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Paying Upfront: A Review of Salt River Project's M-Power Prepaid Program

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Technical Update, October 2010

EPRI Project Manager

B. Neenan

ELECTRIC POWER RESEARCH INSTITUTE
3420 Hillview Avenue, Palo Alto, California 94304-1338 ▪ PO Box 10412, Palo Alto, California 94303-0813 ▪ USA
800.313.3774 ▪ 650.855.2121 ▪ askepri@epri.com ▪ www.epri.com

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EPRI
3420 Hillview Avenue
Palo Alto, CA 94304

Principal Investigators
B. Neenan
J. Robinson

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ABSTRACT

Arizona's Salt River Project (SRP) has operated M-Power, the largest electricity prepayment program in the United States, since 1993. The customer population has grown to about 100,000 (approximately 12% of all residences served by SRP), and it has expanded from the initial target population—consumers with arrears facing service terminations and low-income customers—to include consumers with different expectations from M-Power service. The in-home portion of the SRP prepay configuration consists of a user display terminal (UDT) that communicates with the customer's meter. The purchasing component of the M-Power program is the self-service kiosk, known as a PayCenter, accessed via a Smart Card, which is also the conduit through which electricity consumption information is transferred back to SRP.

The constant aspects of the M-Power experience have been a high level of customer satisfaction and an overall conservation effect reported by SRP of approximately 12%. SRP attributes the conservation effect to a variety of factors, noting that M-Power requires consumers to pay attention to when and how they use electricity, allowing them to make immediate adjustments in usage to lower their bills.

This report provides an overview of how the M-Power program works along with an examination of the technology, systems, and costs associated with the program. The overview is followed by an analysis of customer perceptions of the program as well as a discussion of the program's potential conservation effect. The report concludes with a discussion of impact studies needed to answer several outstanding research questions, including the effect of various types of payment options on conservation as well as whether SRP's experience is transferrable to other markets, climates, customer circumstances, and supply conditions.

Keywords

Salt River Project (SRP)
M-Power Prepaid Metering Program
Energy Efficiency
Energy Consumption Information
Consumer Behavior
Residential
Consumers

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1
INTRODUCTION

As the largest electricity prepayment program in the United States with over 100,000 customers at the time of publication, Salt River Project's award-winning[1] M-Power program provides a potential wealth of experience for other utilities who are considering their own prepayment programs.

SRP personnel respond to frequent inquiries from other utilities about their program, and given that it combines a form of electricity-use feedback with a unique payment approach, the newly reinvigorated interest in behavior change-inducing feedback programs are also spurring interest in the program. Indeed, it was in response to this widespread industry interest that the idea for this report emerged. Its purpose is to capture in one report the details of the M-Power program that would be of use to other utilities considering similar endeavors. This includes an overview of how the M-Power program works (Section 2), the technology, systems, and costs associated with the program (Section 3), an examination of customer perceptions of the program (Section 4), and finally, an examination of impact analysis studies which have reported a significant conservation effect attributable to the program, and a discussion of additional impact studies that would be of use going forward to answer some outstanding research questions (Section 5).

To begin, some historical context will now be provided as a foundation for the report, including the impetus for the M-Power program and the chronological details of its inception, as outlined in Figure 1-1.

The M-Power Story[2]

The M-Power program began in 1993 when the Arizona state legislature proposed the development of programs aimed to assist low income consumers with bill payment. At the time, SRP sought input from various community organizations to learn what programs, in addition to federally funded weatherization programs, could be implemented to aid low income customers in saving energy—prepayment was one component of the pilot that was developed.

The prepay component began with a 100-home pilot, and one of the key findings was resounding customer support for the concept, which came as somewhat of a surprise. SRP found that customers felt that, for the first time, *they* were in control of their electricity bill, not SRP. After the pilot completion, the program expanded to other regions of SRP's service territory, and was no longer limited to low income customers.

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[1] The M-Power program won the National Energy Resources Organization (NERO) first place award for energy efficiency. NERO is a non-profit organization that recognizes organizations active in the promotion of energy efficiency.

[2] The content for this section is based on Personal communication, Mike Lowe, Customer Services Manager, SRP, September 17, 2009; Traasdahl (2009); and Personal communication, Karen Smith, Measurement and Evaluation Manager, May 29, 2010 (forwarded email from Bonnie Temme).

From the beginning, the in-home portion of the SRP prepay configuration consisted of an in-home display, referred to at SRP as an User Display Terminal (UDT), which communicates with the customer's meter; the initial vendor of the meter and UDT was CIC Global. As with any new program there were bugs, and in the early days, the technical difficulties made it necessary to hard wire the meter to the in-home UDT, which was an expensive configuration. Nonetheless, it was in this configuration that enrollment in the program grew to 1,600.

In 1999, Motorola became the provider of both the UDT and meter, and the new configuration employed power line carrier (PLC) communication between the two. Although this configuration was an improvement, there were still communication issues in some instances when other devices in the home prevented communication between the UDT and the meter (e.g., lamps, pool pumps).

Motorola exited the business in 2002, although SRP had purchased the rights to manufacture both the meters and the UDTs. AMPY Metering Limited, a UK-based company that is now part of Landys+Gyr, was the new vendor that was eventually selected.[3] In 2005 the AMPY technology was rolled out to M-Power customers, and a dual frequency approach was employed that solved the PLC performance issues. AMPY (now Landis+Gyr UK, Ltd) remains the provider of both the meter and UDT today.

Another technology component of the M-Power program is the self-service kiosk, known as a PayCenter. These are similar in nature to automated teller machines (ATMs) used by banks, and are located throughout the Phoenix area. The idea for the PayCenters was proposed early on as a cost-effective way of dealing with high volumes of power purchases—M-Power customers generally buy small quantities of power, but relatively frequently (see Section 4 for more details). Customers purchase electricity at the PayCenters through the use of a card, known as a Smart Card. The card is then inserted into the UDT at the home. As will be explained in more detail below, the Smart Card is also the conduit through which electricity consumption information is transferred back to SRP.

In the late-1990s, the first PayCenters were purchased from Diebold Incorporated, which at the time was working with Duke Power on payment machine applications for banked customers. The PayCenters were initially purchased for bill-paying customers, but SRP worked with Diebold to retrofit them to accept the M-Power Smart Cards. This configuration worked well, and enabled SRP to reduce costs by eliminating over-the-counter customer transactions altogether.

This arrangement continued until Diebold exited the business in 2000, at which time SRP contracted with AllKiosk, a division of GECO Incorporated, an Arizona-based engineering house, to develop their own PayCenters. They also used this opportunity to address the issues they had had with the Diebold design, and the result was a less costly and more reliable system. AlKiosk is now licensed to sell the PayCenter design to others as well.

As of April 2010, there were over 100,000 customers enrolled in the M-Power program, with 95 PayCenters in the SRP customer territory.

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[3] Prepayment systems are prevalent in the UK, and much of their early technology was coin operated. However, rising electricity prices in the 1980s led to increased instances of home break-ins to steal the coins, and this precipitated the invention of an electronic version of prepay.

Lessons Learned—30,000 Feet

As with any new program, mistakes were made. Likely the biggest one relates to fact that SRP tried for years to treat the M-Power program like any other rate program, by forcing the back office systems to "make" monthly bills for revenue recognition purposes. Utilities and their employees are used to thinking in terms of a billing cycle, and so it was initially difficult to think of the M-Power program using a different mindset. It took quite a bit to change this mindset, and it has just been since 2007 that the system has changed to cash-based revenue recognition, rather than trying to force M-Power program accounts into the standard billing cycle.

Another lesson learned early on was that customers on the M-Power program buy power frequently. Indeed, the utility industry has forced customers to pay on a monthly basis when in fact most customers are paid weekly or bi-weekly. On average, M-Power customers purchase power in the $20 range approximately four times a month in the winter, and seven times a month in the summer. Vending also peaks on Friday nights, likely coinciding with payday for many customers.

From a customer experience perspective, another lesson learned is to work in partnership with potential program critics to get to the root of any concerns. SRP worked directly with customer advocacy groups who were initially opposed to the idea of a prepay program due to concerns that it might unfairly force low income customers into power outage situations. SRP partnered with one such group, the Arizona Community Action Association, to design market research to assess their concerns. The ACAA is now an advocate of the M-Power program.

As technology continues to evolve, so likely will the M-Power program. Having considered the historical context of the program, the following section will now provide an overview of how M-Power works in its present-day configuration.

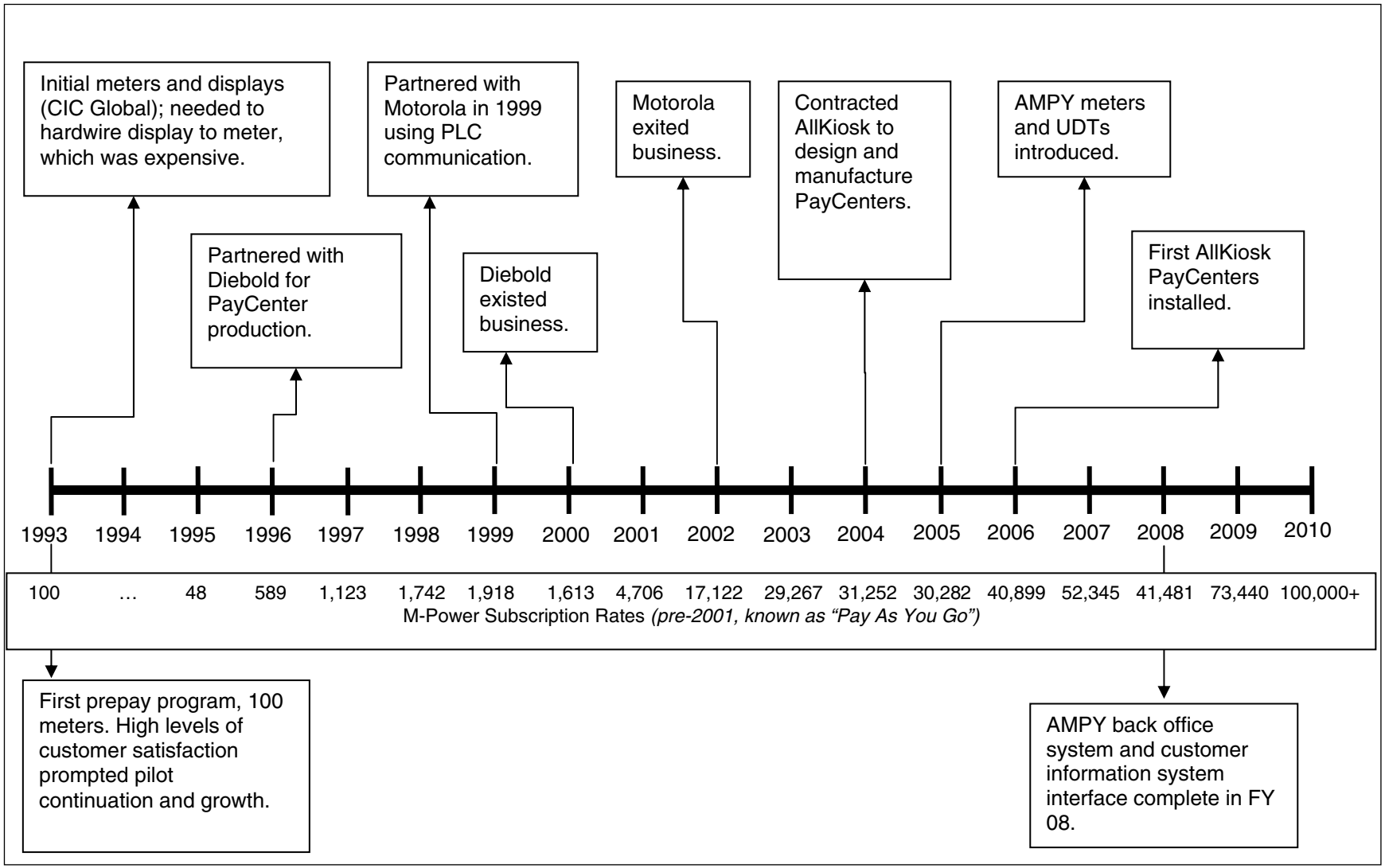

Figure 1-1
M-Power Program Chronology

2
THE M-POWER PROGRAM—AN OVERVIEW

This section builds on the previous inception story by providing an overview of the basic system functionality in its current configuration. Figure 2-1 provides a high-level illustration of system components.

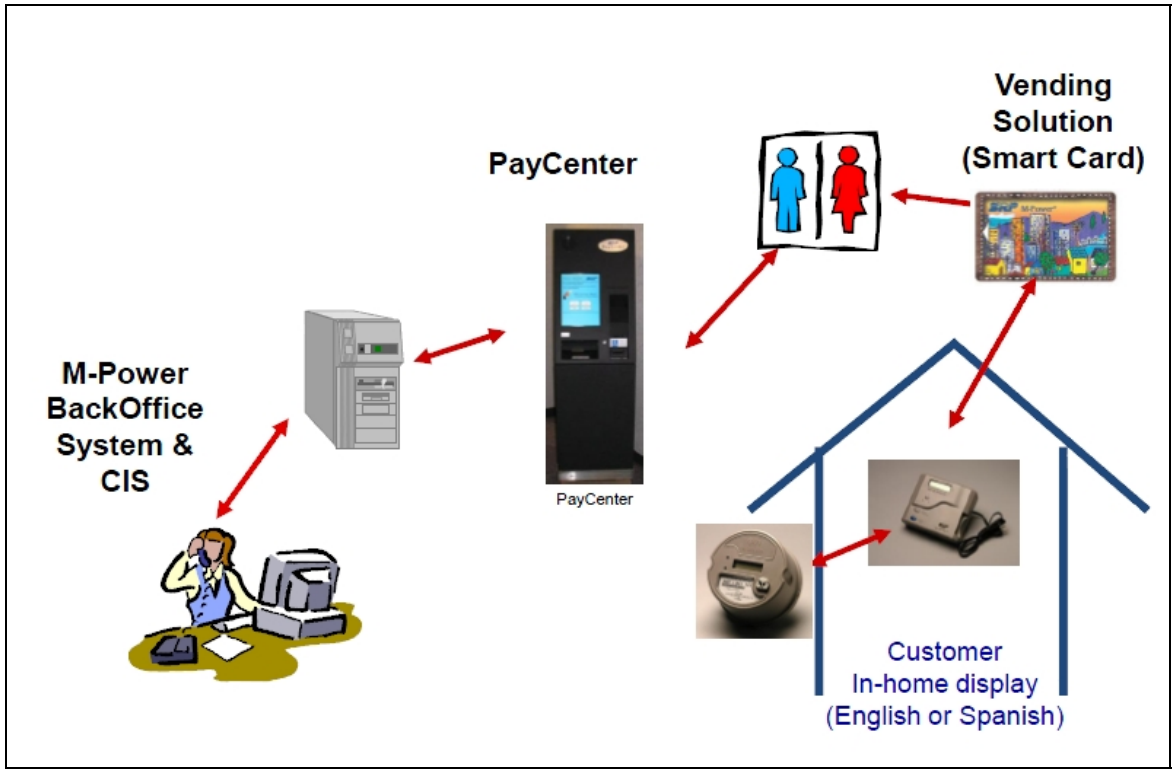

Figure 2-1
M-Power Overview (Source: Pyle, 2009)

A customer can learn about the M-Power program through a number of channels—SRP markets M-Power through direct mail, bill inserts, via email and through their web page, and through Customer Service Representative scripting upon customer call in. The general process by which a customer becomes an M-Power account, and the subsequent business process at SRP, is outlined as follows:

Initial Set-Up

- Customer calls SRP and asks to be on M-Power
- The customer pays a $99 deposit for the UDT, $87.50 of which is refundable upon the return of the device (this is in comparison to the $275 deposit that is required to set up a standard SRP residential account). The customer also pays a $28 (plus tax) service establishment fee.

- SRP back office will write two Smart Cards for the customer, one of which will be loaded with a $30 credit.
- The credit, equipment deposit, and service establishment fee, as well as any other arrears a customer may have from their previous account, is transferred to the prepay account, so that they can be automatically paid off over time at a rate of 40% each time the customer makes an electricity purchase.
- A field order will be created to deliver the meter and UDT to the customer; the meter and the UDT need to be married.
- The meter is installed by an SRP technician, but the UDT and a Start-Up Packet (containing a UDT User's Manua,l[4] a Quick Start Guide,[5] and a map[6] listing all the PayCenter locations in Phoenix) are left with the customer—the technician does not enter the home. No conservation tips are provided with the Start-Up Packet, although tips are available on the SRP website, as well as the M-Power microsite (www.mysrpmpower.com) and various other communications pieces.
- The UDT is plugged in, the card loaded with the $30 credit is inserted into it, and the UDT and meter are "married" (a one-time event); the system is then ready to go.
- When the card is inserted into the UDT, the full amount of credit that was on the card is transferred through the UDT to the meter, and the card balance goes to zero. At the same time, the meter consumption level at that time is transferred to the card, so that it may be transferred to SRP via the PayCenter the next time electricity is purchased.

Purchasing Electricity

- Electricity is purchased at any of the 95 automated PayCenters located throughout Phoenix (these PayCenters can also be used to pay non-M-Power customers' bills)
- PayCenters are located in grocery and convenience stores, some of which are accessible 24 hours a day, seven days a week. These PayCenters can be good for store business as well, as SRP's market research findings indicate that many customers report also purchasing store goods at the time of their electricity purchase.
- PayCenters take cash and "e-Chex", an electronic checking service.
- Phone purchases can be made using credit cards and e-Chex, although credit cards can take up to three days to post to an account, and the customer must still have the credits transferred to their card by visiting a PayCenter and inserting $1 (the minimum amount).
- Although rare, some customers pay by mailed check. When these checks are received by SRP they are input into the back office system as credit.
- The customer inserts one of their Smart Cards, and makes a payment (as low as $1, as high as $2,001). The customer is then issued a receipt that outlines the payment made, and any arrears deducted, and the total electricity purchased. See Figure 2-2 for receipt examples.

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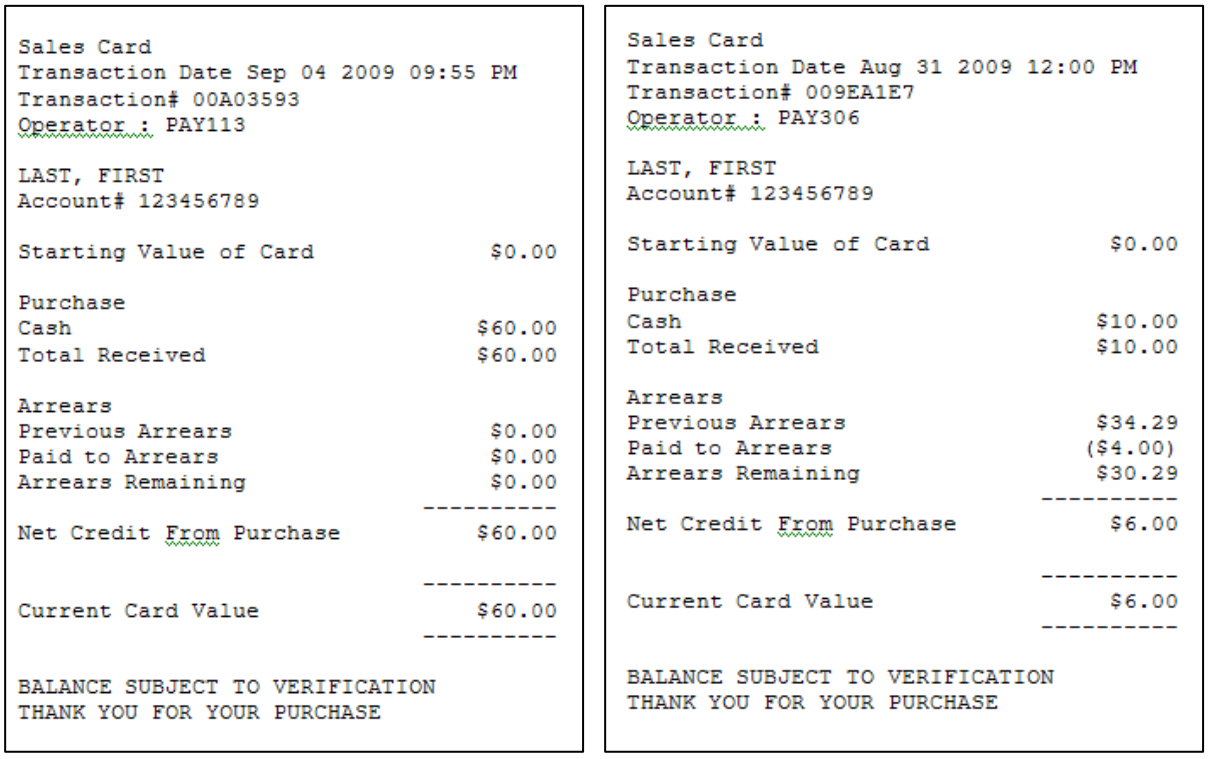
[4] http://www.mysrpmpower.com/pdfx/MPowerUserManual.pdf

[5] http://www.mysrpmpower.com/pdfx/quickstartguide.pdf

[6] http://myaccount.srpnet.com/paymentlocations/

- SRP occasionally uses the PayCenters to broadcast information to customers (e.g., notification of a planned outage)



```
Sales Card
Transaction Date Sep 04 2009 09:55 PM
Transaction# 00A03593
Operator : PAY113

LAST, FIRST
Account# 123456789

Starting Value of Card              $0.00

Purchase
Cash                               $60.00
Total Received                     $60.00

Arrears
Previous Arrears                    $0.00
Paid to Arrears                     $0.00
Arrears Remaining                   $0.00
                                  ----------
Net Credit From Purchase           $60.00

                                  ----------
Current Card Value                 $60.00
                                  ----------

BALANCE SUBJECT TO VERIFICATION
THANK YOU FOR YOUR PURCHASE
```

```
Sales Card
Transaction Date Aug 31 2009 12:00 PM
Transaction# 009EA1E7
Operator : PAY306

LAST, FIRST
Account# 123456789

Starting Value of Card              $0.00

Purchase
Cash                               $10.00
Total Received                     $10.00

Arrears
Previous Arrears                   $34.29
Paid to Arrears                   ($4.00)
Arrears Remaining                  $30.29
                                  ----------
Net Credit From Purchase            $6.00

                                  ----------
Current Card Value                  $6.00
                                  ----------

BALANCE SUBJECT TO VERIFICATION
THANK YOU FOR YOUR PURCHASE
```

Figure 2-2
Example of Customer Credit Purchase Receipts (Left: no arrears, Right: arrears)

Other M-Power Features

- Friendly Credit: The system can be programmed such that a customer can have power even if their credit goes negative during certain periods of time—in SRP's case this is between the hours of 6 p.m. and 6 a.m., seven days a week. The customer must purchase more electricity by 6:00 a.m. the following day to avoid a disconnect. The friendly credit used will be added to the arrears balance, to be paid off gradually with each subsequent purchase transaction.
- Disconnects: When a customer's account goes negative outside the Friendly Credit hours, the meter will disconnect the power source to the home. To reconnect the power, the customer must purchase credit at a PayCenter (or call to invoke Emergency Credit – see below). Once credits are purchased and the card is inserted into the UDT, the customer's power automatically reconnects. There is no disconnection/reconnection fee involved (for a standard residential account, the disconnection/reconnection fee is in the $60-$100 range, and requires a utility truck-roll).
- Emergency Credit: SRP may grant emergency credit over the phone by inputting a code to reconnect the customer's meter. This feature was added to address concerns regarding the loss of electricity in situations where a shutdown of the overall SRP communications network prevented customers from purchasing electricity.
- M-Power customers receive no monthly bill and pay no late fees. They do, however, receive annual letters summarizing their monthly electricity use for the previous year for information

purposes only (standard rate customers receive these reports as well). These reports are also available online.

Back-Office Processes

M-Power customer meters are not read like standard program meters (unless a customer requests this in specific situations). As such, the Smart Card is the conduit through which SRP has access to M-Power customers' consumption information.

- As previously mentioned, when the card is inserted into the UDT, the full amount of credit that was on the card is transferred to the meter through the UDT, and the card balance goes to zero. At the same time, the meter consumption level at that time is transferred to the card, so that it may be transferred to SRP via the PayCenter the next time electricity credits are purchased.
- When a customer purchases electricity credits at a PayCenter, the following information is transferred from the SmartCard to SRP's back office system:
  - Meter read (cumulative kWh and max kW)
  - Reading date/time: that is, when the card was last read by the UDT
  - Cash purchase amount
  - Transaction date/time: that is, time stamp at PayCenter when the customer made a purchase, and therefore different than the "reading date/time"
  - Status date: that is, when the card is inserted into and read by the UDT (some time after the transaction date/time)
  - A code indicating whether a disconnect occurred (i.e., the customer ran out of power)
  - Also the remaining credit on the UDT is recorded; if this is negative, this is another method of knowing if a disconnect occurred
  - Any Friendly Credit used (and corresponding date/time stamps)
- During the same transaction, data are pulled from the back office to the PayCenter in real-time, and recorded on the customer's transaction receipt:
  - Any Emergency Credit that was required (and corresponding date/time stamp): this will be added on to the arrears balance.
  - Arrears owing, arrears payment, updated arrears balance: the system accesses how much the customer owes in arrears and takes 40% of the cash purchase value to apply to that amount; the remaining 60% is used to purchase electricity credits.
  - Confirmation number if paid by e-Chex
- PayFirst: SRP can use this function to input any additional debts the customer may have, which must be paid off first at a rate of 40% before the funds can be used to purchase electricity (e.g., covering any fees and amount owing from previous NSF checks)
- GiveFirst: SRP can use this field to input funds they may owe the customer (e.g., if they have paid by mailed check the value is input in this field, if they are owed any customer service rebates)
- Other information that is transferred to the UDT from the back office via the Smart Card:
  - Rates

    - Holiday dates
    - Configuration changes (e.g., display changes, credit limit changes)
    - Messages to customers
- Given each account has at least two Smart Cards, there may be instances when a card is used that has not been used in a long time, and therefore contains "old" meter read information; these are called "stale reads", and they are tracked and taken into account using both the "reading date/time" stamp and the "transaction date/time" stamp. Once the card is finally used again, the consumption information is automatically re-sequenced in the back office system.
- In cases where the card or UDT becomes corrupt, the meter can be physically probed to obtain the latest consumption reading. Corruption does not affect overall revenue reporting to any extent given the infrequency of such occurrences.

This section has provided a high-level of overview of the systems and general processes by which the M-Power program functions in its current configuration. The following section will examine the technology and business processes that have been developed in more detail.

3
M-POWER TECHNOLOGY, SYSTEMS, AND COSTS

Technology

As described in Section 1, the technologies involved in the M-Power program have evolved over the years. Each component of the technology is now examined in more detail to highlight its functionality and interconnection with the overall M-Power system. Information regarding the costs to the customers is also included, although SRP's technology cost information has not been included as it is protected under non-discloser agreements with the vendors. The meter, UDT, and Smart Cards are illustrated in Figure 3-1.

Figure 3-1
M-Power Meter, UDT, and Two Smart Cards

User Display Terminal (UDT) or In-home Display (IHD)

The UDT currently in use at SRP has not substantially changed since 2005. Its trade name is the *ecoMeter*, and it is manufactured by Landis+Gyr UK, Ltd. (formerly known as AMPY Metering Limited). Table 3-1 provides an overview of its functionality.

Table 3-1
UDT Features

Information Displayed **(Customer toggles through screens using the "Display Cycle" button)**	Current rate per hour is $0.XX Rate Y charge is $0.XXXX/kWh Cost today is $X.XX Cost yesterday was $X.XX Cost this month is $X.XX Cost last month was $X.XX Enough credit for XX days Remaining credit is $XX.XX
Languages	English and Spanish
Communications with Meter	Powerline carrier (PLC)
Real-time Display Update Rate	~3 seconds
Installation	By customer (once meter has been installed by SRP)
Power Source	UDT plugs into a standard 110V outlet. Also a battery back-up for power outage situations.
Manufacturer	Landis+Gyr UK, Ltd.
Model	A version of the ecoMeter (industry name)
Cost to Customer	$99 deposit (87.50 of which is refundable upon return of the UDT to SRP)
Customer Support Options	Customer service telephone support Trouble shooting tips on mysrpmpower.com, and in the Quick Start Card and User's Manual

Meter

The meter is very similar in functionality to a "smart meter", and also has disconnection capability. One main distinction from today's smart meters which are a part of advanced metering infrastructure is that there is no real-time communication capability between the meter and the utility; as previously described, this is accomplished via the Smart Card instead.

Table 3-2
Meter Features

Manufacturer	Landis+Gyr UK, Ltd.
Model	5252 (latest model)
Communications with UDT	Powerline carrier (PLC)
Installation	By SRP. Must marry with specific UDT intended for the residence.
Cost to Customer	None

PayCenters (Self-service Kiosks)

As of September 2009, SRP had 95 PayCenters located throughout the Phoenix area. PayCenter attributes are listed in Table 3-3.

Table 3-3
PayCenter Features

Manufacturer	AllKiosk
Languages	English and Spanish
Payment Methods	Cash and e-Chex Non-M-Power customers can pay bills via the PayCenter as well
Communications with M-Power Network	Real-time connection to the SRP back office system (the AMPY server), PayCenter maintenance, iNovah interface (point-of-sale software), and the e-Chex server (see Figure 3-2)
Installation	By SRP; must marry with specific UDT intended for the residence
PayCenter Support	Dedicated maintenance team PayCenters can be swapped out on the spot for faster recovery time

M-Power Business Systems

Customer Information and Back Office Systems

Multiple systems are used to support M-Power, including the back office system, known as the AMPY Management System or AMS, the Customer Information System (CIS), called Phoenix, and iNovah, which is the PayCenter server. The interrelation of these systems as well as the e-Chex server (the interface with the electronic checking system) and the PayCenter support and maintenance system are illustrated in Figure 3-2.

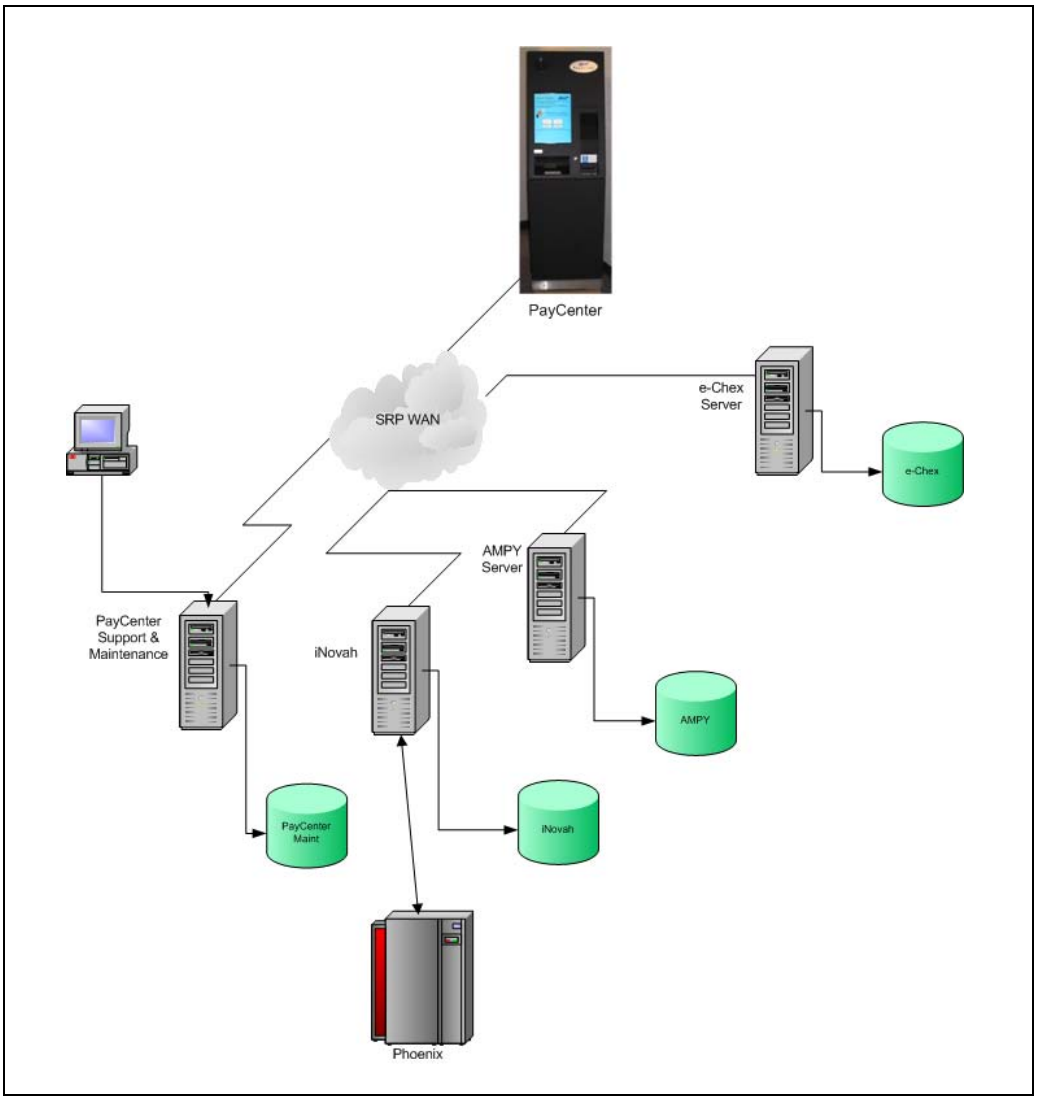


Figure 3-2
PayCenter Interfaces (Source: SRP, 2009)

Phoenix, the CIS, is now the system of record for M-Power customers, as it is for all other residential and commercial customers at SRP. All M-Power customer accounts are set up through Phoenix, and all customer information is housed in the system, including addresses, locations within the service territory, programs the customers are involved in, financial information including customer credit history, as well as records of customer interactions with SRP's customer service center. The Phoenix system was developed in-house by SRP with contractor support.

The back office system (AMS) was developed by AMPY and configured for the SRP M-Power program. It allows for the tracking of customer accounting details including customer service area and billing information, overall transaction history, arrears history, meter read details, meter credit status, and self-disconnection history. See Appendix B for various screen shots of the back office software.

The CIS (Phoenix) and the back office system (AMS) were originally completely separate systems in the early days of the M-Power program. Using this configuration, SRP would use the back office system to enroll M-Power customers, but would then need to enroll the customers in the CIS as well. This configuration entailed a lot of manual labor to ensure the two systems were reconciled and accounts were not out of balance. As M-Power customer numbers grew, so did the motivation to merge the systems. The process was complicated, taking approximately five years to complete. However, as of March 2008, the systems were synchronized, and Phoenix is now used to enroll customers, and any arrears owed by new M-Power customers on prior accounts flow into the back office system. The systems are also synchronized to reconcile when payments are made, etc. A report is run every night to reconcile the two systems, and although there are still some manual adjustments required to keep the systems synchronized, they have decreased dramatically since the initial synchronization in March 2008, and continue to decrease.

> Lesson learned: use one integrated system from the beginning. The integration of the customer information and back office system took several years to develop and debug.

Revenue Reporting

Although M-Power customers do not receive bills, the systems were originally used to essentially "make" a monthly bill for M-Power accounts, so they could be "forced" into a billing cycle such that they would be consistent with the other residential accounts for revenue and tax reporting purposes, energy efficiency reporting, etc. While such a set-up was manageable when M-Power electricity purchase volumes were relatively low, recent enrollment rates have necessitated the need for an alternative approach. In the 2008 fiscal year (May 2007 through April 2008), the accounting methodology has switched to cash-based revenue recognition (i.e., revenue is recognized based on cash purchases) rather than the conventional billing cycle approach. For load forecasting purposes, the cash value is transferred back to an energy quantity. It is felt that this method of revenue recognition is much more accurate than the previous "forced billing cycle" approach. This new approach is also tied more closely to the synchronized business systems previously described as well.

M-Power Costs

Customer Costs

M-Power Start-Up Costs

As previously described, for initial M-Power account set-up, customers pay a $99 deposit for the equipment ($87.50 of which is refundable upon return of the UDT), as well as a $28 (plus tax) service establishment fee. In addition, a $30 electricity credit is placed on one card. This total amount, known as a "pay-down balance", is uploaded as an arrears balance that the customer will pay off gradually with each subsequent purchase transaction.

M-Power Electricity Rates

M-Power customers pay a per-kWh flat rate, which varies seasonally, and is comprised of various adjustment charges. In addition, there is a monthly service charge of $15, which is collected either through hourly or periodic deductions from the account balance. The charges

effective November 2009 are listed in Table 3-4, and are compared against the standard residential price plan (also referred to as E-23). On average, in the summer months the M-Power rates generally result in slightly lower electricity bills compared to the Standard rate beyond a threshold consumption level. In the winter months, the M-Power rate is always more expensive than the Standard rate. Using average seasonal consumption levels for M-Power customers, M-Power customers may actually pay $38 more on an annual basis. It is, however, difficult to compare the two rates using the same consumption levels, as it is possible that a conservation effect induced through the M-Power program may result in lower overall consumption levels.

Table 3-4
M-Power per-kWh Charges (Effective November 2009)

Charge Component	Summer (May-June and September-October)		Peak Summer (July-August)		Winter (November-April)	
	M-Power*	**Standard (E-23)****	**M-Power**	**Standard (E-23)**	**M-Power**	**Standard (E-23)**
Total per-kWh	$0.0984 per kWh	$0.1019 per kWh (≤2,000 kWh) $0.1061 per kWh (>2,000 kWh)	$0.1030 per kWh	$0.1073 per kWh (≤2,000 kWh) $0.1119 per kWh (>2,000 kWh)	$0.0872 per kWh	$0.0879 per kWh (≤400 kWh) $0.0688 per kWh (>400 kWh)
Monthly Service Charge	$15 per month	$12 per month	$15 per month	$12 per month	$15 per month	$12 per month
Estimated Monthly Rates (excl. taxes)	**Assuming 1,069 kWh/month*****		**Assuming 1,539 kWh/month*****		**Assuming 697 kWh/month*****	
	$120 per month	$121 per month	$174 per month	$177 per month	$76 per month	$68 per month
M-Power cheaper at: (excl. taxes)	> 857 kWh/month		> 697 kWh/month		Never (Standard always less expensive)	

Sources:

* http://www.srpnet.com/payment/mpower/pdfx/MPowerE24Nov2009.pdf

** http://www.srpnet.com/prices/pdfx/BasicPlan1009.pdf

*** Based on average M-Power customer usage for FY10

SRP Cost-Benefit of M-Power

Table 3-5 provides an overview of the 2010 benefit-cost calculations for the common energy efficiency screening tests.

Table 3-5
M-Power per-kWh Charges (Effective November 2009)

	Benefits (NPV)	Costs (NPV)	Net Benefits	Benefit/Cost Ratio	Cost of Conserved
Total Resource (TRC)	$10,960,736	$5,574,298	$5,386,438	1.97	$0.037
Utility (UCT) / Program Administrator Cost Test (PACT)	$10,960,736	$5,574,298	$5,386,438	1.97	$0.037
Participant (PCT)	$15,844,237	--	$15,844,237	--	
Ratepayer Impact (RIM)	$10,960,736	$21,418,535	-$10,457,799	0.51	$0.144
Societal Cost (SCT)	$10,960,736	$5,574,298	$5,386,438	1.97	$0.037

The benefits in terms of electricity savings are derived using a 12% value for the conservation effect of the M-Power program, which SRP assessed through by three different conservation impact studies (see Section 5 for more details). To attribute kWh savings, SRP applies the conservation effect savings percentage to the load of current year subscribers. In a departure from conventional energy efficiency program evaluation methods, SRP does not attribute any impact beyond the current year. This is partly to ensure a conservative estimate of savings, but also because the impact studies were not constructed to resolve whether the behaviors undertaken by M-Power subscribers would persist into the future if the customer remained on M-Power, or if that customer migrated to another SRP rate. All tests pass the benefit/cost test except the Ratepayer Impact Model, which includes customer bill savings as a cost, given the savings represents a revenue shortfall. It is rare that an energy efficiency program that elicits a bill savings will pass the Rate Impact Test. The estimated program Societal Test benefit/cost ratio for 2010 is 1.97, which places it above many conventional energy efficiency programs.

This section has provided a high-level overview of the basics of the M-Power program in terms of the technologies and systems that support it and the resulting costs. Building on this information, as well as how the systems work together to provide the M-Power service to customers as outlined in Section 2, the following section outlines the results of several SRP-commissioned studies aimed at understanding customer perceptions of the M-Power program.

4
THE CUSTOMER EXPERIENCE

Past Study Overviews and Findings

SRP has dedicated significant resources to understanding what customers think about the M-Power program. This is partly in response to critics who are concerned that prepay programs may be unfairly forcing low income customers into power outage situations. Some of the initial market research studies were in partnership with the Arizona Community Action Association (ACAA), a low income advocacy group, to jointly investigate such concerns. As a result of some of the early findings that suggested high levels of customer satisfaction, and even "increased self-esteem"[7] due to perceived financial benefits and feelings of self-efficacy in relation to bill payment, the ACAA now publicly supports the M-Power program.[8]

Many of the various studies that were performed are outlined in Table 4-1, and a more detailed review of the results can be found in Appendix C. Considering the results of these studies, some themes emerge.

Table 4-1
Past M-Power Market Research Studies

Reference	Study Title	Study Period	Subject
SRP, 2009b	CCTS M-Power Quarterly Scorecard	May-Jul 2009 (performed every quarter)	Summary presentation of telephone survey results from M-Power customer who visit the PayCenter kiosk to purchase power
PRIZM, 2009	PRIZM Analysis	Jul 2009	PRISM analysis/marketing
Traasdahl, 2009		2009	Overview presentation of program
WestGroup Research, Inc., 2007	SRP M-Power Materials Survey: Topline Report, November 2007	Oct 2007	Telephone interviews to assess salience of updated communications materials; 201 M-Power customers
WestGroup Research, Inc., 2006a	SRP M-Power Communications Focus Group Research	Nov 2006	Focus group report, 3FGs, opinions on M- Power, the Starter Kit and different M-Power communications materials; customers randomly selected from M-Power population who meet desired criteria (e.g., on M-Power for at least two months)

[7] Personal communication, Betty Pruitt, M-Power Marketing, September 16, 2009

[8] Anecdotally, Ms. Pruitt is a former ACAA employee who was initially a critic of the M-Power program. She was convinced through customer testimonials of its benefits, and is now an SRP employee working on M-Power Marketing.

Table 4-1 (continued)
Past M-Power Market Research Studies

Reference	Study Title	Study Period	Subject
SRP, 2006	SRP M-Power Shadow Project September 2006 – Executive Summary	Sep 2006	Executive summary of the SRP M-Power Shadow Project, which involved 8 in-depth, in-home interviews from customers from a range of credit codes, length of time on program, language, income and housing type
WestGroup Research, Inc., 2006b	SRP M-Power/AMPY Benchmark Study 2006	Mar 2006	Telephone survey results, 402 M-Power customers; purpose was to obtain baseline data on attitudes towards M-Power, with emphasis on PayCenter machines, as new machines were to be installed starting in April 2006.
Reiley & Johnson, 2006	What Determines M-Power Customer Satisfaction: How SRP Can Attract and Retain M-Power Customers	2006	University of Arizona Assessment, telephone survey conducted by WestGroup of 401 M-Power customers that had been on the program for 18 months or more. Goal was to assess customer satisfaction with the aim of understanding what would make customers stay on M-Power so as to reduce turnover rates; another goal was to understand traits of long-term M-Power customers.
WestGroup Research, Inc., 2002	SRP M-Power PayCenter Research: Summary of Findings	Nov 2002	Telephone interviews regarding convenience of PayCenters in Circle Ks (convenience store); 214 M-Power customers; interviewees had been on program for at least 2 months and had a telephone number on file.
WestGroup Research, Inc., 2001	SRP M-Power Focus Group Report—June 2001	May 2001	Focus group report, 4 focus groups, opinions on areas of process and operational improvement. One focus group was comprised of people who had left the M-Power program.
WestGroup Research, Inc., 1999a	Pay As You Go Focus Group Report	Aug 1999	Focus group report, 2 focus groups, joint between SRP and Arizona Community Action Association, opinions on M-Power program
WestGroup Research, Inc., 1999b	SRP/ACAA Pay As You Go Study	Sep 1999	Telephone survey report, 179 Pay as You Go customer (precursor to M-Power program); joint study between SRP and Arizona Community Action Association (ACAA), opinions on M-Power program.

Overall Satisfaction Levels

One obvious finding, which is consistent with every customer study, is that M-Power customers are very fond of the program. This finding was first found with the 100-home pilot discussed in Section 1, with the oldest studies reviewed for this report (circa 1999), and with the most recent studies reviewed, in the form of the Customer Contact Tracking Study (CCTS). This is an ongoing quarterly customer service market research report, which as of 2007 began to include M-Power-specific questions. For the M-Power section of the CCTS, the respondents are chosen randomly from M-Power customers who use PayCenters to purchase power, i.e., the vast

majority of M-Power customers. From the range of data available, the percent of customers who are satisfied or very satisfied with M-Power ranges from 83% to 96% (SRP, 2009b).

Overall satisfaction of M-Power customers with SRP is generally favorable as well. In the three surveys performed prior to the start of the CCTS, those who rated SRP's performance as very good or excellent ranged from 70 to 73%. When the CCTS began, the question changed somewhat, but CCTS data from FY07 to FY10 suggest M-Power customers who were satisfied or very satisfied with SRP ranged between 85 and 89%.[9]

Given the high importance SRP places on the customer satisfaction ratings it receives from its M-Power customers, it is instructive to consider how this satisfaction with the utility compares between M-Power and non-M-Power customers. As illustrated in Table 4-2, "overall performance" ratings are comparable, but statistically more M-Power customers perceive high overall value in the service SRP provides compared to non-M-Power customers. Statistically fewer M-Power customers gave SRP top ratings for "overall experience". Therefore, by some metrics M-Power customers are generally happier with SRP, but not by all metrics.

Table 4-2
SRP Ratings: Comparing M-Power and Non-M-Power Customers (FY2010)[10]

Percent 9/10 Rating (Out of 10)	M-Power N=337	Non-M-Power (all other rates) N=3574
Overall Performance as an Electric Company: A service quality metric, and SRP's core business measure	66%	63%
Overall Value: Value received from SRP considering amount you pay for services	46%*	37%
Overall Experience: Broad measure of service received, impressions of the company, customer experience	44%	50%*

* Statistical difference between groups

Perceived Customer Benefits of M-Power

Most of the survey and focus group reports have similar findings in terms of what M-Power customers perceive to be the advantages of the program.

One of the main advantages reported is the educational and awareness aspect of the program: the UDT provides each customer with real-time consumption information about their home (update rate of 3 seconds) allowing householders to see the electricity consumption effect of their household behaviors. Some reports included mention of extending the education to other household members, including children.

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[9] Personal communication, Dena Emary, Senior Analyst, SRP, August 16, 2010.

[10] Data are from SRP's FY2010 "Customer Perspectives" survey, a marketing study that includes questions intended to track overall opinions of SRP, and include representation of all residential sectors.

Indeed, there have been several studies that report conservation effects by providing this sort of electricity use feedback in non-prepaid conditions.[11] In the case of the M-Power program, one can hypothesize that customers are more likely to use the UDT to educate themselves about their unique usage patterns, as the consequences are more severe if they do not do so: they are more likely to have their electricity shut off unexpectedly.

> "I tell all my friends that it was the best teacher for me to teach me how to use electricity efficiently." WestGroup Research, Inc., 2001, p. 4.

> "Because I live paycheck to paycheck, it makes me more conscious of how much I'm using. I don't let my daughters open the refrigerator because I know it's using more electricity. It makes me more aware of what I'm using and where it's being wasted." WestGroup Research, Inc., 2001, p. 3.

> "I found out how much my dishwasher runs, if I have to use it in the summer time, it's cheaper to just hand wash my dishes and dry them in the sink, rather than have my air conditioning catch up for that dishwasher." WestGroup Research, Inc., 1999a, p. 4.

Perhaps a consequence of the knowledge gained regarding a household's electricity usage patterns, another advantage that is often reported is the sense of control the M-Power program provides customers. This includes the ability for customers to monitor their power usage, to pay for power at their own pace (e.g., daily or weekly instead of monthly), and even the ability know and be ready for a disconnection if necessary.

> "It allows me to budget. Being able to see what I spent last month allows me to break it down into pay periods so I can put money aside that I know I'm going to put on the card. You don't have that bill coming. I wish there was a way that we could refill the card over the phone because sometimes I'm going "Oh man, I've got to put money in, it's late, and I've got a four year old so I am pulling him out of bed to go fill the card because of forgetting." WestGroup Research, Inc., 2006a, p. 17.

> "Actually for me it's a lot better than getting a bill at the end of the month especially in summer. It's a lot easier to pay $40 a week because the end of the month is when all the rest of my bills are due so I'm flat broke." WestGroup Research, Inc., 2006a, p. 17.

> "You have control over how much power you are using. There might be reasons for the spikes like leaving on the air conditioning while you were gone that day and things like that. You have more control over it." WestGroup Research, Inc., 2001, p. 3.

> "You can plan your usage better." WestGroup Research, Inc., 1999a, p. 5.

The other main advantage often reported by M-Power customers is the perception that the program saves them money. As illustrated in Section 3, kilowatt for kilowatt, the M-Power program can actually be more expensive than the standard program. However, many customers reported that their increased knowledge of consumption patterns makes them more likely to be able to use less electricity, thus resulting in an overall monetary savings as well. In addition, as reviewed in Section 3, start-up costs are less for the customers. Finally, given there are no late

[11] Studies involving an in-home display (IHD) in non-prepaid conditions have reported conservation savings in the 0 to 7% range.

fees or disconnection charges, this can be another source of monetary savings for customers who previously had to pay these charges through the standard program.

> "An advantage is that it saves you money and you can put like $2 if you have to, if you're low on cash or whatever. You don't have to worry about your lights going out." WestGroup Research, Inc., 1999a, p. 4.

Other benefits that were reported included:

- The provision of an alternative to the hassle and sometimes embarrassment of going through the conventional program's disconnection/reconnection process
- The elimination of the fear of not knowing how much a monthly bill will be

Perceived Disadvantages

Most of the M-Power disadvantages reported relate to the PayCenters. A qualitative study from 2006 found that more payment options at PayCenters would be preferred by customers, as well as the ability to pay by phone or online; also, there were complaints about the working order of the PayCenters (WestGroup Research, Inc., 2006a). Quantitative research from this era found that 71% reported encountering a PayCenter machine that was not working in the previous year (WestGroup Research, Inc., 2006b). In addition, satisfaction with PayCenters decreases the longer customers are on the program (choices ranged from <1 year to 2+ years). Another study from the same era found that 49% of survey respondents reported having had a problem with the M-Power program. Of the 401 respondents, the top complaints were the PayCenters being out of order (44%), that money sometimes does not successfully transfer to the card (14%), and that they have to go too far to get to a PayCenter (10%) (Reiley & Johnson, 2006). Somewhat inconsistently, the same study also indicates that 76% of customers had experienced an out-of-order PayCenter, and that 24% stated the PayCenter locations were inconvenient. From CCTS data, M-Power customers who are "satisfied" or "very satisfied" with the "PayCenter process" have varied between 80 and 90% since fiscal year 2007.[12] For fiscal year 2010, 84% reported this level of satisfaction. Also, 24% of all surveyed customers (not just M-Power customers) indicated experiencing PayCenters not working in the past 30 days.[13] Although some of the 2006 findings are somewhat inconsistent and the CCTS question wording is different than the 2006 study, the indication is that the overall PayCenter problem rate has declined since 2006.

Several studies recommend addressing these disadvantages by increasing the payment options available to M-Power customers. While customers can now pay with a credit card via the telephone, they still must visit a PayCenter to have that value transferred to their Smart Card. Of course, for unbanked and/or credit-challenged customers, the M-Power configuration remains the only viable prepaid option.

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[12] Personal communication, Dena Emary, Senior Analyst, SRP, July 14, 2010

[13] Personal communication, Jennie King, Manager, SRP Market Research & Info, SRP, August 25, 2010. Note that the 24% value is not directly comparable to the others cited, as it represents all customers, not just M-Power customers; given that M-Power customers are much higher users of the PayCenters than the other customers, it is possible that the value could be higher than 24% for M-Power customers only. Also, the question wording asks for problems in the 'last 30 days', whereas the 2006 study asked for problems in the 'last year'.

M-Power Customer Characteristics

SRP has analyzed their residential customer base using Claritas, Inc.'s commercially available PRIZM tool, which uses address and zip code data to segment customers into different income, age, and life stage (e.g., "single" versus "family") categories. From a 2009 PRIZM analysis, M-Power customers compared to all other residential customers were more likely to be relatively young, have families, be relatively low-income, be low electricity consumers, live in apartments, have been SRP customers for less than five years, and have unsatisfactory or "new" credit ratings (PRIZM, 2009).

Table 4-3 provides an overview of some M-Power customer demographics. The latest demographic data for the 2010 fiscal year indicate that M-Power household heads tend to be relatively young (average age 36 years), low-income (average income $24,400), and predominantly Hispanic.

Table 4-3
M-Power Customer Demographic Trends

	1999	2006	FY07	FY08	FY09	FY10
Data Source	Phone Survey	Phone Survey	CCTS (Quarterly Phone Survey)	CCTS (Quarterly Phone Survey)	CCTS (Quarterly Phone Survey)	CCTS (Quarterly Phone Survey)
Reference	WestGroup Research Inc., 1999b	WestGroup Research Inc., 2006b	*	*	*	*
Average Age	NA	NA	35	36	36	36
Median Age	NA	NA	33	33	33	35
18-34 age range	NA	NA	54%	53%	52%	50%
Average Income	$31,400	$32,586	$33,200	$29,600	$25,800	$24,400
Median Income	NA	NA	$27,600	$19,500	$18,300	$17,900
Income <$30,000	64% (<35K)	67% (<40K)	54%	71%	80%	82%
Ethnicity						
Hispanic	22%	23%	45%	48%	43%	41%
African American	24%	14%	11%	11%	13%	14%
Caucasian	50%	53%	31%	31%	29%	34%

* Personal communication, Jennie King, Manager, SRP Market Research & Info, August 25 2010. Summary of CCTS data.

When more recent CCTS data are compared to older phone survey data, the M-Power customer traits appear to have changed substantially over the years. Considering income statistics, 64% and 67% of respondents reported incomes of $35,000 and $40,000 or less for 1999 and 2006 respectively, as compared to 82% reporting incomes of $30,000 or less from the CCTS data for FY10. Considering ethnicity, 22% and 23% of respondents were Hispanic as compared to 41 to 48% from the more recent CCTS data. While there is some concern in comparing the 1999/2006

studies to the more recent CCTS surveys, the overall trends suggest the make-up of M-Power customers has shifted between 2006 and 2007. Considering the more comparable CCTS data between FY07 and FY10, it appears the average income of M-Power customers is declining, the average age is increasing, and relatively fewer Hispanics and more Caucasians and African Americans are enrolling in M-Power on average. It is possible that these demographic changes are due to the economic recession and that they will change again as the economy recovers.

Customer Purchase Behavior

Table 4-4 contains a summary of some of the findings relating to average customer purchase amounts. While an older quantitative study indicates average purchase amounts are in the $50 range, more recent data suggests purchases in the $20 range. Also, the more recent data suggest customers may purchase roughly the same dollar amount during high use periods (i.e., the summer), but will make the purchases more frequently.

Table 4-4
Electricity Purchase Amount and Frequency Information

Study	Ave no. of purchases per month	Ave amount per purchase
Traadahl, 2009	Summer = 7.1 Winter = 3.6	Summer = $24 Winter = $21
WestGroup Research, Inc., 2006b	3.0	Not reported
WestGroup Research, Inc., 2002	3.0	Not reported
WestGroup Research, Inc., 2001 (focus group, not quantitative)	Ranges reported from twice a week to once a month, but generally associated with receipt of paycheck	Ranges reported between $10 and $100
WestGroup Research, Inc., 1999a (focus group, not quantitative)	Not reported	Amount spent per purchase between $50 and $100, and customers will buy more if they can
WestGroup Research, Inc., 1999b	3.7	$56.70

Customer Retention

While survey results indicate high levels of satisfaction with the M-Power program and that customers would prefer to continue to remain on the program, the turnover rate of the M-Power program is relatively high. CCTS respondents were on the M-Power program for an average of 20 months (less than two years) as of July 2009, consistent with other CCTS data that has been hovering around the two-year mark since early 2008.

Part of this relates to the fact that, due to the very nature of the program and its minimal start-up costs for the customer, it likely attracts customers that anticipate a short-term stay in their residence in the first place. However, one study was commissioned to expressly understand how to decrease the turnover rate of M-Power customers, as this represents cost to SRP (Reily & Johnson, 2006). They report that of approximately 40,000 customers, only 11,200 had been on

the program longer than 18 months as of February 2006. Using the assumption that those customers who reported being "very satisfied" with the program would be more likely to continue on the program, they determine what customer and program traits correlated with a very satisfied customer. They found that very satisfied customers had also reported that PayCenters were conveniently located; perceived their bill would be higher on the standard rate (or that they would save money on M-Power); were between 35 and 55 (20% more likely) or older than 55 (33% more likely); or live in certain cities (Apache Junction, Glendale, Mesa, Phoenix). The probability of a customer answering that they were "very satisfied" with the program decreased for customers reporting experience with out-of-order PayCenters, who did not believe they consumed differently on M-Power compared to the standard rate, who required more frequent card refills each month, or who were African American. Traits not found to influence the probability of answering "very satisfied" included income, consumption level, number of months on program, whether the customers was Hispanic, household size, occupation, or whether the customer was a college graduate.

This section has attempted to paint a portrait of the M-Power customer and their experience with the program. Customer satisfaction is high, owing to the perceived sense of control the program offers, as well as the awareness and educational aspects relating to household electricity consumption patterns. Related to both of these is the perception that consumers are saving money on their electricity costs. The main disadvantages relate to the PayCenters: customers would like more of them, and would like them in better working order, although more recent research findings (FY10) indicate machine performance has improved for customers. M-Power customers tend to be relatively young, be relatively low income, and are predominantly Hispanic. However, customer demographics appear to have changed in recent years, likely due to the economic downturn—the program is attracting customers who are somewhat older and slightly lower income still; more Caucasian and African-American customers are becoming customers as well. Recent electric purchase behavior data suggest people make purchases in the $20-$25 range, and do so with a frequency that varies based on usage, about three times per month in the winter and up to seven times per month in the summer. Finally, while customers express that they are very satisfied with the M-Power program, the turnover rate is still relatively high, likely due somewhat in part to the program's appeal to customers who intend a short-term stay. While there is a net growth rate of 10,000 customers per year on the program, the average M-Power customer stays on the program for roughly two to five years.

In addition to obtaining the above self-reported information regarding customer perceptions of the M-Power program, including perceived energy savings, SRP has also performed various savings impact evaluations of the program, which will now be examined in more detail.

5
INFLUENCE OF M-POWER ON ELECTRICITY USAGE

M-Power turns conventional electric service on its head. Instead of paying an invoice issued by the utility for recorded energy usage, the customer is responsible for making sure that there is sufficient credit in the UDT to meet his or her upcoming electric service needs. M-Power requires that consumers pay attention to when and how they use electricity.

The UDT anticipates the need for such awareness and displays the cash credit left and indicates when, under usual circumstances, the customer can expect that the device will shut service off. The service was initially intended as a way to help customers gradually work off arrears without losing electric service. Over time, M-Power has gained a wider following, and some new SRP customers, for example, choose M-Power over the conventional service because they can initiate electric service without paying the standard a cash deposit.

The most striking result that SRP reports from its M-Power experience is the reduction in overall electricity use that it associates with M-Power participation. The so-called conservation effect is substantial—SRP reports an average annual household annual reduction of almost 12%. That exceeds the reduction that many energy efficiency programs or portfolios report. Accordingly, a close examination of the M-Power conservation effect is warranted to provide others with insight into the behavioral mechanisms at work so that these findings can be extended to other circumstances.[14]

Many Reasons for a Conservation Effect

M-Power is fundamentally different from traditional electric service whereby consumers are billed periodically (typically monthly) for the energy (kWh) they used. M-Power is a prepaid service that requires the consumer to anticipate its rate of electricity consumption (aided by the UDT) and take action to keep the on-board balance positive. The preventative action involves a trip to a PayCenter to purchase power and then return home to transfer that balance to the meter through the UDT. Each customer decides how much to purchase at each transaction, balancing expected electricity needs with other budget imperatives. Smaller purchases require more trips to the PayCenters, but tie up less cash. As previously described, M-Power reports that the number of PayCenter transactions increases in the summer, but the amount of such purchases is only slightly higher, which suggests that careful cash management is a defining benefit.

Additionally, some consumers enroll in M-Power to avoid a service termination due to an excessive level of unpaid arrears. Because M-Power requires a heightened awareness of when and how electricity is used, some consumers may be attracted to it because it enables reducing usage and lowering the level of expenditures. Some may be more inclined because lowering

[14] The discussion that follows is based on the results of analyses provided to EPRI that were undertaken by SRP analysts. EPRI did not conduct an independent assessment of the electric consumption impact of M-Power on its participants, nor did it attempt to reproduce the results of the studies conducted by SRP.

electricity consumption reduces environmental emissions to which they impute a high level of intrinsic benefit.

These dramatic changes in electric service provisions, or the perception thereof, would be expected to result in changes in how consumers use electricity. The extent and nature of those changes depend on how and to what extent they influence consumer behavior. Although the behavioral mechanisms are varied, a plausible hypothesis is that the majority of these influences will likely result in reduced energy consumption. The discussion that follows explores these influences, culminating in a discussion of how SRP has striven to quantify M-Power's influence on the level of electricity use of its subscribers.

Managing What You can Measure

A prominent feature of M-Power is that it allows customers to purchase electricity on a cash-and-carry basis. With conventional electric services, consumers benefit from periodically (after the fact) invoiced services because it transfers the working capital obligation to the service provider. But, that benefit comes at the expense of a temporal and spatial disconnect between the rate of consumption and the ultimate payment obligation. Customers may not be aware that they are consuming an abnormally high amount of electricity until they receive the bill; the immediate budget consequences are unavoidable. Making adjustments in consumption going forward, to avoid the consequences, is challenging under conventional invoicing service because the consumers can not associate specific coincident usage with the cost.

M-Power's prepayment service involves the customer continuously; it requires monitoring the available service balance, thereby providing constant feedback on the rate of electricity consumption. If the rate at which new purchases are required changes, or the level of routine purchases increases, the consumer is immediately alerted to the situation, and associating electricity usage with these circumstances involves looking back over just a few days, or at most a week or so. Was the increase due to special circumstances, like additional people in the household or weather? Was it due to a lapse of diligence in practicing conservation measures? These circumstances can more easily be diagnosed, and if warranted, corrected. M-Power facilitates drawing such associations and taking the appropriate remedial consumption change, if one is warranted.

The same sequencing of diagnosis and remedial action applies if the consumer discovers that electricity payments at current levels cannot be sustained. Changes in income or other expenditure obligations can obligate altering the allocation of income across expenditure categories. M-Power facilitates making a reduction in electricity use and payments when conditions warrant doing so. Again, the temporal connection between usage and cost is accentuated when payments are made frequently (every few days) rather that periodically and routinely (paying a monthly invoice).

Alternatively, the consumer's understanding of how it uses electricity, through M-Power enrollment, may result in an increase in consumption for specific end uses. The consumers may have adopted behaviors based on erroneous understanding of what a specific and discretionary service costs, for example air conditioning. Discovering the actual cost may cause the consumer to conclude that this service is a good buy, and increase usage up to the point the marginal value of consumption is equated to the corresponding cost.

Deposit Avoidance

M-Power requires a substantially lower deposit to initiate service than what SRP requires for its conventional residential services. The M-Power deposit of $99 secures the UDT device—no provision for non-payment, as is the case with conventional residential electric service, is required. This feature may be especially attractive to people operating under budget limitations and lower income families. Students (and their parents) may be attracted to the lower cash outlay that comes when they already face several substantial cash outlays for rent deposits, books, and tuition.

The importance of this aspect of M-Power service is underscored with SRP's experience in administering the service over the past 10 years. It reports that changing the level of the M-Power deposit relative to the deposit for standard post-pay service measurably alters the subscription rate and level.[15] Apparently, customers that are primarily, or perhaps solely, attracted to the deposit avoidance feature, and recognize that it comes at the price of some inconvenience (going to a kiosk to refresh the UDT balance) are quite sensitive to the level of that benefit. As the deposit rises, M-Power enrollment is less attractive.

Accommodating Particular Circumstances

Some customers may have subscribed to M-Power due to the circumstances of their living arrangements. As cited above, one report suggests M-Power is popular in rental housing (PRIZM, 2009), perhaps because it facilitates a smooth transition from tenant to tenant, while keeping electric service on continuously for safety and security reasons. Some of these circumstances are discussed below.

Pay-as-You Go Household Accounting

Pre-paid service has attractive features to people that do not have ready access to, or prefer to avoid, paying through checking accounts. Cash counting forces budget discipline that some customers require to make ends meet. Others value it because it gives them control over what they spend on electricity (budget-conscience), or how much electricity they use (environmentally concerned). Another important factor is that electricity must be purchased at the PayCenters; this apparent inconvenience for some may be a desired feature as it acts as another force of discipline.

Arrears Financing Through a Rate Differential

Customers that go on M-Power to avert a service disconnect pay back the outstanding arrears incrementally. Each time they purchase electricity at a PayCenter, 40% of what they pay goes to buy-down the arrears, and the rest becomes a debit balance on the card that is subsequently transferred to the customer's UDT as a positive balance. This 40% larger payment may raise the perceived cost of electricity to the M-Power consumer. This perception will be influenced by the information on actual cost provided by the UDT, however, it is not known to what extent the UDT information overrides the perception of larger payments. To some extent, it could be expected that larger payments would result in reduced electricity usage. The extent to which this results depends on each customer's price elasticity of demand for electricity. The discussion that

[15] Personal communication, Mike Lowe, Customer Services Manager, September 23, 2010

follows is illustrative of how price elasticity would predict electricity consumption if consumers respond to the actual price they pay (the cost per kWh purchased) rather than the posted (at purchase) tariff rate.

Price elasticity, in this case the own-price elasticity, establishes a link between price changes and consumption levels. As the price of electricity goes up, customers readjust their budget to accommodate the fact that something has to give: electricity use goes down. Price elasticity indicates the percentage change in electricity usage that results from a one-percent change in electricity price, providing a simple way to convert price changes in consumption adjustments. For example, if the price elasticity is negative 0.10, then a doubling (100% increase) in price results in a 10% reduction in electricity usage. Studies of household electricity usage, under uniform electricity rates, report that the price elasticity of demand (expressed as absolute value percentage) is in the range of five to 10%.[16] The level of price elasticity may vary by region and climate owning to greater ability to modify controllable and discretionary end uses.

How much of an adjustment in electricity use under M-Power would price response account for? Assume a customer in arrears routinely pays $20 at a PayCenter, and receives $12 in energy given that 40%, or $8, applies to the arrears. This larger payment raises the effective price of electricity by 67%.[17]

Figure 5-1 illustrates the impact on electricity consumption at different levels of price elasticity. It plots out the percentage reduction in electricity associated with different price elasticity levels. A 5% reduction is expected based on the range of price response cited above. If an M-Power customer in an arrears situation is more price elastic, then even larger reductions in usage would be undertaken. Many uses of electricity that most households take for granted may become discretionary under severe budget pressure, which is manifest as high price elasticity, and more sharply reduce usage as long as arrear payments are being made.

[16] EPRI, 2008; Faruqui, Hladek, and Sergici, 2010. Changes in the pattern and level of electricity use may be induced by time-varying rates such as time-of-use and real-time pricing owning to a more poignant incentive to modify controllable and discretionary end uses. Since M-Power accentuates awareness of the cost and price of consumption, participants may indeed be more price elastic than their conventional rate counterparts.

[17] Assume that the uniform rate under M-Power is about $0.11/kWh. A $20 purchase would buy 181 kWh under the base tariff. If only $12 goes toward energy, only 109 kWh are debited to the Smart Card and as a result the effective price of purchased electricity is approximately $0.18/kWh.

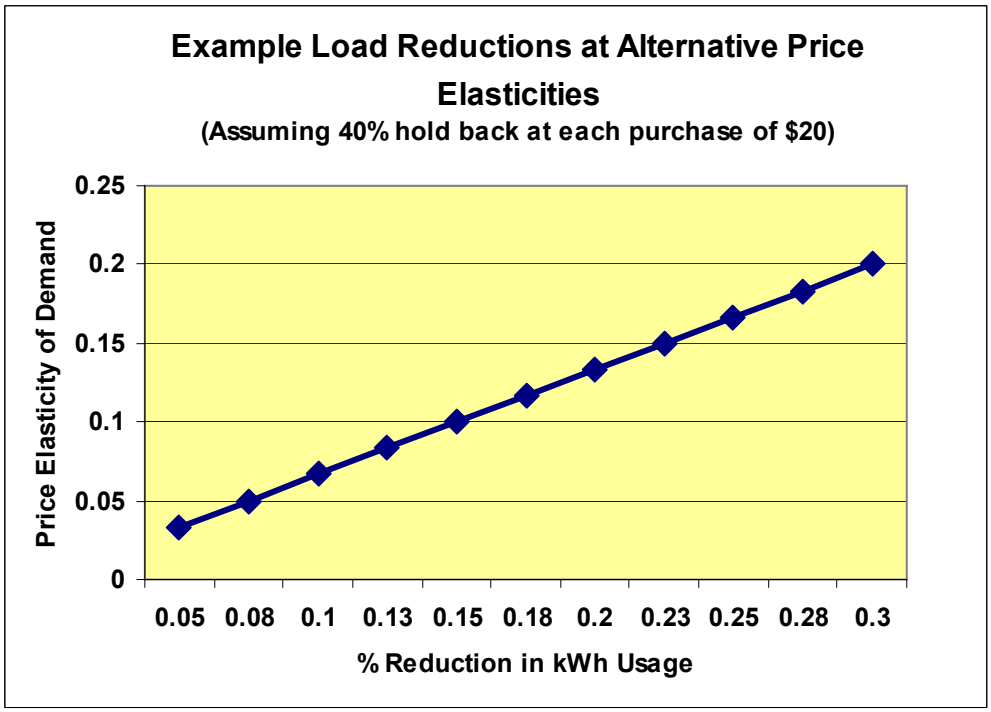

Figure 5-1
Example Price Elasticity

The price elasticity explanation is less compelling for customers that elect M-Power to avoid paying a larger cash deposit. They start M-Power service with a relatively small arrears balance (the cost of the $99 deposit, the $28 service establishment fee plus tax, and the $30 electricity credit), so the higher effective price they pay per kWh is only a temporary phenomenon. However, other factors may come into play that result in lower energy usage, which will now be discussed.

Conservation Ethic

Some consumers may be drawn to M-Power because they associate the service with promoting the conservation of resources through parsimonious electricity usage. SRP's M-Power marketing efforts are specifically designed to instill this attitude and convince prospective participants that M-Power is a tool to help them to achieve a specific objective: reduce energy use. In effect, this represents a conservation ethic that embodies several of the influences discussed above.

Summary of Potential Influences

Table 5-1 summarizes the M-Power influence according to which aspects of electricity consumption are influenced along with a speculative estimate of the degree of that influence. While some of the influences are either indeterminate or may result in increased usage, overall M-Power seems to be tilted toward reduced consumption, or a conservation effect.

Table 5-1
Potential Influences of the M-Power Program on Consumption

Influence	Character of Impact on Electricity Usage	Degree of Impact
Manage what you can measure	Decrease or increase kWh and kW	Depends on the extent to which the perceived value of electricity diverged from the value realized through information
Deposit avoidance	Indeterminate, but reduced kWh and kW seem likely for pay-as-you-go feature	A lower deposit may be the attractant, but pay-as-you go comes with the bargain
Particular circumstances	Indeterminate	Agency issue: if the landlord makes the M-Power decision-does the tenant adopt
Pay-as-you-go	Decrease kWh and kW	Seems more likely that the predominant effect is that consumers discover ways to save
Arrears financing through price	Decrease kWh and kW	Price effect may be small, but its influence reduces usage
Conservation ethic	Decrease kWh and kW	Self-fulfilling outcome

SRP Impact Assessment

SRP conducts a wide range of studies to track customer satisfaction with M-Power, as reported in Section 4. SRP has also undertaken directive studies to quantify the conservation effect attributable to the M-Power program. If M-Power does demonstratively result in reduced electricity consumption, then those savings produce benefits beyond the lower bills subscribers enjoy. They lower utility supply and administrative collection costs that result in savings to all SRP customers, in the same manner and level as equivalent reductions attributed to the energy efficiency programs SRP undertakes.

SRP has undertaken three studies, designed and executed by staff analysts, to quantify the conservation effect attributable to M-Power. The first two studies, using post-treatment data from 2002/2003 and 2003/2004, produced similar results. M-Power subscribers were found to use approximately 11% and 13% less electricity respectively than their counterparts on the standard default price plan, known as E-23 (Kirkeide, 2009). The third study, completed in 2007 using post-treatment data from 2005/2006, found a similar effect of 12% (ibid). This study employed the same methodology as the other two, so a description of its design and execution serves as a foundation for understanding the results of all three.

Characterizing the Conservation Effect

Assessing how M-Power influences consumption is a particularly vexing analytical challenge, because by design and character, it appeals to several different consumer groups with different objectives or expectations. The challenge is to define a control group that includes those that are similarly inclined to subscribe, or are compelled do so because of circumstances, to serve as the counterfactual (i.e., what would have been but for the M-Power treatment) against which usage of subscribers are compared.

M-Power subscription is voluntary, selectively marketed, and attractive to consumers for a variety of reasons owing to different sources of potential benefits. This creates challenges for constructing a comparison group whose usage can be compared to that of M-Power participants. The most robust approach would be to assign customers to M-Power or standard service randomly, the conventional approach to establishing statistical inference. In cases where that is not feasible or practical, quasi-experimental protocols have been devised to develop compelling estimates of the influence.

To attribute an effect to a treatment, in this case M-Power, with a high degree of certitude requires eliminating all other possible explanations.[18] This is difficult to do systematically since there are many factors that could have intervened: changes in lifestyles while on M-Power; differential weather influences; dramatic changes in economic circumstances; and unobserved factors like social influences, publicity about SRP or energy use, and level and type of M-Power marketing efforts undertaken by SRP.

One approach to establishing the M-Power effect on consumption is to construct an experiment whereby the treatment is provided to customers randomly, that is, some get it and others serve as controls, so that every customer is equally likely to have been selected for the treatment. This neutralizes, to the extent possible, all other influences on electricity consumption, and the treatment (M-Power) effect can be quantified using the differences-in-difference method; the subtraction of the difference between control customers before and during the experiment from that difference from treatment customers.[19] This randomized sampling produces robust results—they have intrinsic credibility as characterized by the sampling properties (significance) and they can be validly extended to the population of customers to which the experiment was directed. However, this approach is not always practically viable in a utility's business environment.

In the case of M-Power, SRP did not find it feasible to conduct a randomly designed experiment, for a variety of reasons.[20] First, the program was initially offered to help a specific group of customers, those in arrears and facing shut-off of electric service. Assigning some applicants to a control group whereby they were denied M-Power service, and presumably would have had their service shut off, would have been counterproductive to the program's intent.

Second, M-Power started as a program targeted to a specific population, which had fewer than 30,000 customers at the time of the first study (Figure 5-2), which is about 3% of all residential customers. SRP determined that it needed to characterize how these customers were reacting to the service, retrospectively, in order to assess whether there were any impacts outside of improved customer service, and reduced nonpayment and write-offs. It did not anticipate in those early years that the program would grow as large as it has, with enrollment spreading to other segments of the residential customer base. Improved technology over time offered improvements

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[18] This discussion draws heavily from EPRI, 2010.

[19] Campbell and Stanley (1963) caution that it is impossible to assure that the control and treatment groups were equal before the treatments, but conclude: "Nonetheless, the most adequate, all-purpose assurance of the lack of initial biases between groups is randomization", p. 25.

[20] The narrative description of the evaluation of the M-Power program was constructed from interviews with SRP staff. The assessment of the programs performance, specifically the conservation effect, was constructed using analysis materials prepared by SRP. EPRI did not undertake an independent assessment of any of the data collected for the three studies or collect any new data to support a subsequent analysis.

in scale and cost effectiveness in all facets of the program. The charter given to the program analysts was to produce an estimate of the how M-Power had affected the electricity usage of current enrollees.

Subsequent analysis in 2003/2004, when M-Power had grown to about 30,000 subscribers, was influenced by the same factors. The primary focus was to understand the sales revenue implications to support forecasting, and evaluate the business case for continuing the service. The third study, which used 2005/2006 post-treatment data, was chartered in 2007 to see if there were changes relative to the previous studies, and employed same basic methodology. However, it sought to enrich the findings by characterizing the impacts across subpopulations of M-Power subscribers and determine if the relative load reduction effects were seasonally uniform. The essence of this study's methods is described below, followed by a discussion of the findings.

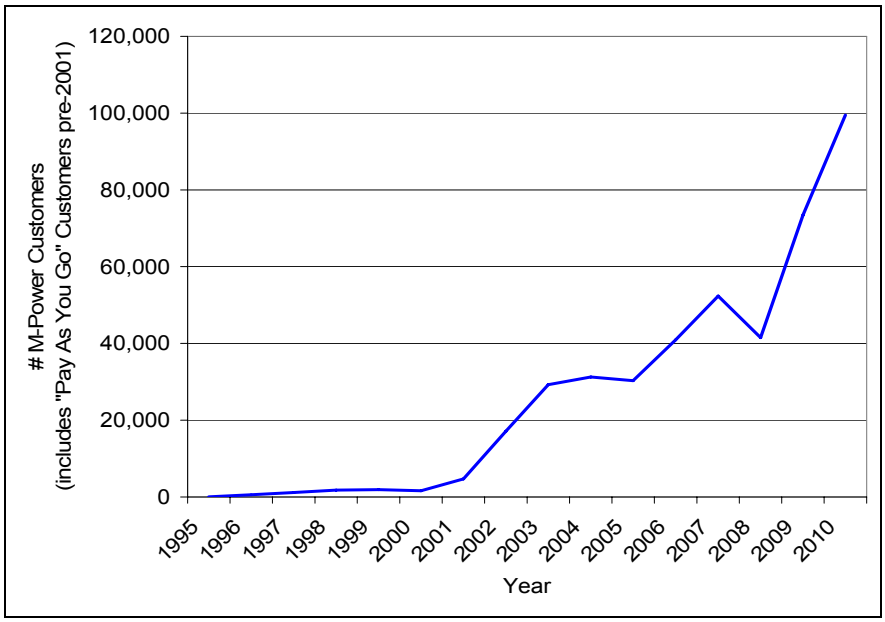

Figure 5-2
M-Power Program Size

Research Design

A retrospective, case matching methodology was undertaken in 2007 to characterize how M-Power subscribers were responding to the price, feedback, and the energy purchase aspect of the program. The population of interest was the current subscriber base. The focus was estimating how electricity usage (kWh) of M-Power subscribers differed from that of E-23 residences (standard residential service), to support sales and revenue forecasting, and to estimate the relative benefits of the program using the cost/benefit tests SRP applied to screen energy efficiency programs.

The M-Power analysis consisted of several steps:

1. A study period was selected that allowed establishing electricity usage for a treatment period (subscription to M-Power) and for a period prior to that time period when treatment customers were still on E-23. This facilitates a difference-in-difference calculation of the impacts using data from treatment and control customers.

2. Because of the possibility that the effect of M-Power on usage would vary seasonally, the study (treatment period) was defined as sequential summer and winter periods. To accommodate the seasonal design, the study period was October 2004 through October 2006, as illustrated in Figure 5-3.
3. A set of treatment customers was randomly selected from the population of all subscribers. A principle selection criterion was that for each treatment billing history could be constructed that would conform to the monthly definitions that comprise the seasons. As previously mentioned, M-Power service does not involve a typical bill issued routinely (monthly) based on metered usage, as is the case with E-23 residential service. Subscribers add to their account by making a purchase at a PayCenter. Hence, the SRP analyst had to construct equivalent monthly billing amounts (kWh) which could be compared to the equivalent usage of E-23 control customers.
4. Billing data were retrieved for treatment customers to correspond to the same periods as for the control customers. Data for the winter 2004-5 and the summer of 2005 provided a baseline for measuring changes after these customers subscribed to M-Power. The latter winter and summer billing quantities were actual usage under M-Power.
5. A control group was selected to establish the counterfactual, the level of usage that M-Power subscribers would have used but for M-Power subscription. Controls were selected as follows:
    a) Customers located in the neighborhood of each treatment M-Power subscriber were identified.
    b) These were then reduced to those that had M-Power billing data available to match the billing cycle they had when on E-23 billing cycles that were approximated corresponding to calendar months. This was done to avoid using data from periods that were two to three weeks before the season started and/or data for two to three week after the season period ended.[21]
    c) Finally, a single control (E-23) customer was selected as a match to each treatment (M-Power) customer based on which of the eligible control customers had usage levels (kWh) most closely aligned with that of the treatments. Control customers matched the billing cycles of the treatment customers, since each treatment customer had a control customer in the same neighborhood with very similar energy usage.
6. E-23 control customer usage (monthly kWh) was accumulated from billing records for the winter for 2004-5 and winter of 2005-6 to establish a control baseline. Billing data was also

[21] Utilities typically divide residences into 21 or 22 batches that correspond to days of the month. The May Batch 1 customer meters are read the first work day of the month of June (June 1) and the customers are billed on the previous 30 or 31 days' usage. For them, the May bill corresponds almost exactly with the previous calendar month (the month of May). The second batch of meters are read on the second day of June and billed issue accordingly, and so on through the 20 working days of the month. Each subsequent read batch results in an accommodation to the correspondence of the may bill month and the month for which the billing applies. The last May bill batch is read and billed in June on June 30, is mostly comprised of June usage. To prevent using data that do not correspond to the calendar months, which might inject systematic weather effect bias, control customers were selected that had batch reads that correspond to calendar months.

accumulated for the summer of 2005 and the summer of 2006, again to establish the counterfactual.

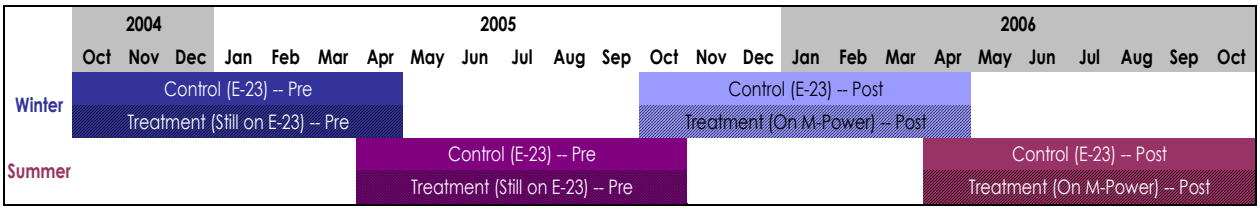

Figure 5-3
2005/2006 M-Power Impact Analysis Timeline

There were 463 treatment customers selected for the 2005/2006 study: 272 treatment customers in the summer period and 191 different treatment customers in the winter period. Each treatment customer was matched with a single control customer, aligned seasonally, to establish the counterfactual. The conservation effect was estimated by constructing difference-in-differences and then applying conventional analysis of variance (ANOVA) statistical tests to ascertain if the calculated differences were significant.

The findings from the 2005/2006 study were that usage, on average, by M-Power customers was 12% less than that of the control customers, and that the difference was highly significant (Kirkeide, 2009). Separating out the differencing process, M-Power customers reduced usage, on average, 8% and control customers' usage, on average, grew 4%. Additional tests using construction for segments from the control and treatment customers indicated that the difference was not influenced by the amount of energy consumed per month (which ranged from a low of 200 kWh/month in winter months to a high of over 3,000 kWh/month in summer months) or by season.

The level of the conservation effect estimated in the 2005/2006 study for the M-Power population, which was about 40,000 in 2006, was very close to that estimated in the earlier studies (approximately 11% and 13% respectively--Kirkeide, 2009), when subscription was about 30,000.

Measuring the Potential of M-Power

Learning from Experience

SRP conducted a series of analyses to understand how electricity consumption behavior changes under M-Power service. The initial study indicated that M-Power subscribers reduced their consumption. The program was designed to help customers work off arrears balances while continuing to have electric service at their premises. As discussed above, M-Power's features provide a variety of encouragements and incentives to watch electricity consumption closely and husband its usage. Also, M-Power marketing and program materials are designed to promote these actions.

A commonly used evaluation protocol was employed to quantify the impact, matching customers with M-Power experience with others with apparently similar financial and living circumstances to establish the counterfactual. This methodology was repeated subsequently and produced consistent results—a conservation effect of about 12%.

The use of a case-matching protocol, applied retrospectively, seems prudent in light of what SRP intended at the time to learn, and how those findings were to be used. A purely randomized experimental design was determined by SRP to be impractical. It would have required denying some applicants access to M-Power to create a rigorous control group. SRP had gone to great lengths to provide an alternative to having to cut service off to customers in financial distress. Denying some that resource could have had adverse consequences not just for those customers.

Case-matching averted the need to deny service to those that M-Power was intended to help. It involved establishing control customers by finding a match for each treatment customer that would in effect serve to negate other factors that might influence electricity use, and thereby reveal the treatment (M-Power) effect (Campbell & Stanley, 1963). It is part of a class of quasi-experimental designs that were widely used at the time in circumstances where fielding a true experiment was infeasible, but nonetheless there was a need to establish, to the best extent possible, the impact of a treatment.

The character of M-Power subscriber has changed substantially since the last impact assessment, which involves customers taking service in 2004-6. As of April 2010 it has approximately 100,000 subscribers, about one in eight SRP residential customers; over twice as many as at the time of the previous study.

The character of subscribers has changed also. It still includes a core of those that chose M-Power as a means of working off an excessive arrears balance. But, SRP attributes most of the growth to customers that are attracted by the absence of a cash deposit (primarily new customers to SRP, rental premises that have a high turn-over rate), and customers that want the feedback and conservation inducement that M-Power provides. It would be reasonable to presume that the impact on consumption might differ from that of credit stressed customers, but presumptuous to accept that premise without substantiation.

A more robust approach might more fully characterize how customers with diverse circumstances, expectations, and capabilities to adjust load responded to M-Power. Several methods have been devised over the past few years that address the possible shortcomings of the conventional quasi-experimental designs. In particular, the randomized encouragement design (RED) might be conducive to characterizing how M-Power influences participants' electricity consumption level and patterns.[22]

They will not, however, provide a definitive verification of the results of past studies, because the methods used can not be applied retrospectively. The goal of undertaking a new study with a new approach is to guide the future design and administration of the program. A full discussion of issues to be taken into consideration in designing such studies can be found in EPRI's Feedback Protocols (EPRI, 2010).

[22] A proposed application of a randomized encouragement design is found in Fowlie & Wolfam, 2009.

6
CONCLUSIONS AND RECOMMENDATIONS

SRP has operated a prepaid electric service, M-Power, since 1993. The technology used has undergone several transformations to take advantage of new service delivery options and fulfill the participants' requirements and expectations that experience revealed. The M-Power customer population has grown to about 100,000 (approximately 12% of all residences served by SRP), expanding from the initial target population, consumers with arrears facing service terminations, to include consumers with different expectations from M-Power service.

The constant aspects of the M-Power experience have been a high level of customer satisfaction and an overall reduction in electricity use (of about 12%) reported by SRP compared to customers served on the standard residential service, despite nearly identical nominal $/kWh rates on the two services. SRP attributes the conservation effect to a variety of factors, including the increased awareness of when and how electricity is consumed that the program has created, as well as its focus on marketing M-Power as enabling and encouraging reduced electricity usage.

The scale of M-Power participation, along with the magnitude of the change in consumer behavior (the conservation effect) that SRP attributes to the M-Power program warrant attention. This is especially so given that the M-Power delivery technology, while effective, is quaint compared to what can be accomplished with a smart meter system combined with web portal-based information delivery and payment system. Removing the inconvenience of going to a PayCenter may make prepaid service attractive to a larger number of consumers. Moreover, it may reduce attrition among those that enroll initially due to one factor or circumstance (e.g., arrears payback, avoidance of a service initiation deposit), but whose situation changes.

Because smart meter deployment is expanding, and virtually every utility is at least undertaking a comprehensive business case, it seems prudent to acknowledge the SRP experience as presenting the possibility that prepaid service will become a staple in utility service portfolios. The cost of adding the functional capabilities required to support various levels of prepaid services are most easily determined in the context of a larger smart meter business case study. Moreover, such a study provides the means for characterizing how prepaid service influences and affects consumer behavior, and for quantifying the attributable impacts.

But, if prepaid becomes very convenient -- payments can be made electronically, account balance information is available on the web or from a mobile phone -- will that undermine some of the very behavioral forces that are assumed to induce the conservation effect? Prepaid has worked well in and for SRP's circumstances, but is that experience transferrable to other markets, climates, customer circumstances, and supply conditions? These are research questions that must be addressed systematically and thoroughly in order to evaluate the costs and benefits associated with various prepaid service program designs.

A comprehensive research agenda regarding prepaid service costs and benefits would include answering the following questions:

- Consumer behavior influences
  - How does prepaid service influence consumer behavior in the short run? In the long run?
  - Does that influence vary according to customer expectations or circumstances, and if so, by how much?
  - How do those behaviors translate into kW and kWh changes?
  - Is prepaid service compatible with energy efficiency goals? With demand response program objectives? Net Zero Energy Home designs?
  - Is prepaid service compatible with diversified residential services such as on-site generation and storage? Home electric vehicle charging?
- Technology function capabilities
  - What additional measurement, communications, and computation capabilities are required in a smart metering system to support prepaid services?
  - What institutional arrangements are required to accommodate prepaid service transactions?
  - How are prepaid accounts integrated into those that follow a traditional meter-read cycle structure to support financial accounting, regulatory reporting, forecasting, energy efficiency and demand response program participation, etc.?
  - Is prepaid compatible with smart grid technologies such as home area networks?
- Overall market impacts
  - What are the amount and distribution of the benefits attributed to prepaid service?
  - How do the impacts affect wholesale market operations? Retail market operations?
  - Can prepaid service be provided by a third party (technology vendor or commodity provider) through commercial channels?

Obtaining answers to these fundamental research issues will facilitate estimating the net benefits under almost all market circumstances. It is knowledge that will be costly to obtain, but with high public value and only relatively limited corresponding private value (i.e., to an individual utility). In other words, resolving how prepaid service influences and affects consumer electricity consumption behavior is a public or collective good. Some utilities may see sufficient value to undertake some of the research, but probably not the full array of understanding and solid characterizations. An obvious solution is collaboration that spreads the cost among many parties that stand to gain and distribute the finding to everyone.

A
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B

M-POWER BACK OFFICE SOFTWARE SCREEN SHOTS

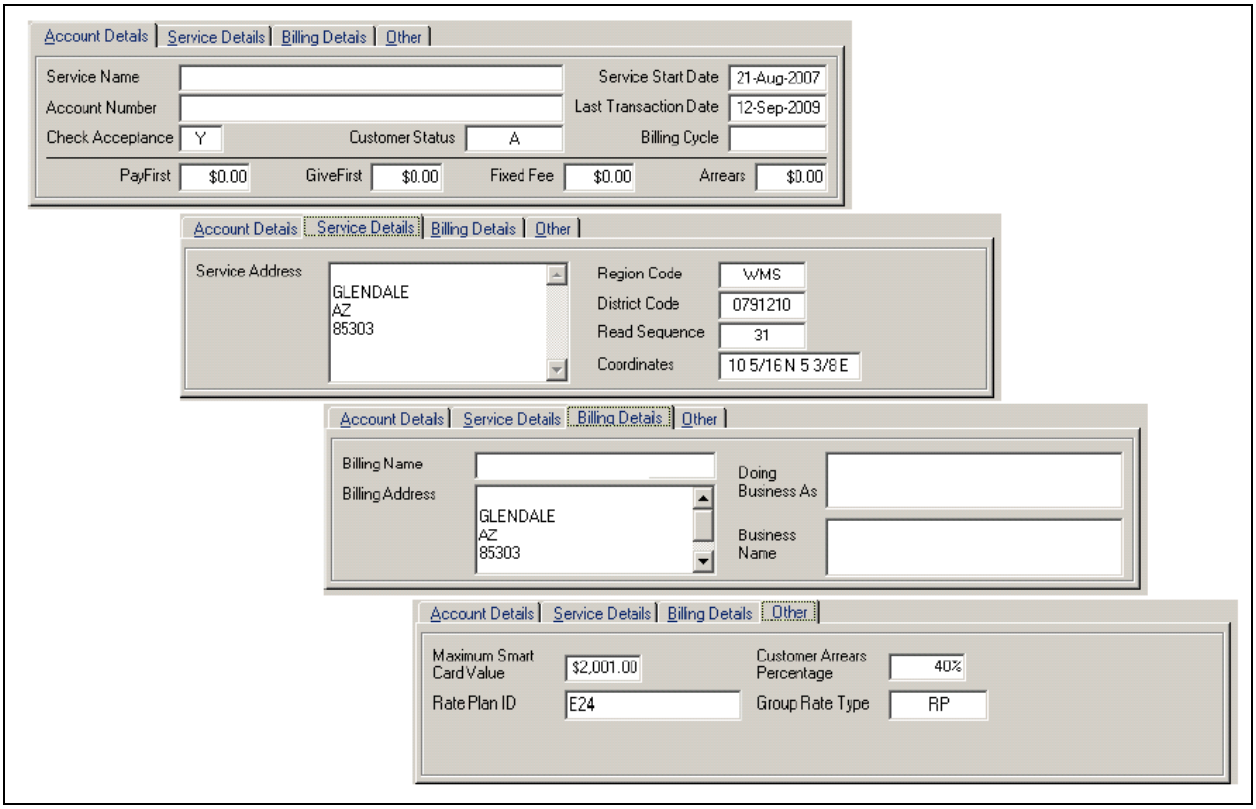

Figure B-1
Account Details Screens

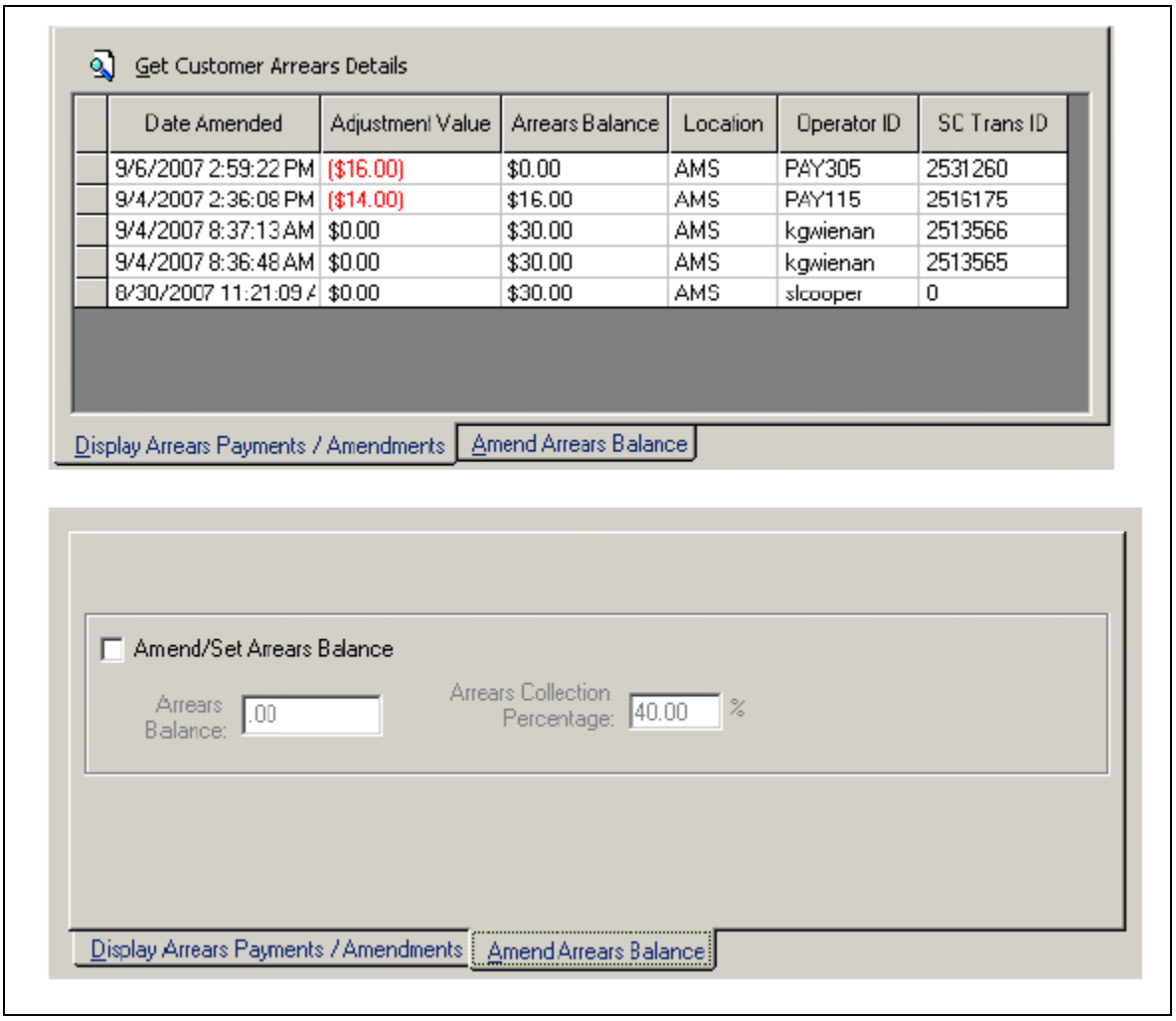

Figure B-2
Arrears Details Screens

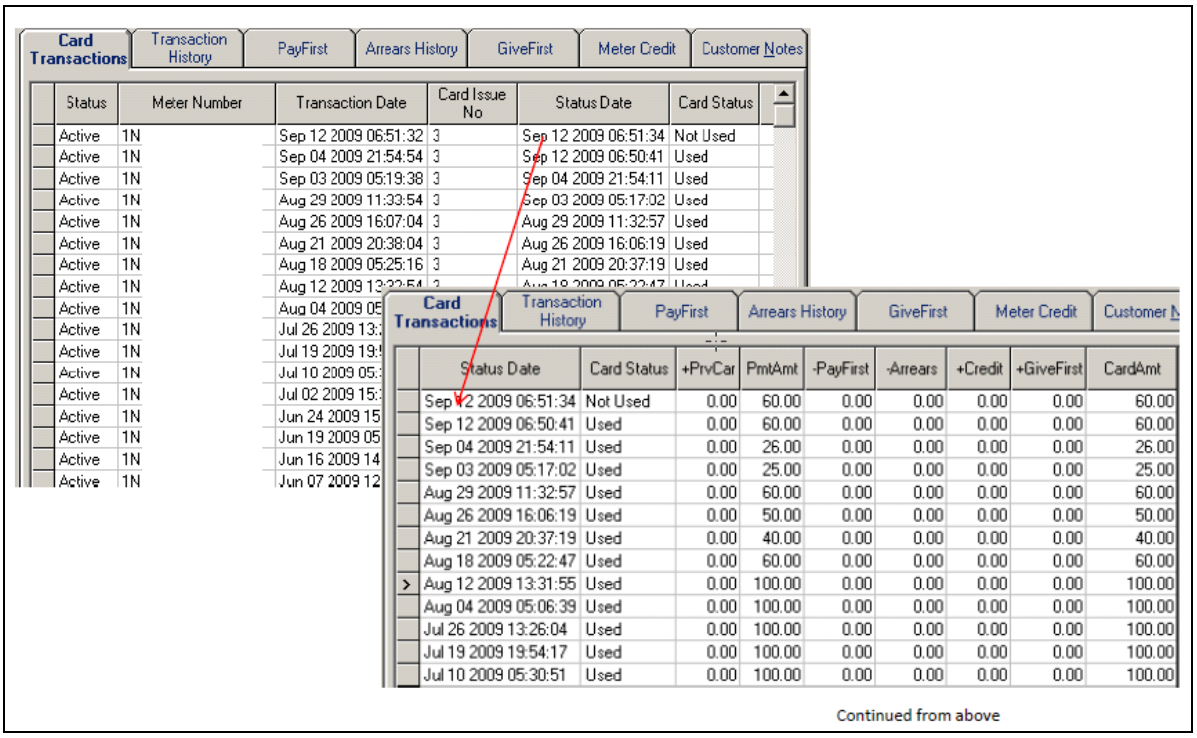

Figure B-3
Transaction History Details

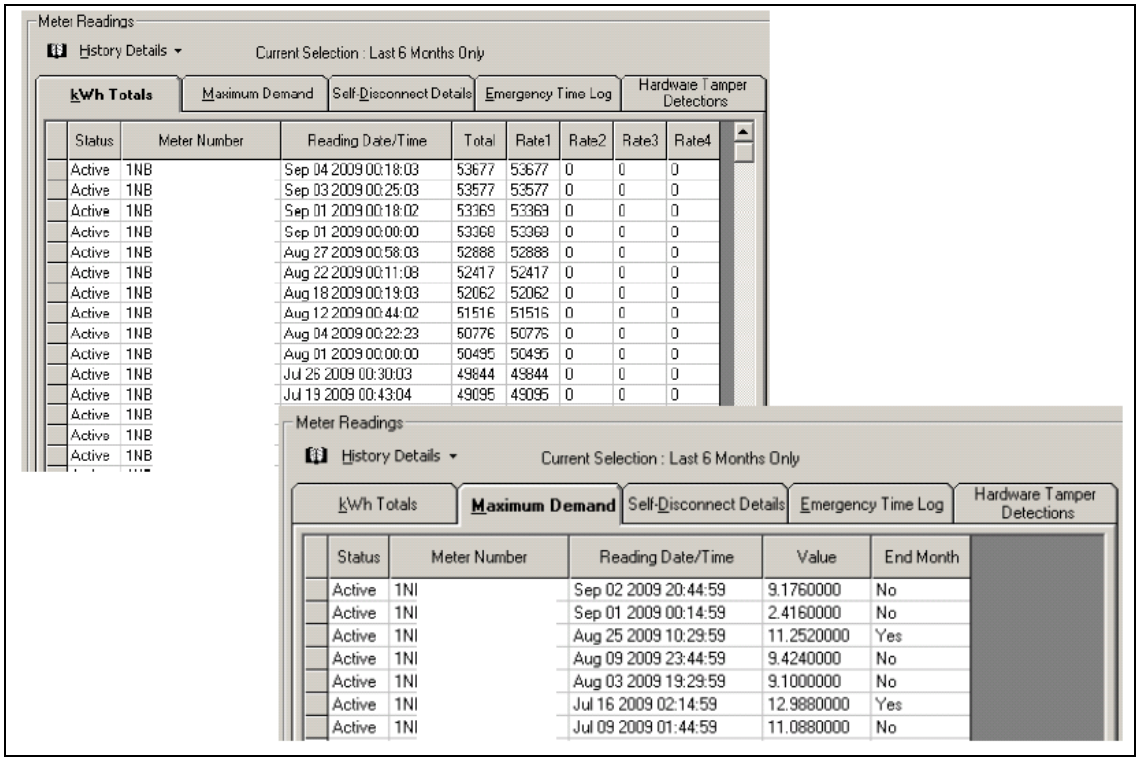

Figure B-4
Meter Read Data

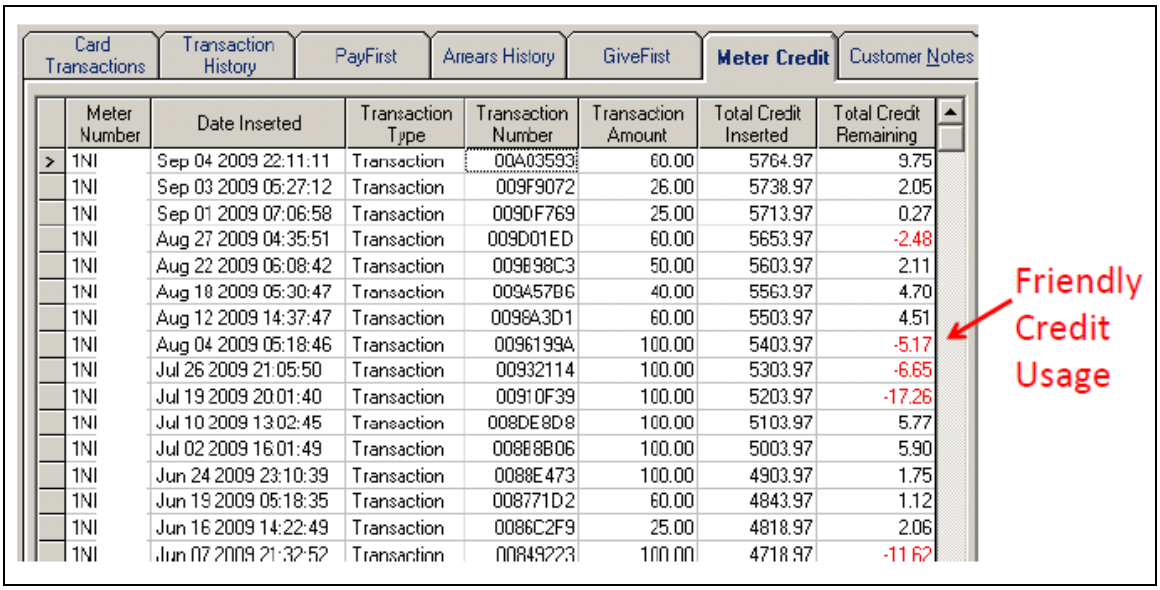

Figure B-5
Meter Credit Status

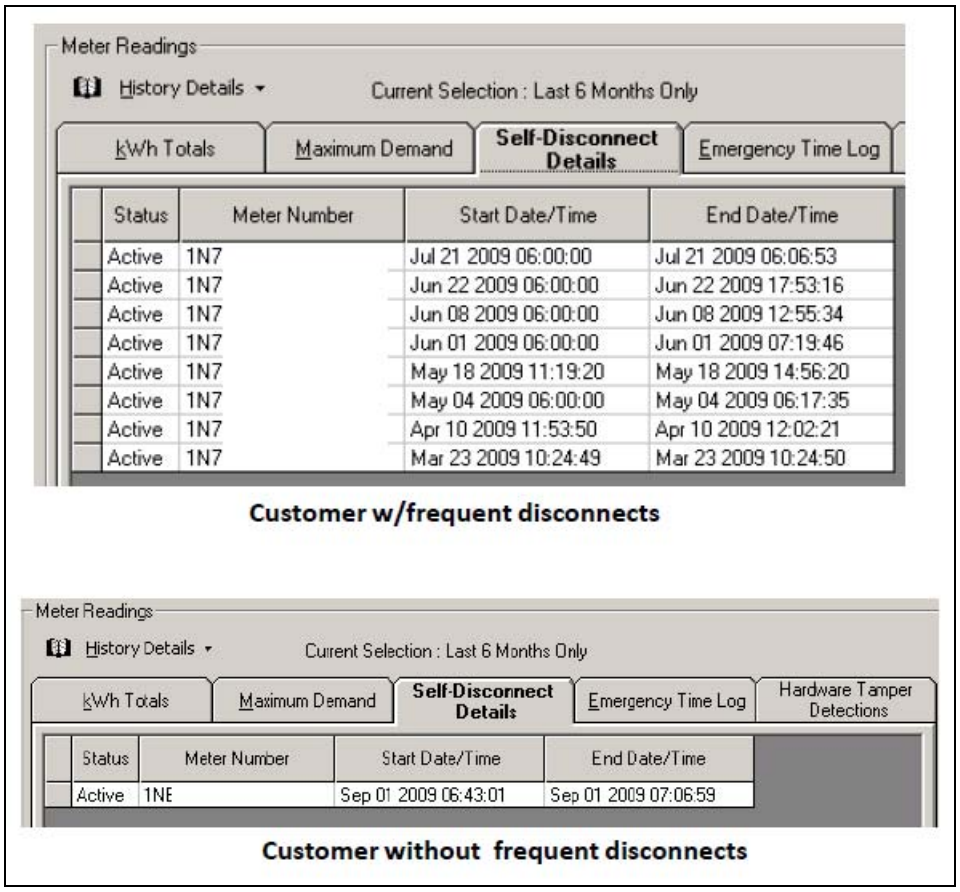

Figure B-6
Self-Disconnection History

C
MARKET RESEARCH STUDY DETAILS

Table C-1
M-Power Market Research-related Studies Performed

Reference	Study Title	Study Period	Subject	Overall Findings
SRP, 2009b	CCTS M-Power Quarterly Scorecard	May-Jul 2009 (performed every quarter)	Telephone survey results from M-Power customer who use the customer service call center	87% satisfied or very satisfied with M-Power program (through July 2009) Top reason for signing up: - 72%: gives me control over electricity - 63%: avoid late fees - 60%: reduced deposit, affordable way to start Percent agree or strongly agree: - 97%: M-Power could help a lot of people - 91%: use electricity more wisely
PRIZM, 2009	PRISM Analysis	Jul 2009	Prism analysis/marketing	M-Power customers: - are more likely to live in apartments, less likely to live in single family homes (compared to Standard and TOU customers) - are newer - just over 50% have “slow” credit, unsatisfactory credit, or new customer credit ratings - ~15$ receive a Spanish-language bill (more than any other rate type); most are English-speaking - tend to be lower energy users - are generally younger households

Table C-1 (continued)
M-Power Market Research-related Studies Performed

Reference	Study Title	Study Period	Subject	Overall Findings
Traasdahl, 2009		2009	Overview presentation of program	Largest prepay program in the US Took stats from a week in August 2009, found most purchases on Friday between 4pm and 10pm (likely corresponding to payday), and most purchases in the $11 to $20 range. Average no of purchases per month: summer = 7.1; winter = 3.6 Average $ amount per purchase: summer = $24; winter = $21 Average # of customers who disconnect per month: 20% Of the 20%, average # of disconnects per month: 2
WestGroup Research, Inc., 2007	SRP M-Power Materials Survey: Topline Report, November 2007	Oct 2007	Telephone interviews to assess salience of updated communications materials; 201 M-Power customers	Low recall of some materials, although ratings were fairly positive
WestGroup Research, Inc., 2006a	SRP M-Power Communications Focus Group Research	Nov 2006	Focus group report, 3FGs, opinions on M-Power, the Starter Kit and different M-Power communications materials; not known how FG members were recruited	Most participants believed the sign-up and start-up processes were relatively easy. Most preferred the idea of having newsletter delivered quarterly and tailored to them. Most liked the M-Power program and thought its main benefit was its educational quality. Those in difficult financial situations (most of the group) liked that SRP provided M-Power as an option. Areas for improvement included having more payment options at the PayCenters, as well as over the phone and internet. Poor working order of some PayCenters was also expressed. English speaking customers felt information included in starter kit was "overwhelming and redundant". A recommendation was to make the information provided more concise.

Table C-1 (continued)
M-Power Market Research-related Studies Performed

Reference	Study Title	Study Period	Subject	Overall Findings
SRP, 2006	SRP M-Power Shadow Project September 2006 – Executive Summary	Sep 2006	Executive summary of the SRP M-Power Shadow Project, which involved 8 in-depth, in-home interviews from customers from a range of credit codes, length of time on program, language, income and housing type	People generally thought of SRP and M-Power positively, and authors were surprised at the wide range of households visited (i.e., not just low income). Three had run out of power once, although this was not perceived as a serious issue. Sense is that most households visited are conservation-minded.
WestGroup Research, Inc., 2006b	SRP M-Power/AMPY Benchmark Study 2006	Mar 2006	Telephone survey results, 402 M-Power customers; purpose was to obtain baseline data on attitudes towards M-Power, with emphasis on PayCenter machines, as new machines were to be installed starting in April 2006.	Seven in 10 rated SRP's performance as excellent or very good 90% were very satisfied or satisfied with the M-Power program Reasons for satisfaction were reported as (starting from most frequently reported): the ability to pay for power at customers' own pace, having ability to monitor energy use/more aware of energy use, perception that it was cheaper/saved energy, allowed for more control, and was more convenient in general Satisfaction high for IHD (93% very satisfied/satisfied, significantly higher amongst customers with a high school education or less); relatively lower for the PayCenter machines (72% very satisfied/satisfied, with more highly educated customer reporting significantly lower vs./s ratings than those with high school or less). Satisfaction with PayCenter machines decreases the longer customers are on the program (choices ranged from <1 year to 2+ years). SRP performance rated excellent or very good by significantly more lower income and high school (or less) educated. Indication that the longer a customer is on the M-Power program (choices ranged from <1 year to 2+ years), greater likelihood to be very satisfied Significantly more Hispanic customers were likely to rate it very satisfied or satisfied; significantly more high school educated (or less) customers chose very satisfied than more highly educated customers. M-Power customers report purchasing electricity three times a month. High school educated (or less) customers purchase more frequently than more highly educated customers.

Table C-1 (continued)
M-Power Market Research-related Studies Performed

Reference	Study Title	Study Period	Subject	Overall Findings
WestGroup Research, Inc., 2006b… Continued	SRP M-Power/AMPY Benchmark Study 2006	Mar 2006	Telephone survey results, 402 M-Power customers; purpose was to obtain baseline data on attitudes towards M-Power, with emphasis on PayCenter machines, as new machines were to be installed starting in April 2006. Customers were contacted randomly from SRP M-Power account list.	Cash most popular form of payment (choices at the time were cash, check or money order). Seventy-one percent reported encountering a PayCenter machine that was not working in the previous year. Of these respondents, the average number of problems over the year was 3.9. PayCenter machines located in grocery stores were used the most often (82%), followed by the SRP office (15%), convenience stores (2%), and the mall (1%). Ninety percent or more agreed or strongly agreed that M-Power could benefit others, learned a lot about their usage, use electricity wisely, prefer M-Power over other programs, and that helps them manage their finances. Twenty five percent were concerned about the meter shutting the electricity off, 22% felt their lifestyles were inconvenienced, and 18% said it led to household arguments. Demographics of M-Power customers surveyed: female (61%), low to moderate education (51% high school graduate or less; 28% some college), slightly Caucasian majority (51%), low income households (average income $32,586). Last survey of this breadth was 1999

Table C-1 (continued)
M-Power Market Research-related Studies Performed

Reference	Study Title	Study Period	Subject	Overall Findings
Reiley & Johnson, 2006	What Determines M-Power Customer Satisfaction: How SRP Can Attract and Retain M-Power Customers	2006	University of Arizona Assessment, telephone survey conducted by WestGroup of 401 M-Power customers that had been on the program for 18 months or more (sample skewed more towards recent customer, 18-24 months, than entire 'long-term' population). Goal is to assess customer satisfaction with the aim of understanding what would make customers stay on M-Power so as to reduce turnover rates; another goal is to understand traits of long-term M-Power customers. Authors note that surveying those who did drop out would be useful as well.	General conclusions: improve PayCenter quality and locations; use marketing messages such as "Take control of electricity usage." And "Save money by using less electricity"; consider providing a display with other non-M-power programs, as customers attributed benefits to it Turnover rate relatively high: as of Feb 2006, 11,200 of approximately 40,000 had been on for 18 months or less. 88% satisfied or very satisfied with M-Power 73% rate SRP as excellent or very good 92% prefer to stay on M-Power compared to E-23 Reasons for wanting to stay on: easier to manage bills, cheaper, can monitor energy usage 83% would want to keep the display 49% say they stay on M-Power as it is too much trouble to switch back ("inertia") 49% report having trouble with M-Power, although 73% have had a problem with an out of order PayCenter Biggest complaints: PayCenters out of order, money doesn't get transferred to card, have to go too far to get to a PayCenter (or not enough of them) Logistic regression analysis results: Probability of a customer answering they are "very satisfied" with the M-Power program increases for customers: reporting that PayCenters are conveniently located; that perceived their bill would be higher on E-23 (or that they would save money on M-Power); that are between 35 and 55 (20% more likely) or older than 55 (33% more likely); or that live in certain cities (Apache Junction, Glendale, Mesa, Phoenix). Probability of a customer answering they are "very satisfied" with the M-Power program decreases for customers: reporting experience with out-of-order PayCenters; that don't believe they consume differently on M-Power compared to E-23; that required more frequent card refills each month, that are African American. Traits not found to influence probability of answering "very satisfied": income; consumption level; # of months on program; whether the customers is Hispanic; household size; occupation; whether the customer was a college graduate.

Table C-1 (continued)
M-Power Market Research-related Studies Performed

Reference	Study Title	Study Period	Subject	Overall Findings
WestGroup Research, Inc., 2002	SRP M-Power PayCenter Research: Summary of Findings	Nov 2002	Telephone interviews regarding convenience of PayCenters in Circle Ks (convenience store); 214 M-Power customers; interviewees had been on program for at least 2 months and had a telephone number on file. "Customers interviewed were M-Power participants who were on the program at least two months and had an available telephone number Customers were randomly selected and filtered based on desired criteria.	87% were very satisfied or satisfied with the M-Power program On average, customers buy power 3 times a month Customers drive 2-3 miles to purchase power, 5-7 minute one-way trips. 72% satisfied with PayCenter locations Liked idea of buying power at Circle Ks; if service fees charged for this, likelihood of buying power there dropped; at $1, less than 50% said they'd buy there; for those that would they'd do so if at Circle K anyway (convenience) or if standard PayCenter was down Estimated that approximately 25% of users might use Circle Ks. Those who are positive towards Circle K approach: those who frequently Circle Ks often, Hispanics (versus non-Hispanics), Number of miles to Circle K or regular PayCenter not a factor in choosing one over the other Conclusions: customers are satisfied with current PayCenter locations and like the Circle K idea for emergencies; the fee would be a deterrent for some.

Table C-1 (continued)
M-Power Market Research-related Studies Performed

Reference	Study Title	Study Period	Subject	Overall Findings
WestGroup Research Inc., 2001	SRP M-Power Focus Group Report—June 2001	May 2001	Focus group report, 4 focus groups, opinions on areas of process and operational improvement. One focus group was comprised of people who left the M-Power program.	Most customers are very happy with all aspects of the M-Power program (e.g., sign-up through equipment installation), with the only exception relating to the PayCenters. Customers identified concerns with malfunctioning equipment, the inability of some machines to take forms of payment other than checks, and the lack of machines in close proximity to their homes For those who had left the M-Power program, the main categories of reasons were "concern about running out of power, machine/equipment problems, and the expense of the program and difficulty managing the program"; some also felt that the customer service representatives were "rude", or uncaring of their monetary situation. Some did not understand how the program worked at sign-up, and were surprised when their power went off; suggestions as to what would have encouraged them to remain on the program included a 24-hour phone line where you could purchase credits M-Power generally customers tend to be strong advocates of the program, and the study recommends marketing methods such as "refer-a-friend" Retention of customers is reported to depend on how well educated customers become regarding the program, and how it can affect their energy usage Although an "easy sell" to credit-challenged customers, the study indicates the UDT and the lower energy bills are what "hooks" the customers. The study raises the concern that M-Power could become labeled as a "low income" program, potentially acting as a deterrent for non-low income customers.

Table C-1 (continued)
M-Power Market Research-related Studies Performed

Reference	Study Title	Study Period	Subject	Overall Findings
WestGroup Research, Inc., 1999a	Pay As You Go Focus Group Report	Aug 1999	Focus group report, 2 focus groups, joint between SRP and Arizona Community Action Association, opinions on M-Power program	Customer very positive toward the program, which they believed gave them a sense of control. Participants also expressed it made them more aware of their electricity use patterns, and lowest instances of argument over the bill. Most had reported incidences when their power was shut off. Participants also liked that the program gave them an alternative to the "embarrassing" situation of having to go through the disconnect/reconnect process with SRP (on the standard program). The biggest negative trait expressed was the lack of payment machines that were in working order. Self-reported usage traits: power purchased when approximately one day of power left, one-way trip to payment machines approximately one to five miles, amount spent per purchase between $50 and $100, and customers will buy more if they can. Most customers do not store credits on their spare card for emergency purposes (advised by SRP to do so). "Pay As You Go customers felt that the program has significantly helped them manage their electric usage, save money, and would be helpful to a lot of other SRP customers". Most participants said they preferred it to the traditional program and would stay with it in the future.

Table C-1 (continued)
M-Power Market Research-related Studies Performed

<table>
<tr><th>Reference</th><th>Study Title</th><th>Study Period</th><th>Subject</th><th>Overall Findings</th></tr>
<tr>
<td>WestGroup Research, Inc., 1999b</td>
<td>SRP/ACAA Pay As You Go Study</td>
<td>Sep 1999</td>
<td>Telephone survey report, 179 Pay as You Go customer (precursor to M-Power program); joint study between SRP and Arizona Community Action Association (ACAA), opinions on M-Power program. List of 1,023 current users was provided by SRP, and had been screened to ensure they had been on the program at least one year. 160 more customers were removed for other screening (changed telephone numbers, worked for the utility, no longer a Pay As You Go customer, etc.). “The sample of 179 customers has a margin of error of +/- 6.5% at the 95% level of confidence (with finite population of 863).”</td>
<td>Overall, Pay As You Go customers were found to be satisfied with the program, with the biggest opportunity for improvement relating to the PayCenters.

73% of Pay As You Go customers rate SRP’s performance as excellent or very good

Problems cited included not enough machines and machines out of service, although 29% reported no disadvantages with the program

Approximately one third had applied for “utility assistance” prior to being on the program, and only 7% had applied since being on the program

“Fewer customers recall being disconnected from their electric service since participating in the program.”

Those who did have their service disconnected felt, for the most part, that their cases were handled well by the customer service representatives. Seventy-one and 69% agreed that the disconnection was handled “fairly” and “with respect” respectively, and 50% felt their case was handled with comparison.

Fifty-eight percent would rather purchase power from a PayCenter rather than a customer service representative.

Self-reported program statistics include 3.7 purchases per month, power purchased when 4.3 days of power on average left, average one-way trip approximately 5.6 miles, average amount spent per purchase approximately $56.70.

Other self-reported stats
<table>
<tr><td>Ave # times machine broken</td><td>1.1</td><td>(48% reported no machine problems)</td></tr>
<tr><td>Ave # times needed to drive 5+miles</td><td>3.0</td><td>(45% reported never having to)</td></tr>
<tr><td>Ave # of times having to buy power in dangerous neighborhood</td><td>1.2</td><td>(77% reported never having to)</td></tr>
<tr><td>Ave # of times office was closed</td><td>1.2</td><td>(58% reported never experiencing this)</td></tr>
<tr><td>Ave # of times having to write more than one check</td><td>0.3</td><td>(83% reported never having to)</td></tr>
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Electric Power Research Institute
3420 Hillview Avenue, Palo Alto, California 94304-1338 • PO Box 10412, Palo Alto, California 94303-0813 • USA
800.313.3774 • 650.855.2121 • askepri@epri.com • www.epri.com