program evaluation, econometric analysis, and economic modeling. Dr. Ozog holds a Ph.D. in Economics from Boston College, an M.S. in Mineral Economics from the Pennsylvania State University and a B.S. in Geology from the Massachusetts Institute of Technology. His company is Integral Analytics, Inc.

Furthermore, over time, with substantial data and analysis of actual use, prepaid consumers may appreciate predictive recommendations and dynamic pricing options that optimize their use of the service. As part of the regular information flow, prepaid customers would likely be open to receiving relevant and actionable information such as rebate details, different pricing options and energy assistance.

Regulatory Concerns:

Any benefits in support of a prepaid service business case must be balanced against the regulatory issues. Prepaid electric service has served as a catalyst, raising legitimate concerns around consumer protections, and exposing tensions and incompatibilities between existing regulatory constructs and new technological capabilities.

Back in 2010, the Prepay Energy Working Group convened an advisory panel of energy industry thought leaders with the purpose of identifying the leading regulatory issues facing energy prepayment, and then invited discussion around these key issues through an interview process.[9] Additionally, DEFG conducted an industry survey on prepaid service, garnering 600+ responses representing a broad array of industry views, with nearly all respondents highlighting regulatory issues from some angle. [10]

Disconnect and related consumer protection policies (e.g., account notifications, weather moratoria) were by far the leading concern among interview and survey respondents.[11] While these concerns apply to all customers, they are heightened with regard to low-income and high-risk populations (e.g., elderly and those dependent on medical devices).

Consequently, the Prepay Energy Working Group sponsored a follow up research and effort around prepaid service issues specific to low-income customers. This included commissioning essays authored by three industry thought leaders representing divergent perspectives. While some stakeholders consider prepaid service a positive innovation for consumers, others view it as potentially predatory or discriminatory against low-income consumers. (For further detail, see DEFG's Series of Regulatory Choices, No. 6, "Low Income Consumer Issues and Voluntary Prepaid Energy Offerings: Perspectives from Three Industry Thought Leaders," Sept. 2011, at Attachment C, p.49)

Through many discussions involving various market participants, regulators and consumer advocates, however, we discovered a broad consensus supports that many consumer protections do and will exist for a prepaid service offering as they are grounded in common sense and have been in place for post-paid consumers for decades. For example, nobody is arguing that moratoria for extreme weather events or certain protections around disconnection should be done away with (e.g, disconnections should not occur during non-

[9] Interviewees represented the following states: Arizona, California, Illinois, Maryland, Michigan, Mississippi, Ohio, Oklahoma, Pennsylvania, Texas and Washington.

[10] Respondents self-identified (as percentage of sample): consultants (19%), regulators/ government (11%), utilities (20%), public interest/ consumer representatives (14%), and marketers/ retail energy (9%).

[11] DEFG's Series of Regulatory Choices, No. 4, "Regulatory Issues and Questions Presented by Voluntary Prepay Options Offered by Utilities," Feb. 2011.

business hours/nights, weekends or holidays). Additionally, there is consensus that prepaid electricity should not be an option for those with serious medical conditions or dependent on medical devices.

Still, industry stakeholders – market participants, regulators, and advocates – have all acknowledged that disconnect policies do need to change to comport with automation, and thus consumer protections accordingly need to be reviewed. Two key questions are – how can a balance be struck between allowing consumers to exercise their preferences and ensuring that adequate consumer protections are in place? Second, how can regulatory rules and practices, including for low income consumers, be revised or updated to allow for innovation and new offerings such as prepaid energy or other new services enabled by smart grid yet maintain the intent of the original regulatory rationale?

This year the Prepay Energy Working Group plans to advance the discussion by framing the regulatory issues through identification of the basis for the challenges, concerns and opportunities presented by prepaid service. With new capabilities and offerings enabled by AMI, there is a need for fresh thinking in the regulatory arena. Further investigation into the anticipated benefits, costs, and impacts of prepaid electric service, combined with a better understanding of customer preferences, will provide much needed answers. This process is critical to develop trust among stakeholders and move forward in a new world.

---

(6)(d) *Should the Commission support well designed field tests by EDUs and/or CRES providers of additional time-differentiated or dynamic pricing options and various approaches to and combinations of consumer education, targeted messaging, information feedback, and/or enabling technology to better assess what options may work best for consumers and have the greatest beneficial impacts?*

RESPONSE (6)(d): Yes, there should be well-designed field tests by EDUs and/or CRES providers that include consumer education, targeted messaging, information feedback, and/or enabling technology. Experimentation is critical.

---

(6)(f) *Should EDUs and/or CRES providers develop and implement a plan to better inform eligible consumers regarding time-differentiated and dynamic pricing options? If so, what should such plans include?*

RESPONSE (6)(f): Yes, these new pricing options are fundamentally about program design, in particular incentives, and communications.

Consumers may be smart but not necessarily understand how they can align the purported benefits of dynamic pricing with their home as it exists (e.g., older appliances and heating/cooling systems), their lifestyle, or the potential inconvenience of time-differentiated prices. The complexity of the prices may also increase customer anxiety about exposure to price volatility and a sense of losing control can breed mistrust. A

critical component of pricing programs is deciding on the level of consumer exposure to volatility. The success of dynamic pricing hinges on communications that result in consumer adoption, and the realization of the benefits of cost and peak reduction by both the customer and the energy provider.

DEFG recently worked with several utilities on an initiative titled, "Communicating Smart Grid Goals and Benefits: Lessons Learned and Planning for 2012." In pursuit of a smart grid, many utilities focused solely on the deployment and integration of advanced metering infrastructure, with communications efforts being uneven.

Smart grid communication efforts that achieved any level of success included the need to frequently and persistently communicate, and the identification of consumer benefits. Consumer participation in new programs increases if people feel they are choosing pricing and technology that fits their values, residential structure, and lifestyle. Moreover, each state and audience will require different approaches and specific / targeted messaging, and that is precisely why experimentation is so critical. (For further detail regarding smart grid visibility and communications strategies, see "Smart Grid Communications March 2012 Top Line Findings," at Attachment D, p.80)

Building on this work, DEFG has planned an initiative looking specifically at enhancing the customer strategy and communications for dynamic pricing programs. Sample issues to be explored include:

- What is the message regarding dynamic pricing?
- Is the program push-oriented, too complex and too full of jargon?
- Is dynamic pricing framed in a way that is accessible to a typical consumer?
- What channels of communication are appropriate for pricing programs and for the target audience?
- Is the utility up to speed on mobile communications channels (mobile communications parallel the real-time nature of dynamic pricing)?
- Is the program designed in a manner that allows the customer to learn about and understand pricing and risk, including signals that may seem like random events (e.g., critical peaks), which makes the consumer feel helpless to predict or control?
- Can the customer learn over time what is expected and when to expect it? Is there a means for creating a sustainable relationship with the new pricing approach?
- Does the consumer have sufficiently sophisticated appliances, sensors, monitors and controls to allow an orderly curtailment of service in response to higher prices?
- Does the program address the consumers' definition of reliability to ensure that service levels are considered safe and adequate?
- Can the convenience of "flip the switch" be replaced with a new definition of convenience that allows for time-dependent pricing?
- How are "time" and "lifestyle" connected in the consumer's mind to a sense of convenience and value?

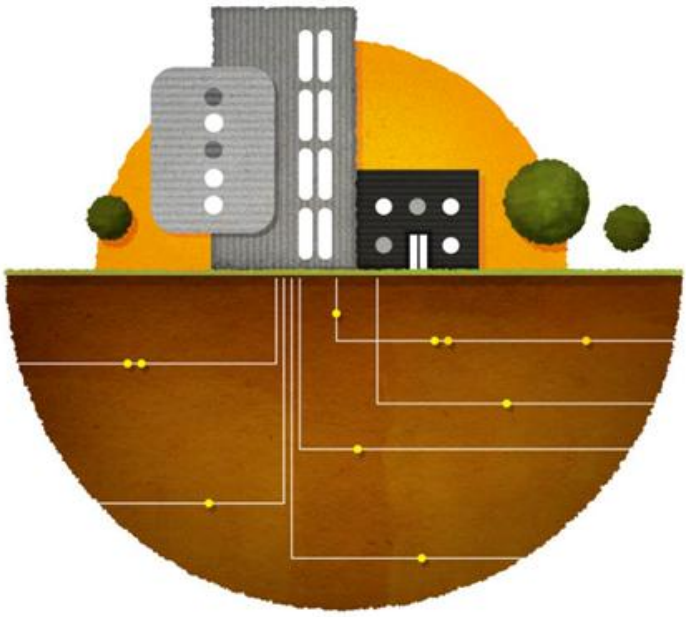
ATTACHMENT A

DEFG's Series EcoPinion Survey Report No. 12, "Prepay Energy's Pathway to Consumer Satisfaction and Benefits: Survey Results from Texas and Arizona," Feb. 2012.

EcoPinion

Prepay Energy's Pathway to Consumer Satisfaction and Benefits: Survey Results from Texas and Arizona

Survey Report • Issue 14 • February 2012



Prepared by:
Cindy Boland O'Dwyer
EcoAlign

EcoPinion Survey Report

Prepay Energy's Pathway to Consumer Satisfaction and Benefits: Survey Results from Texas and Arizona

February 2012

Introduction

EcoAlign, a strategic marketing agency focused on energy and the environment, and DEFG LLC, a specialized management consulting firm in the energy space, partnered to conduct approximately 900 online interviews in November 2011 to test customer awareness and acceptance of prepay electricity offerings in Texas and Arizona, the two states with the most consumers currently on prepay electricity plans.

The EcoAlign-DEFG project team worked with the members of the Prepay Energy Working Group[12] to finalize the survey instrument, and then contracted with Russell Research to conduct the survey. Prepay electricity service, or a "pay-as-you-go" option offered by a utility or energy supplier, would be voluntary and require the customer to prepay or pay upfront for electricity before using the service.

DEFG's Prepay Energy Working Group—now in its third consecutive year—has previously researched trends and levels of consumer satisfaction across different prepay industries. The Prepay Energy Working Group conducted a national consumer survey in late 2010 to test consumer perceptions and expectations related to a variety of prepay services and products, and furthermore to examine the potential for voluntary prepay electricity options offered by local utilities to customers.[13]

The 2010 national survey revealed prepay as an option for a variety of products and services that had in fact become mainstream. Americans were

[12] The Prepay Energy Working Group is managed by DEFG LLC and consists of market participants (utilities, energy retailers, metering and software vendors) and a pro-bono advisory panel of regulators and consumer advocates. Member interacts on a regular basis, and all research efforts and deliverables are put through an iterative process and thoughtful discussion prior to public release.

[13] The results and key findings from the national survey were shared in EcoPinion Survey Report No. 9, "Is Prepay the Way? Consumer Perceptions of Prepay in the Utility Sector."

increasingly using prepay in many forms such as reloadable debit cards, transit cards, healthcare, wireless service plans, etc., and they were satisfied with prepay services. Moreover, once consumers used a form of prepay, they were likely to continue using it, to try it for other services and products, and to recommend it to their network of family and friends.

The findings pointed to "ease" and "convenience" as the drivers behind customer satisfaction with various prepay options. Prepay is aligned with consumer bill payment, budget and lifestyle preferences. This appears to be especially true of younger Americans (18–30 years) and renters, segments that put a premium value on mobility and flexibility. When asked for one word to describe how prepay products made them feel, many Americans simply responded "happy."[14]

One objective of the latest survey conducted in Texas and Arizona was to revisit trends and levels of consumer satisfaction across different prepay industries. However, even more important was an effort to gain insight around consumer awareness and acceptance of prepay electricity service. These two states represent the largest base of U.S. consumers currently on a prepay electricity plan. Survey questions explored actual or perceived benefits, concerns and expectations tied to prepay electricity.

Today, nearly all U.S. energy consumers get an energy bill at the end of the month with no real or temporal linkage between consumptive behavior and cost. When supported by smart technologies, however, prepay may be linked with a two-way communication channel between the supplier and the consumer, where energy consumption data is available to suppliers in regular intervals (fifteen-minute, hourly, daily, etc.) and consumers can receive frequent information regarding energy usage, payments and account updates, energy management options, and perhaps even price signals.

Prepay enabled by smart grid is a billing option with the potential for a consistent feedback loop delivered via SMS, email, web, in-home display, or possibly a combination of these channels. The consistent information flow allows consumers to monitor their usage and credit balance, thus linking dollars and energy usage in close-to-real time. An energy usage impact has been reported by different prepay service providers, with Salt River Project in Arizona reporting an average decrease in usage of 12 percent per household.[15]

[14] *Id.*

[15] *Paying Upfront: A Review of Salt River Project's M-Power Prepaid Program*. EPRI, Palo Alto, CA: 2010. 1020260.

The findings of EcoPinion Survey Report No. 14 point to consumers strongly correlating prepay electricity with increased control and management, and the potential to use less energy and save money. There is, however, uncertainty around price or cost, and the potential for fees or overpaying.

While still a nascent offering in most U.S. jurisdictions, prepay electricity shows promise for high satisfaction among the consumers that choose it.

The top line findings include:

- The top reasons consumers would enroll in a prepay electric service plan are: "control over energy costs and budget" (46 percent), "prefer to pay for energy as you use it" (37 percent), and "want to reduce energy use and monitor closely" (32 percent)

- Consumers think the most important features of a prepay electric service plan are: "using less energy and saving money" (33 percent), "avoiding fees" (25 percent) and "helps manage my budget better" (24 percent)

- When asked for one word to describe prepay electric service, "convenient" was mentioned the most by far. Other terms mentioned at lower levels were: "interesting," "easy" and "savings"

- When asked for one word to describe the biggest concern regarding prepay electric service, the most frequently-mentioned were: "cost," "price," "overpaying" and "expensive." At slightly lower levels, consumers mentioned: "money," "unknown," "reliability," "running out," "usage" and "budget"

- When asked to rate their concerns using a ten-point scale, consumers applied a "9" or "10" (representing extreme concern) to the following: "service disconnect/electricity going off when my prepay account balance runs out" (53 percent), "price/higher rates" (48 percent), "fees associated with prepay" (43 percent), "expiration of credits over time" (37 percent), "knowledge/awareness of my account status" (35 percent)

- One half of the respondents do not know whether prepay or post-pay energy costs more, and one fifth think prepay energy is more expensive

- When the respondents were asked what types of consumers may benefit from a prepay electric option, 18 percent thought it was best suited for low-income consumers, but 27 percent thought it would benefit all the

consumer segments that were listed (i.e., renters, seniors on a fixed income, young people 18–30 years old, among others)

As noted earlier, Texas and Arizona were chosen as the focus of this consumer survey because they are the states with the greatest number of consumers currently on a prepay electricity plan. Responses indicate that both states are still in the early stages of adoption, with 7 percent of respondents in Texas and 10 percent in Arizona indicating that they currently receive prepay electricity service[16]

Admittedly a small base of respondents, but nearly all of the current prepay customers are satisfied with their current prepay electric service

More than half (62 percent) indicated being "very satisfied," while an additional 29 percent are "somewhat satisfied" (totaling 91 percent)

When asked if they were likely to recommend prepay electric service to family and friends, 63 percent are "very likely" to recommend, while additional 25 percent are "somewhat likely" (totaling 88 percent)

These numbers are nearly identical.

When asked to rate their satisfaction level with generally using prepay as an option to make purchases or contract for services, 44 percent of all respondents indicated being "very satisfied," with an additional 40 percent being "somewhat satisfied" (totaling 84 percent)

While certainly a small sample, an interesting result is the potential willingness of 88 percent of current prepay electric consumers to recommend the service to their families and friends. This finding indicates high satisfaction, but also points to these customers having trust in the potential for benefits to be shared by a certain segment of their family and friends network. This impact can be employed as a customer satisfaction metric referred to as "net promoter score," which over the last few years attained greater significance in response to increased communication via mobile lifestyles and social media.

An offering such as prepay electricity—and other options enabled by smart grid—mandates a more nuanced, segmented view of the marketplace that goes well beyond the "ratepayer" construct where everyone is treated the same regardless of personal preferences. The reality is that prepay

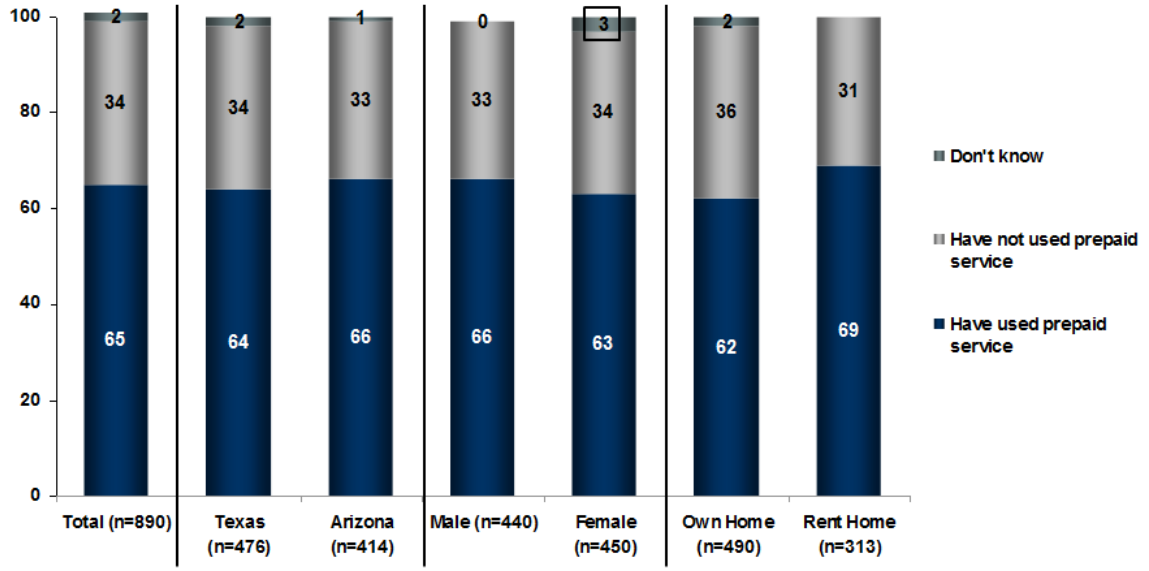
[16] The total number of consumers enrolled in a prepay electric plan in Texas and Arizona is currently in the hundreds of thousands, which is still substantial and also ripe for growth.

electricity is a voluntary option that will be preferred and valued by certain segments of customers, and not by others.

Experience With Prepay Service of Any Kind

This survey confirms the earlier finding in EcoPinion Survey Report No. 9 that a large segment of the U.S. population uses or has purchased some form of prepay services, and that they are satisfied with those services. Among those now surveyed in Arizona and Texas, 65 percent have ever used or purchased a prepay card, wireless telephone or other prepay service.

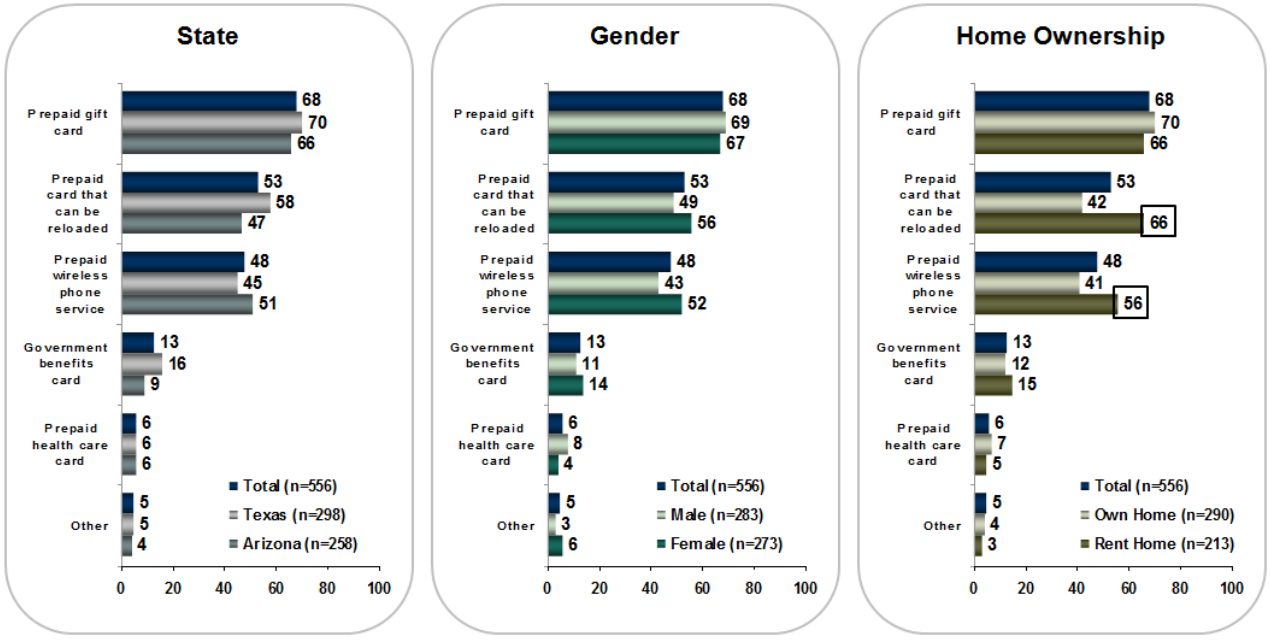
Whether Ever Used or Purchased a Prepay Card/ Wireless Phone or Service[17]



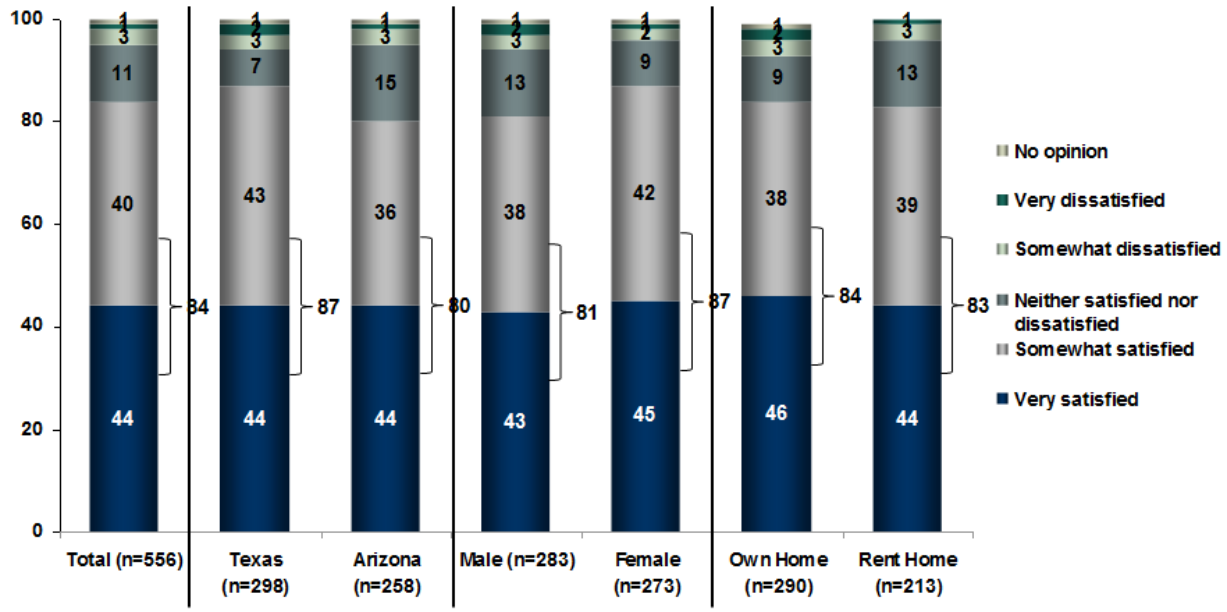
These include 68 percent that claim they have used a gift card, 53 percent a reloadable card, and 48 percent prepay wireless phone service. Among renters the usage is significantly higher as compared to homeowners: 66 percent (v. 42 percent) for the reloadable card, and 56 percent (v. 41 percent) for prepay wireless phone service.

[17] Question 1: Have you ever used or purchased a prepaid card (e.g., payroll, gift or reloadable), prepaid wireless phone service plan or any other service that you paid before you used the good or service?

Types of Prepay Card or Service Used[18]



Satisfaction Rating of Prepay Options[19]



When asked to rate their satisfaction level with generally using prepay as an option to make purchases or contract for services, 44 percent of all respondents indicated being "very satisfied," with an additional 40 percent being "somewhat satisfied" (totaling 84 percent).

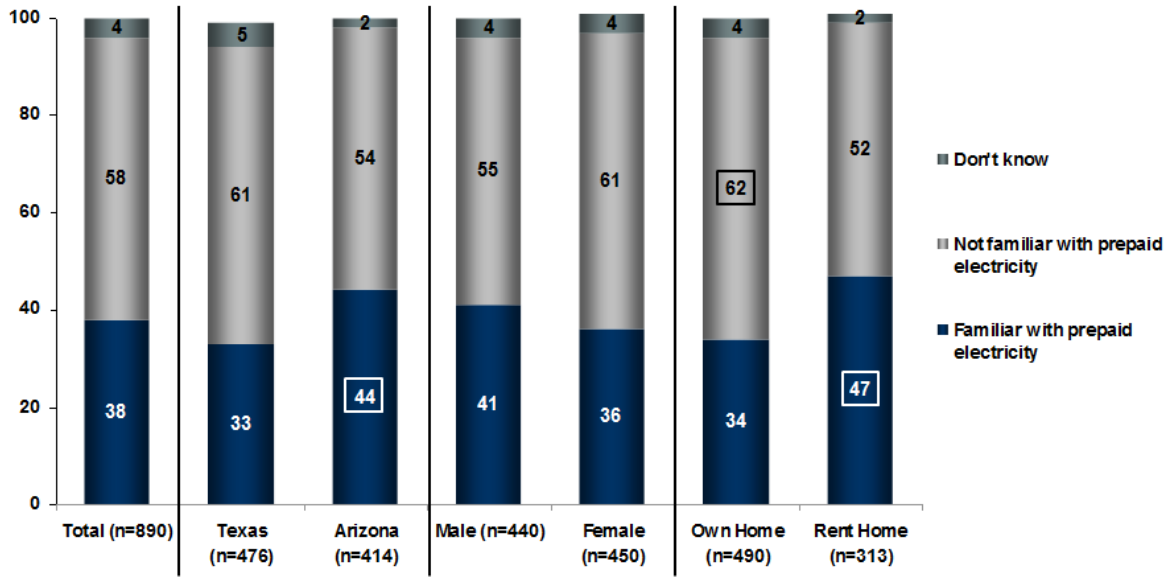
[18] Question 2: What types of prepaid card or service have you used?

[19] Question 3: How would you generally rate your satisfaction with using prepaid as an option to make purchases or contract for services?

Prepay Electricity: Familiarity and Enrollment

In Arizona and Texas, 38 percent are familiar with prepay electricity as an option. A significantly higher rate (44 percent) occurs in Arizona, and among those who rent homes (47 percent). People is Arizona have been exposed to the option for a longer time (Salt River Project has offered it for over a decade), whereas in Texas it is relatively new (several years) for most consumers.

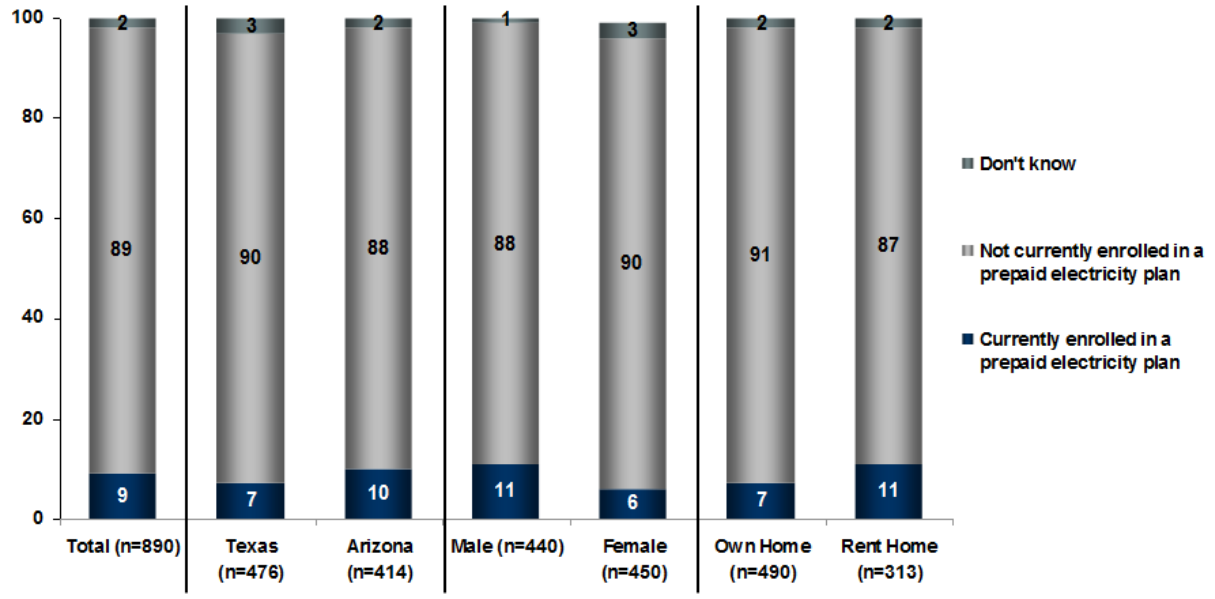
Whether Familiar with Prepay Electricity Service Options[20]



As noted earlier, Texas and Arizona were chosen as the focus of this consumer survey because they are the states with the greatest number of consumers currently on a prepay electricity plan. In Texas, 7 percent state that they are currently enrolled in prepay electricity, and in Arizona, 10 percent state that they are enrolled. (Admittedly a small base of respondents—25 customers in Texas and 34 customers in Arizona—but nearly all of the current prepay customers are satisfied with their current prepay electric service.)

[20] Question 4: An electricity provider (your local utility or energy retailer) in your area may offer a prepaid electricity service or "pay-as-you-go" option. This means that the customer prepays or pays upfront for electricity before using the service. Are you familiar with this payment option?

Whether Currently Enrolled in a Prepay Electricity Plan[21]



The next four questions—numbers 6 through 9 in the consumer survey—present the results of the responses from these small numbers of customers who state that they are currently enrolled in prepay electricity.

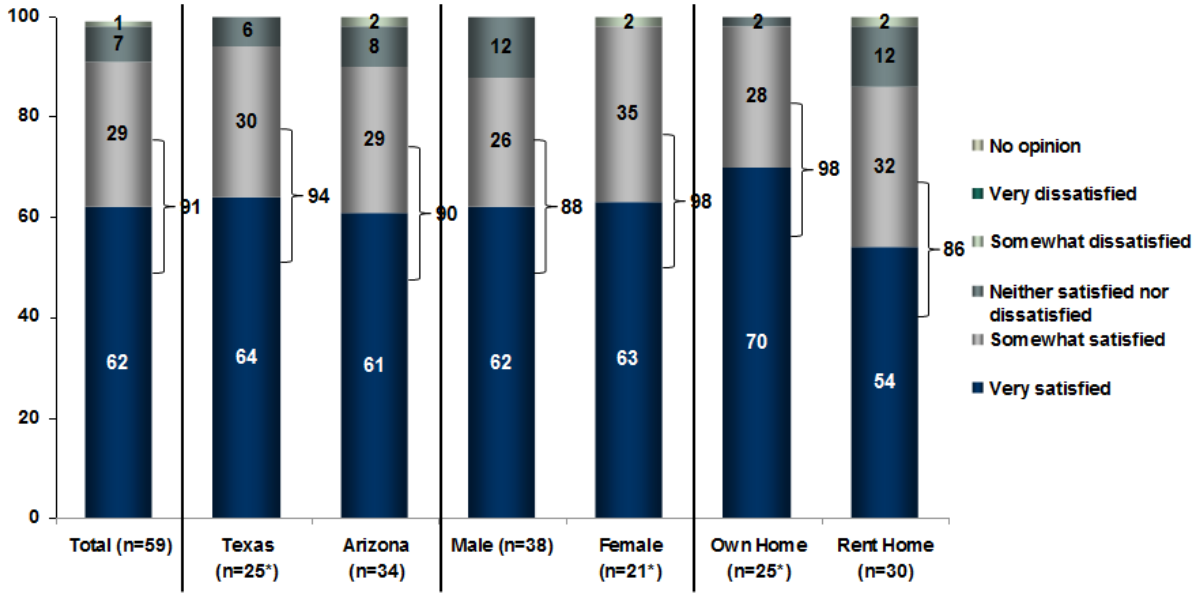
Experiences of Customers Enrolled in Prepay

Satisfaction among customers enrolled in prepay electricity is high. In Texas, 64 percent indicated that they are "very satisfied" and 34 percent indicated "somewhat satisfied" (totaling 94 percent). In Arizona, 61 percent indicated that they are "very satisfied" and 29 percent indicated "somewhat satisfied" (totaling 90 percent).

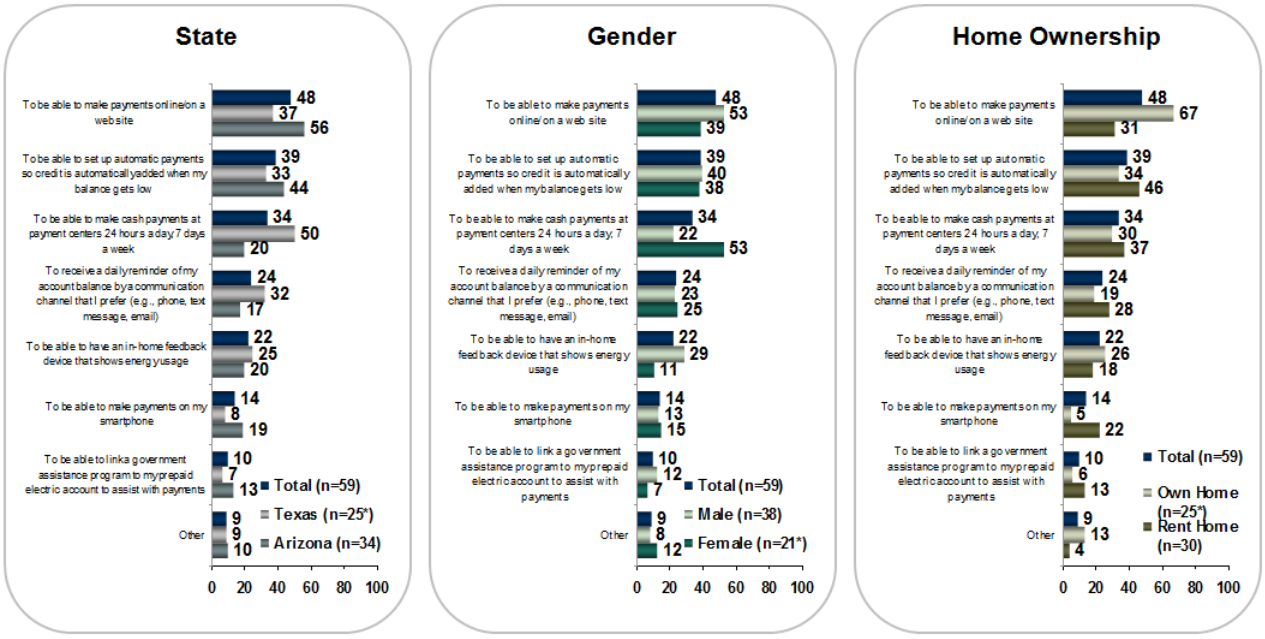
Respondents were asked to pick two features, from among a list of seven likely options, that would improve their prepay electric service. Flexibility "to be able to make payments on a Web site (48 percent) and "to be able to set up automatic payments" (39 percent) and "to be able to make a cash payment at payment centers" (34 percent) were selected most frequently.

[21] Question 5: Are you currently enrolled in a prepaid electricity plan?

Satisfaction Rating of Prepay Electricity Service[22]



Two Features That Would Improve Prepay Electric Service[23]



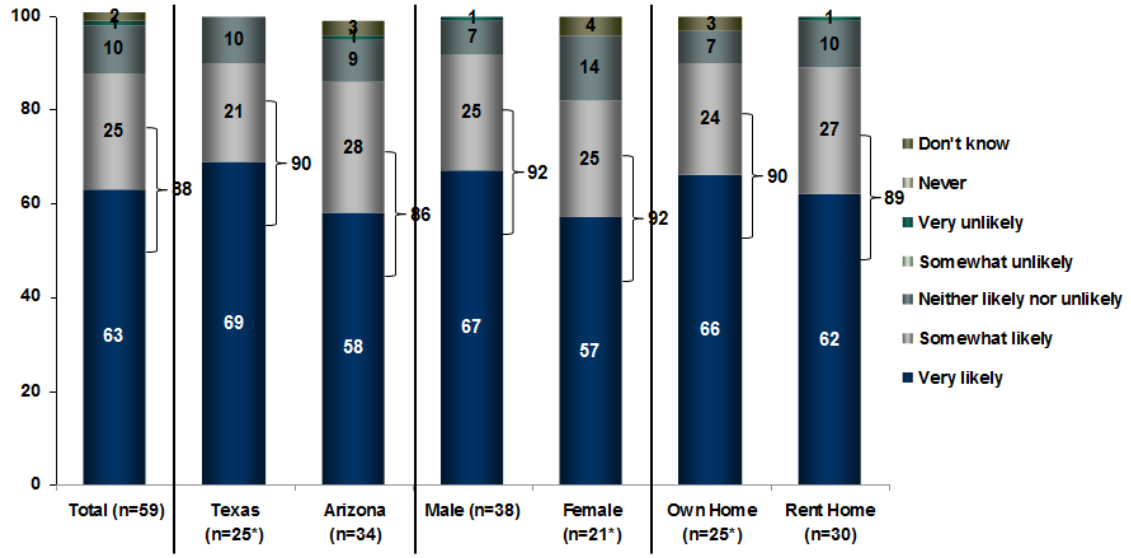
These customers were also asked whether they were likely to recommend their prepay electric service plan to family and friends. In this small sample,

[22] Question 6: How would you generally rate your satisfaction with your prepaid electricity service? (Caution, small base size: total currently enrolled in prepaid electricity plan.)

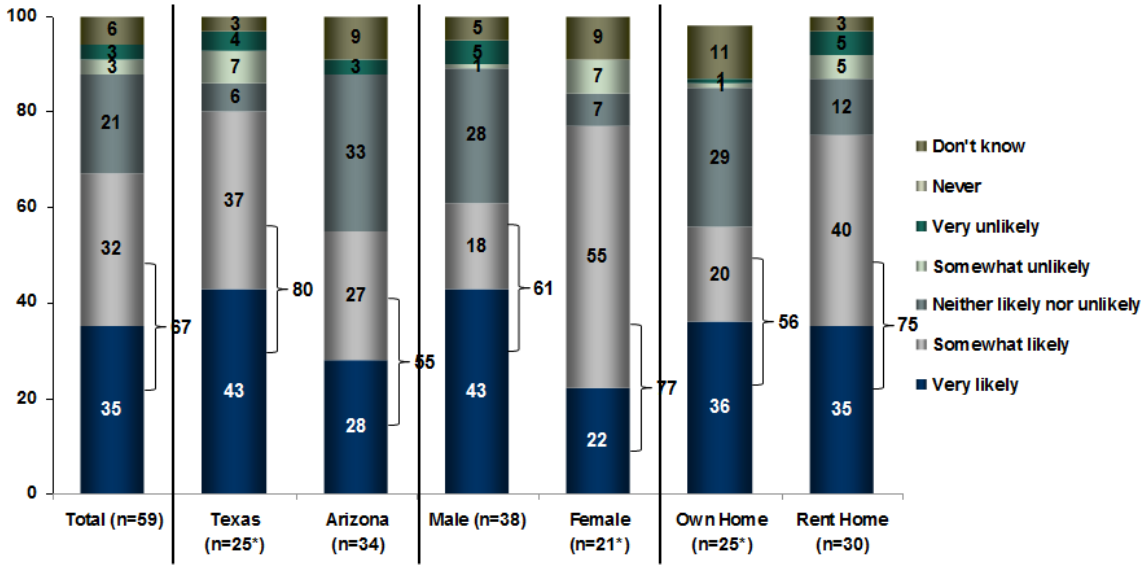
[23] Question 7: Which of the following <u>two</u> features would improve your prepaid electric service? (Caution, small base size: total currently enrolled in prepaid electricity plan.)

88 percent indicated that they were either "very likely" (63 percent) or "somewhat likely" (25 percent) to recommend prepay electric service.

Likelihood of Recommending Prepay Electric Service Plan[24]



Likelihood of Household Enrolled in Prepay Electric Service Plan Over the Next Year[25]



[24] Question 8: How likely are you to recommend your prepaid electric service plan to family and friends? (Caution, small base size: total currently enrolled in prepaid electricity plan.)

[25] Question 9: How likely would you say that you or a family member in your household would be to enroll in a prepaid electric service plan over the next year? (Caution, small base size: total currently enrolled in prepaid electricity plan.)

More than one-half (57 percent) indicated that they or a family member in their household would be "very likely" or "somewhat likely" to enroll in a prepay electric service plan over the next year.

Prepay Features and Reasons to Choose

The top reasons consumers would enroll in a prepay electric service plan are: "control over energy costs and budget" (46 percent), "prefer to pay for energy as you use it" (37 percent), and "want to reduce energy use and monitor closely" (32 percent).

Top Two Reasons Would Choose/Have Chosen to Enroll in Prepay Electric Service Plan[26]

		State		Gender		Home Ownership	
	Total	Texas	Arizona	Male	Female	Own Home	Rent Home
Total Respondents	(890) %	(476) %	(414) %	(440) %	(450) %	(490) %	(313) %
You want control over energy costs and budget	46	46	45	42	49	45	48
You prefer to pay for energy as you use it	37	38	36	37	37	39	33
You want to reduce energy use and monitor closely	32	29	35	32	32	31	28
You don't want to pay a security deposit to open up an account and/or avoid other fees	25	27	23	24	26	23	28
You do not want a monthly bill	22	17	27	24	19	18	27
You want to go paperless and save a stamp	11	12	9	13	9	13	8
You want more feedback/advice from your utility to manage your bills	11	10	12	12	10	13	10
You want to help pay/manage a family member's account, e.g., student at college or elderly parent	10	12	8	9	12	11	11
You have a seasonal home and prepaid provides greater flexibility	7	8	5	7	7	6	8

Regarding the most important features of a prepay electric service plan, consumers selected: "using less energy and saving money" (33 percent), "avoiding fees" (25 percent), "helps manage my budget better" (24 percent) and "eliminate any surprises" (21 percent). In Arizona, there was a statistically significant preference for "using less energy and saving money" (37 percent) and "eliminate any surprises" (25 percent).

When the respondents were asked what types of consumers may benefit from a prepay electric option, 18 percent thought it was best suited for low-income consumers, but 27 percent thought it would benefit all the consumer

[26] Question 10: Which of the following are the top two reasons that you and your family would choose or have chosen to enroll in a prepaid electric service plan?

segments that were listed (i.e., renters, seniors on a fixed income, young people 18–30 years old, among others).

Two Features Most Important of a Prepay Electric Service Plan[27]

	Total	State		Gender		Home Ownership	
		Texas	Arizona	Male	Female	Own Home	Rent Home
Total Respondents	(890)	(476)	(414)	(440)	(450)	(490)	(313)
	%	%	%	%	%	%	%
Use less energy and save money	33	28	[37]	33	33	31	35
Avoid fees	25	29	22	26	25	25	26
Helps manage my budget better	24	21	27	20	27	23	25
You want to eliminate any surprises	21	16	[25]	[25]	16	18	22
Peace of mind that my electricity is paid into the future and will not owe late fees	18	21	16	16	21	16	22
Convenience/flexibility	17	19	14	16	18	14	20
Avoid paying a security deposit	15	14	17	17	14	12	19
Ability to manage/pay bills for a family member, e.g., student at college or elderly parent	7	8	5	5	8	8	5
More information regarding my energy use	7	6	8	6	7	8	5
Better customer service	4	6	3	5	4	5	4
Other	3	2	3	3	2	3	2
Don't know	13	15	11	14	13	[17]	7

Type of Customer Predict Would Find the Most Value in Prepay Electric Service Plan[28]

	Total	State		Gender		Home Ownership	
		Texas	Arizona	Male	Female	Own Home	Rent Home
Total Respondents	(890)	(476)	(414)	(440)	(450)	(490)	(313)
	%	%	%	%	%	%	%
Low income consumers	18	17	20	20	17	18	20
Seniors on fixed incomes	17	16	18	16	18	20	12
Young people (18 – 30 years old)	10	10	10	12	9	7	[15]
Renters	9	7	11	[12]	5	6	[12]
Families with second homes	7	9	6	7	8	[10]	4
Immigrant communities	4	4	3	[6]	1	5	2
Soccer moms with busy schedules	1	2	0	1	2	2	1
All of the above	27	29	25	19	[35]	24	30
None of the above	6	6	7	6	6	8	4

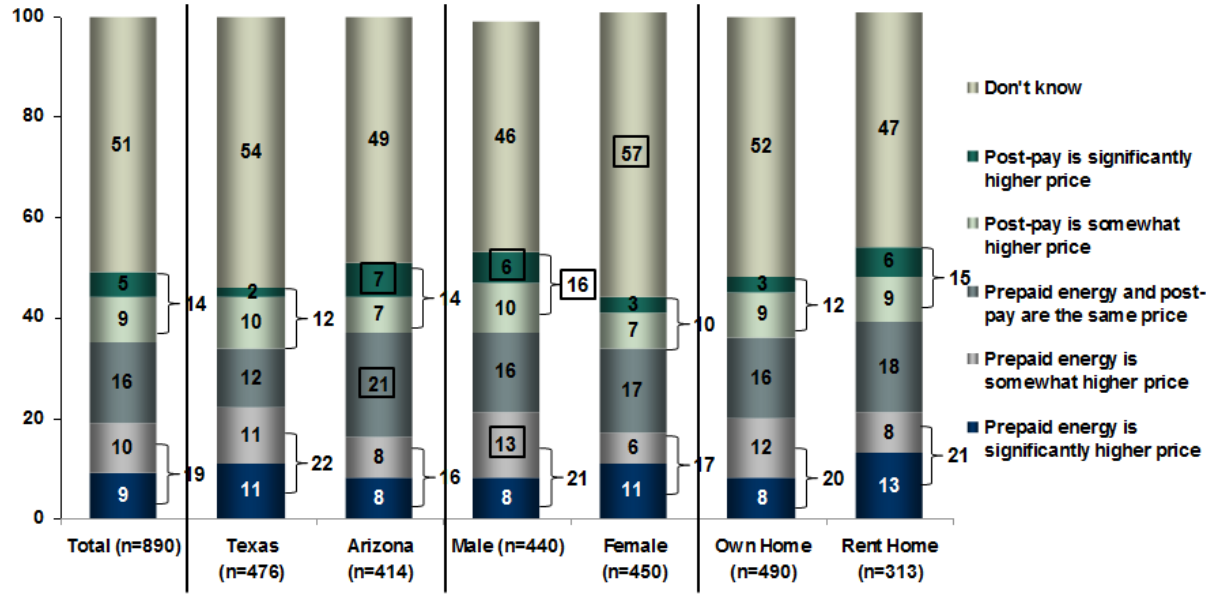
[27] Question 11: Which of the following two features of a prepaid electric service plan are the most important to you?

[28] Question 12: When thinking of other types of customers who might like a prepaid electric service plan, what type of customer do you predict would find the most value in having this option?

Cost and Responsiveness to Future Savings

One half of the respondents do not know whether prepay or post-pay energy costs more, and one fifth thinks prepay energy is a "somewhat higher price" or a "significantly higher price."

Comparison of Price of Prepay Energy Versus Post-Pay[29]

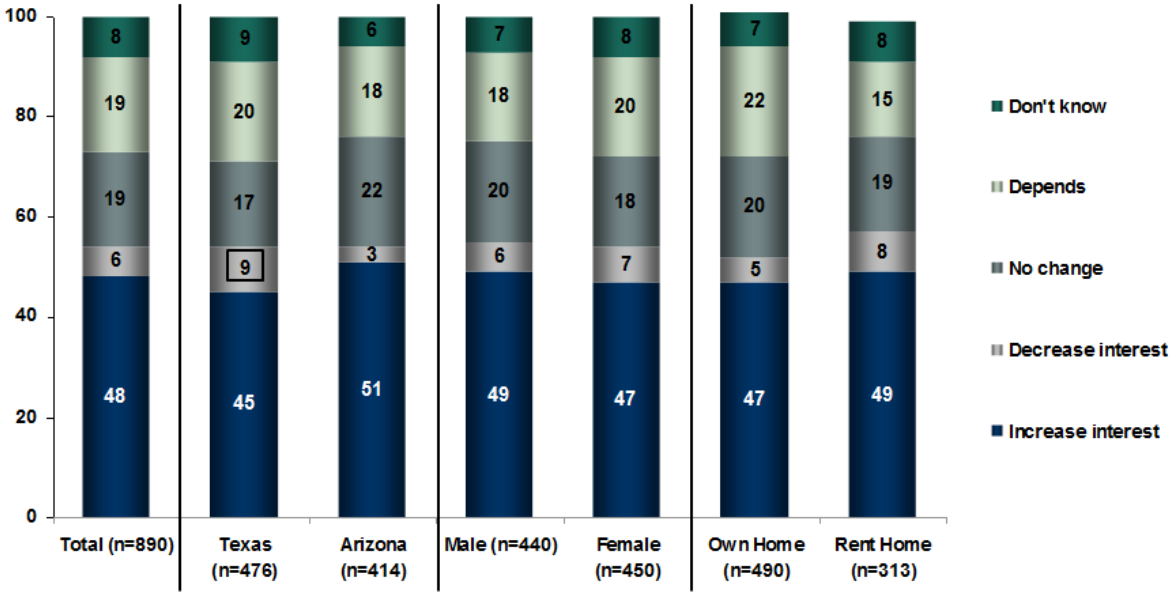


When presented with a scenario of savings from enrollment in prepay electricity and by "providing you information regarding your usage in near real time," 48 percent indicated "increased interest" in prepay electricity if it lowered the electric bill by 5 to 15 percent.

Respondents were also asked about additional services. Among nine listed choices, respondents gave a "9" or a "10" out of ten to "rebates/special offers" (38 percent), "different pricing options" (31 percent), and "energy assistance to help pay bills" (30 percent). These three choices were supported by women as statistically significant higher levels than men. Renters showed a preference for "different pricing options."

[29] Question 13: What is your experience or expectation when comparing the price of prepaid energy versus what you traditionally paid when you got a bill at the end of the month for utility service that you already used (post-pay)?

Interest in Enrolling in Prepay Electric Service if Saved 5-15 Percent[30]



Add-On Features Value Ratings (Top-Two Box Ratings: Rated 9 or 10)[31]

	Total	State		Gender		Home Ownership	
		Texas	Arizona	Male	Female	Own Home	Rent Home
Total Respondents	(890) %	(476) %	(414) %	(440) %	(450) %	(490) %	(313) %
Rebates/special offers	38	40	37	32	44	41	37
Different pricing options	31	29	32	26	35	27	37
Energy assistance to help pay bills	30	29	31	24	36	28	33
Budget alerts	21	18	25	19	24	20	24
Energy conservation tips	21	16	26	19	22	20	19
Energy management options	20	16	24	23	17	18	22
Energy savings calculator	20	18	22	17	22	17	23
New apps for smart phone	14	14	14	14	14	14	14
Calculator on environmental impacts	14	12	16	15	13	14	14

[30] Question 14: If prepaid electric service resulted in lowering your utility bill by 5-15 percent through discounts and/or helping you reduce your energy consumption by providing you information regarding your usage in near real time, how might that impact your interest in enrolling in a prepaid electric service plan?

[31] Question 15: If your prepaid electric service came with add-ons to create more customer value, how valuable would each of the following add-on features be to you? Please use a scale from 1 to 10, with 10 being Great Value and 1 being No Value.

Word Associations

When asked for one word to describe prepay electric service, "convenient" was mentioned the most by far. Other terms mentioned at lower levels were: "interesting," "easy" and "savings." The emphasis on convenience may reflect an association that people have with prepay service generally.

One Word To Describe "Prepaid Electric Service"[32]

Next we asked for one word to describe the biggest concern regarding prepay electric service. The most frequently-mentioned were: "cost," "price," "overpaying" and "expensive." At slightly lower levels, consumers mentioned "money," "unknown," "reliability," "running out," "usage" and "budget."

One Word To Describe Biggest Concern Regarding "Prepaid Electric Service"[33]

[32] Question 16: What one word would you use to describe prepaid electric service? Please be as specific as possible.

[33] Question 17: What one word would you use to describe your biggest concern in regards to prepaid electric service? Please be as specific as possible.

Concerns About Prepay Electric Service

When asked to rate their concerns using a ten-point scale, consumers applied a "9" or "10" (representing extreme concern) to the following: "service disconnect/electricity going off when my prepay account balance runs out" (53 percent), "price/higher rates" (48 percent), "fees associated with prepay" (43 percent), "expiration of credits over time" (37 percent), "knowledge/awareness of my account status" (35 percent). Females indicated statistically-valid higher levels of concern in five of nine choices.

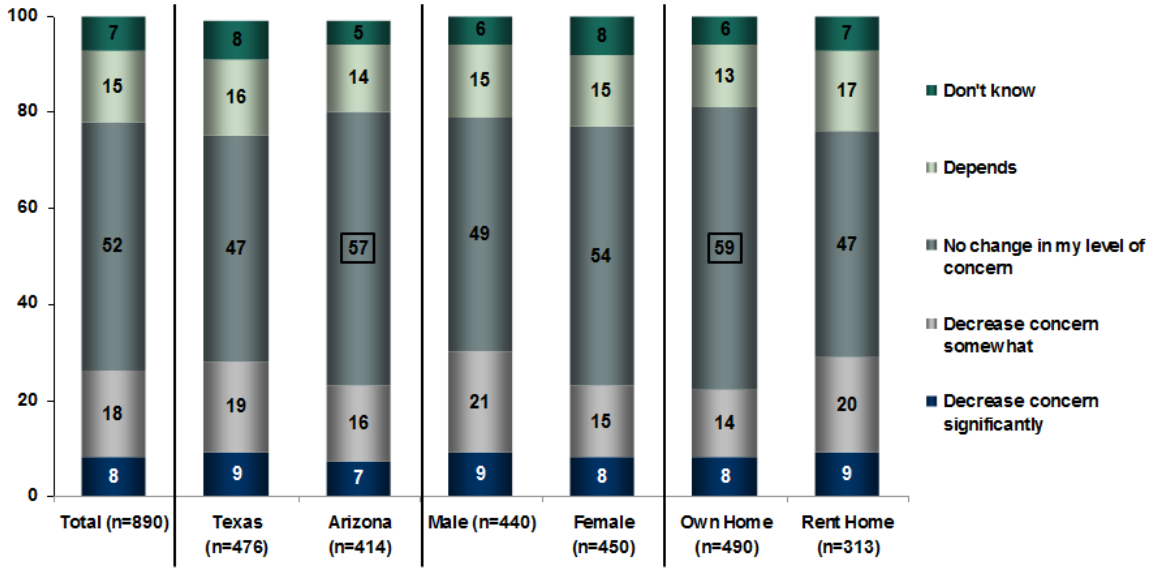
Prepay Electric Service Specific Concern Ratings (Top-Two Box Ratings: Rated 9 or 10)[34]

	Total	State		Gender		Home Ownership	
		Texas	Arizona	Male	Female	Own Home	Rent Home
Total Respondents	(890)	(476)	(414)	(440)	(450)	(490)	(313)
	%	%	%	%	%	%	%
Service disconnection/electricity going off when my prepaid account balance runs out	53	54	51	47	58	55	51
Price/higher rates	48	47	48	43	53	47	48
Fees associated with prepay	43	41	46	37	50	43	44
Expiration of the credits over time	37	36	39	34	40	37	37
Knowledge/awareness of my account status	35	35	34	29	40	32	38
Security	31	32	30	29	33	30	35
Privacy	30	32	28	28	33	31	29
Consumer protection	30	32	27	26	33	29	32
Making payments	28	28	27	21	34	24	32

When asked whether the voluntary nature of the enrollment decreased concern, more than one half indicated that it did not change their concern. About one quarter indicated that it would decrease their concern "somewhat" or "significantly."

[34] Question 18: When considering prepaid electric service, how concerned would you say you are when thinking about each of the following? Please use a scale from 1 to 10, with 10 being Extremely Concerned and 1 being Not Concerned At All.

Whether the Voluntary Nature of Enrollment in Prepay Plans Decrease Concern[35]



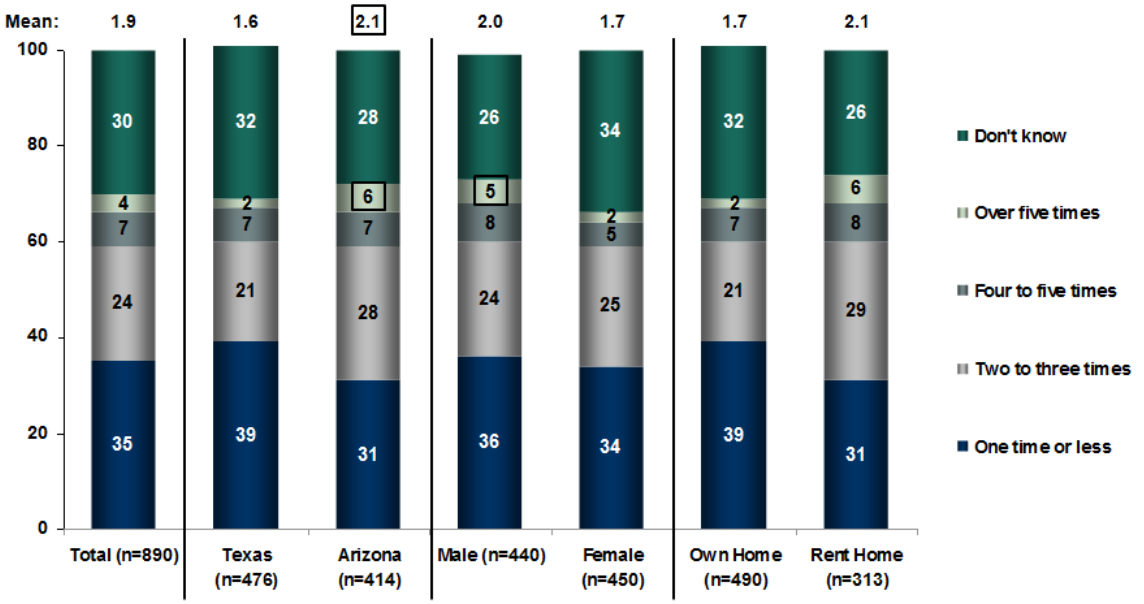
Likely Usage of a Prepay Electric Account

We asked how often the customer was likely to put money into the prepay account. The average response was about two times (1.9 times per month), with one third indicating once a month or less, one-quarter indicating two to three times a month and a few indicating three, four, five or more times per month.

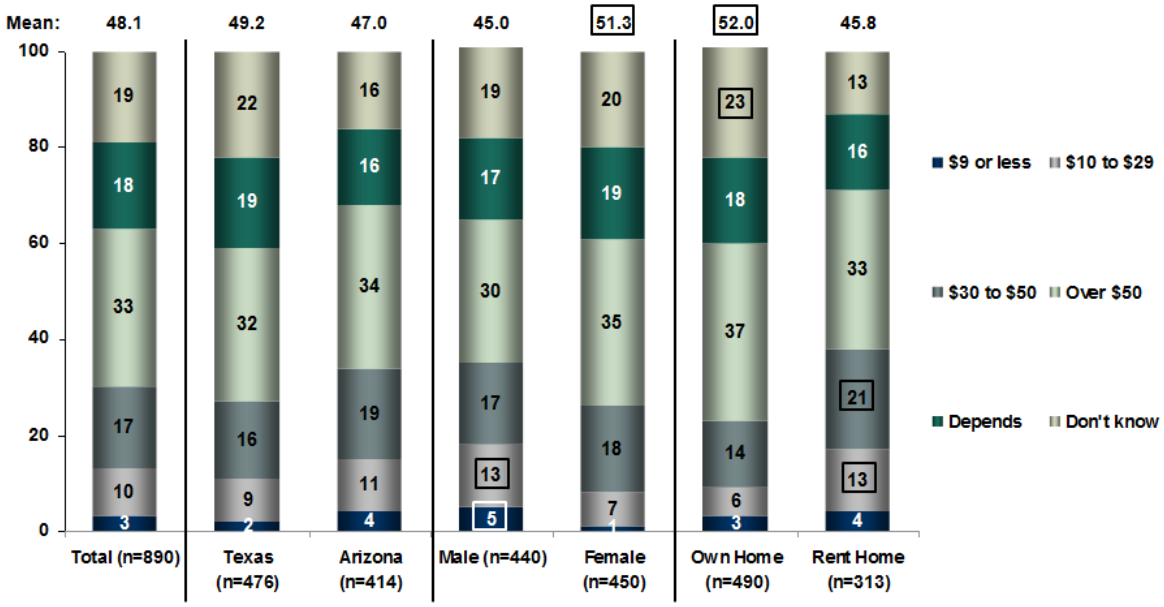
The average amount they would recharge the account each time was about $50 ($48.10 per transaction). One third indicated "over $50."

[35] Question 19: If prepaid electric service options were strictly voluntary and up to each consumer to decide to enroll or not to enroll, would the voluntary nature of enrollment decrease any concerns you may have?

Number of Times Would Put Money Into Prepay Electric Service Account Per Month [36]



Amount Would Put Into Prepay Electric Service Account Per Transaction[37]



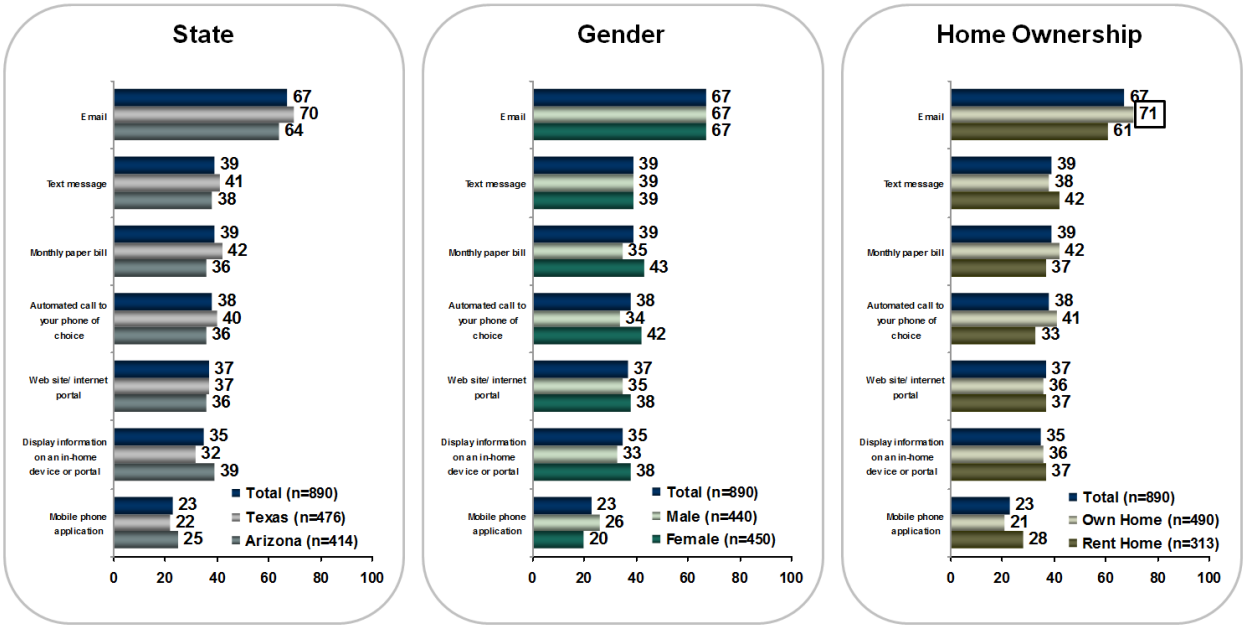
[36] How many times do you estimate that you would put money into your prepaid electric service account on a monthly basis?

[37] Question 21: How much do you estimate that you would put into your prepaid electric service account per transaction?

Notifications to Protect Consumers

Respondents overwhelmingly stated (67 percent) that email should be required to notify customers regarding low credit balance, confirmed payments, status regarding disconnect and reconnect of service, daily energy consumption, etc. Several other methods of notification received support from 35 to 39 percent of respondents: "text message," "monthly paper bill," automated phone call," Web/Internet portal" and "display on in-home device."

Notification Methods Consider Mandatory for a Prepay Electric Service Option[38]



What Does It All Mean?

Prepay as a bill payment option or alternative means to transact business is clearly acceptable to the mainstream of energy consumers. The findings show that the trend towards prepay products and services continues to intensify, with approximately two thirds of consumers in Texas and Arizona having used some type of prepay method in the recent past, in particular gift cards, reloadable debit cards, and/or prepay wireless services. Use of prepay

[38] Question 22: What notification methods for information (e.g., low credit balance, confirmed payments, status regarding disconnect and reconnect of service, daily energy consumption, etc.) would you consider to be mandatory for a prepaid electric service option?

is definitely not limited to low income consumers but clearly used and accepted by the majority of Americans regardless of income.

What is behind the trend? Why are consumers satisfied with prepay options? Leading drivers for customer satisfaction with various prepay products and services are convenience and ease. Similarly, the perceived attributes of prepay electric service and top reasons to sign up for prepay electric service in both the 2010 survey and this survey were convenience and control over costs and energy usage.

These drivers for customer satisfaction are directly related to customer lifestyle, budget and bill payment preferences. The ability to pay for electricity in any amount (small or large increments) at a selected time (24/7 online or at a pay center at the local supermarket) through your normal channel (mobile) will be preferred by a certain segment of customers over a one-time lump sum monthly bill. Other segments that will be interested in prepay service will have a different set of motivations and expectations. Perhaps more affluent "snowbirds" will like the ability to pay in advance for several months and receive regular updates with usage data for a home they left vacant, or possibly even "self disconnect" (purposely allow credit to run to zero prompting disconnect) for an extended period without the hassle of late payment penalties and the reconnect process typical for post-pay service.

Recommendations

With a line of sight to customer satisfaction and benefits for certain segments of consumers that will opt for prepay electric service, the DEFG EcoAlign team makes the following recommendations:

Research: There is a need for more research to identify and better understand the segments of customers that are going to like prepay electricity, and the different motivations and expectations for each segment.

Satisfaction and Benefits: Perceived benefits of prepay electricity include: using less energy and saving money, increased budget control, convenience, no security deposit and late fees, and no monthly bill. Indeed, prepay can meet expectations around improved cash management in a number of ways. For instance, the nature of prepay is incremental compared to traditional monthly billing. As more consumers, especially younger adults, increasingly conduct financial transactions via smart phone, there is a real opportunity for

consumers to make payments wherever and whenever and in an amount that best suits them. The option to make more payments in smaller amounts aligns nicely with a mobile lifestyle.

Messaging: With different segments identified, a provider can market to groups in a manner (via preferred communication channel) and with content that aligns with their motivations and expectations (e.g., explain why prepay provides additional budget control).

Education: Prepay electricity is a bill pay option, but also a very different way of buying and using electricity that changes the relationship between the provider and the customer. Education on how prepay works will be important. Over time, with substantial analysis and data of actual use, consumers would appreciate predictive recommendations to help them optimize their use of the service.

Transparency: There is real uncertainty regarding the price of prepay electric service and concern regarding the possibility of service disconnect / electricity being turned off. Service providers must be transparent to dispel confusion—the basis for pricing and the applicable policies and protections for service disconnection must be addressed.

Potential for Energy Management and Pricing Options: The results point to consumers making a strong correlation between prepay electric service and using less energy and saving money. Prepay should be viewed as a platform for energy management and other pricing options. In other words, prepay could be viewed as a daily bill pay conversation that is transactional (dollars and cents), relevant (focused on saving energy to manage bills), and actionable (today's information could result in impacts on tomorrow's conversation). As part of the conservation, consumers would be open to receiving relevant and actionable information, such as rebate details, different pricing options and energy assistance. Prepay could, for instance, be further extended into a budget billing offering.

The facts show real potential for a substantial consumer base to use and value prepay electric service. Prepay service, however, is often framed as a low income option within the utility sector. As many low income consumers value the option to better manage their cash/ credit, so too would other consumer segments. The key is to identify them.

For more information about this survey, please contact Jamie Wimberly at 202-483-4443 or jwimberly@ecoalign.com.

For more information about EcoAlign and other EcoPinion consumer surveys, visit our website at www.ecoalign.com. You may quote portions of this document with proper citation: ©2012 DEFG LLC EcoAlign

EcoAlign: The Energy and Environment Agency

EcoAlign is the energy and environment marketing agency. We develop and execute marketing strategies for utilities, renewable energy providers and companies operating in the energy and environment space.

.

Distributed Energy Financial Group LLC

DEFG LLC is a specialized consulting firm focused on the energy sector. Our vision is that customers are core to the future of energy: as a resource, to reduce risk, and to increase revenue potential. Our mission is to help our clients engage with customers to create value in the energy commodity market place and to enhance the customer experience. Our clients include energy utilities, technology companies, energy suppliers and energy solution providers. We focus on business strategy and planning, regulatory, customer service and operations, marketing and product development, and analysis of customer-facing technologies.

Methodology

The Russell Omnibus was conducted via the internet among 890 adults, 18 years of age or older, from November 18-21, 2011, in Arizona and Texas (additional boost interviews were conducted in Arizona and Texas). Figures for gender, age, and geography were weighted where necessary to match their actual proportions in the population. In theory, with probability samples of this size, one could say with 95 percent certainty that the results have a statistical precision of plus or minus 3.1 percentage points of what they would be if the entire adult population had been polled with complete accuracy. Unfortunately, there are several other possible sources of error in all polls or surveys that are probably more serious than theoretical calculations of sampling error. They include refusals to be interviewed (non-response), question wording, question order and weighting. It is impossible to quantify the errors that may result from these factors. This online survey is not a probability sample. Online sample for the study was drawn from Survey Sampling International's SurveySpot online consumer panel. Survey Sampling is recognized as the premier sample provider in the market research industry. The SurveySpot panel currently has 1.6 million panel members who are recruited using a wide variety of online and offline methods, including website registrations, email invitations and telephone recruiting. For this study, invitations were e-mailed to potential respondents targeted by gender, age, census region and ethnicity.

These statements conform to the principles of disclosure of the National Council on Public Polls.

ATTACHMENT B

DEFG's Series of Regulatory Choices, No. 7, "A Method for Estimating the Conservation Effects of Energy Prepayment," Nov. 2011.

Series of Regulatory Choices

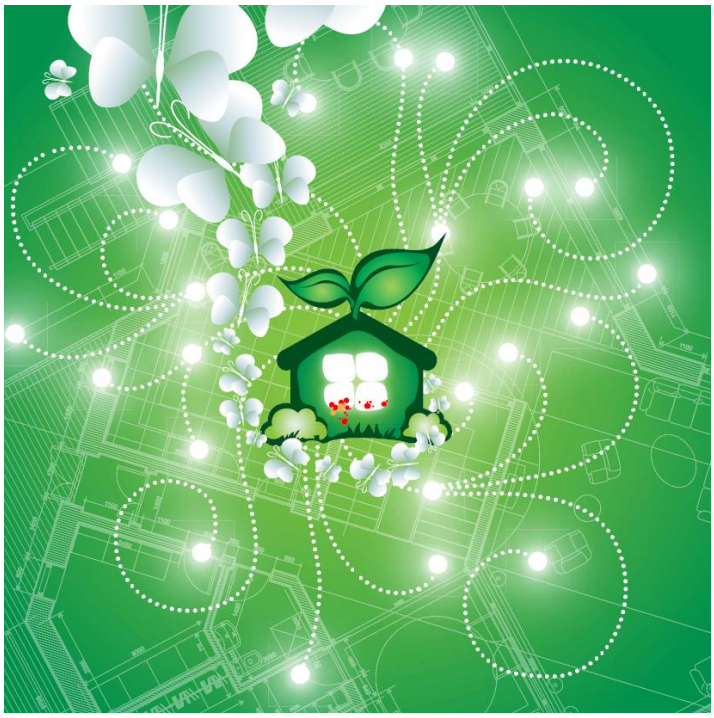
November 2011

No. 7

A Method for Estimating the Conservation Effects of Energy Prepayment

By: Michael Ozog, Ph.D.

A research project commissioned by the DEFG Utility Prepay Working Group



DEFG's Series of Regulatory Choices explores the federal, state and local regulatory decisions that expand the choices available to energy consumers as they construct and inhabit buildings, purchase and maintain energy-consuming devices, purchase energy, or manage their consumption of energy. Greater choice increases efficiency.

◄ All agencies make a series of choices ►

Introduction

The concept of paying for electricity before use (energy prepayment or "prepay"), rather than paying after consumption, metering and monthly billing, is not new. Over ten million consumers prepay for electric service in approximately 40 countries.[39] One of the earliest such programs was started by Eskom in South Africa in 1990.[40] Perhaps the largest proliferation of prepaid energy services occurs in Great Britain where 4 million electric and over 2.5 million gas customers are on prepayment meters.[41]

While prepaid electric service has been offered outside the U.S. for over a decade, it is only quite recently that prepayment has gained increased attention by utilities and consumers in the U.S. One of the reasons is the introduction of new technology. Many "smart meters" are part of the advanced meter infrastructure (AMI) and offer two-way communications. This allows for both automatic meter reading and remote customer disconnection and reconnection. These technologies reduce the cost and complexity for utilities that provide prepaid electricity, and can enhance the customer experience. Advances in smart phones and other Web-enabled devices can increase the ability of consumers to manage their energy usage.

While there are several reasons to expect that energy prepayment will result in consumers using less energy (these reasons will be addressed below), there has been little analysis of this relationship. One possible reason for this is that the energy effects of prepay can extend beyond the adoption of energy conservation behavior or efficiency measures and to the self-rationing (Mummery and Reilly, 2010). Self-rationing involves reducing energy usage to such an extent (including self-disconnecting) that the well-being of the customer is significantly reduced.[42] This can have significant societal implications. Therefore, an analysis of the relationship between energy usage and prepay should be able to separate the role of adopting energy conservation behavior or efficiency measures versus curtailing consumption.

In addition, significant reduction in energy usage that is not associated with a more efficient use of energy can also have a significant impact on a utility's revenue. In North America, the issue of lost revenue is less of an issue due to various mechanisms such as decoupling revenue from sales, performance incentives, and mandated conservation goals. However, all these mechanisms require robust measurement and evaluation that both quantifies the reduction in energy usage and differentiates this from self-disconnections.

The purpose of the paper is to explore the potential linkage between prepaid energy and reduced energy usage. The research is critical as the connection between behavioral changes grounded in a

[39] EPRI 2001. Options for Prepayment Service Accords. December 2001.

[40] Tewari, D.D. and Shah, T. 2003, "An assessment of South African prepaid electricity experiment, lessons learned, and their policy implications for developing countries." Energy Policy 31, pg 911-927.

[41] United Kingdom Department of Energy & Climate, 2011. "Fuel Poverty Monitoring Indicators, 2011." URN 11D/813. Part of the reason for this widespread use of prepayment meters in the UK may be that energy suppliers are allowed to install prepay meters on customers who are in arrears. In addition, a recent study from Mummery, H, and Reilly, H. 2010. "Cutting Back, cutting down, cutting off-self-disconnection among prepayment meter users," found that a 28% of customers with prepayment meters were installed by their landlord. The program is not without significant criticism however, as the program initially had prepay customer paying higher rates than non-prepay customers. In 2010, these rate premiums were eliminated (National Housing Federation, 2010).

[42] Smith, 2003, reports that prepay customers in the UK have lowered by consumption by upwards of 22%, such a large reduction is unlikely to result from purely more efficient use of energy, and thus may include a large amount of curtailing usage.

feedback loop (energy usage information) and a transaction (prepayment) is neither sufficiently documented nor understood. Critical questions to be explored include:

What is the available research on the relationship between prepay and energy usage?
What methodologies can be implemented to provide evidence supporting a linkage that would be defensible in a regulatory environment?
What are the data necessary to conduct an analysis between participation in prepay and reduced energy usage?

The following sections present a brief discussion of the features of prepaying for energy that may impact energy usage, and review the current evidence for the link between prepay and reduced energy consumption. The remainder of the paper focuses on how to quantify a reduction in energy usage for both internal benefit/cost analysis as well as regulatory filings.

Link between Prepay and Energy Usage

While the energy impacts of prepay have not received a great deal of attention in the past, there is little question that aspects of prepay can help customers use less energy. The features of prepay that can lead to a reduction in energy use can be grouped into three general areas and each is discussed in detail below:

- Feedback
- Price effects
- Budget management through disconnects

Feedback

With monthly billing, there is a significant temporal disconnection between energy using behavior and the associated cost. This temporal disconnection makes it difficult, if not impossible, for customers to understand and relate their behavior to energy usage (and the associated cost) because of the time lag between the behaviors and receiving their energy bill. So while all customers are motivated to reduce their energy bills, customers on prepay have the ability to know how much energy they are using, and its cost, in near real-time.

The link between information and behavior change can perhaps be best understood by coaching the situation in the context of control theory, more specifically feedback loops (Goetz, 2011). Generally speaking, in a feedback loop, a controller adjusts controlled behavior to make the output from a system equal to desired state. All feedback loop control systems have four elements:

Information on system output
Information on the desired state
A means to compare the results of the input and the output
A control mechanism

Following Goetz, we can relate these elements to a system that is designed to affect behavior. Under that framework, a behavioral feedback loop will have these elements:

Evidence – information about the system must be measurable

Relevance – the information must be presented in a context that is relevant to the individual

Consequence – the information must help the customer understand how actions will affect outcome.

Action – the customer must have the ability to change the necessary behavior.

For customers that receive monthly energy bills, the delay between action and evidence is far too long to allow the development of the consequences of actions, so it is impossible to develop a feedback loop. The ability of a prepay program to present near real-time information to the customer opens up the possibility of a feedback loop. Given the customer's motivation to reduce his/her energy bill, this feedback loop will likely result in a reduction in energy use.

Price effects

For some prepayment programs, there is a difference in the cost of energy between being on the prepayment program and remaining on monthly billing. In some cases, this can be an actual difference in the charge per amount of energy used, while in other cases it may be an additional fee to cover outstanding past balances, the deposit, or service establishment fee. If there is a difference in the cost of energy associated with prepay, then the customer will alter their energy usage passed upon their price elasticity (i.e., the percentage change in energy use associated with a one percent change in the price of energy).

There has been a great deal of recent research on the price elasticity of demand for electricity due to increased interest in time-differentiated rates. While there is a wide range of price elasticity depending upon region, season, enabling technology, and type of rate, the estimated elasticities are typically around -0.05 (Faruqui and Sergici, 2009), which implies that a 100% increase in the cost of electricity will reduce the customers usage by 5%.[43]

While there is the potential that enrollment in prepay may cause a decrease in energy use due to price effects, the extent to which this occurs is difficult to gauge without detailed information about both the program and without investigating how customers react ex post. In general, it is unlikely that a prepay program will significantly increase the rate for energy, as that may lead to significant political issues (witness the early stages of prepayment in the UK). In addition, it is not clear that increases in the charges that are not linked to usage (such as payment of past arrears or deposits) affect the actual usage of customers. Therefore, while price effects may impact energy usage for prepay customers, these effects are likely to be small.

Budget Management through Disconnects

One of the key features of prepay is that there is generally no fee to the customer for disconnection/reconnection of service. This has the effect of making self-disconnection a viable option for customers in managing their budget. A recent study of the UK prepayment meter (PPM) program (Mummery and Reilly, 2010) found that 16% of PPM customers had self-disconnected during 2009. While a majority of those customers disconnected unintentionally (either they did not realize that there were so little funds remaining, or they forgot to top up their account), 21% reported that they purposely self-disconnected due to budget constraints. In terms of the length time the customers were

[43] IEE, 2010 investigates price elasticity as it relates to low-income customers, concluding that past studies have shown that low-income customers do indeed respond to prices, though there is evidence that their elasticity is lower than non low-income customers.

disconnected, 50% reported that they disconnect for less than seven hours, at most once a month, slightly over 20% reported that they disconnect for less than seven hours, at least 2-3 times per month, and 20% reported that they disconnect for more than seven hours.

Clearly, self-disconnects, independent of the underlying reason, do represent a significant reduction in energy usage. It can be argued that self-disconnection does not signify a more efficient use of energy, and moreover has clear negative impacts on households and an overall decrease in societal welfare. Therefore, it is important that any evaluation of the effects of prepay on energy use should make a distinction between actions that are associated with a more efficient use of electricity versus self-disconnections.

Evidence for Reduced Energy Consumption

The lack of meaningful information on the energy use impacts associated with prepayment is shown in the 2001 EPRI report on the benefits-costs of prepayment. While this report acknowledges the possibility of reduced consumption effects, it presents no information on the size of this effect. Rather, it assumes a scenario with a 10% energy usage reduction effect.

More recent publications have presented estimates of the energy impacts associated with prepay, including:

- A 1.5% reduction in prepayment in a prepayment pilot in Helsinki (Arvola et al, 1994).
- A 12% reduction by customers in the Oklahoma Electric Cooperative prepayment program (Buck, 2008).
- An 11% reduction in usage when customers receive training on the system, and a 4% reduction for customers without training (EEI, 2008).
- A 12.8% reduction in energy use in the Salt River Project (SRP) M-Power program (EPRI, 2010).

However, aside from the analysis of the SRP M-Power program research, none of these estimated energy usage effects discuss the procedure used to determine these impacts. Therefore, this review will focus exclusively on the analysis of the SRP M-Power program as presented in EPRI, 2010.

SRP M-Power Program Analysis

In 2007, SRP conducted a retrospective investigation of the relationship between the M-Power program and energy usage. Specifically, the focus of the study was to determine how the usage of M-Power customers compared to the usage of customers on the standard residential rate. In order to estimate the baseline (i.e., non-program) usage of the M-Power customers, a control group was developed that consisted of customers located in the same neighborhood of each M-Power customer. This control group was matched one-for-one with each M-Power customer based upon usage levels (kWh). In order to account for seasonality, summer and winter usages for both groups were defined, where the pre-treatment period was October 2004 through April 2005 for the winter analysis, and April 2005 through October 2005 for the summer. The post-treatment period was October 2005 through April 2006 for the winter analysis, and April 2006 through October 2006 for the summer.

The energy impact of the program was estimated by using differences-in-differences (DiD) between the consumption in the control group and the consumption in the M-Power group.

The DiD approach measures the average usage of the treatment and non-treatment group both before and after introducing treatment. *The effect of the program is simply the difference between the observed change in the treatment and the non-treatment group*:

$$\text{Program Effect} = \left(\text{Usage}_{pre} - \text{Usage}_{post}\right)_{treat} - \left(\text{Usage}_{pre} - \text{Usage}_{post}\right)_{non-treatment} \quad (1)$$

M-Power customers reduced usage, on average, 8% and control customers' usage, on average, grew 4%, indicating that M-Power customers reduced their usage by 12%. Additional tests indicated that the difference was not influenced by the amount of energy consumed per month or by season.

The quasi-experimental design that was used to investigate the energy usage effects associated with M-Power was fundamentally sound. In addition, SRP should be commended for the one-for-one matching of the control group with the treatment group, as this step is often omitted in other differences-in-differences approaches. However, it is instructive to note that there are a few general evaluation issues which were not explicitly addressed in the analysis. These are discussed below.

Complicating Factors

As discussed previously, the reduction in energy usage associated with prepay is generally related to changes in behavior by customers. These behavioral responses are similar to other normative energy efficiency programs such as nominative reports (where a customer's energy usage is compared to customers with similar demographics and housing characteristics). This is in contrast to the more familiar measure-based energy efficiency programs, where the utility subsidizes the installation of energy efficient technologies in customer's homes.

This difference has produced a significant collection of literature on how to evaluate these behavioral programs that is distinct from the measure-based evaluation literature that has been available for over three decades. Examples of this of literature includes EPRI (2010), Brandon (1999), Allcott (2009), Ayers et al. (2009), Allcott and Mullainathan (2010), Sergici and Faruqui (2011), and EDF (2011). While much of this literature is consistent with energy efficiency program evaluation literature, there are several areas where they are markedly different, and as will be shown below, these differences have profound impacts on how to estimate the effects of prepay on energy usage.

Self-Selection Bias

A majority of the literature of behavioral energy conservation programs focuses on normative programs. In this approach, customers are given a report that shows their energy consumption over time relative to similar households, and includes several energy conservation tips. A unique feature of these programs is that customer's do not make the decision of whether to participate in the program. Rather, these customers are randomly assigned into two groups – those who receive the report and those who do not.

This is in stark contrast to other utility-sponsored programs, including prepay, in which customers make the decision to participate in the program. The implication of customers selecting themselves into the program (termed "self-selection" in the evaluation business) is that it makes it difficult to determine causation. For example, individuals who enroll in a prepayment program may have a higher probability

of losing their jobs during a recession, so that observed decreases in energy use may not be the direct result of the prepayment program, but is instead the result of worsening economic conditions.

Non-Program Effects

Throughout the history of utility-sponsored energy efficiency programs, there has been a distinction between net and gross savings. Gross savings are those savings that result from the program-promoted actions irrespective of how the program influenced the customer. The complicated aspect of gross savings is the energy savings must be a result of the program, and not due to other effects (such as changes in weather or economic conditions).

Net savings are the gross savings that are directly attributed to the program (that is, not a result of other influences). The primary (but by no means exclusive) difference between the two is that net savings does not include the savings associated with "free riders." Free riders are those program participants who would have implemented the measure or behavior associated with the program even in the absence of the program. Many utility commissions set incentives and goals on the basis of only net savings.

For normative behavioral programs, the random assignment aspect implies that both the treatment and the non-treatment group will be subject to the same external (non-program) influences, so the non-treatment customers accurately reflect the energy use of the treatment group without the program. In other words, their usage can serve as the baseline for the treatment group, and thus can be used to directly determine gross impacts.

For behavioral programs in general, the concept of free ridership is not relevant because the utility is not offering any financial incentive to the customer to adopt specific energy efficient behaviors; it is basically supplying information to the customer. Therefore, the gross and net energy savings are equal.

For prepay, the situation is considerably more complicated. While the utility does not overtly provide incentives to the customer to adopt energy efficient behaviors, prepay does indeed reduce the cost (both in terms of the cash outlay as well as the customer's transactions cost) of disconnecting service. Therefore, there may indeed be customers who are "free riders" in terms of disconnects. If a large amount of the energy savings associated with the prepay program is due to customer self-disconnecting, then there is the possibility that the net savings of the program are well below the gross savings. Later in this paper is a discussion of how this feature impacts the analysis of the energy savings due to prepayment.

Persistence

One important component necessary for a utility to be able to claim credit for the energy savings from a program is the ability to show that these savings persist over time. For measure-based programs, this is a relatively straightforward task, as the savings are expected to last as long as the effective useful life of the measure, which in turn can be obtained from manufacturers, or prior research and databases (such as the Database for Energy Efficient Resources or DEER).[44]

For behavioral-based programs such as prepay, the situation is considerably more complicated. The key question is whether the energy savings behaviors become habitual, or will the customer lose interest

[44] Available at: http://www.deeresources.com.

and revert back to prior behavior. In order to determine the persistence of savings, the only alternative is to determine how the estimated savings change over a long time period. Since the concept of behavioral-based energy efficiency programs are relatively new, there is little information on how the savings from these programs change over time. Evidence from programs that use in-home displays of energy use have shown that savings persist for at least three years if the in-home display is operating throughout that period (Darby, 2006 and Staats et al, 2004), while there is some indication that savings do not persist with removal of the display (Van Houwellingen and Raaij, 1989). So while there has been no formal analysis of the persistence of the energy savings with prepay, there is evidence that the savings will persist as long as the customer is enrolled in the program.

Approaches for Energy Impacts

This section of the paper reviews the methods that are commonly used to determine the energy savings associated with a utility-sponsored energy efficiency program. Since verification of these savings is a key element of whether or not the utility receives credit for these savings, there is a large collection of literature on what methods are appropriate.[45] One of the most commonly referenced for the regulators across the US is the State of California Public Utilities Commission Evaluators' Protocols.[46] The protocols set forth the following methodology that can be used to determine gross energy savings:[47]

- Engineering models using calibrated building energy simulation models or measure-level technology information.
- Experimental design based upon differences between energy consumption between treatment and non-treatment groups from consumption data.
- Regression analysis of consumption information from utility bills with inclusion/adjustment for changes and background variables over the time period of analysis.

Each of these approaches is discussed below.

Engineering Models

Engineering principles and models are used extensively in estimating the effect of measure-based energy efficiency programs. Essentially, these approaches compute the energy savings by comparing the energy use profile of the measure or premise before participation to after participation. The energy use profile is derived from the technology involved, and not the information on the actual energy usage of customers.

Engineering modeling has little applicability to behavioral programs such as prepay for several reasons. First, because it is based on changes in technology, customers will have to be surveyed individually to determine if they installed any measures due to the program. This requires careful development of a sampling plan, and can significantly impact the cost of conducting the analysis. Secondly, since these approaches are tied to specific measures, they are limited in their ability to capture the effect of behavioral changes that are not related to technology and therefore not measured.

[45] CEE, 2008 provides an overview of much of this literature.
[46] CPUC, 2006.
[47] CPUC, 2006, page 26.

Quasi-Experimental Design

A true experimental design will use random assignment to assign customers into a treatment and a non-treatment group. This random assignment implies that all non-treatment aspects will be the same in each group (there are no inherent differences between the two groups), so the energy impacts can be determined by using the DiD approach discussed previously.

Since random assignment is not possible for most energy efficiency programs, an alternative is to attempt to match the control group to the treatment group as much as possible. In theory, if the groups are perfectly matched, then using the DiD approach is still valid, as there are no non-program differences that will bias the savings estimate. This is essentially the approach that was taken by SRP in the evaluation of the M-power program discussed above.

The complicating aspect of this approach is that it is difficult, if not impossible, to have information on all the factors that may affect energy usage. Thus, it may not be possible to insure that the control group is perfectly matched to the participant group.

Regression Analysis

A regression analysis is similar in spirit to the quasi-experimental design approach, except rather than trying to eliminate the effect of differences between the control group and the treatment group through matching, it uses a regression equation to control for observable differences. These variables can include such things as weather, demographics, and the characteristics of the house.

Algebraically, a regression analysis for a prepay program can be represented as:

$$kWh_i = x_i'\beta + \delta PP_i + \varepsilon_i \tag{2}$$

Where kWh_i is the energy usage for customer *i*, x_i are the set of non-program variables that determine energy use independent of participating in prepay, PP_i is a variable indicator whether or not the customer is a prepay customer, ε_i is the error term, β is a vector of estimated coefficients, and δ is the estimated effect on energy usage given prepay.

If, as is usually the case, there are generally more than two time periods of data available, the general framework is:[48]

$$kWh_{it} = \lambda_t + \alpha_i + x_{it}'\beta + \delta PP_{it} + \varepsilon_{it} \tag{3}$$

Where *t* indexes time. This model includes a full set of time effects (λ_t), a full set of individual effects, α_i , individual-specific covariates (z_{igt}), and individual-specific errors, ε_{igt}.[49] This is termed a fixed-effect panel model, where the fixed-effect is α_i, which represents the individual specific intercept. The term "panel

[48] See Wooldridge, 2010.

[49] Many evaluations of normative programs do not use this more general specification, instead they rely upon a simpler models that are variations of $kWh_{it} = \beta_{0i} + \beta_1 Post_t + \beta_2 Post_t Treat_i + \varepsilon_{it}$ (which can be shown to be identical to equation (1)) even though Woodridge (2002) notes on page 284, that this approach can yield "misleading answers."

model" indicates that the model is estimated across individuals (*i*) as well as over time (*t*). Equation 3 has been used extensively in the regulatory environment to estimate the energy savings associated with all types of utility-sponsored energy efficiency programs, and therefore is the fundamental approach that we recommend using for determining the link between participation in prepay and reduced energy consumption. The specifics of our proposed approach are discussed in detail in the next section.

Proposed Methodology

Based upon the characteristics of a prepay program and the regulatory requirements for receiving credit for energy conservation behavior or efficiency measures that may arise from the program, we recommend that the analysis uses the following regression model:

$$kWh_{it} = \lambda_t + \alpha_i + \beta(\lambda_t \cdot Weath_t) + \delta PP_{it} + \gamma PP_{it} SD_{it} + \psi SD_{it} + \varepsilon_{it} \quad (4)$$

Where $Weath_t$ is the weather conditions (temperature or HDD/CDD), PP_{it} indicates whether the individual was a prepay participant during time *t*, and SD_{it} denotes the total amount of time the customer was disconnected during time *t*. The energy effects associated with prepayment is therefore estimated by δ and γ. By differentiating between energy savings due to prepay in general from those that are due to self-disconnection, it becomes possible to differentiate between more efficient use of energy from budgetary imposed restrictions on energy use.

Further, it is proposed that equation 5 is estimated over the prepayment customers only, as discussed below, there is no need to include a control group because, in a sense, the treatment group serves as its own comparison group. Eliminating the control group significantly reduces the effort and cost associated with conducting an analysis and eliminates the challenge of matching participants to comparable non-participating customers.

This approach has been used extensively in the evaluation of utility-sponsored energy efficiency programs, and has been used and accepted for measurement and verification of impacts across North America.

The natural (and important) questions that arise are, since this is based on the assumption of random assignment, how can it address the issues of self-selection bias and gross/net savings discussed previously? Each of these issues will be addressed below.

Accounting for Self-Selection Bias

One aspect of the issue of self-selection bias that was not included in the prior discussion, indeed one that is rarely addressed at all, is whether or not it is truly necessary to account for self-selection bias. Following Heckman's (1979) discussion of selection bias, self-selection arises because of the endogenous decisions by individuals to participate in the program or not. This implies that any comparison between a self-selection participant group and a non-participant group will result in biased estimates of the program effect that would result from a random treatment of the population.[50]

[50] See James Heckman, "Sample Selection Bias as a Specification Error." Econometrica, Vol. 47, No. 1 (Jan., 1979), page 154.

This has two significant implications. First, for the purposes of evaluating a prepay program, the goal is to determine how much electricity savings the program actually produces for participants, ex post. This is a fundamentally different question than trying to estimate how much electricity savings the prepay program would produce if participation is *randomly assigned*. In addition, since it is likely that the decision to participate in a prepay program will always be up to the customer, there will never be random treatments across the population. Therefore, the issue of self-selection bias, within the context of programs that will always be voluntary, is usually irrelevant from the perspective of a retrospective determination between prepay and reduced energy usage.

In addition, it can be shown that a fixed-effect estimator in equation 3 is indeed free of self-selection bias if one assumes (as is usually the case) that the selection bias relates to the level of energy use and as such is a function of time-invariant individual-specific effects.[51] The intuition behind this result is relatively straightforward. Suppose each customer has an inherent motivation to participate in the prepay program, and this inherent motivation to participate is constant during the period covered by the analysis, then a fixed-effect panel model will automatically include this customer-specific motivation (as well as other unobservable characteristics) directly into the customer-specific fixed-effect term. In this manner, self-selection bias is directly accounted for within the model specification.

Of course, if the selection bias is not constant, but varies over time, then the fixed-effect term will not capture this motivation. This is also true for the two-step Heckman approach that is widely addressed in program evaluation literature.

Non-Program Effects

Perhaps the most surprising aspect of the proposed approach is that it does not include a control group. The two most widespread beliefs are that 1) a control group is necessary to ensure that the estimated kWh savings are net of non-program effects (i.e., general economy wide influences), and 2) including a control group will somehow automatically correct for "natural conservation," i.e., free ridership. However, both of these assumptions are misleading. Perhaps the easiest way to understand this is through an actual example.

Assume that there is a relatively simple relationship between monthly energy use, temperature, whether or not there is an economic recession, and program participation. Assume that this relationship can be expressed as:

$$\mathrm{kWh}_{i,t} = 3 + 5.6 \bullet \mathrm{temp}_{t} - 25.0 \bullet \mathrm{recession}_{t} - 0.5 \bullet \mathrm{part}_{i,t} \quad (5)$$

Where "temp" is the monthly average temperature, "recession" is an indicator variable which equals to the number of months in a recession (i.e., 1 for the first month, 2 for the second, etc.), and "part" is an indicator variable which equals one if that household was randomly assigned (to eliminate any confusion about self-selection bias) to participate in the EE program. This simple data generation process tells us that everyone has a "base load" of 3 kWh (the constant term), for every degree increase in the average temperature there is a 5.6 kWh increase in usage, and during a recession, all customers consume 25

[51] See Marno Verbeek and Theo Nijman, "Testing for Selectivity Bias in Panel Data Models." International Economic Review, Vol. 33, No. 3 (August 1992), or Francis Vella, "Estimating Models with Sample Selection Bias: A Survey." The Journal of Human Resources, Vol. 33, No. 1 (Winter, 1998). The appendix presents a detailed discussion of how the fixed-effect model corrects for static self-selection bias.

kWh less than otherwise for each month in the recession. Finally, if a customer is involved in the utility EE program, they will save 0.5 kWh for each month.[52]

We can simulate the data generation process by adding a normally distributed random error term (with average of 0 and large standard deviation of 4 to introduce significant variation in the data) to equation (1) and generate, for example, 12 months of simulated data spanning the last 6 months of last year and the first 6 months of the current year. We create this dataset for 10,000 control group customers (part is always equal to 0) and 10,000 participating customers. For participants, we further assume that there are two equal groups, one group that participated in November of the first year, and another in March (this is done to introduce a simple form of variability in the participation variable, and is typical of the type of monthly participation tracking found in most EE programs).

In addition, assume that there was a recession that starts in December of the first year, and lasts for four months. Thus, there is an overlap between the participation period and the recession. Finally, the temperature is the same for all customers, and starts at 75° and decreases 5° each month for six months, and then increases 5° during the next six months to return to 75° by the end of the ten months.

Let's start by estimating a regression model of the "true" data generation process with both the participant and control groups. The coefficients and t-values are shown in Table 1. Of course, in this case, the estimated coefficients match the true coefficients.[53]

Table 1: Estimated true specification, participants and non-participants

Independent Variable	Coefficient	t-value
Constant	3.05	41.74
Temperature	5.60	5,025.32
Recession	-25.01	-3,496.08
Participation	-0.48	-25.36
R-Squared	99.7%	

Table 2 shows the results from a regression model where *only* the participants are included (there are no non-participants in the estimation) using the true specification. Note that *the estimated coefficients match their true values*, even though there is no control group and program participation is occurring during the recession. The immediate implication, *empirically,* is that a control group of non-participants is not required to control for general market effects. But, let's investigate further.

Table 2: Correct specification, participants only

Independent Variable	Coefficient	t-value
Constant	3.04	29.37
Temperature	5.60	3,520.58
Recession	-25.00	-2,396.64
Participation	-0.48	-19.86
R-Squared	99.7%	

[52] These coefficients are purely arbitrary.
[53] The random error introduced into the model limits a perfect match.

In the third estimated model (Table 3), both participants and non-participants are included in the model, but let's assume that the modeler was unaware of the recession, so it is not included in the estimated model (thus there is an omitted variable bias). Now *none* of the estimated coefficients match their true value, and indeed the estimated savings from the program is significantly larger at -4.31 kWh than the true value given the masked recession bias. Note as well that the t-values and R-squared give no indication that anything is amiss, and one may even inappropriately prefer this model relative to the correct model just on the basis of the high t-value on the participation variable.

The reason that the estimated coefficients are incorrect is that the variables in the model are 'picking up' the effect of the omitted recession variable on kWh. *The fundamental implication here is that naively including a control group in the model does not automatically account for market-wide effects;* there must be variables within the model to capture this effect. So, the blind application of a control group does not guarantee accurate, unbiased estimates of energy savings.

Table 3: Incorrect specification, participants and non-participants

Independent Variable	Coefficient	t-value
Constant	-140.08	-321.37
Temperature	7.60	1,103.28
Participation	-11.60	-85.40
R-Squared	84.6%	

For the fourth model (Table 4), the control group is eliminated from the model, the modeler still does not know about the recession, but he/she includes monthly indicator variables (omitting one to avoid collinearity with the constant term) to insure that any general (unknown) market trends are controlled for in the model (this is the general approach that will be used in these evaluations).

Table 4: Include monthly variables, participants only

Independent Variable	Coefficient	t-value
Constant	2.88	3.50
Temperature	5.60	494.52
Month 9, Year 1	0.06	0.58
Month 10, Year 1	0.06	0.37
Month 11, Year 1	0.00	0.00
Month 12, Year 1	-24.96	-95.90
Month 1, Year 2	-49.97	-191.96
Month 2, Year 2	-74.94	-365.26
Month 3, Year 2	-100.04	-645.05
Month 4, Year 2	-0.01	-0.11
Month 5, Year 2	-0.08	-1.12
Month 6, Year 2	0.02	0.28
Participation	-0.44	-11.09
R-Squared	99.7%	

Note that *the estimated savings from participation now, once again, is close to the correct value.* And while it may seem that the coefficient on the constant term appears incorrect, one has to remember

that the constant term is now modified to contain both the original constant as well as the omitted month. Two conclusions can be derived from this result:

The analyst does not need to know *a priori* the specific nature of the general market-wide trends to develop a correct specification; all that is needed are time-effect variables that vary period by period, the collection of which capture the intended effects and lead to accurate model specification.

As before, a model estimated only over participants will indeed account for general market trends, even when there is a strong correlation between the participation period and these general market trends.

So, generally speaking, there is no guarantee that the blind application of a control group will yield accurate, unbiased estimates of energy savings. Sometimes control groups are useful. Sometimes they are misleading, as we have seen here. From the above examples, it is apparent that simply including a control group does not automatically account for changing trends in electricity usage.

Data Requirements

One of the significant benefits of using a fixed-effect panel model to determine energy impacts is that relatively little data is required to do the analysis. Essentially, all that is necessary is:

Pre and post-treatment consumption data for prepay customers.
Weather data covering the pre- and post-treatment periods.
Pre and post-treatment disconnection data for each customer.

Since consumption data is needed prior to participation, the expected time interval will be monthly, as this information will likely be available from the utilities billing records. After prepayment, the usage data will need to be aggregated up to the monthly level. In order to capture the effect of the non-program variables (and to be consistent evaluation protocols) the evaluation period should cover at least one year prior to participation and one year after participation.

Information of customer's demographics, housing, or other factors that affect energy usage that are generally collected through surveys are not needed, as the fixed-effect term essentially captures the effect of all these variables (so long as they are constant during the analysis period). The impacts of variables that do change overtime (such as economic conditions) are captured by the time-effect terms.

Since the analysis does not require survey data, it is possible, indeed preferred, to conduct the analysis over the entire population of prepay customers. This eliminates the need to develop sampling plans, and thus avoids the issue of whether the analysis sample is representative of the prepay customer population.

The specification is general enough to capture price effects if there is a significant change in the price of energy between the standard rate and the prepay rate. In that situation, the analysis will require information on the rates for the customers during the pre and post periods.

Issues Presented, Conclusions and Next Steps

This paper addressed the relationship between prepaying for energy usage and energy usage. It discussed that while there are several features that are likely to alter customer's energy-using behavior, there has heretofore been little research in this area. After reviewing the behavioral and program evaluation literature, noting the important issues involved in establishing this linkage, this paper discussed how using a fixed-effect panel model is the appropriate methodology. A critical component in developing this model will be the differentiation between energy savings that result from the adoption of energy conservation behavior or efficiency measures of the customer and the energy usage declines that are due to the customer self-disconnecting. This approach has been accepted by regulatory bodies throughout North America to measure the energy impacts of energy efficiency programs.

During a webcast presentation with the members of the 2011 Prepay Working Group, several regulators expressed doubt regarding the omission of a control group, noting that the group controls for "other factors," in particular factors that are dynamic and can only be captured by a control group. I posit that the issue of a control group goes to a cost-benefit analysis and with a large enough sampling, there is adequate data and a control group does not provide any new data but does add cost and complexity with additional non-essential variables.

The importance of additional variables was also noted (i.e., humidity, cloud cover, outages and blackouts), as they can influence peak loads and in turn impact capital investments. Indeed variables may be inserted into the same regression model. However, the measurements would need to be hourly as more data points are needed and these data points would be missing from the pre usage data / data reflecting when the consumer was on a post-paid plan.

The natural next step in this analysis is to obtain the data necessary to estimate the link between prepay and reduced energy consumption, and estimate the proposed regression equation, and compare the results to the results that have been published in the literature.

Appendix A: Self-Selection Bias and Fixed-Effect Panel Models

The key assumption is that there is a latent variable, denoted as s_i, that describes the likelihood that an individual will decide to participate in the program or not (the selection process), and this latent variable is time-invariant and specific to each individual. In other words, one can view s_i as the probability of participation, and this probability differs across people, but does not change over time.

Suppose that the i[th] customer's energy usage at time t (kWh_{it}) is a function of exogenous variables that vary over time and across customers, denoted x_{it} and this latent variable[54]

$$kWh_{it} = x_{it}'\beta + \theta s_i + \varepsilon_{it} \quad (6)$$

Clearly, estimating (1) without the latent variable can potentially lead to bias results. We can express the fixed-effects model as a least squares regression of the deviations from the group means[55]

[54] For simplicity, the model is assumed not to contain an intercept term.
[55] See page 297-289 in Greene, Econometric Analysis, fifth edition, 2003.

$$kWh_{it} - \overline{kWh_{it}} = (x_{it} - \overline{x_{it}})'\beta + (s_i - \overline{s_i})'\theta + (\varepsilon_{it} - \overline{\varepsilon_{it}}) \quad (7)$$

Since the selection process is assumed to be time-invariant, s_i equals $\overline{s_i}$, so the term $(s_i - \overline{s_i})'\theta$ drops out of (2), and the equation becomes

$$kWh_{it} - \overline{kWh_{it}} = (x_{it} - \overline{x_{it}})'\beta + (\varepsilon_{it} - \overline{\varepsilon_{it}}) \quad (8)$$

Thus, the fixed-effect model "nets out" the effect of the selection process, so estimation of (3) (with no latent variable) yields unbiased and consistent estimates of β.

Appendix B: References

Allcott, Hunt. "Social Norms and Energy Conservation." MIT Center for Energy and Environmental Policy, 09-014, October, 2009.

Allcott, Hunt and Mullainathan, Sendhil. "Behavioral Science and Energy Policy." Science Magazine, Vol. 327, no. 5970, March 5, 2010.

Arvola A, Uutela A and Anttila U. "Billing feedback as a means of encouraging conservation of electricity in households: a field experiment in Helsinki." Energy and the consumer, Finnish Ministry of Trade and Industry, 1994.

Ayres, Ian, Raseman, Sophie, and Shih, Alice. "Evidence from two large field experiments that peer comparison can reduce residential energy usage." NBER Working Paper 15386, Sept. 2009.

Brandon, Gwendolyn. "Reducing Household Energy Consumption: a Qualitative and Quantitative Field Study." Journal of Environmental Psychology 19, 75-85, March 1999.

Buck, Jonna. "Prepaid Service Benefits A Co-op and its Customers." Utility Automation, May 2008.

California Public Utilities Commission (CPUC). "California Energy Efficiency Evaluation Protocols: Technical, Methodological, and Reporting Requirements for Evaluation Professionals." April 2006.

Consortium for Energy Efficiency (CEE), "Energy Efficiency Program Evaluation: A Guide to the Guides." Feb. 2008.

Darby, Sarah. "The Effectiveness of feedback on energy consumption." Environmental Change Institute, Oxford, April, 2006.

Edison Electric Institute (EEI). "Information Technologies for Demand Response – Appendix G." January 2008.

Environmental Defense Fund (EDF). "Behavior and Energy Savings: Evidence from a Series of Experimental Interventions." May 24, 2011.

EPRI. "Paying Upfront: A Review of Salt River Project's M-Power Prepaid Program." Technical update 1020260, October, 2010.

Faruqui, Ahmad and Sergici, Sanem. "The impact of informational feedback on energy consumption – A survey of the experimental evidence." Energy, v.35, 2010.

Goetz, Thomas. "Harnessing the Power of Feedback Loops." Wired Magazine, June 19, 2011.

Institute for Electric Efficiency (IEE). "The Impact of Dynamic Pricing on Low Income Customers." IEE Whitepaper, Sept. 2010.

Mummery, Hannah and Reilly, Holly. "Cutting back, cutting down, cutting off – Self-disconnection among prepayment meter users." Consumer Focus, 2010.

National Housing Federation. "Ending the Prepay Meter Rip-Off." 2010. http://www.housing.org.uk/campaigns/past_campaign_successes/ending_the_prepay_rip-off.aspx.

Sergici, Sanem and Faruqui, Ahmad. "Measurement and Verification Principles for Behavior-Based Efficiency Programs." The Brattle Group, Inc., May 2011.

Smith, Tim. "Prepaid Metering: Clear Value, Clearer Hurdles." The Wiglaf Journal, Sept. 2003.

Staats, Henk, Harland, Paul, and Wilke, Henk. "Effecting Durable Change: A Team Approach to Improve Environmental Behavior in the Household." Environment and Behavior, Vol. 36 No. 3, May 2004.

Van Houwellingen, Jeannet and Raaij, W. Fred. "The Effect of Goal-Setting and Daily Electronic Feedback on In-Home Energy Use." Journal of Consumer Research, Vol. 16, June 1989.

Wooldridge, Jeffrey. Econometric Analysis of Cross Section and Panel Data. The MIT Press, Second Edition, October 1, 2010.

Appendix C

Michael Ozog, Ph.D. has worked in the energy and water industries for over 15 years specializing in econometric modeling, demand forecasting, discrete-choice modeling, risk management and program evaluation. He is a recognized expert in the area of energy efficiency program evaluation, econometric analysis, and economic modeling. His research has been published in Environmental and Resource Economics, Southern Economic Journal, Energy Policy, Energy Services Journal and the Energy Journal, as well as in numerous national conference proceedings. Dr. Ozog holds a Ph.D. in Economics from Boston College, an M.S. in Mineral Economics from the Pennsylvania State University and a B.S. in Geology from the Massachusetts Institute of Technology. His company is Integral Analytics, Inc.

The DEFG Utility Prepay Working Group is entering its third year. Members of the working group include industry stakeholders from energy utilities, retail energy suppliers, technology vendors, and an advisory panel of regulators and consumer advocates. The working group is pursuing several tracks: regulatory issues, consumer and marketing research, energy conservation, and the business and operational requirements for prepay service. Over the past two years, extensive research has been conducted regarding both the opportunities and challenges presented by voluntary prepaid service offerings in the utility sector. For more information, contact Cindy Boland O'Dwyer, codwyer@defgllc.com.

DEFG's *Series of Regulatory Choices* provides general information and is not intended as legal or financial advice. Your specific circumstances may vary from those described in this document. For more information about Distributed Energy Financial Group LLC or its publications, please contact DEFG Managing Partner Nat Treadway, ntreadway@defgllc.com or (713) 729-6244 or go to http://www.defgllc.com.

You may quote portions of this document with proper citation: ©2011 DEFG LLC. DEFG's Series of Regulatory Choices, No. 7, "A Method for Estimating the Conservation Effects of Energy Prepayment," November 2011.

ATTACHMENT C

DEFG's Series of Regulatory Choices, No. 6, "Low Income Consumer Issues and Voluntary Prepaid Energy Offerings: Perspectives from Three Industry Thought Leaders," Sept. 2011.

DEFG
Consumer • Energy • Performance

DEFG 2011 Utility Prepay Working Group

Low Income Consumer Issues and Voluntary Prepaid Energy Offerings: Perspectives from Three Industry Thought Leaders

Prepared By:
Cynthia Boland O'Dwyer

Contributing Authors:
Martin R. Cohen, Judith Schwartz and James Steffes

Executive Summary

Extensive research conducted by DEFG in 2010 revealed that prepaid energy[56] could be transformational as it touches upon many of the more challenging regulatory questions facing the energy sector today. DEFG thus launched the 2011 Utility Prepay Working Group to further explore leading regulatory and consumer opportunities and challenges presented by prepaid energy. Regulatory issues include disconnect and reconnect policies, weather moratoriums, forms of account notification, cost and benefit allocation, fees and rates.

While these issues need to be addressed to implement a prepaid offering for all customers, they present greater concerns when dealing with low-income customers. Consumer advocates argue that prepaid energy invites low-income customers to make tough choices, potentially opting to disconnect electric service to keep money available for other necessities such as food, clothes and gasoline. Yet, existing prepaid customers provide positive feedback, primarily the convenience, flexibility and control that goes with paying any amount at any time. Consumers find that prepayment allows them to budget in a manner most compatible with their lifestyle and income (e.g., make payments weekly or every other week).

Any benefits in support of a prepaid offering business case however must be balanced against the regulatory issues. Part of the 2011 Working Group efforts included commissioning essays authored by three industry thought leaders representing divergent perspectives on low-income specific issues presented by a voluntary utility prepaid energy offering. The contributing authors are: Martin R. Cohen, Judith Schwartz and James Steffes (brief biographies included below).

Each author drafted an essay consisting of introductory paragraphs framing their point of view, responses to a set of ten questions prepared by DEFG, and a conclusion. To ensure consistency, they worked with the same definition of a low-income population taken from the U.S. Department of Health and Human Services, Low Income Home Energy Assistance Program (LIHEAP).[57]

The objective is to present different points of views around prepay issues specific to low-income customers to facilitate discussion and a consensus-building process where differences may be narrowed and recommendations introduced. Following the essays prepared by Cohen, Schwartz and Steffes, and DEFG presents a summary and findings.

[56] When supported by smart technologies, prepay may be linked with a two-way communication channel between the supplier and consumer. Energy consumption data is made available to suppliers in regular intervals (fifteen-minute, hourly, daily, etc.), which allows for different types of pricing structures. Consumers may also opt to receive communications regarding payment and account updates, price signals (potentially using dynamic pricing), and energy management options. Prepay enabled by smart grid is thus a billing option with a consistent feedback loop delivered via SMS, email, web-based portal, in-home display, or perhaps a combination of these options. The information flow allows consumers to monitor their usage, creating opportunities to reduce energy consumption and costs. With prepay, moreover, the usage data is tied to the payment transaction in real time, so consumers can directly relate energy consumption with dollars.

[57] Referring to the online LIHEAP Fact Sheet, the program's "Target Population" is defined as: [A]n eligible household's income must not exceed the greater of 150 percent of the poverty level or 60 percent of the State median income (In FY 2009, 75 percent of the State median income). Grantees may not set income eligibility standards below 110 percent of the poverty level, but they may give priority to those households with the highest home energy costs or needs in relation to income (source: http://www.acf.hhs.gov/programs/ocs/liheap/about/factsheet.html).

Biographies

Martin R. Cohen currently runs his own consulting firm based in Illinois, Martin Roth Cohen & Assoc., specializing in energy regulatory policy. His clients include government agencies, consumer advocacy organizations and environmental protection groups. Martin recently was a lead facilitator of the Illinois Statewide Smart Grid Collaborative. Previously, Martin held positions including: Director of Consumer Affairs with the State of Illinois, Office of the Governor; Chairman, Illinois Commerce Commission; and Executive Director, Citizens Utility Board (CUB). While at the CUB, Martin led the organization through the restructuring of the Illinois electricity industry, and was instrumental in negotiating language of the Electric Service Customer Choice and Rate Relief Act of 1997, including its consumer protection and rate provisions.

Judith Schwartz is all about action through collaboration: how to identify opportunities, strategize and plan, communicate and align. For the past several years, she has been on the forefront of sustainability issues, the Smart Grid, alternative energy, and the digital home. Working at the nexus of public policy, technology, communications, and business, Judith brings an unusual perspective that crosses functional disciplines to cut to the heart of the problems and solutions. Judith is the Strategic Communications Consultant to the National Action Plan on DR/SG Coalition, a member of the steering committee for the Worcester Green today/Growth Tomorrow Community Summit, and a regular speaker at industry conferences and webinars. She organizes cross-stakeholder Consumer Symposia and produces a viral education resource library, Renewable Reality. Recent video productions may be seen at www.powercentsdc.org. Her publications include the 2011 State of the Consumer Report for the Smart Grid Consumer Collaborative and the National Action Plan Communications Action Guide for the NAP Coalition. She is a co-author of Costs and Benefits of Smart Meters for the Institute for Electric Efficiency. Judith is a graduate of Cornell University's College of Architecture, Art, and Planning.

James Steffes is Vice President and General Manager, Texas Residential, for Direct Energy, part of the Centrica group of companies and one of the largest multi-state providers of retail energy services in North America. The North American operations have grown to more than 6 million residential and commercial customer relationships. Through its Direct Energy, CPL and WTU brands, the company is the third largest competitive retail energy provider in Texas. Jim oversees the sales, marketing, customer operations, and business results for Direct Energy's presence in Texas. As part of that role, Jim leads the prepaid electricity business, which launched in 2010. Previously at Direct Energy, Jim was Vice President of Customer Operations for the residential organization, managing customer relationships for almost 2 million households. Prior to that role, Jim led the US Northeast Business Services team, selling natural gas and electricity to commercial, business and institutional customers throughout the Northeast and Midwest US. Jim started with Direct Energy managing public affairs while directing the US Government and Regulatory Affairs organization. He has worked in different capacities in the electricity and natural gas industries since the early 1990s.

Introductory Paragraphs

Martin R. Cohen

Unlike most transactions, public utility services are usually paid for only after consumption, measurement, and billing. While prepaid meters have been available since the dawn of electricity service, they are seen in just a handful of jurisdictions in the US today. But as AMI is deployed across the country, prepayment has been added to the growing list of potential smart meter applications. That doesn't necessarily make it an idea whose time has come.

Core questions arise: Is providing a prepayment "option" to payment-challenged customers contrary to the spirit (and perhaps the letter) of laws prohibiting discrimination in provision of utility services? Do potential negative consequences for some customers appear to outweigh the benefits of prepayment programs? Most consumer advocates answer "yes" to these questions and believe that the introduction of prepayment programs would create more problems than it solves.

Identifying and prioritizing the goals of prepayment programs is the first step in assessing their efficacy and judging their success. If the primary intent is to reduce the utility's bad debt, enhance cash flow and working capital, and lower the costs of billing, collection and customer service, prepayment programs can be effective to the extent they achieve significant penetration. There is little doubt that elimination of reconnection fees and deposits would reduce barriers to service for some customers under some circumstances. However, if the central goals of regulatory policy regarding service to low-income customers are to make electricity more accessible and affordable, then the key metrics for judging a prepayment program may be the change in number of households that remain connected to electricity service and the average costs they experience.[58] The value proposition for customers is quite different for a prepaid service that offers a discount versus one that charges a premium.

Higher electricity costs makes service less affordable, yet the only sizeable prepay program in the U.S. raises basic rates for participants.[59] The "M-Power" program of the Salt River Project (SRP) has attracted 112,000 participants, more than 12% of households in the Phoenix area. How much more an M-Power customer pays for electricity compared to a standard rate customer with identical usage depends on load shape and volumes.[60]

Are higher rates justified by the costs of prepayment programs? SRP estimates $300 in annual utility avoided costs per prepay account (billing, collection, notices, truck rolls, write-offs, etc.).[61] The large gap between the operational cost savings expected by the utility and the higher rates charged to program

[58] Other countries where prepayment is more common have often seen higher costs for prepay customers. For example, according to British regulatory agency Ofgem, (Office of Gas and Electricity Markets) prepaid customers in the deregulated UK market pay more than $300 higher annual electricity and gas costs than standard payment customers; see: http://www.energychoices.co.uk/reclaiming-prepayment-meter-charges.html However, a discount for prepaid service was proposed for a pilot in India; see: http://www.dnaindia.com/mumbai/report_opt-for-prepaid-meter-reduce-electricity-bill-in-mumbai_1330985 and http://www.thinkindia.net.in/2011/03/prepaid-electricity-meters-to-be-installed-in-pune-soon-.html

[59] Some much smaller co-op programs appear not to raise rates for participants; see: http://www.mvec.net/payment/prepay.asp and http://www.okcoop.org/account/prepaid.aspx

[60] For a residential customer with average usage in each season, the annual difference amounts to $83. However, a customer with a flat load shape that uses the same number of annual kilowatt-hours pays $250 more than the same usage would be on standard rates.[60] Because low-income customers tend to use less air-conditioning and therefore have flatter than average load shapes, it is reasonable to conclude many of them are paying substantially more on M-Power than they would pay on standard rates.

[61] According to RW Beck's 2009 analysis; see http://www.comedamifuture.com/WorkshopDocs/V2-Prepaid%20Electric%20Service_White%20Paper_3-10-09_.pdf

participants suggests a high cost for program investment and implementation. While deployment of smart meters promises to significantly reduce the incremental costs of prepayment (and perhaps produce net cost savings), comprehensive cost-benefit analyses should be conducted prior to any decision about introducing a program.

Evaluation of costs and benefits should focus particularly on the financial, social, health, and other effects of prepayment programs on low-income customers -- who will clearly be the core participants (unless and until rate discounts are offered for prepaid service). Potential negative and unintended consequences due to prepayment incentives should be an important part of the discussion. For example, cutting energy usage in response to the meter account quickly ticking down toward zero during a heat wave or cold snap may endanger a household's health and safety.

Judith Schwartz

Environmental, regulatory, and economic pressures facing the utility industry are forcing electricity providers to consider new technologies, business models and transformed relationships with customers. Considerable public funding has driven grid modernization to enable greater efficiencies of usage, delivery, and integration of distributed generation. In advance of fully automated solutions priced for mass adoption, a reasonable interim strategy is to encourage and incentivize consumers to develop more conscious consumption habits. Consistent with the common public view of electricity as a cheap, reliable commodity, utilities have treated residential consumers as a single customer segment. Limited exceptions have been made for income-qualified households as if that one factor results in common perceptions and attitudes across the board.

In fact, just as high-income consumers are not a monolithic group, neither are low-income consumers. People who consume resources like electricity or water frugally versus unconsciously or wastefully exist at all levels of society. The same array of motivations: cost-consciousness, technology enthusiasm, green altruism, comfort loving, indifference, resistance; appear in people who have been raised in poverty, are trapped in low wage jobs, have suffered a blow to their middle class lifestyle due to an illness or job loss, or have retired on a modest fixed income. Renters may spend a great deal of effort overcoming the structural inefficiencies of their homes. Individual households often contain a mix of attitudes with decisions on program participation likely to be made by the member of the household who pays the bill.

The Smart Grid Consumer Collaborative's (SGCC) 2011 State of the Consumer Report describes how consumer segmentation taxonomies across a wide range of research studies have fairly consistent characteristics including the EcoAlign analysis in Green Gap Redux, Green Words Gone Wrong. While the percentage mix of "energy worldviews" varies locally, as do regional variations of poverty level, the same patterns appear nationally and internationally. In work with cross-stakeholder groups such as the National Action Plan on DR/SG Coalition, SGCC, the PowerCentsDC board (SMPPI), and the City of Worcester/National Grid's "Green Today / Growth Tomorrow" Community Summit steering committee, one can also observe how often personal perspectives inform policy positions. Programs like prepay need to be evaluated in the larger context of energy worldviews, consumer choice, adoption of other technologies such as mobile phones, as well as personal finances.

James Steffes

Prepaid electricity is not just a new way to pay for electricity. It is fundamental shift in the customer experience around how and when to consume electricity, brought about by advances in metering technology, communication solutions and customer service.

Prepaid electricity is not a novel concept in the global industry. It has been used in various countries such as the UK (70 years), South Africa (21 years), New Zealand (18 years) and Northern Ireland (10 years) for many years. Here in the US, the most recognized example of prepaid electricity has been the effort in Arizona's Salt River Project (10 years)[62].

Moreover, prepaid as a service solution for many products is a widely understood structure for many American households – for instance, prepaid cellular service and prepaid debit cards.

US Utilities are now updating their electricity delivery infrastructure with smart grid technologies, which include meters capable of two-way communication and recording multiple consumption interval data. These meters allow utilities to read consumption without having to send a meter reader. These meters also allow the utility to perform service actions, such as connecting and disconnecting electricity to the premise, from a central control system. All these benefits help utilities become more efficient; in combination they also enable new products, such as prepaid electricity.

This new metering technology, when combined with the ubiquity of electronic messaging through mobile phones and the web, enables a "smart" prepaid electricity offering – one that leverages new technology to provide consumers with increased awareness and control over their electricity usage.

Prepaid electricity plans designed for the budget-conscious consumer can help people get control over their electricity bills. Prepaid service allows customers to choose when they pay, how they pay, and what they pay. In combination with two-way meters which provide consumption information, consumers have far greater control over when and how much they consume. Ultimately, as time-of-use offerings increase in conjunction with prepaid, further options and control will be provided to energy customers – allowing consumers to align spending with value.

Responses to Questions regarding Low-Income Specific Issues Presented by Prepay

1. Under what circumstances do you envision low-income consumers enrolling in a voluntary prepay option offered by a utility?

Martin R. Cohen

Rules governing the circumstances under which customers may be required to post a deposit to acquire or be reconnected to electricity service vary from state to state, as would the circumstances under which low-income customers would enroll in a prepayment plan. However, for some customers, prepayment would be the only way to avoid an unaffordable deposit or to be reconnected while retaining an arrearage. These circumstances call into question whether prepayment would be truly "voluntary" for payment-challenged customers. For some customers, prepayment might be a good choice from among an array of pricing and payment options. For others, it might be an offer they can't refuse.

The first enrollment principle ought to be that customers must be fully informed prior to opting in. This means disclosure in plain language of relevant rates, rules, and projected effects on the customer's annual bills compared to other options. If prepayment is to be offered, it should be an option provided

[62] Source: Allen Co., ABS Energy Research, Ofgem, SRP annual reports, NIE annual reports

by regulated utilities operating transparently. Predatory and or misleading marketing of prepayment by unregulated providers would harm unwary or vulnerable consumers.[63]

Judith Schwartz

Research supports the contention of many consumer advocates that people should be permitted to choose pricing programs that best reflect their perspectives. Most pilots to date have assigned households to specific rates, thereby missing the opportunity to measure the impact of choice. The same holds true for payment options. I submit that consumers of all income levels will benefit if permitted to enroll in payment plans that reflect their personal preferences around cash flow, predictability, or opportunity to capture the greatest savings.

Rather than positioning prepay as punishment for delinquent customers, it will be most attractive if presented as a one offering in a portfolio of options to intelligently manage costs with minimal cash flow required. M-Power, offered by SRP (Salt River Project), finds low-income consumers enrolled in the prepay program prefer the flexibility and conscious control that results from participation. This aligns with findings from a Cornell/Carnegie Mellon study[64] that suggest that since energy represents such a high percentage of monthly household expenditures, the low-income audience has strong incentive to make the reasonable behavior adjustments necessary to result in a lower bill.

James Steffes

Direct Energy's experience with the competitive electricity market in Texas demonstrates that voluntary enrollment into prepaid options is not just a vision, it is now a reality. Out of the more than 30 Retail Electric Providers (REPs) active in Texas, six REPs now offer AMI-based prepaid electricity.[65] Consumers have a choice not only between pre- and post- paid electricity, but among prepaid providers as well.

And while the smart meter based prepaid electricity market in Texas only started in middle of 2010 (driven by metering technology roll-out timelines), Direct Energy sees a large and growing market forming as consumers begin to understand the value prepaid electricity offers. Speaking to the relevance of this product to low-income consumers, currently 1 out of 5 of Direct Energy's prepaid customers qualifies for and receives a low-income discount.[66] And every one of these customers has made a voluntary decision to take this product from Direct Energy. Consumers are not only voluntarily

[63] Problems have cropped up in Texas, where competitive suppliers are allowed to offer prepaid service; see: http://www.khou.com/news/local/Consumer-group-Electricity-companies-have-big-fees-hidden-in-small-print--121014164.html. In England, where 14% of customers are on prepaid service, high costs and unjustified charges are commonplace; see: http://news.bbc.co.uk/2/hi/business/8383837.stm, http://www.energychoices.co.uk/partner-lp_prepayment-meters/prepayment-meters-a-scourge-penalising-the-poor.html.

[64] *It's Not All About "Green": Energy Use in Low-Income Communities* by Tawanna Dillahunt, Jennifer Mankoff, Eric Paulos, Susan Fussell of Carnegie Mellon University and Cornell University. October 2009

[65] Direct Energy, LP, http://www2.directenergy.com/powertogo/index.aspx; Ambit Energy, http://ambitenergyprepaid.com/, First Choice Power Special Purpose, LP, http://www.firstchoicepower.com/plans-services/electricity-plans/prepaid-electricity-service.aspx, Reliant Energy Retail Services, LLC, http://www.reliant.com/en_US/Page/Shop/Public/misc_smartstart_landingpage.jsp?txtPromocode=WK3583&s.campaign=APR_BR_2011JulySmartStart, Smart Prepaid Electric (Tara Energy, Inc.), http://www.smartprepaidelectric.com/ContactUs/AboutUs/tabid/65/language/en-US/Default.aspx, and TXU Energy Retail Company LLC, http://www.txu.com/residential/promotions/mass/plan-flex-power currently offer smart meter based prepaid electricity (August 5, 2011).

[66] The LITE-UP TEXAS program is designed to help qualified low-income individuals reduce the monthly cost of electric service. The program provides discounts to eligible customers. See http://www.puc.state.tx.us/consumer/lowincome/Assistance.aspx.

choosing this product – they are staying on it. Direct Energy's prepaid business continues to see average customer tenure on the product increasing month after month even with a growing customer count.

Prepaid electricity is not just a new way to pay for electricity. It is fundamental shift in the customer experience around electricity consumption, brought about by advances in technology and customer service.

Prepaid electricity is what Direct Energy calls a smart, flexible, convenient, and responsive product. Smart, because customers learn about their consumption in kilowatt-hours and dollars in a timely enough manner so they can take appropriate action. Flexible, because prepaid allows customers to make better informed (and smaller) purchase decisions around their electricity, adapting their payments and usage to their household cash flow. It is convenient because it removes the traditional barriers to obtaining electric service, such as credit checks and deposits. Finally, it is responsive – over 90% of Direct Energy's prepaid customers get reconnected in two hours or less, with a mean reconnection time of less than 30 minutes; and this significantly improved customer experience is provided during the technology pioneer phase when retailers rely upon the wires company and its new metering technology. Imagine the response time in a regulated utility market where all the components to deliver this service are operated by the same entity (i.e. utility, municipality, or electric cooperative) using well-understood technology.

Overall, prepaid electricity significantly raises the bar around customer experience. In designing its prepaid product, Direct Energy conducted focus groups and surveys to understand what consumers want from a prepaid service. Overwhelmingly, customers wanted payment convenience, no deposit requirements, daily usage information, payment flexibility, no reconnection fees and quick reconnections. Through Direct Energy's prepaid product, customers, including low-income households, are receiving these benefits – and at a price consistent with post-paid products.

The best test for voluntary adoption of prepaid electricity is to listen to what real customers who have chosen prepaid service have to say about it. "With pay-as-you-go, you know each day what you spend," said Tonie Page. "You can remember what you did yesterday versus what you did a month ago. It took all the guesswork out of what my bill was going to be. I love the program."[67]

2. If a low-income customer simply did not have money available to purchase energy and contacted the utility requesting help, how should the situation be managed? Would credit be extended for a certain amount of time or does the prepay model require automatic disconnection after a certain period of time? If credit were extended, what period of time would be deemed reasonable?

Martin R. Cohen

Prepayment programs could include hardship rules, disconnection delays, temporary credit extensions, amperage reductions, and other means to help participants to avoid loss of service. Indeed, they must include some of these measures to be acceptable. But at the core of the prepayment concept is the fact that if you do not have money in your electricity account, you will not have service. Ameliorations of that fact to make its effects less immediate and less harsh undermine the concept of prepayment and reduce its benefits while raising its costs, calling into question whether prepayment programs are worthwhile in the first place.

As regulators begin to consider the policy implications of AMI technology deployment, before considering prepayment program rules they will confront a raft of contentious new issues surrounding

[67] Direct Energy prepaid customer quote from taped interview in May 2011.

"traditional" disconnection practices which arise from the remote connection/disconnection functionality embedded in most smart meters. Utilities today often have discretion in applying disconnection rules and negotiating payment arrangements. Outcomes are influenced not only by personal history and circumstances of individual customers, but by weather, truck availability, staffing, volumes, seasonality, and other variables affecting when and where disconnections occur. Many utilities have automatic rate adjustment mechanisms in place to reduce or eliminate under-recovery of uncollectibles, which may reduce incentives for aggressive disconnection practices. Lengthy periods between receipt of a final notice and actual disconnection are common in some jurisdictions. Technology facilitating automatic and immediate remote disconnection of non-paying customers – whether on prepay or post-pay service – requires rethinking disconnection rules and practices.

Judith Schwartz

I assume that we are distinguishing here between someone who might like their own place but cannot really afford all the expenses involved in maintaining an independent household, as opposed to someone who has minimal income and is trying to choose how to allocate limited resources and manage cash flow. Free or subsidized access to vital services, be they shelter, medical care, food, water, or electricity in American society generally requires enrollment in a public or private program. With the current economic downturn and reduced funding to agencies that deliver the social safety net, more households are going to be challenged and pressure on utilities to help is going to increase.

PG&E, for example, has well-subscribed income-qualified programs including the CARE (California Alternate Rates for Energy) discount program, REACH (Relief for Energy Assistance through Community Help), FERA (Family Electric Rate Assistance), an Energy Savings Assistance program, and a medical baseline allowance (qualification for the last is not income based). They provide a 66-day customer outreach resolution cycle that encourages people to provide partial payments and apply for financial assistance to avoid disconnection. (These programs can be models for other utilities that have not put such programs in place: http://www.pge.com/energypartners/.)

Collaborating with agencies already in the business of vetting and supporting people enrolled in these types of programs would reduce the administrative burden, minimize exposure for either fraud or declining a deserving account, and allow the utility's contribution to be focused on delivering service with a managed payment plan. Requesting minimal but regular contributions might be required at certain periods to avoid disconnection. Furthermore, there is ample evidence to support that building relationships with these same groups who are trusted sources of information for disadvantaged communities increase the likelihood of participation in other smart energy and demand response programs.

James Steffes

Whether or not prepaid options exist, households that consume more than they can afford inevitably become unable to maintain electric service without external help. The amount of credit any entity can extend consumers is limited, and electric service will become unavailable as those credit lines dry up. Prepayment helps these households by allowing them to make informed decisions about their usage, and by limiting the amounts that fall in arrears so that recovery is not as difficult. Daily usage updates encourage customers to monitor and change their energy-consumption habits. Customer feedback shows that prepaid service as a budget management tool works. "My prepaid electricity has been running $25 to $30 a month whereas my bill used to be somewhere between $100 and $180," said

Marilyn Evans. "I think it is a lot, lot better to give people not having a lot of money the control over what they're getting in electricity."[68]

That being said, providers of electricity, whether prepaid or post-paid, should work with energy and other assistance agencies so that deserving households receive the reprieve they need in order to maintain electric service. Later in this discourse, Direct Energy discusses how prepaid lends itself very well to agency assistance.

One stigma around prepaid electricity is the concept of immediate disconnection. While conceptually possible, in practice disconnection actually takes a little more time. AMI meter reads need to go through the VEE (Validation, Estimation, and Editing) process to ensure that the reads are billable-quality. Then the customer needs to be notified of their new balance, and whether or not they will be disconnected that day. Then a grace period of a few hours may apply so that the customer can "cure" their situation, before the disconnection signal is sent to the meter. This process can take up to 36 hours.

Combined with the practice of not disconnecting during nights and weekends, and during weather- or other- related moratoria, there is a nominal amount of credit that is actually extended to prepaid customers.

Customers need to be given a chance to avoid disconnection, as it provides for a better customer experience. Some of the ways to do this include the grace period mentioned above, allowing a certain amount of "overdraft" protection to consumers, and appropriate communication activities to keep consumers informed.

3. Would friendly-credit periods (meaning no disconnection during nights or weekends) alleviate any concerns around service disconnection? Is this flexibility necessary with a prepay option?

Martin R. Cohen

Most jurisdictions prohibit disconnection during certain time periods, including seasonal and/or temperature and weather emergency moratoria. These rules protect health and safety and should be retained regardless of the customer payment plan. With or without "friendly credit" periods, the potential for immediate disconnection under a prepayment plan should be matched by a requirement for immediate reconnection upon payment. Quick payment, processing, and reconnection would be essential for a prepayment regime that allowed immediate disconnection, but it would be difficult to accept 24-7 payments from those low-income customers who do not have bank accounts and instead use cash to pay bills.[69] Easy access to account management tools is crucial to a positive prepay experience for participants. The advent of smart meters, smartcards, smart phones, smart keypads, in-home displays and devices, and online banking may make prepayment a desirable service for some customers – though much less so if the cost savings to the utility from prepayment are not passed on to the participating customer in the form of lower rates. However, low-income households, who are most likely to choose prepaid service, are least likely to have access to these technologies and services.

Judith Schwartz

Policies around disconnection should be grounded in common sense and good customer service practices. Turning off anyone's electricity in the middle of the night or when there is no one to call at the

[68] Direct Energy prepaid customer quote from taped interview in May 2011.

[69] A study found that 4% of utility customers paid with cash in 2010. It is reasonable to assume that most of these are low-income customers without banking access. See: http://www.utilityreceivables.com/pdfs/UtilityThoughtLeadershipPiece.pdf

utility is pointless and makes the company look heartless and punitive regardless of the resident's payment plan, income level, or technology embedded in the meter itself.

The beauty of digital technology attached to each service location is the ability to make it practical as the account limit is approaching to send advance notices automatically via text message, email, or automated call to the person responsible for the account. (Designated backups can be prompted on behalf of elderly residents who live alone but are becoming less able to manage their affairs). This allows proactive intervention in the form of at least a partial payment to maintain service. Giving this type of early-warning feedback certainly will reinforce that the prepay option is "smart" and humane and will generate valuable goodwill for the utility.

James Steffes

In principle, policy should protect consumers from being disconnected during periods when a remedy is not available. Disconnecting at night, or when utility service for reconnection is not available does not allow the customer to remediate their disconnection and creates an untenable situation. The same applies when the customer's health and well being can be endangered by an interruption of electric service, such as during weather emergencies and seasonal moratoria. In Texas, where there are alternative prepaid solutions, policy outlines a general framework and then allows companies to offer subsequently varying degrees of customer flexibility for competitive and customer experience purposes. One could envision a day when companies are marketing different disconnection rules than required by regulation (for instance, "No Monday Disconnections"). The experience in Texas can help guide utilities and regulatory agencies in crafting the right level of function, consumer protection and customer experience.

4. What would the parameters of a friendly-credit period look like? How would a negative balance be handled following a friendly-credit period?

Martin R. Cohen

If a credit period is truly friendly to the customer, it will begin to look like the regulated utility credit policies we already have: allowable arrearage amounts for certain periods, deferred payment plans, customer contact attempts, notifications, and fees to cover added costs – in short, all the things that "pure" prepayment is supposed to do away with (see answer #2). The need for these correctives suggests how difficult it is to design a workable prepayment program that will not be pulled apart by adding necessary consumer protections. That said, these measures are essential components to prepayment program design. The difference between prepay and post-pay credit rules might lie primarily in the amount and timing of credit extension. Negative balances in a prepay account should be deferred and paid over time, with the lion's share of the amount allocated to the current account. SRP requires 40% of prepayments to be allocated to arrearages existing at the time of prepay signup. For a low-income payment-challenged customer, maintaining service while paying down a past due amount at this level may be extremely difficult.

Judith Schwartz

Independent of the payment mechanism, households who are consistently having problems paying their bills in a timely fashion would benefit from human intervention. Community-based organizations like GreenDMV (www.greendmv.org) conduct "Sustainability Assessments," a more welcoming term than "energy audit." During a 60-90 day "friendly-credit period" demonstrating a willingness to participate in weatherization, CFL replacement, and other energy literacy programs, would indicate to the utility that this household is willing to partner to reduce usage. Helping the family obtain a simple feedback device

to monitor and manage their usage would be a worthwhile investment. A good trade off would be to allow any negative balance to be paid off in manageable amounts while continuing service.

For those who are not willing to make an effort, are not eligible for subsidies, and who choose to invest their resources in other non-essential priorities, it is difficult in my mind to make the case to the public that they should receive extended terms and be subsidized by other customers.

James Steffes

The parameters of a friendly credit period need to be consistent with policy intent to offer consumers needed basic protection as described in the response to Question No. 3 above. One thing to note is that not all consumers do well in regimes with generous credit. The benefit of properly structuring credit is that consumers don't dig a themselves into a hole too deep for them to climb out of.

That being said, Direct Energy's experience during lengthy weather moratoria (e.g. in Texas almost all of August 2010 was a weather moratorium), is that prepaid customers still tend to keep their balances positive. This is a testament to the consumer's level of responsibility when given the understanding, information, and incentive needed to manage their finances.

Prepayment also offers a new way to handle negative balances. Rather than simply require full repayment, prepaid solutions can work wherein a percentage of each customer's future payments can be used to pay down their arrearage in a deferred payment account. While it will take longer for the debt to be paid off, it offers an easier way for consumers to pay off large balances while maintaining electric service.

Customers should be allowed this deferred payment option after acquiring a negative balance during the friendly-credit period. It increases the amount of credit extended by the electricity provider but keeps the customer satisfied and able to maintain electric service.

5. Does technology that limits amperage (in place of disconnecting service) alleviate any concerns around service disconnection? What are the benefits and/or concerns? Do you know whether this technology been employed successfully / unsuccessfully?

Martin R. Cohen

Amperage reduction technology would allow a minimum level of service to be retained for a period of time, which would help alleviate but not eliminate some concerns about service disconnection. Reduced current may be preferable to no current at all, but it is a still a form of self-disconnection that could harm low-income households. A "current choke" system certainly would add a new dimension to the concept of demand response, as a household might choose to unplug the refrigerator in order to be able to take a hot shower. And it could be dangerous during weather emergencies. Determining the circumstances under which current would be reduced rather than shut off, what would be the appropriate amperage limit, for how long, whether to decrease it as a deficit balance grows, and related policies will add another new set of challenges to AMI-era regulation.

Judith Schwartz

The concept of selective management of devices within the home so that refrigerators or medical equipment can be kept running longer while other usage is limited, is a very interesting and powerful idea for storm and emergency response as well as avoiding blackouts during critical peak periods. As a means of motivating the consumer to pay, reduced electrical flow requires careful discussion and education, if it is not going to become a backlash issue. Reaching out to people in an open, collaborative

way so they understand that a few hundred hours each summer is responsible for a significant portion of their annual energy costs can be very persuasive.

James Steffes

Amperage limitation may sound good in concept, but will be difficult to implement in reality. Every household may vary in terms of the minimum required amperage needed to maintain the use of essential electric appliances, just as the definition of what constitutes an essential electric appliance may vary from customer to customer. It would be difficult to determine how much amperage reduction each household should be subject to. Generally speaking, consumers don't think in these types of terms. Given that, this type of solution could end up creating significant unintended consequences and result in very poor customer experience.

6. How should a utility manage service disconnection – what triggers service disconnection, what form(s) of notification would be required and when? How would low-income persons with no internet access and/or SMS (texting) capability be managed?

Martin R. Cohen

Service disconnection should be managed with customers' health and safety given highest priority and the same concerns addressed for prepay as for post-pay customers. Moratoria for weather, nights and weekends, medical conditions and other health and safety issues should be observed. As the balance in the meter account shrinks below a threshold level, a notice should be communicated through whatever means is accessible to the customer. As with post-paid service, that should include an attempt at personal contact. An IHD associated with the service should also be used to provide an easily observable notice mechanism. When an account reaches a zero balance, it should switch to a credit system for a limited period, long enough to assure a reasonable opportunity for the customer to become aware of the deficit and to make a deposit. Subsequently, the amperage could be reduced to allow minimal usage for another period, perhaps including further reductions over time. Notices and customer contact attempts would continue throughout the period, as well as subsequent to a disconnection, including information about payment arrangements and available subsidy programs. As suggested in #4, upon payment, the lion's share of the amount should be allocated to the current account, with a smaller portion assigned to reduce the balance for past usage.

Communications to customers without phone or computer access would have to be handled in the old-fashioned way: by mail and direct utility contact. These appear to be inefficient methods, particularly given that prepayment eliminates the monthly bill cycle and the often lengthy period preceding a conventional disconnection.

Judith Schwartz

(See Response to No. 7.)

James Steffes

Service disconnection on any electricity or utility product should be based on a predefined agreement between the provider and the customer that the customer willingly and consciously agrees to. For prepaid products, a disconnection threshold when the balance goes to zero is typical, and it is the most intuitive for customers to understand.

Customers should be given ample communication regarding their outstanding balance, their consumption levels, and a reasonable estimate of how much longer their electricity will last. They should

be given enough advance warning before their power shuts off, so that they can make the necessary payments and avoid an interruption to their service. In Direct Energy's experience, customers typically make a payment with one day's worth of power left in their accounts. They receive their warnings when Direct Energy estimates that the customer has three days remaining or less, followed by continuous warnings every day during that period.

Prepaid service presents new opportunities for communicating with the customer. The typical cycle time of a paper bill does not meet the need to provide consumers more frequent information regarding their balances and consumption in a meaningful way. Electronic methods deliver information to consumers more quickly and efficiently, and should be employed to give customers timely warning when they have low balances.

These electronic methods may be through SMS and email, as implied in this question. They can also be through automated outbound phone calls, through an in-home device, or through pagers. Customers should also be provided this information when inquiring about their account through a "pull" channel, such as when viewing their account online or when calling into a customer service number.

Arguably, customers without access to these electronic means of communication should not be placed on a prepaid program. It is Direct Energy's experience that very few customers seeking prepaid service are turned away because they do not have SMS or email access; furthermore, companies such as Assurance Wireless and TracFone have programs to provide free mobile phones to low income consumers and make SMS access almost ubiquitous.[70]

7. How do you envision communication with low-income consumers for the purposes of account status information / alerts? What means of communication would be most effective? Would prepay entirely eliminate paper billing?

Martin R. Cohen

Lack of customer connectivity poses a significant challenge to operation of a prepayment program, even in an AMI environment. First of all, convenient means for making and accepting payments from customers without online payment capability must be in place. Because prepay customers tend to "top off" the meter frequently in small increments – averaging almost twice a week in summer months in the SRP program – neighborhood cash payment opportunities would be needed to accommodate low-income customers.[71] (Another alternative, of course, would be to follow the lead of India, South Africa and parts of the UK that use coin operated meters!)

Part of the intent of prepayment is to eliminate the expense of paper billing. But under friendly credit and notice policies, an account statement for people without internet access would require a paper mailing.

Judith Schwartz

(Responses to Nos. 6 & 7 combined)

This audience is familiar with the "prepaid" concept for phone cards. There is also a nearly ubiquitous penetration of mobile phones for younger to middle-aged consumers. People who are paid in cash, are

[70] See information about Assurance Wireless at http://www.assurancewireless.com/Public/FAQs.aspx#faq1. See information about TracFone at http://www.tracfone.com/redirect_landing.jsp#/includes/content/questions/Lifeline.jsp?a=13124318.

[71] See Table 4-4, of the Electric Power Research Institute study: http://www.srpnet.com/environment/earthwise/pdfx/spp/EPRI_MPower.pdf

employed on a variable hourly basis, or work long shifts across conventional 9-5 business hours are likely to appreciate a mechanism where one can pay at one's own convenience at any hour or day. The ability to receive warning texts in advance of their balance reaching its limit and then to use the text function to pay for more electricity whenever they have the cash will fit a known set of standard operating practices. This could definitely minimize the need for paper billing (available upon request) as the person would receive a text "statement" and/or an email bill that could be printed on demand or shared with a support organization.

Every account will have a usage pattern associated with it that could be the basis for an automated approach either via text, email, in-home display, or robo-call. For example, a friendly monthly balance feedback notification could shift to a weekly pattern in the "final" month and then to daily to an hourly warning in the 24 hours approaching the deadline. The robo-call could shift to a customer rep call in the final weeks and daily for those who qualify for the program but do not have a digital connection. With the countdown of their "energy account balance" nearing zero, consumers have both time and an added incentive to be frugal while they identify a source of funds to keep the account open. Links to energy saving tips, support programs, and payment options can be embedded in the site or text message to raise energy consciousness.

The utility could use the amperage limiter to keep the essential service (for the refrigerator, for example), with intervention needed to reset service for the grace period of 60 days. The grace period could be extended for severe heat waves or cold snaps. The emphasis in the text messages, emails, and calls during the grace period should focus on the flexibility of payment options and the speed in which service can be restored after payment (a matter of seconds).

Older customers are likely to want to receive written notification as that mechanism will be more familiar for them. They are also likely to want a phone contact and access to a customer service center to resolve their situation. If a customer has neither Internet access, nor a mobile phone with a text plan, and/or simply could not function safely with reduced service, then one might question whether this person would qualify for the prepay program. Rather than argue in the abstract, it would be worth quantifying within a given service area how many people would actually fall between the cracks and are not already covered by a comprehensive energy assistance or Caduseus program. If this represents a manageable number of individuals then it might make better business sense to request a regulatory exception and enroll those households into one of the existing subsidy programs even if they do not meet the means test.

James Steffes

(See Response to Question No. 6 above.)

8. Assuming that a prepay offering would not require a security deposit or assess late fees, how might the credit cycle for low-income consumers be impacted? What are the potential benefits and/or concerns?

Martin R. Cohen

Prepayment may not require a security deposit, but participation in M-Power requires a $99 equipment deposit, which presents a similar hurdle for many low-income customers.[72] AMI and back office software could functionalize prepayment without additional in-premises equipment, so perhaps upfront

[72] See: http://www.srpnet.com/payment/mpower/default.aspx.

fees and deposits could be eliminated. However, an IHD to show usage, account status and messages would still be necessary.

The question of how to address an existing arrearage or past due amount from a previous address is problematic regardless of payment plan. States have varying requirements for maintenance of service or reconnection, but maintaining service generally requires sticking to a payment plan to eliminate any past due amount in a specified time period; in many cases reconnection require full payment of amounts due. The terms for handling existing past due balances of customers switching to prepaid service would be crucial drivers of a customer's choice of payment plan.

Judith Schwartz

Prepay programs like SRP M-Power are finding that even low-income consumers are happy to trade a slightly higher cost per kWh in exchange for eliminating the need for security deposits or late fees.[73] They have seen that with greater energy usage awareness, the household bills tend to be lower overall. When one is on a limited income—living check to check—avoiding the need to accumulate funds for deposits, and applying one's resources in a pay-as-you go fashion, is more practical.

James Steffes

Security deposits are not typically required for prepaid plans, despite the nominal credit that is still extended to prepaid customers (see Response to Question No.2 above).

Historically, security deposits have been an inevitable part of post-paid electricity where credit is extended, as the service provider needs to manage credit risk and remain viable to continuously serve all its customers. This presents a hurdle to consumers with poor credit and/or limited cash flow.

Prepaid electric service alleviates a substantial portion of this risk and allows service providers to feasibly serve "riskier" customers both without charging the consumer high deposit amounts and without penalizing the rest of the customer base.

In addition, in what will probably be the largest market for prepaid in most utility territories, Direct Energy now has experience voluntarily converting post-paid customers onto a prepaid program. Under this process, the Company is seeing increased recovery of past debt, extended customer tenure and favourable customer comments. When converting customers to prepaid, prepaid plans enable gradual payment of arrearage amounts through a deferred payment plan that allocates a portion of each future payment towards bringing down the debt. Consumer acceptance of this has been extremely favourable.

Therefore, while the customer receives much less credit while on a prepaid program, the additional control they obtain over their finances seems to make it quite appealing and actually increases the affordability of energy.

[73] azcentral.com/Arizona Business & Money, "SRP's prepaid electricity plan found to have higher rates" http://www.azcentral.com/business/articles/2010/07/11/20100711biz-prepaid-power-srp-rates0711.html.

9. Taking question no. 6 into consideration (no deposit, no late fees), would it be reasonable for utilities to charge transaction fees associated with each payment? What fees if any would be deemed reasonable or should fees be prohibited?

Martin R. Cohen

Transaction fees are justifiable only to cover net incremental costs of a transaction and only to the extent that the costs are appropriately assigned to the participating customer. If social goals are advanced through prepayment programs and if costs and risks to other customers (for bad debt, collections, working capital, customer service, etc) are reduced, it would be appropriate to socialize all or a portion of prepayment program costs. Smart meters and advanced payment processing and meter data management systems may reduce these incremental costs to a de minimus level. In the SRP program, participants average seven payments per month during the summer, indicating that many customers are only buying a few days of electricity at a time.[74] Because low-income prepayment customers are likely to make frequent purchases of relatively small amounts of electricity, any transaction fees could add up to a significant cost.

Judith Schwartz

I would argue that slightly higher rates rather than transaction fees are a better way to go and easier for the low-income consumer to absorb. Recognizing that this population is likely to move more often than other groups, the ability to take one's account with them with instant transition from location to location, without extra fees or the need to be on site for the changes (if AMI is installed), would be helpful and reward responsible usage.

The questions raise the larger question of what is reasonable? Utilities in most jurisdictions exchange monopoly status and a guaranteed rate of return (something few other businesses enjoy) for regulatory oversight and the obligation to serve the public interest. On the other hand, is it really practical to extend unlimited credit or subsidies to everyone if the utility is to operate and thrive? At the end of the day, the expenses must either be borne by other ratepayers or by the investors and taxpayers (in the case of municipal utilities) who are providing the investment capital.

As we entertain the idea of other potential industry participants and re-vamped business models for utilities, we need to make sure that sustainability extends to the entities running the operation. Greater transparency of actual costs and rate choice would help consumers understand how the energy ecosystem works and how they can be partners in their smart energy future.

James Steffes

Most utilities incur costs for processing payments, such as in-house labor for processing payments, fees from payment network vendors, and credit card merchant fees. Prepaid customers, in Direct Energy's experience, pay many more times a month than post-paid customers, increasing the cost burden of handling payments. There needs to be a balance between how these costs are passed on to consumers and the resulting burden of these fees, so that the prepaid experience does not become unappealing.

These fees can be woven into the price of the product, or structured such that consumers incur it as they use it. The benefit of building the price into the product is that it simplifies the product for consumers. However, it introduces distortion: 1) customers who consume more electricity subsidize this cost more than consumers who use less; and 2) customers who make larger payments (and therefore

[74] See Table 4-4, of the Electric Power Research Institute study: http://www.srpnet.com/environment/earthwise/pdfx/spp/EPRI_MPower.pdf.

pay fewer times) bear a disproportionate amount of the cost burden. Charging these fees on an a la carte basis drives the right behaviors by making consumers aware of the costs they generate. In a way, when consumers behave properly they help fellow consumers by not increasing the costs required to serve everyone.

10. What efforts would be required to make prepay compatible with government energy assistance programs? What challenges do you foresee with this process?

Martin R. Cohen

A tariff that provides lower rates to low-income customers, whether subsidized through public or ratepayer funding, would not require modifications to accommodate prepayment. However, other programs to reduce electricity costs for low-income customers would pose different types of challenges. Some energy assistance programs appear not to be compatible with prepayment. For example, a percent of income payment program (PIPP) has a varying subsidy tied to income and generally includes a method of reducing initial arrearages over time. Customers on a PIPP who pay a specified monthly amount are not disconnected for accruing an arrearage within certain limits. Reconciling a PIPP program with prepayment would be difficult and perhaps pointless.

Budget billing programs, under which estimated annual costs are spread evenly through the year (and popular with customers at all income levels), also would be difficult to incorporate into prepayment, as would any other payment plan based on extension of credit to the customer. In jurisdictions that implement dynamic pricing, seasonal rates and corresponding variations in monthly bills are likely to increase, making budget billing even more popular and necessary for household money management, yet even more difficult to reconcile with prepayment.

Direct voucher programs provide monthly or seasonal offsets to bills, raising the question of how to apply lump sum subsidies to prepayment. Weekly credits could be deposited in an eligible customer's prepayment account, which, combined with "friendly credit" policies discussed above, could help maintain uninterrupted service or at least avoid lengthy periods of disconnection. "Crisis" subsidy programs to address seasonal emergency needs of prepay customers would have to be far more nimble in order to help maintain service before the meter balance hits zero, instead of being directed to prevent a scheduled conventional disconnection.

Implementation of prepayment programs should be preceded by development of new approaches to energy assistance that can accommodate the needs of prepayment customers. But at its core, the prepayment model relies on automatic disconnection, which may be irreconcilable with the intent of low-income assistance programs.

Judith Schwartz

As noted earlier, I believe that prepay will be attractive to a range of consumers if it is positioned properly. The greatest efficiencies and fewest instances of fraud would occur if those customers who qualify for government energy assistance could have their credits applied directly to their utility accounts, thereby providing the baseline energy budget for the household. Simultaneously enrolling those households in sustainability assessment programs either run by the utility or local community-based organizations (CBO) would help the families learn how to stay within those boundaries.

The challenge to implement this would be to persuade regulators and government agencies to eliminate program-specific funding silos that currently discourage overlapping initiatives from being implemented in an integrated fashion. Consumer advocates could play a powerful role by communicating the big

picture to their constituents and partnering with the utilities to facilitate the connections with the CBOs currently providing similar programs. Utilities, for their part, would benefit if they invite the consumer and environmental groups to the table so everyone has incentive for their collective success. This collaborative model is not the norm in most jurisdictions today though it is increasingly standard procedure for the most successful communities.[75] [76]

James Steffes

The purpose of government assistance programs is to make electricity as affordable as possible to as many as possible. The beauty of prepaid service is in the timely awareness of usage and cost that helps prepaid consumers budget their electricity and spend in a responsible and conscious manner – ultimately, making electricity affordable. In fact, prepayment solutions support low-income assistance programs by providing workable structures to allow funds to be paid quickly and efficiently into consumer accounts so electricity can stay on and provide the benefits American consumers need.

Prepaid service, conceptually, creates a special kind of "bank" account that can only be used for electric service. Government and other assistance agencies today go to great lengths to ensure that assistance provided is indeed going towards electricity use; the prepaid account eliminates a lot of paperwork that would otherwise go into auditing and validating the use of assistance funds. In addition, it allows for direct charitable contribution of money to prepaid customers with the confidence that funds will be used towards electric service.

One challenge is that most assistance agencies have optimized their operations for the slower monthly cycle of a post-paid product. Agency assistance payments typically arrive 30 - 45 days after the assistance pledge is made; this creates a dilemma as the funds arrive way after consumers expect to have those funds applied to their accounts. Direct Energy has developed an innovative process that allows the consumer to experience the benefits of the pledge while the funds are still in transit.

Another challenge is in the suspicion and distrust that assistance agencies have for prepaid products. Utilities, agencies, and the competitive market need to openly collaborate on new ways to use prepaid electricity to help consumers. Denying consumers a better product, which can lower overall spending and which can allow consumers to manage their cash flow, because of misunderstanding or distrust is not in the interest of our industry or consumers.

Authors' Conclusions

Martin Cohen

Putative benefits of prepayment include lower utility costs, new options for customers, and enhanced motivation for energy management. Much has been made of the conservation effect of prepayment, but systematic analysis separating prepayment from other variables has not been conducted. In other parts of the world where prepayment is more common, the evidence of sustained usage reductions is mixed at best.[77] In Arizona, SRP found that annual usage of prepay customers dropped by an average

[75] Case Study: PowerCentsDC Pilot: A Model for Stakeholder Collaboration, National Action Plan Coalition, 2011.
[76] Driving Demand for Home Energy Improvements, Lawrence Berkeley National Lab, 2010.
[77] Other countries have often not seen reductions in usage associated with prepayment. For example, a study of Northern Ireland, where 30% of customers take prepaid service, found higher usage by those customers. See: http://www.eprg.group.cam.ac.uk/wp-content/uploads/2011/02/1108_main-text.pdf; (p.16) A study of prepaid service in Argentina found that usage increased over time, relative to post-pay customers. (Note: This may be related to factors in the program design, which included a 5% lower rate for prepaid service.) See:

8%, however, it is not clear that prepayment itself was responsible.[78] Other factors attenuating usage for M-Power participants include higher basic rates, the allocation of a large part of current payments to arrearages (which can dramatically increase the effective per-kilowatt-hour cost), and temporary self-disconnections (whether inadvertent or due to financial circumstances).

Rising interest in the potential of prepayment stems primarily from the search for new applications of the AMI systems under deployment across the U.S. However, AMI pilots to date suggest that time-variant pricing, efficiency investments, and direct load control programs are more effective than prepayment in achieving incremental changes in consumption patterns and volumes.[79] The "Prius Effect" -- the tendency to reduce consumption in response to usage information – appears to be a driver of consumer behavior in an AMI environment. Participants in today's prepayment programs already receive near real-time consumption data that will become available to all customers when smart metering is in place. A wide range of factors needs to be considered before concluding that prepayment alone causes significant usage reductions, much less that such reductions are beneficial, not harmful to low-income consumers. The implications for low-income customers of combining dynamic pricing with prepayment also need careful evaluation before a regulatory decision about the merits of prepaid electricity service.

A comprehensive utility-specific study should be required to sort out costs and benefits of any proposed prepayment program. To the extent feasible, it would be valuable to disaggregate costs and benefits to study the net effects of prepayment programs on identifiable customer groups. Determination by regulators that the benefits of a prepayment program exceed incremental costs for both participants and non-participants should be the first level of analysis. A decision on whether the program advances the public interest should also consider social factors and other regulatory goals.

Judith Schwartz

At the ConnectivityWeek Consumer Symposium sponsored by Clasma Events and co-hosted by SGCC, we brought together a mix of stakeholders to discuss controversial issues (privacy, health effects, and dynamic pricing and low-income consumers). It was obvious that everyone, including the utilities, shared a common desire to see low-income consumers paying fair rates for electricity and being supported safely during dangerous weather periods.[80] The biggest barrier to solutions for all these topics—as identified by the group in 30 different breakout discussions—is **trust** among the parties and consumers. Sitting down and talking through the issues is one valuable step. Reports like this one afford a basis for constructive dialog.

James Steffes

Prepaid electricity brought about by advances in metering and communication technology holds great potential for consumer benefits, especially for low-income consumers. It provides an option that was not meaningfully available before, and raises the bar as consumers begin to expect faster cycles of delivery, better technology, and better customer service from their electricity provider.

While dialogue and education are critical before industry, consumers, regulators and other stakeholders become truly comfortable with the change, it is important to keep in mind that consumers are already

---

http://www.sandiego.edu/business/documents/Casarin.pdf and
http://www.iae.edu.ar/pi/Documentos%20Investigacin/Working%20Papers/DT%20IAE01_2009.pdf p.13

[78] See chapter 5, page 5-10 of the Electric Power Research Institute study:
http://www.srpnet.com/environment/earthwise/pdfx/spp/EPRI_MPower.pdf

[79] See: http://www.brattle.com/_documents/uploadlibrary/upload772.pdf

[80] CW11 Consumer Symposium: conversation, listening, collaboration, To the Point, 2011

voluntarily demanding this product in many parts of the world, including in Texas. If the technology exists to offer prepaid electricity in other areas of the US, waiting for additional studies to validate consumer preference seems unnecessary.

Moving forward will require a fresh perspective unburdened by preconceptions about prepaid products and by entrenched thinking from decades of post-paid electricity. In addition, views around the benefits and costs of this solution for low-income consumers must recognize the reality of our current structure – lights are going out when payments aren't made today; prepaid electricity won't change that fact except by giving more timely information so that disconnects become less of a reality. Prepaid electricity gives consumers, including low-income consumers, a better tool to help them help themselves. Prepaid electricity won't be chosen by everyone, but it can and should be a voluntary option wherever the technology exists.

DEFG's Summary and Findings

With the introduction of advanced metering infrastructure (AMI) and communication capabilities, the relationship between electric consumers and providers will soon undergo significant changes. AMI offers utilities the opportunity to provide prepaid electric service with relative ease and without the costs associated with older prepay technology. In an AMI world, prepaid service can be fully integrated with utility back office and meter operations. There is remote connect/disconnect capability and customers can add money to their accounts by methods already available to all customers (i.e., check, cash, and credit card via telephone, internet, or smart phone application). Thus, as AMI technology is rolled out, offering prepaid service becomes a real option for many utilities.

The different perspectives presented here by Cohen, Schwartz and Steffes were shared with the DEFG 2011 Prepay Working Group and incited detailed discussion. A mix of industry representatives – from utilities, public utility commissions, energy retailers, and consumer advocate groups – participated in a conference call exploring low-income consumer issues presented by a voluntary prepaid offering. Prepayment is a catalyst, raising legitimate concerns around consumer protections, and exposing tensions and incompatibilities between existing regulatory constructs and new technological capabilities. Cohen noted that, in an AMI world, the rulebook in fact needs to be re-written. All stakeholders agreed, at minimum, that disconnect policies need to change with automation and thus, consumer protections need to be reviewed in light of new capabilities.

A summary of additional points made by industry stakeholders include:

Consumer Preferences

- Utilities and regulators should ask—are we meeting the needs of the people we are trying to serve?
- States need to focus on how much the consumer likes services such as prepaid and allow for preferences
- Utilities must be transparent and offer choices that customers can understand
- Texas experience is that more timely information has a significant impact on customer experience and usage

Notification and Disconnect

- With prepaid service, perhaps e-communication channels and forms of e-payment need to be requirements

- Increased and new forms of communication are a part of smart grid implementation as a whole, not just a challenge specific to prepaid service (e.g., dynamic pricing)
- While disconnect is easier with new technologies, reconnect has also improved – two sides to the coin

Energy Consumption

- There are questions around achieving reduced energy consumption with prepaid service (where the transaction and usage feedback are coupled) and achieving reductions when employing only usage feedback with post-paid service; what are the range of impacts with information-only vs. information and transactional combined?
- Must explore the drivers for load reduction, e.g. marginal cost of energy, increased information around usage, and/or the transactional element
- Information regarding usage and energy conservation tips may be essential to the success of prepaid service
- The tie between price and consumption will be strengthened with smart grid

Costs, Benefits and Allocations

- Price / affordability is critical, can see a path where prepaid service is cheaper
- Prepaid being a cheaper service could be a game changer in the eyes of regulators and consumer advocates
- "The devil is in the pricing details"
- Perhaps increased flexibility provided by prepaid service is worth an extra cost to customers
- Need to look at new rate recovery mechanisms – when costs are accounted for (e.g., capital expenditures recovery), what is the timeframe? Who is paying for it?
- Provision of electric service is in the "public interest" – the impacts reach beyond economics

Low-Income and High-Risk (elderly) Specific Issues

- Perhaps prepaid will be an "impossible voluntary choice" for some customers
- Yet, how do you allow for voluntary expression of preferences for all consumers if low income protections are the tail that wags the dog?
- May need elements that feel "paternalistic" in order to maximize goals, even if prepaid service is just an option
- Participation should be limited to customers who really could benefit
- "It is expensive to be poor"; concerns expressed around prepaid transactional fees and potentially higher rates being similar to the payday loan atmosphere
- Federal funding is rapidly declining for energy assistance, especially LIHEAP. Need to go back to fundamentals around how energy assistance projects are structured, and absolutely need new mechanisms
- Similar to current piloting programs, an educational component should be directly tied to prepaid service as part of an energy budgeting effort. The counselor will know where the client is at a given point. These issues cannot be viewed in a vacuum, but need to be part of the "next level of low income energy assistance"

There is a tension between the possibilities enabled by new technologies and consumer protections. Consumer protections are grounded in principles regarding how society should treat people. Opponents of prepaid service argue that it deprives the low-income customer of the necessary financial assistance and flexibility available with post-paid service. Consumer advocates are concerned that low-income consumers might find themselves without electricity for extended periods because they elect to forego power in order to pay for other necessities such as food, clothing and gasoline. Yet feedback, at least anecdotally, shows that credit-challenged consumers like prepaid service, expressing satisfaction with increased budget control and convenience.

Two key questions are – how can a balance be struck between allowing consumers to exercise their preferences and ensuring that adequate consumer protections are in place? And, how can regulatory rules and practices, including for low income consumers, be revised or updated to allow for innovation and new offerings such as prepaid energy or other new services enabled by smart grid yet maintain the intent of the original regulatory rationale?

A broad consensus exists that consumer protections do and will exist for a prepaid service offering as they have been in place for post-paid consumers for decades. For example, nobody is arguing that moratoriums for extreme weather events or rules around disconnection should be done away with. Rather, the question is how those rules and regulations should govern new products and services given that many regulatory rules and practices were first implemented decades ago, long before the Internet and smart grid. In addition, many stakeholders would agree that limiting the form of communication for disconnect notifications to letters and/ or a knock on the door may not only be impractical but counterproductive when considering consumer credit issues. We live in different times. Prepaid service, being the first customer-facing application from smart grid that touches the body of bill pay and consumer protection rules, is highlighting the need to update the regulatory rulebook and separate intent from practice.

Regulatory "straw man" proposals for different policy areas were developed out of DEFG's research initiative conducted in 2010 (*see* Appendix). The proposals were not intended to be solutions, but rather to encourage discussion. The 2011 Prepay Working Group is now working to move the discussion forward by identifying points of consensus and clarifying differences related to these areas.

Critical policy areas touched by prepay include: 1) service disconnect, moratoriums, and notifications; 2) specific concerns for low-income and high-risk customers; 3) cost allocation, recovery, and treatment; 4) tariff; and 5) billing & accounting. Consumer protections cut across each of these areas, and considering how these issues potentially impact low-income consumers further intensifies concerns and makes the issues even tougher to address.

The Debate around Disconnection and Finding Common Ground

Disconnection policies are no doubt the leading concern among opponents of prepaid service. There are numerous issues to debate (e.g., the timing of disconnects, maximum time lag between payment and reconnect, the form of notice for service disconnection, protections during extreme weather, etc.), but some common ground can be found.

Schwartz aptly framed the discussion above – *policies around service disconnection should be grounded in common sense and good customer service practices*. Texas, for instance, recently implemented new consumer protections for prepaid service offered by retail electric providers, and prohibited prepaid service to customers dependent on medical devices. Likewise, most stakeholders agree, and Texas rules require, that weather moratoriums must apply to all customers, including prepaid customers. These

policies reflect common sense and are grounded in the principle that consumers should never knowingly be placed in a dangerous or life-threatening situation.

Furthermore, different stakeholders agree that prepaid can only work with a certain minimum level of flexibility and accommodation for customers. Steffes dispels the notion that there is immediate disconnection with prepaid electricity, at least in the Texas market:

> While conceptually possible, in practice disconnection actually takes a little more time. AMI meter reads need to go through the VEE (Validation, Estimation, and Editing) process to ensure that the reads are billable-quality. Then the customer needs to be notified of their new balance, and whether or not they will be disconnected that day. Then a grace period of a few hours may apply so that the customer can "cure" their situation, before the disconnection signal is sent to the meter. This process can take up to 36 hours.

Additionally, existing prepaid programs offered by retailers in Texas and the Salt River Project (Arizona) do not disconnect service during nights and weekends, or during weather or other moratoria (e.g., holidays). Thus, there is a nominal amount of credit that is actually extended to prepaid customers. Schwartz concurs with the need for baseline customer accommodation, "[t]urning off anyone's electricity in the middle of the night or when there is no one to call at the utility is pointless and makes the company look heartless and punitive regardless of the resident's payment plan, income level, or technology embedded in the meter itself." Steffes further confirms that customers need to be given a chance to avoid disconnection, as it provides for a better customer experience. These limitations and accommodations reflect common sense, and thus should be part of any consumer protection regulatory scheme for prepaid service.

In addition to friendly-credit periods and a certain amount of "overdraft" protection, there is an absolute need for appropriate communication to keep consumers informed of their account status. Cohen points out that easy access to account management tools is crucial to a positive prepay experience for participants. He notes the advent of smart meters, smart phones, in-home devices, online banking, etc. can make prepay a desirable service for certain customers, but also asserts that "low-income households, who are most likely to choose prepaid service, are least likely to have access to these technologies and services."

Some would object and note that more and more people have mobile phones with at least basic SMS capability to receive account balances and notices. As noted by Steffes, companies such as Assurance Wireless and TracFone have programs to provide free mobile phones to low income consumers and make SMS access almost ubiquitous. Moreover, as Steffes asserts, customers without access to electronic means of communication should (arguably) not be placed on a prepaid program.

Steffes shared details of Direct Energy's prepay offering during the recent Working Group conference call. Direct Energy only communicates via SMS and email with prepaid customers (no IHD, no robo-dial), sending daily messages regarding usage and account balances. Daily texts appear to be the right "touch point" or daily "pocketbook event," according to Steffes, as customers have anecdotally confirmed that the daily texts, or information exchange, provide them "increased control." The feedback from Direct Energy's prepay customers is that they feel better informed regarding usage and payments, find prepay to be convenient, and enjoy the flexibility and adaptability to personal cash flow. Moreover, speaking to the relevance of this product to low-income consumers, currently 1 out of 5 of Direct Energy's prepaid customers qualifies for and receives a low-income discount.[81]

[81] The LITE-UP TEXAS program is designed to help qualified low-income individuals reduce the monthly cost of electric service. The program provides discounts to eligible customers. See http://www.puc.state.tx.us/consumer/lowincome/Assistance.aspx.

Placing an optimistic spin on the opportunities presented by new technologies, Schwartz writes:

> The beauty of digital technology attached to each service location is the ability to make it practical as the account limit is approaching to send advance notices automatically via text message, email, or automated call to the person responsible for the account … Giving this type of early-warning [and regular] feedback certainly will reinforce that the prepay option is 'smart' and humane and will generate valuable goodwill for the utility.

Current disconnect policies, however, may require in-person or written notice by the US Post Office, and thus are incompatible with a prepay option. Prepay thus invites a discussion around re-writing consumer protections such as service disconnection notification policies. Certain jurisdictions will naturally be more or less willing to embrace electronic communication as a substitute for traditional mail or in-person visits. As consumer protections for prepaid service in an AMI world have been addressed in the Texas retail energy market, they can conceivably be worked out elsewhere as well.[82]

Prepay: A Billing and Budgeting Preference … or an Offer that Can't Be Refused?

Certain stakeholders view remote disconnection and prepay as advanced meter features providing new opportunities, prepaid service being just one bill pay option within a portfolio of choices. Certain consumers, for instance, may prefer to make several small prepay payments each month as cash becomes available, and avoid paying the security deposit and potential late payment penalties assessed under traditional monthly post-paid plans. Should service be disconnected for a day or two, certain consumers may prefer losing power on a limited basis to not being able to make a payment on a post-paid bill which results in a late payment penalty and potentially falling into a negative credit cycle.

Prepay is an alternate payment option and invites the question – should consumers be permitted to choose a payment plan that best suits their preferences around cash flow and lifestyle? Or, looking at the question from a different angle, why should monthly post-paid plans be the sole bill payment option offered by electric utilities?

Views presented by consumer advocates starkly contrast with the notion that low-income consumers can benefit from a prepaid option. Consumer advocates have voiced strong disapproval for prepaid service. During our 2010 research efforts, an advocate asserted that equitable access to energy is a right and access to energy is a necessity – that there is a societal responsibility to make sure access is provided in a manner as fully as possible without reducing a person or group to the category of a second-class citizen or second-class service. Another advocate expressed "deep philosophical problems with prepaid energy service," finding that it invites customers to place a value on saving money versus

[82] Under Texas Administrative Code, §25.498(j) relating to Prepaid Service offered by REPs, service may be disconnected by a REP only with a "timely warning" when a customer falls below the disconnection balance or fails to comply with a deferred payment plan, with the following exceptions -- no disconnection on a weekend day, or when mechanisms used for payments specified in the customer's PDS (Prepaid Disclosure Statement) are unavailable, or during an "extreme weather" emergency. Further, within one hour of a customer establishing a connection balance (or any otherwise satisfactory correction of the reason for disconnection), the REP must reconnect service or request that the TDU reconnect service. Under §25.498(c)(5), covering REPs offering Prepaid Service, a REP may choose the means by which it communicates required information to a customer (i.e., IHD, USPS, email, telephone, mobile phone or other e-communications), but must describe the means of communication in the Terms of Service (TOS) and Prepaid Disclosure Statement (PDS). Further, §25.498(c)(7) requires that a customer's current balance, including the date and time the current balance was calculated and the estimated time or days of credit remaining, be available to the customer either continuously via internet, phone or IHD, or within two hours of the REP's receipt of a balance request via the means of communication specified in the TOS. Additionally, under §25.498(c)(7), the REP shall provide a warning at least 1 day but not more than 7 days before the current balance is estimated to drop to the disconnection balance. Under §25.498(h), prepaid customers may request a Statement of Usage and Payment (SUP) at any time and a REP shall provide the SUP within 3 business days of the request, and deliver it by electronic means providing a downloadable and printable record, or by USPS if requested.

reliability and a commitment to energy being available; those for whom money is dear will potentially make a trade off, devaluing the ubiquity of energy services and turning it into a commodity. There are real concerns shared by advocates, perhaps the primary one being that payment-challenged consumers will not really have a choice but in fact opt for prepaid service to avoid overwhelming deposits or penalties.

Cohen notes above that prepaid service might be a good choice from among an array of pricing and payment options for some customers, yet for others it may be an offer that they just cannot refuse. Cohen asks, "[i]s providing a prepayment 'option' to payment-challenged customers contrary to the spirit (and perhaps the letter) of laws prohibiting discrimination in provision of utility services?" The position that consumers should be able to select prepaid service as a payment option in line with their cash flow and lifestyles preferences is indeed radically different than seeing prepaid as potentially discriminatory or predatory with regard to low-income consumers.

Quite different from Cohen's skeptical approach, Schwartz highlights potential benefits tied to prepay. Schwartz notes that research supports and many consumer advocates contend that people be permitted to choose pricing programs that best reflect their perspectives (yet most pilots to date have assigned households to specific rates, missing the opportunity to measure the impact of choice). Schwartz thus submits that the same thinking be applied to payment options – consumers of all income levels will benefit if permitted to enroll in payment plans that reflect their personal preferences around cash flow, predictability, or opportunity to capture the greatest savings.

Schwartz further expounds:

> Just as high-income consumers are not a monolithic group, neither are low-income consumers. People who consume resources like electricity or water frugally versus unconsciously or wastefully exist at all levels of society. The same array of motivations: cost-consciousness, tech enthusiasm, green altruism, comfort, indifference, resistance; appear in people who have been raised in poverty, are trapped in low wage jobs, have suffered a blow to their middle class lifestyle due to an illness or job loss, or have retired on a modest fixed income.

And, while the smart meter based prepaid electricity market in Texas only started in middle of 2010 (driven by metering technology roll-out timelines), Direct Energy sees a large and growing market forming as consumers begin to understand the value prepaid electricity offers. Direct Energy's prepaid business continues to see average customer tenure on the product increasing month after month even with a growing customer count. Steffes notes that prepaid electricity is "not just a new way to pay for electricity. It is fundamental shift in the customer experience around electricity consumption, brought about by advances in technology and customer service." Direct Energy deems prepaid electricity to be a "smart, flexible, convenient, and responsive product."

Again, we see the tension between the possibilities presented by new technologies and philosophies that underlie regulatory constructs such as consumer protections around electric service. Steffes describes prepaid service as a "fundamental shift in the customer experience" brought about by new technologies, while Schwartz challenges segmentation by income, cutting through the notion that all low-income consumers should be treated the same way. These concepts test the perspective that low-income consumers are a monolithic group requiring blanket protections.

Who Bears the Costs? Who Benefits?

Certain benefits will accrue to customers, some to the utility, and others to society. Identifying what costs and benefits in fact exist and to whom they accrue is critical to garnering support in a regulatory

environment. Anticipated benefits of prepaid programs include: reduced utility delinquency costs; reduced utility costs for truck rolls managing service connection and disconnection in the field; increased customer satisfaction resulting from a stronger sense of budget control and related lifestyle management and convenience; and a reduction in energy consumption and accordingly lower bills.[83] Furthermore, the elimination of reconnection fees and deposits will reduce barriers to service for certain customers. These anticipated benefits have different dimensions and may touch on one or more of the following: 1) cost 2) affordability; 3) energy management / usage; and 4) lifestyle.

Cohen proposes that, if the central goals of regulatory policy regarding service to low-income customers are to make electricity more accessible and affordable, then the key metrics for judging a prepaid service program may be the change in number of households that remain connected to electricity service and the average costs they experience. Cohen adds that the value proposition for customers is quite different for a prepaid service that offers a discount versus one that charges a premium.

Steffes offers that, "[o]verall, prepaid electricity significantly raises the bar around customer experience. In designing its prepaid product, Direct Energy conducted focus groups and surveys to understand what consumers want from a prepaid service. Overwhelmingly, customers wanted payment convenience, no deposit requirements, daily usage information, payment flexibility, no reconnection fees and quick reconnections." Direct Energy's prepaid customers, including low-income households, are receiving these purported personal benefits and at a price consistent with post-paid products.

Some advocates and regulators, however, believe that automatic disconnection for failure to make a prepayment and any potential tradeoffs made to keep the lights on leading up to disconnection may result in potentially grave and detrimental consequences for low-income consumers, making prepaid service entirely unworkable from their perspective. This position represents a strict principle – society has an obligation to protect certain populations from potentially harmful conditions.

As a next step, Cohen proposes a comprehensive utility-specific study to sort out the costs and benefits of proposed prepaid programs. To the extent feasible, he holds that it would be valuable to disaggregate costs and benefits to study the net effects of prepaid service on identifiable customer groups, recommending a particular focus on the financial, social, health, and other effects of prepaid programs on low-income customers. A determination by regulators that the benefits of a prepaid program exceed incremental costs for both participants and non-participants should be the first level of analysis, according to Cohen.

DEFG's Series of Regulatory Choices white paper No. 4, "Regulatory Issues and Questions Presented by Voluntary Prepay Options Offered by Utilities," presented summary points from interviews with regulators across the country. Cost allocation recovery and treatment played a critical role in the discussion. Different scenarios were raised around treatment of costs and benefits.

Program costs, for example, might be baked into the total cost of the tariff, or alternatively passed through as a fee to the individual prepaid consumer on the occasion of each payment. Regarding the treatment of benefits, ideas included the utility retaining any savings (which ultimately in some form would pass through to the entire customer base), the utility passing savings through to only the customers enrolled in prepaid service, or potentially implementing a shared-savings model with a direct benefit to the prepaid customers and an additional benefit to the utility that in some way would positively impact the entire customer base.

[83] For instance, AZ's Salt River Project has reported the following relative to their "M-Power" prepaid program: Data from FY07 to FY10 suggests M-Power customers who were satisfied or very satisfied ranged between 85 and 89%; and data shows an average annual household reduction of energy consumption by 12%. (*See Paying Upfront: A Review of the Salt River Project's M-Power Prepaid Program*. EPRI, Palo Alto, CA: 2010. 1020260.)

The points raised by Cohen, however, go beyond dealing with the math of costs and benefits, and seek answers around "the financial, social, health, and other effects of prepayment programs on low-income customers." Questions around the different dimensions of anticipated benefits and costs associated with prepaid service, and how the benefits and costs will be handled and allocated, need to be more closely examined for prepaid service to be supported as a customer offering in a regulated utility environment.

Lack of Certainty around the Conservation Effect of Prepaid Electricity

Conservation effects of prepaid service in particular have not been well researched or documented. An interesting development occurred earlier this year when the Arizona Corporation Commission approved a prepaid option to be offered by the Arizona Public Service Company (APS) as part of a residential demand response (DR) pilot program. APS' stated goal for the pilot is to test a variety of technologies currently available, as well as customer response to the technologies and DR program design, which in turn will provide essential information for rolling out of a full-scale residential DR program.

Furthermore, the DEFG 2011 Prepay Working Group recently commissioned research to explore critical questions around this conservation issue, including: what relevant data is available and supports a linkage between prepay and energy conservation, what are the gaps in the data and research, how evidence supporting a linkage could potentially tie in with utility energy efficiency mandates and strategy around integrated resource planning, what would be required for regulatory credit to be given to utilities or other parties for energy efficiency gains and/ or for other regulated services such as resource adequacy or ancillary services, and what improved methodologies can be implemented to collect and analyze data necessary to establish a linkage.

Findings from the DEFG-sponsored research and the APS pilot should reveal critical information regarding the potential linkage between prepaid service and reduced energy consumption.

DEFG's Conclusion

A lack of trust among stakeholders has been palpable during the course of DEFG's research and conference calls around the potential of utility prepaid offerings. While some stakeholders consider prepaid service a positive innovation for consumers, others view it as potentially predatory or discriminatory against low-income consumers. Schwartz makes the critical observation that stakeholders, including utilities, attending a recent industry symposium shared a common desire to see low-income consumers paying fair rates for electricity and being supported safely during dangerous weather periods, and that the biggest barrier to policy solutions (as identified by the group in 30 different breakout discussions) was trust among the parties and consumers.

To advance the discussion and frame the regulatory issues, it is helpful to identify a basis for the challenges, concerns and opportunities presented by prepaid service. Below are four "screens" to apply as an analytical framework to existing regulations. For example, to inquire whether a fundamental principle is involved (e.g., everyone must be served equally). Perhaps a rule formulated decades ago might be based on a practice involving older technologies, and with new capabilities there might be potential for change. And, with new capabilities, there are new services and products, which challenge boundaries or the degree to which consumers are permitted to make choices and express preferences. Or, perhaps a rule or practice is rooted in an ideology or policy position (e.g., supporting or opposing the role of competition in energy markets).

Analytical Framework:

Regulatory Basis	**Definitions**
Principle / Value	Underlying rationale
Practice	How implemented
Preference	Degree of allowing customer options/ preferences
Ideology / Policy Position	Extent / Role and degree of government oversight required

For instance, the analytical framework may be applied to disconnection policies and prepaid service. Disconnection policies, or more specifically weather moratoria, do not permit shut off during extremely hot or cold weather. This rule is grounded in a principle – society should protect people from potentially harmful or life-threatening circumstances. This is a widely-shared view, thus most people would support weather moratoria applying to all electric service customers, including prepaid customers.

With regard to disconnect notifications, existing rules are mostly based on older technologies, so various forms of e-communication available now are just not addressed. The basis for a rule therefore may be tied to a practice. With new practices, come new circumstances and a need for new rules. When dealing with degrees of customer preference or choices, rules are tied to the options that are available at the time, but there is also a focus on limiting or expanding the degree to which options are made available to customers. An element of protection may be in play. With prepaid service, a customer might opt to let their credit run to zero and disconnect service for two days. This customer may prefer to manage their credit in this manner and, while unconventional, is merely a preference. Regulations can prohibit or permit such an option.

Last, prepaid service and the notion of self-disconnect may be unacceptable from an ideological perspective. The act of self-disconnecting may be seen by some as a "bad" decision, and certain stakeholders may assert that government's role is to help people not make" bad" decisions.

With new capabilities and offerings enabled by AMI, there is a need for fresh thinking in the regulatory arena. Further investigation into the anticipated benefits, costs, and impacts of prepaid electric service, combined with a better understanding of customer preferences, will provide much needed answers. This process is critical to develop trust among stakeholders and move forward in a new world.

Appendix

Regulatory "Straw Man Proposals"

1. Disconnect, Moratoriums & Notification	*2. Low-Income & Credit*	*3. Cost Allocation, Recovery & Treatment*	*4. Tariff*	*5. Billing & Accounting*
- Prepay alerts are part of increased feedback and account management options - Moratoriums apply to prepay customers - Do not offer to elderly or persons dependent on medical devices - Redefine what is life-line / emergency service to use limiting amperage - Require either a security deposit, credit card or linked bank account to cover float - Upon disconnect fall back on traditional service as default	- Make prepay compatible with energy assistance programs - Consistent (potentially daily) messaging via customers' preferred means of communication - Standard consumer protections hold for prepay	- Define mechanism; is prepay a rate case or a rider? - Utility keeps any savings - Utility eats any program-related costs and passes any savings onto the customer - Shared-savings model between utility and consumers - Energy conservation is a treated as a savings factor - Utility is simply a pass through; service is offered by a 3rd party	- "All-in" option without future adjustment (covers fuel adjustment, taxes, fees, etc.) - Competitive states look at TX model - Regulated states look to Salt River Project as a model - For pilot programs, seek waiver as a temporary measure - Consider prepay from a fresh perspective - where the customer needs to earn credit	- Break tie with paper billing - Shared savings for going paperless - Tie into energy conservation and goals - Hybrid offering with traditional plan as back-up system satisfies requirement for monthly bill

You may quote portions of this document with proper citation: ©2011 DEFG LLC. DEFG's Series of Regulatory Choices, No. 6, "Low Income Consumer Issues and Voluntary Prepaid Energy Offerings: Perspectives from Three Industry Thought Leaders," Sept. 2011.

ATTACHMENT D

DEFG's "Smart Grid Communications March 2012 Top Line Findings."

Meta Analysis and Utility Case Studies on Smart Grid Communications

Smart Grid Communications Final Report
March 2012 (Top Line Findings)

Overview, Table of Contents and Primary Investigator

In the fall of 2011, DETech members selected a new research initiative "Communicating Smart Grid Goals and Benefits: Lessons Learned and Planning for 2012." In pursuit of a smart grid, many utilities have focused solely on the deployment and integration of advanced metering infrastructure. Communications efforts have been uneven. The industry is in a period of discovery regarding consumer opportunities. This DETech 2011 Fall Initiative is designed to:

- Understand lessons learned from past smart grid communications efforts
- Determine what efforts are appropriate for 2012, either as a mid-course correction, or starting point for new deployments
- Establish a framework for ongoing measuring and assessment of the effectiveness of smart grid communications efforts

Judith Schwartz, President, To The Point (www.tothept.com)**.** Judith works on the forefront of sustainability issues, the Smart Grid, alternative energy, and the digital home. Operating at the nexus of public policy, technology, communications and business, she brings an unusual perspective that crosses functional disciplines to cut to the heart of the problems and solutions. To the Point has been building a viral stakeholder education program, Renewable Reality, with such utilities as Hydro One, National Grid, PG&E, leading scientists, analysts, and technology companies. Recent video productions may be seen on www.powercentsdc.com and www.green2growth.com. A panelist at the FERC Technical Conference for the National Action Plan for Demand Response, Judith is the Strategic Communications Consultant to the NAPDR Coalition of Coalitions and author of their *Communications Umbrella Action Guide*. A regular speaker at industry conferences and webinars, she was asked by the SGCC to apply her broad understanding of stakeholder perspectives and consumer attitudes to the examination of the many research studies made available to the Smart Grid Consumer Collaborative and authored the *2011 State of the Consumer Report*. Judith is a co-author of The Costs and Benefits of Smart Meters, published by the Institute for Electric Efficiency and organizer of cross-stakeholder events such as the GridWeek and ConnectivityWeek Consumer Symposia.

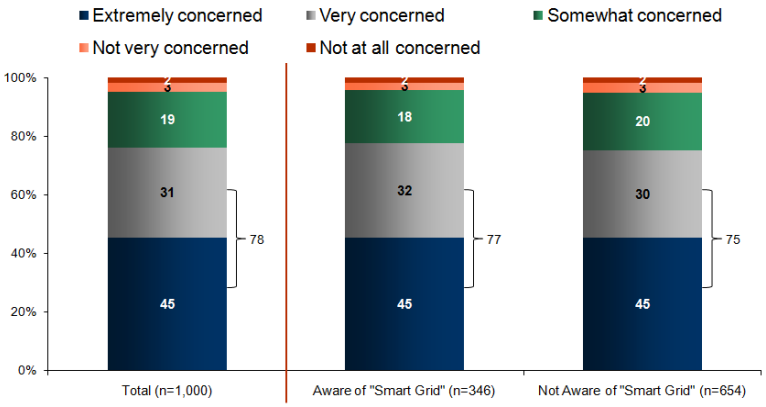
Overview of the Research Initiative

- Why Are Utilities Struggling With SG Communications?
  - *Opinion #1*: Utilities have focused on bill savings, failing to connect smart meters to reliability
    - *Smart meters are fantastic at allowing the utility to implement very elegant and customized rate structures (TOU, CPP, tiers, etc.); they do not, and never will, be good at improving reliability. The utility has much better and far cheaper tools than smart meters to accomplish this goal.*
  - *Opinion #2*: Consumer benefits have not been documented, so the opponents point to the costs without context
    - *The primary issue I see is that the end customer is forced to pay for a device (the smart meter) which will, in the end, result in higher energy costs to that same consumer.*
  - *Opinion #3*: Economic messages resonate more than non-economic messages
    - *Different consumers have different priorities. One-size-fits-all messaging only will lead to trouble. Segmentation is critical.*
- Methodology for this study
  - Examine what programs are attracting attention
  - Review literature, studies, best practice presentations at conferences
  - Baseline research shows few consumers are knowledgeable: Who is making headway in consumer understanding?
  - Best practice trends show common themes and patterns
  - Look at how techniques compare to other transformative sectors
  - Examine shortcomings: What could be done better? Past not prologue
  - What are the criteria?
    - Demonstrated understanding and awareness of subtleties of segments within classic distinctions among residential, C&I
    - Willingness to prototype new vehicles and channels and learn how those findings can be applied, learn from missteps
    - Recognition that one program, channel, value propositions, and set of messages won't work for everyone

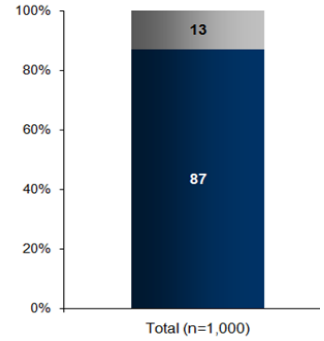
"The past hundred years have trained consumers to be passive. It will take time and a lot of effort to make consumers the smartest part of the smart grid. I expect real consumer interest to start when rates made possible by the smart grid, offer options to consumers that will provide them with opportunities to save money while helping the utility to shave or shift peaks." (Participant in Smart Grid Executive Forum)

Macro Picture on Smart Grid and Consumers

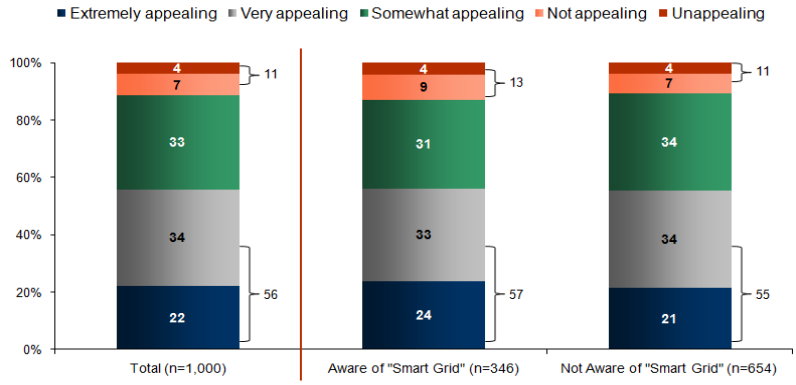
- Consumers are extremely concerned about price increases
- Consumers want to be engaged with utility to manage price increases
- Consumers find smart grid appealing as a useful tool



High levels of Consumer Concern About Prices



87 percent of Consumers Desire Utility Help



Majority of Find the Idea of Smart Grid Appealing

Online Survey of Energy Professionals on Smart Grid Communications

Who participated?

- 200+ energy professionals took part in the survey
- Nearly 1/3 were from electric utilities
- Geographically dispersed

Overview of findings:

- Existing smart grid communications are considered below average:
  - 40% rate it as ineffective (1, 2 or 3 on a 10-point scale, where 1 is "highly ineffective")
- When thinking about the metrics to measure effectiveness of utility smart grid communications, respondents believe:
  - "General awareness that deployment is planned or in progress" is important for consumers to know
  - They want consumers to "understand the principles and benefits of smart grid"
- By far, the biggest barrier to effective smart grid communications from among a list of nine items offered is a "lack of a comprehensive strategy" by utilities
- A significant proportion of respondents (78%) believe that grid modernization will "make it easier for individuals to control their bills" is a message will resonate with consumers

Biggest barrier to effective smart grid communications:
Lack of a comprehensive strategy by utilities

Online Survey of Energy Professionals (continued)

- In an open-ended response, top mentions listed “best in class” utilities in smart grid communications, including large utilities in California and Texas
- The activities that have worked well include a need to communicate frequently and persistently, and the consumer benefits including programs and offerings
- Different models describe the smart grid communications strategies in North America
  - 34% described their utility as “slow build”
  - 31% described their utility as “active engagement”
  - 24% described their utility as “fly under the radar”
- With regard to styles of communications, utilities rely on and are expected to rely on news, promotional campaigns, transactions, administrative approaches, and instruction
  - Fewer utilities are anticipating the use of inspiration, documentary approaches or consumer interaction
- 45% of respondents expect utility activities in smart grid to be somewhat higher in 2012; 30% expect utility activities in smart grid to be about the same
- All phases of deployment require utility communications, with “application/new product roll out” identified as requiring the greatest level, as compared to the other three phases
- The top cited challenge to effective smart grid communications related to customer programs and benefits, customer acceptance and engagement, and customer education
- Respondents are “concerned” about the costs of smart grid, privacy and security
  - 52% rated “costs of smart grid” with an 8, 9 or 10 on a 10-point scale
  - 49% rated “privacy” as a concern
  - 47% rated “security” as a concern
- “Outreach teams and energy advisors” received the highest percent of “first choice” selections for customer engagement and enrollments in new programs and offerings
- Nearly ½ of respondents believe that “empowering customers to be part of cost mitigation” and “improve the utility’s ability to respond to extreme weather” will resonate
- Many respondents believe there will be “very high interest” in storm outage detection and associated restoration maps and alerts

Effective Visibility Strategies Vary by Key Drivers

Fly Under the Radar	Active Engagement	Slow Build
Back end deployment first in sequence	AMI rollout in process or pilots are imminent	Practice incremental modernization efforts
High % of “indifferent” customers	Motivational mix, active stakeholders, media	Limited stakeholder urgency or interest
Low energy prices and costs to deploy	Costs may precede full benefits and offerings	Pay as you go approach
Business case justified on operational grounds	Inspiring vision to justify investment, slower ROI	Customers or voters may be owners
Minimal residential participation needed in initial stages	Community champions and influencers available and motivated to partner	Pattern of community involvement in plans and decisions
Build foundation for community exchange	Reflect local social norms, phases, don’t overpromise	Emphasis on energy literacy for youth

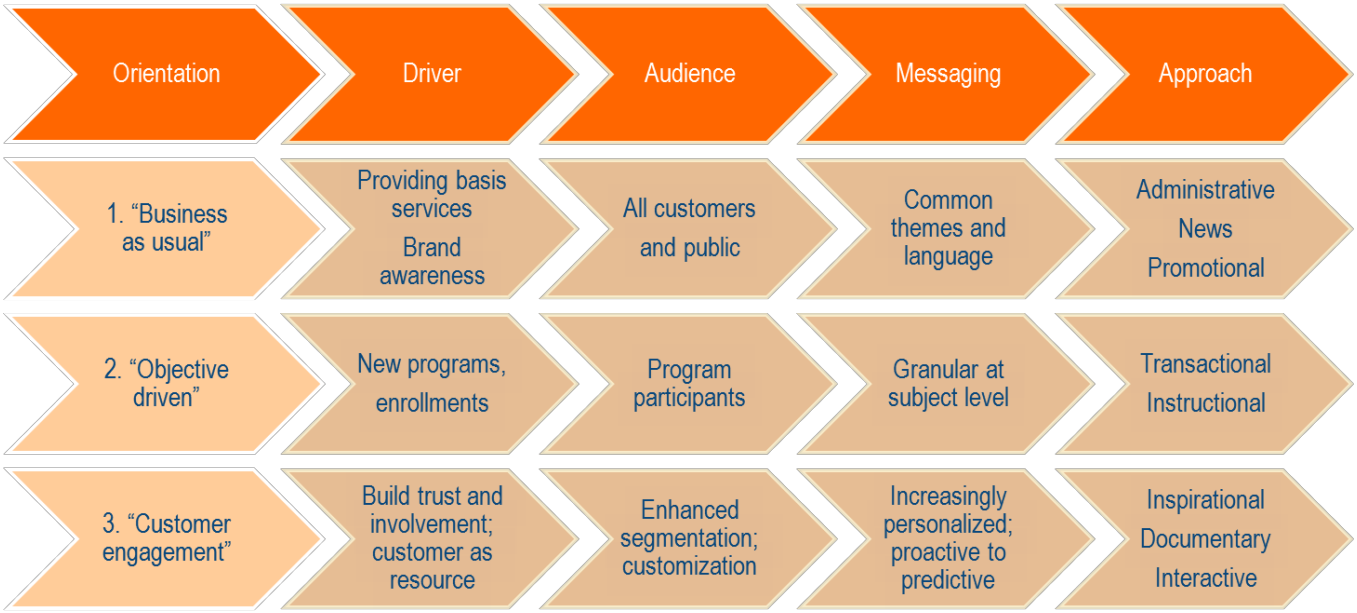
Communications Framework: Distinct Tones and Goals

- Different tones are suitable and needed for different contexts
- Risk of misapplied tone: a promotional tone may give the perception of selling rather than educating

Administrative	Establish account, transfer, or discontinue service; provide contact info; collect preferred channels
News	Notification of maintenance, visits to site, storm alerts, outages, restoration; responses to hot button issues
Promotional	Brand awareness, product announcements, ads, commercials, billboards, community events, contests
Transactional	Balance notifications, payment options, bill design, activity portals, rebates, usage visibility and comparisons
Instructional	How to? What is? How does? Tell us what you think about …
Inspirational	Vision; community connection of sustainability to positive economic and personal opportunity or impact, PSAs
Documentary	Scientific validation, behind the scenes, event coverage, human interest: real customer experiences
Interactive	Two-way exchange, customer generated content, peer-to-peer advice

Three Stages of Communication Styles

- The framework includes eight communications approaches, each with a distinct tone, appropriate for varied applications and outcomes. “Business as usual” are standard industry practices. Many organizations have added transactional and instructional materials to expand the understanding of program participants and interested customers. We are starting to see innovative groups using inspirational vision narratives, articulate customer and employee stories, targeted outreach, and peer-to-peer interactions quite effectively to encourage behavior changes and more conscious energy consumption.



Case Studies

Five case studies were conducted that include background research, a social media assessment (online conversations), and interviews with the utility communications staff and stakeholders.

AEP Indiana Michigan Power (I&M):

Dominant Theme: "Save money and Energy"; Visibility Strategy: Slow build

- Integrating social networks with outage management
- Telling the technical infrastructure story
- Making clear comparisons

Consolidated Edison (Con Edison)

Dominant Theme: "The Power of Green"; Visibility Strategy: Fly Under the Radar

- Encouraging self-selection priorities
- Communicating transactions as opportunities
- "Smart" is just part of the overall story
- Creating strong connections with community

Chattanooga Electric Power Board (EPB)

Dominant Theme: "Upgrade the grid with fiber optics

Visibility Strategy: Fly under the radar

- Inspire by aligning with forward thinking community leaders
- Sophisticated yet subtle branding can be very powerful
- Connecting smart energy with economic vitality
- Matching educational materials with the right audiences

Commonwealth Edison (ComEd)

Dominant Theme: Smart, jobs & economic development"

Visibility Strategy: Active engagement

- Breaking new ground with a critical enterprise app
- Positioning the smart grid story
- Choosing technology and considering immediacy

Hydro One Networks (Hydro One)

Dominant Theme: "SaveONenergy"; Visibility Strategy: Active engagement

- Personalizing communication with customers
- Leveraging shared programs, brands, creative
- Explaining Time of Use (TOU) pricing

Summary of Case Study Highlights

	I&M "slow build"	Con Edison "under radar"	EPB "under radar"	ComEd "engage"	Hydro One "engage"
News	Working with regional alliances	DR/DLC residential, Plug-in ready EVs microsites	Geek Hunt, Address hot button issues proactively*	Smart Energy Illinois	Social responsibility highlights
Promotional	TV ads: Safety	TV/radio brand awareness	TV spots "Know What's Coming"; "Empowering you"	Green our fleet; Exelon 2020	Conservation and demand management in-store events
Transactional	Rate options for pilot customers; Customer choice	Voluntary TOU, Power*Your*Way ESCO program	Green Power Switch	Opt-in RT hourly pricing, CRM System	TOU pricing for all customers
Instructional	Compare smart & traditional meters; Anatomy of electric system video series	Free iPhone app; TOU quiz	Support tab on site Dr. Shock for kids	Smart Ideas (integrated campaign)	Seasonal home tips & advice; Energy Wise farming videos
Inspirational	Energizing Indiana	SG animation, Power of Green	Speeches by Mayor of Chattanooga	Executive leadership and media participation	Vision video part of community outreach
Documentary	Consumer success stories for saving energy	Customer and Employee Stories	Fiber Optic Success Stories	Employee Community Volunteers	"First nation" and remote communities
Interactive	Interactive outage map, FB, Twitter	My Energy Toolkit, Child-oriented portals	Energy Efficiency Calculators	FB, YouTube, Twitter Two-way exchange	IESO Co-branded "10 Smart Meter Lane" application

Top Line Findings and Recommendations

- Utilities are investing very modestly in customer education, especially when viewed in the context of overall smart grid deployment costs. Yet the critical barriers to implementation and acceptance often appear in the courts of public opinion which would be helped by greater media and customer understanding.
- Typical utility communications emphasis and skills are in brand awareness and reactive damage control (PR). Brand and tagline consistency are not as persuasive in situations where different segments need targeted messages and interactive exchanges to make the connection. While smart grid teams at utilities are becoming more aware of psychographic customer segmentation and energy worldviews, that awareness does not appear to be influencing most outbound marketing and outreach. (There are some exceptions, who seem to reflect the distinctions but very few examples of utilities using digital applications, analytics, and customer data to support targeted delivery of content used at scale in other sectors.)
- It is reasonable to take different paths for different deployment sequences. A good long-term vision can set the stage with reasonable milestones and actual benefits added at each stage of deployment. Only a few utilities seem to have developed or articulated a clear path forward.
- Traditional and digital communication channels work best if complemented by employee volunteers and speakers in the community and collaboration with trusted non-profit partners. Interactive sessions allow spokespeople to respond to the real concerns of the people present which is the best way to overcome misinformation and fears. Consumer participation will increase if people feel they are choosing pricing and technology that fits their values, residential structure, and lifestyle.
- There are good examples of simple and clear explanations of smart meters, smart grid, and visions of potential benefits of a smart energy vision integrated with other energy efficiency practices. Sharing resources, productions, applications, and approaches could help regional adoption and reduce development costs.

You may quote portions of this document with proper citation: ©2012 DEFG LLC.

This foregoing document was electronically filed with the Public Utilities

Commission of Ohio Docketing Information System on

4/11/2012 4:46:27 PM

in

Case No(s). 12-0150-EL-COI

Summary: Comments Comments submitted by Distributed Energy Financial Group LLC ("DEFG") electronically filed by Ms. Cynthia Boland ODwyer on behalf of Distributed Energy Financial Group LLC ("DEFG")