Salt River Project:

Delivering Leadership on Smarter Technology & Rates

Institute for Energy and the Environment
Vermont Law School

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Smart Grid Case Study Series – Case 2

June 2012

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SMART GRID PROJECT OVERVIEW

The United States electric transmission and distribution system is on the verge of a transformation to a smart electric grid. At the center of this evolution is the introduction of new technology at the customer meter as well as the distribution and transmission system level. Unsurprisingly, the introduction of this new technology has presented new legal, policy, and regulatory challenges for state and federal regulators. The federal government has added additional momentum to this technological evolution by making a smart electric grid a central component of the US clean energy agenda and awarding $3.4 billion in Smart Grid investment grants to utilities and other entities as part of the American Recovery and Reinvestment Act.

THE SMART GRID CASE STUDIES SERIES

Vermont Law School's Institute for Energy and the Environment Smart Grid Project was initiated in 2010 through joint funding of the United States Department of Energy, with the support of Vermont Congressman Peter Welch, and Vermont Law School. Utilizing case study analysis of Smart Grid program implementation, the research project is examining the question: what legal, regulatory, and other policy changes can best ensure that Smart Grid implementation in the U.S. improves reliability, enhances consumer value, and meets our clean energy goals?

Our Smart Grid Case Study Series Includes:

- ✓ Central Vermont Public Service (Vermont)
- ✓ Commonwealth Edison (Illinois)
- ✓ Pecan Street Project (Texas)
- ✓ Sacramento Municipal Utility District (California)
- ✓ Salt River Project (Arizona)
- ✓ San Diego Gas and Electric (California)

PROJECT FOCUS 2012 AND BEYOND

FERC Chairman John Wellinghoff has noted that climate change and a smart electric grid are both key issues for the energy industry and the federal government, but rarely are these two issues linked in policy debates. The focus of the Institute for Energy and Environment's Smart Grid Project is to help better define this important link, and to promote smart policies that benefit both the climate and the electric grid. Research such as that conducted by Pacific Northwest National Laboratory (PNNL) and the Electric Power Research Institute have identified that a smarter grid is likely to be a significantly greener grid, which could lead to significant reductions in both energy usage and carbon emissions. PNNL's research suggests that a Smart Grid can lead to a 12% reduction in carbon emissions alone by 2030. Building on our case study research during the second phase of our project, we are producing up to five Smart Grid policy reports. These reports will examine best practices, lessons learned, and policy issues related to:

- Legal and regulatory challenges to Smart Grid implementation, including customer data privacy;
- Integration of electric vehicles into the grid;
- Supercharging efficiency and expanding demand response;
- Integration of clean distributed generation and storage; and
- Distribution optimization and conservation voltage reduction.

More about the Institute's Smart Grid Project is available at: www.vermontlaw.edu/smartgrid

INTRODUCTION

As utilities across the country are deploying smart meters, rolling out miles of fiber, and grappling with cyber security and data management challenges, "Smart Grid" is the ultimate buzz word in the industry. Yet providing an exact explanation of what the Smart Grid is made of, what it can do, and what benefits it will bring is illusive.[1] For the Salt River Project ("SRP") in the greater Phoenix, Arizona area, the Smart Grid is nothing new. Noted by smartgridnews.com, SRP has been investing in Smart Grid technologies before the term "Smart Grid" became an industry buzz word.[2]

This paper presents a case study of SRP's Smart Grid programs. The impetus for this study was SRP's award of a $56.9 million investment grant to expand its smart meter network awarded by the Department of Energy through the American Reinvestment and Recovery Act. However, SRP's Smart Grid investments reach far beyond customer-centered smart meter applications. SRP's unique governance and regulatory structure has allowed it to focus on essential Smart Grid backbone infrastructure supporting the full spectrum of its power system.

BACKGROUND OF SALT RIVER PROJECT

The Salt River Project is the third largest public power entity in the United States, serving approximately 940,000 customers in Arizona.[3] SRP's unique history and governance structure plays an important role in its investment and strategic operations. Originally founded in 1903 through the National Reclamation Act of 1902,[4] SRP is comprised of two entities; the Salt River Valley Water User's Association, a private corporation that supplies water and manages water rights, and the Salt River Project Agricultural Improvement and Power District which is a political subdivision of the state. The Salt River

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[1] M. Granger Morgan, *et al*, *The Many Meanings of "Smart Grid,"* Carnegie Mellon University Department of Engineering and Public Policy (July 2009).

[2] SmartGridNews, *Salt River Project Profile* (2011), http://www.smartgridnews.com/artman/publish/Key_Players_Utilities/Salt_River_Project_Profile-1095.html (last visited May 11, 2011).

[3] *Id.*

[4] Salt River Project, *Building a Legacy: The Story of SRP*, 12, 2006.

Project Improvement and Power District, now simply referred to as the Salt River Project, was formed in 1937 to operate power generation and distribution systems and meet the expanding power needs of the area.[5]

As a political subdivision of the State of Arizona, SRP is not subject to regulation by the Arizona Corporation Commission (ACC) in the same manner that investor owned utilities are.[6] Rates, investments, and day-to-day activities of SRP do not require ACC approval. SRP is only subject to ACC regulation for approval of generation projects over 100 MW or transmission projects over 115kV.

Instead, SRP is governed by landowners within its service territory through elections of Board and Council members.[7] The Board sets specific policy objectives and works with Officers and executive management members to operate SRP,[8] while the Council is responsible for broader policies and communication with constituents.[9] In many ways, being free from ACC regulation allows SRP to operate with more flexibility. As discussed below, this structure has proved advantageous in SRP's Smart Grid investments.

SRP is an integrated utility with ownership interests in generation as well as being responsible for transmission and distribution services.[10] SRP has 8,094 MW available to serve peak demand, and reported annual total sales of 33,064 GWh in 2009.[11] SRP has full or partial ownership interest in natural gas and coal fired plants, one nuclear facility, and 493 MW of renewable power.[12] Hydro facilities compose 57% of SRP's renewable resources, or 383 MW.[13] SRP also owns over 1,500

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[5] Salt River Project, *A History of the Salt River Project*, http://www.srpnet.com/about/history/legacy.aspx (last visited May 11, 2011).

[6] The ACC is similar to Public Utility Commissions or Public Service Commissions in other states, except that the ACC also has authority of corporations, securities regulation, and railroad/pipeline safety. *See* http://www.azcc.gov/Divisions/Administration/about.asp.

[7] *SRP Elected Officials*, http://www.srpnet.com/about/elected.aspx (last visited May 11, 2011).

[8] The Board is composed of ten district representatives and four at-large members. District representatives are elected by acreage-based voting system. This acreage-based system dates back to the origination of SRP when landowners pledged private property for collateral on government loans. The system has been upheld by the Supreme Court in 1981. At-large members have a one-landowner, one-vote system. *See* http://www.srpnet.com/about/governing.aspx#district; *and* Salt River Project, *Building a Legacy: The Story of SRP*, 8, 2006.

[9] *SRP Governance*, http://www.srpnet.com/about/governing.aspx#district (last visited May 11, 2011).

[10] Salt River Project, *Building a Legacy: The Story of SRP*, 8, 2006.

[11] *Facts About SRP*, http://www.srpnet.com/about/facts.aspx (last visited May 11, 2011).

[12] *Id.*

[13] *Renewable Energy*, http://www.srpnet.com/environment/renewable.aspx (last visited May 11, 2011).

miles of transmission lines and 1,400 miles of fiber optic lines.[14] SRP recognizes that improving efficiencies in its systems through Smart Grid technologies can help lower costs and improve reliability while continuing to meet the modern energy challenges of a rapidly growing metropolitan area.

OVERVIEW OF SRP'S SMART GRID PROGRAM

BROAD PERSPECTIVES

The Energy Independence and Security Act of 2007 established new standards under Section 111(d) of the Public Utilities Regulatory Policy Act (PURPA). One of those new PURPA standards required utilities to consider investments in Smart Grid systems based on cost effectiveness, improved reliability, security, system performance, and societal benefits.[15] SRP's Board adopted the new PURPA standard in full with the exception of Section 16B Rate Recovery and 16C Obsolete Equipment. These two sections were not applicable to SRP because they refer to each State making a policy determination about these topics. These standards relate largely to investments in "non-advanced" technologies.

SRP has been working in the Smart Grid arena for several years prior to the new standards developed in the EISA. The company began installing fiber optics in the late 1990's and has now connected over 98% of substations with fiber optics, began deploying smart meters as early as 2003, and has been offering time of use rates for decades.[16] SRP is currently investing in Smart Grid technologies for all aspects of its power system. In doing so, SRP is focused on building out the backbone of a Smart Grid system to support all components of the Smart Grid and ensure interoperability with future technologies.

For SRP, investing in the Smart Grid at this stage requires expanding infrastructure in three key areas. First, communications systems at the transmission level must be enhanced. Enhanced systems begin with SRP's fiber network but extend to mobile communications, system automation, and network controls. Second, SRP is investing in IT infrastructure. According to Joe Nowaczyk, Manager of Electronic Systems at SRP, much of the Smart Grid requires linking information technology with operations technology. A successful Smart Grid IT infrastructure requires unified communications to efficiently manage and utilize data across multiple Smart Grid components and corporate departments. Finally, SRP is

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[14] SmartGridNews, *Salt River Project Profile* (2011), http://www.smartgridnews.com/artman/publish/Key_Players_Utilities/Salt_River_Project_Profile-1095.html (last visited May 11, 2011).

[15] 16 U.S.C. § 2621(d) (2010).

[16] Phone interview with Joe Nowaczyk, Dec. 6, 2010.

working to develop an enterprise strategy for Smart Grid cyber security. As the grid becomes intertwined with more data and communications technology, it is essential that information is managed securely.

SRP's ability to focus on these fundamental pieces of Smart Grid infrastructure is in part due to its unique self-regulated structure. As a political subdivision of the State, SRP is not subject to ACC approval for its investments nor required to submit regulatory filings or demonstrate immediate benefits from Smart Grid infrastructure. Therefore, SRP only needed internal approval to begin investing in backbone communications infrastructure. While immediate reliability benefits of backbone infrastructure investments are often difficult to quantify, they are fundamental investments that will help ready SRP for future Smart Grid technologies. Other utilities across the country remain focused on consumer-centered technologies such as smart meters and advanced meter infrastructure ("AMI") because they are commonly thought to provide the most immediate benefits. Yet some utilities are still encountering regulatory hurdles. Anecdotally, Baltimore Gas & Electric's original proposal to install 1.2 million smart meters was denied by the Maryland Public Service Commission in June of 2010, threatening the company's eligibility for DOE funding.[17] While BGE's plan was conditionally approved on resubmission,[18] this exemplifies the type of regulatory hurdles that SRP does not have to face. Certainly SRP is subject to internal review from its Board and Council, but this process is easily contrasted with the review of a Public Service Commission.

Focusing on the Smart Grid backbone is not to say that SRP is unconcerned with consumer benefits or measuring system improvements. In fact, SRP began installing advanced meters in 2003, and with the help of a DOE grant SRP plans to reach 100% installation of smart meters in its service territory by 2013. The key point is that SRP's core Smart Grid investments reach far beyond smart meters. Before realizing the full potential of end-user benefits, utilities must start with the backbone of a Smart Grid system and gain benefits on the utility side.[19] To that end, SRP developed seven key initiatives in 2009. These areas include the following:[20]

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[17] The plan was primarily rejected because the Maryland PSC would not approve a cost recovery customer surcharge, would not impose mandatory time of use rates, was concerned with educational components of the plan, and did not want customers to face the full economic risk of smart meter technology. Maryland Public Service Commission Order No. 83410 2-3, June 21, 2010; *see also* http://www.greentechmedia.com/articles/read/baltimore-gas-electrics-smart-meter-plan-is-rejected/.

[18] Maryland Public Service Commission Order No. 83531, August 13, 2010.

[19] Butler, Frederick. "A Call to Order: A Regulatory Perspective on the Smart Grid." IEEE Power & Energy Magazine, March/April 2009, Pages 16-25, 93.

[20] Joe Nowaczyk, presentation of SRP Smart Grid Roadmap Validation Review, April 8, 2009 [hereafter Smart Grid Roadmap].

- Improve existing **Cyber Security** strategies
- Implement automated tools for **WAN Monitoring**
- Create and deploy an **Integrated Substation LAN** strategy
- Utilize a single **Unified Communications** infrastructure for field devices
- Expand the deployment of **Distribution Feeder Automation**
- Deploy an **Electrical System Data Acquisition and Management** for automation and analysis
- Implement an integration bus for secure **Enterprise Application Integration** between applications and databases

Each of these areas fit within the three key elements discussed above of communications systems, IT infrastructure, and cyber security. There are also synergies across these seven areas that, to the extent possible, SRP is attempting to take advantage of. A brief synopsis of these seven initiatives is provided in section II.C., below.

PROGRAM MANAGEMENT AND DEVELOPMENT

SRP has been integrally involved in the Electric Power Research Institute's ("EPRI") Smart Grid initiatives. SRP is a participating utility and original funder of EPRI's Intelligrid program,[21] a collaborating utility in the Smart Grid Demonstration Initiative,[22] and a participant in the Green Circuits Initiative.[23] SRP retained EPRI in 2008 for the development of case studies about the use of Smart Grid technology and assistance developing a Smart Grid Roadmap.[24]

SRP obtained executive staff approval of its Smart Grid Roadmap in July of 2008.[25] The Roadmap identifies the seven key areas discussed above. It also adopted four guiding principles; leveraging investments, integrating technology, developing open standards and protocols, and engaging industry efforts.[26] Management teams were created at two levels. A Smart Grid Leadership Team was appointed to promote the guiding principles,[27] and seven cross-functional teams were

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[21] IntelliGrid seeks to link the communications and safety systems of modern grids together to create a central management system for a quicker healing grid. Smart Grid Newsletter, *The Case for Use Cases*, 2006 *available at* http://intelligrid.epri.com/docs/SRP_use_cases.pdf.

[22] Electric Power Research Institute, EPRI Smart Grid Demonstration Initiative Two Year Update, 2010.

[23] Transmission and Distribution World, *EPRI Green Circuits Project Launched* (May 1, 2010) http://tdworld.com/overhead_distribution/epri-green-circuits-project/.

[24] Salt River Project presentation to the National Science and Technology Council Subcommittee on Smart Grid, August 23, 2010.

[25] *Id.*

[26] *Id.*

[27] *Id.*

created in September 2008 to evaluate each of the seven initiatives.[28] The leadership team has representatives and participation from ten different SRP departments.[29]

SRP's "Smart Grid Vision" is to develop "a power delivery infrastructure that enables practical integration of advances in communications, computing, and electronics to optimize system reliability, contain costs, and accommodate the delivery of services to meet the future needs of [SRP] customers."[30] SRP's "Mission Statement" is to "plan and deploy a well coordinated, interoperable, cost-effective corporate infrastructure that will enable the development, integration and application of new technologies throughout SRP that provide secure, high-quality, cost effective, reliable services both internally and externally."[31]

SRP'S SMART GRID ROADMAP: SEVEN KEY INITIATIVES

CYBER SECURITY

The goal of SRP's cyber security initiative is to develop a secure infrastructure spanning from technology platforms to policies, procedures and employee culture to meet information requirements in a secure manner.[32] SRP identifies cyber security as a high-impact but relatively easy initiative to begin to implement. Though the initiative was one of the first to begin, SRP understands that a comprehensive enterprise-wide cyber security implementation will be difficult and take years to fully develop. To date, SRP has completed development of an enterprise strategy for cyber security and goals for FY 2011 are centered on implementation of that strategy.[33]

SRP's security model includes both preventive and reactive measures. The model covers risk management, standards compliance, incident management, and security operations.[34] In addition to compliance with NERC Critical Infrastructure Protection standards ("CIP"), SRP's enterprise cyber security plan is modeled after two National Institute of Standards and Technology ("NIST") standards. NIST 800-37, *Guide for applying the risk management framework to federal*

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[28] Smart Grid Roadmap, *supra* note 20.

[29] Joe Nowaczyk, presentation of SRP Smart Grid Implementation, Dec. 15, 2009.

[30] Smart Grid Roadmap, *supra* note 20.

[31] Joe Nowaczyk, presentation of SRP Smart Grid Implementation, Dec. 15, 2009.

[32] Smart Grid Roadmap, *supra* note 20.

[33] Phone interview with Jeff Younger, Feb. 21, 2011.

[34] Smart Grid Roadmap, *supra* note 20.

information systems assisted the development of preventative security protocols. NIST 800-53, *Recommended security controls for federal information systems and organizations* guided SRP in developing its enterprise security control framework.[35]

While SRP is moving forward with cyber security standards, challenges still persist. SRP notes that NIST standards should be developed before NERC CIP standards to ensure consistency between industry standards and regulatory requirements that could produce significant penalties.[36] SRP also notes that like much of the industry, it is still struggling with the issue of consumer privacy.[37] One key may be to physically separate networks for certain types of data in order to control a secure perimeter for that data.[38]

WAN MONITORING

WAN Monitoring, or Wide Area Network monitoring, refers to managing the growing network of data associated with Smart Grid developments. SRP is looking for ways to integrate advances in communications and IT technology with the physical electric system. SRP visited Network Operations Centers at two utilities, Arizona Public Service and Southern California Edison and one telecom utility, Calence, to assess the tools others were using to manage their communication networks.

Recognizing there was an immediate need for additional monitoring tools, SRP worked with existing vendors to expand monitoring capability.[39] SRP has recently developed a communication network operating center to allow for more robust monitoring of SRP's extensive communication network.[40]

INTEGRATED SUBSTATION LOCAL AREA NETWORKS (LAN)

Advanced communications inside the fence of a substation can help to provide system operators with fast and reliable event data.[41] When SRP first evaluated this topic in 2009, EPRI assessments stated several benefits from fully

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[35] Salt River Project presentation to the National Science and Technology Council Subcommittee on Smart Grid, August 23, 2010; Phone interview with Jeff Younger, Feb. 21, 2011.

[36] *Id.*

[37] Phone interview with Joe Nowaczyk, Dec. 6, 2010.

[38] *Id.*

[39] Phone interview with Jeff Younger, Feb. 21, 2011.

[40] *Id.*

integrated substation LANs. However, surveys of other utility experiences showed almost no U.S. participation with the most current International Electrotechnical Commission (IEC) 61850 standard[42] and mixed results from other automation experiences.[43] SRP recommended pursuing an implementation strategy including further research and expanded funds to accelerate a lab pilot study.[44] Some utilities are adopting IEC 61850 as the standard design for substation automation in newly constructed substations. However, SRP is currently monitoring the maturity of this technology for consideration of use in future substations, but has no plans at this time to deploy it.[45] SRP currently uses DNP3/IP IEEE approved protocol.

UNIFIED COMMUNICATIONS

The unified communications initiative essentially refers to creating and managing the telecommunications infrastructure that will support and integrate SRP's Smart Grid activities.[46] SRP considered this initiative to have the highest impact but to be moderately challenging to achieve. Main challenges include connecting various applications already using field communications with new systems, anticipating future automation needs, and determining what physical technology has the best business case in each application. The SRP communications functional team divided its challenges into three areas: communications infrastructure, AMI and the Smart Grid, and enterprise planning and collaboration.[47]

The purpose of building out communications infrastructure is to eventually unify the various systems so that multiple Smart Grid functions can work seamlessly together. For instance, one potential long term goal is to connect the AMI infrastructure with distribution feeder automation ("DFA") infrastructure. This would improve outage management by allowing individual customer data from smart meters to alert system operators about faults or voltage problems on the distribution system and link automated system responses to reroute power and pinpoint outage locations for more efficient crew utilization and reduced restoration time. However, achieving this link is not realistic in the short term because of bandwidth issues, **Supervisory Control and Data Acquisition** (SCADA) requirements, intelligent distribution devices and

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[41] Smart Grid Roadmap, *supra* note 20.

[42] IEC 61850 is the International Electrotechnical Commission standard design for substation automation. *See*, http://seclab.uiuc.edu/docs/iec61850-intro.pdf.

[43] Smart Grid Roadmap, *supra* note 20.

[44] *Id.*

[45] Phone interview with Jeff Younger, Feb. 21, 2011.

[46] SRP Smart Grid Roadmap, *supra* note 20.

[47] *Id.*

AMI/DFA architecture.[48] In short, smart meter data is downloaded once every 24 hours through the AMI infrastructure, while SCADA operates by pinging substations once every four cycles (referring to the AC voltage cycle, for which there are 60 every second) and intelligent devices such as Intelliruptors™, digital fault recorders and automated capacitor controllers all currently use varying methods of communications. Since every smart meter collects data on 50 different types of information, and there will eventually be over 900,000 smart meters on SRP's system, there is simply not enough capacity with the existing communication systems in place to run both AMI and DFA together. Essentially, this is a problem of latency and bandwidth limitations due to the amount of data and existing communication infrastructure of the two systems. SRP is currently reviewing multiple communication options to determine the best solutions to address these issues.[49]

Establishing the proper AMI is essential to SRP's, or any utility's, success with the Smart Grid. AMI supports meter to bill information management, and it is the precursor to many benefits including outage management, system automation, and residential demand response. SRP has undertaken significant research to anticipate future needs as AMI is expanded. More detail regarding the AMI infrastructure is included in section II.D., below.

In sum, creating solutions for unified communications systems will support almost all aspects of the Smart Grid. While challenges still exist, SRP recognizes that "successful implementation of AMI and integration via Meter Data Management system is fundamental to enabling the Smart Grid of the future."[50] Furthermore, collaboration between departments and effective planning will be critical to maximize returns on investments.[51]

DISTRIBUTION FEEDER AUTOMATION

SRP already has 15 years of experience with automation and has over 179 automated switches throughout its system.[52] As SRP expands DFA and creates guidelines and policies, it plans to take advantage of existing designs that already allow flexibility.[53]

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[48] *Id.*

[49] Interview with Joe Nowaczyk and Jeff Younger, March 21, 2011.

[50] SRP Smart Grid Roadmap, *supra* note 20.

[51] *Id.*

[52] Presentation to National Science and Technology Council Subcommittee on Smart Grid, Aug. 23, 2010.

[53] Smart Grid Roadmap, *supra* note 20.

When EPRI made recommendations for increasing efficiencies, improving reliability, and incorporating green practices during its Green Circuits initiative, SRP had already implemented much of what EPRI recommended.[54] SRP was already purchasing the most efficient transformers, and had shorter feeders in the range of 3 to 10 miles which helps reduce inefficiencies.[55] EPRI's modeling of four SRP circuits indicated a potential 2% energy savings across the system. SRP then ran a field study in the summer of 2010 to test whether these modeled results could be achieved. SRP's field study is currently being evaluated to determine if EPRI's 2% energy savings across the system is achievable. If field results verify the modeled results, then a full cost/benefit analysis will be run. However, to realize the full potential benefits of energy reduction, communication and automation between meters, capacitor controllers, load tap changes and possibly inverters would need to be developed along with the applications to analyze and make the automated system decisions.[56] Large scale penetration of distributed renewable energy may require the same type of communication, automation and applications to ensure reliability of the distribution system.

With reference to future DFA initiatives, SRP is considering several implementation plans. These include expanding on existing concepts, linking fiber hot spots with DFA, remotely controlling future distributed generation projects, integrating PHEVs, automating capacitor controls and fault location, and controlling demand response.[57] SRP has broken these segments out as near-term opportunities and long-term opportunities as well as estimating build-out costs for each segment.[58] SRP continues to study new opportunities in these areas.

At this stage, SRP is deploying feeder automation technology strategically. Upgrades are focused in specific areas with reliability issues; SRP is taking a geo-targeted approach.[59] SRP also offers optional enhanced service agreements for some commercial and industrial customers to achieve a higher level of reliability. These are customers that demand

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[54] Interview with Joe Nowaczyk and Jeff Younger, March 21, 2011.

[55] *Id.*

[56] *Id.*

[57] Smart Grid Roadmap, *supra* note 20.

[58] *Id.*

[59] Interview with Joe Nowaczyk and Jeff Younger, March 21, 2011.

continuous power service for their operations, such as data processing centers, chip manufacturers, and hospitals. Automated switches are placed on their feeders to decrease the probability of any potential outages to near zero.[60]

ELECTRIC SYSTEM DATA ACQUISITION AND MANAGEMENT

The immense increase in automated processes and data gathering associated with Smart Grid activities creates a significant data management problem. The data acquisition and management initiative seeks to support the Smart Grid by developing a system to collect, manage, and utilize information across various systems.[61] Data management will help to improve operational efficiency, mainly in more technical system operations areas. Data acquisition plans are aimed at all intelligent devices located within SRP's electric and water system.[62] Ultimately, these systems will help to enhance grid efficiencies, operations, maintenance, and diagnostics.

Implementing these systems within the IT department presents an enormous challenge. SRP is in the early stages of implementation, and the full process will require a high degree of personnel development to familiarize IT staff with the intelligent devices. IT staff must be familiar with the types of data each device sends, where it sends the data, how the data is formatted, how the data is currently used and who else within the company might be able to utilize this data. SRP must also overcome challenges related to storing this data for enterprise access, securing it, and determining who will have ownership of the information.

ENTERPRISE APPLICATION INTEGRATION

Integrating applications will allow Smart Grid data to benefit the full range of SRP's system. It requires linking the masses of data with the back-office functions that need, or could benefit from, accessing that information. SRP ranks this initiative as the *most difficult* and *highest impact* out of all seven initiatives.[63] Currently, SRP describes the system of data sharing as "spaghetti," because many different corporate divisions that need to use this data. Corporate IT, transmission and generation, distribution operations, power generation, and customer services departments all need access to Smart Grid systems information.

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[60] *Id.*

[61] Smart Grid Roadmap, *supra* note 20.

[62] *Id.*

[63] *Id.*

SRP is using the Common Information Model ("CIM") to make data transferrable between departments.[64] A CIM standardizes data interfaces and allows multiple parties to access and exchange information. SRP is working internally with its IT department to develop a robust multidisciplinary CIM.

SMART METERS AND AMI

DOE/ARRA SMART GRID INVESTMENT GRANT

In late 2009, SRP was awarded $56.9 million by the Department of Energy ("DOE) from American Reinvestment and Recovery Act funds to continuing expanding its smart meter infrastructure.[65] The funds are part of the Obama administration's larger commitment of $3.4 billion in grants for investments in Smart Grid technologies to help improve efficiency and reliability in the nation's electric grid.[66] Prior this award, SRP was well advanced in smart meter installations. SRP installed its first smart meter in 2003[67] and reached 54,822 installations by the close of 2006,[68] and 374,457 by 2009 when the ARRA funds were awarded.[69]

The DOE selected SRP for this Smart Grid Investment Grant as one of 100 companies to receive funding for Smart Grid projects, and one of 31 approved AMI projects.[70] SRP is matching the ARRA funds with $57.1 million in its own funding. SRP will use the bulk of the funds to install 540,000 additional smart meters while a portion will cover software updates for data management.[71] SRP's smart meters are manufactured by the Elster Group, a global manufacturer and leader in AMI technology.

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[64] *Id.*

[65] http://www.smartgrid.gov/project/salt-river-project-smart-grid-project.

[66] Ryan Randazzo, *SRP Gets $56.9M Boost from Feds for Customer 'Smart Meters'* The Arizona Republic, Oct. 27, 2009, *available at* http://www.azcentral.com/business/articles/2009/10/27/20091027biz-srp1028.html.

[67] http://www.srpnet.com/electric/home/smartmeterfaqs.aspx

[68] SRP 2010 Annual Report, 6 (2010).

[69] *Id.*

[70] http://www.smartgrid.gov/projects/investment_grant

[71] Patrick O'Grady, *Salt River Project Buys Smart Meters for Stimulus Package*, American City Business Journals, May 18, 2010.

The project, referred to at SRP as Advanced Data Acquisition and Management ("ADAM"), puts SRP on track for 100% deployment of smart meters by 2013 – three years ahead of its prior schedule.[72] As of April 1, 2011, SRP's website reported 642,631 meters installed. As reported by Michael Lowe, Manager of Customer Services at SRP, this pace requires approximately 14,000 meter installations every month by a crew of about 25 employees.[73] The ADAM work plan calls for 163,000 meters installed in 2011, 170,000 in 2012, and 145,000 in 2013. Customers cannot request installation, and customers on SRP's pre-pay program, M-Power (see section II.E., below) will not receive the Elster smart meters.[74] Only customers who opt into SRP's new EZ-3 rate structure (see section II.E., below) can obtain installation outside of SRP's installation schedule.[75]

The Investment Grant with DOE is a three year program with two years of subsequent metrics and benefits reporting.[76] SRP negotiated a look back period of 8-9 months to obtain DOE cost sharing for prior investments in AMI network and smart meter installation.[77]

AMI COMMUNICATIONS NETWORK

Successfully utilizing these 980,000 smart meters will require a strong communications system connecting the meter to the back office. Each Elster meter collects over 50 data points every 15 minutes which are downloaded nightly by SRP. To collect this massive amount of data, SRP relies on GPRS wireless communications between the Radio Frequency Mesh endpoints and other field deployed Smart Grid devices.

SRP deployed its backhaul wireless communication network and infrastructure well in advance of receiving the DOE grant, and before beginning wide-scale installation of smart meters.[78] The RF Mesh network transmits smart meter data

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[72] SRP 2010 Annual Report, 6 (2010).

[73] Patrick O'Grady, *Salt River Project Buys Smart Meters for Stimulus Package*, American City Business Journals, May 18, 2010.

[74] http://www.srpnet.com/electric/home/smartmeterfaqs.aspx.

[75] *Id.*

[76] Interview with Scott Trout, March 21, 2011.

[77] *Id.*

[78] *Id.*

from the home over a 900MHz unlicensed network to collector meters.[79] SRP then transmits the meter data from the collector meters over the GPRS wireless and Public Switched Telephone Network (PSTN) to SRP's office.[80] SRP is considering transitioning the PSTN communication network to a more advanced wireless (CDMA) communication network, which will also provide redundancy. SRP is currently reviewing multiple communication options to identify the best solutions to meet the needs of SRP and its customers.[81]

Once data reaches SRP offices, it enters SRP's meter data management system ("MDM"). SRP has recognized that developing a successful MDM system is critical to fulfilling the potential of smart meters to provide services such as outage management, demand response, voltage verification, load profiling, and customer services.[82] SRP is working with EnergyICT, a division of Elster, to help develop an MDM system.[83] One major challenge facing SRP's MDM system is the ability to share data across different corporate departments. When SRP's IT department conducted an initial survey and study, thirty-two different organizations within SRP expressed interest in utilizing varying data elements attainable from smart meters for various analysis and services.[84] SRP developed a prioritization matrix based on these results. Yet for the time being, the key priority is "meter to bill data," giving the customer service and billing departments first access to the advanced MDM system. Along with its early experience with smart meters, SRP has been dealing with back-office meter data for years.[85] The IT department first internally developed an application to link smart meter data with SRP's billing system.[86] As the MDM system advances, SRP will use meter data in operations to aide outage management then it will begin linking with other management systems according to the prioritization matrix.[87] This phase of the project will begin after the DOE grant closes in 2013.

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[79] Smart Grid Roadmap, *supra* note 20.

[80] *Id.*

[81] Interview with Joe Nowaczyk and Jeff Younger, March 21, 2011.

[82] Smart Grid Roadmap, *supra* note 20.

[83] Interview with Scott Trout, March 21, 2011.

[84] Phone interview with Jeff Younger, Feb. 21, 2011.

[85] Michael T. Burr, *Middleware Mashup: Smart Grid and the Back Office*, 145 NO. 5 PUB. UTIL. FORT. 65, 3 (2007).

[86] *Id.*

[87] Phone interview with Jeff Younger, Feb. 21, 2011.

For now, the AMI and MDM systems are linking smart meters in the home with SRP's back office, enhancing billing practices, and empowering customers with information. After data is received in SRP's MDM system, customers can access data about their daily usage through the "My Account" application on SRP's website. SRP expects to support hourly usage information in the near future, but does not currently support in-home displays or PC applications.[88]

COST SAVINGS

SRP's smart meters have no net cost to the customer. The benefits of automated meter reading are more than covering the costs of upgraded service. As of March 2011 SRP has remotely addressed over 1.2 million service orders, saved over 401,000 labor hours, avoided 2.0 million driving miles, and conserved 198,000 gallons of fuel.

DYNAMIC PRICING

SRP offers customers four price plans to choose from. They include a basic plan with seasonal rates, a time of use (TOU) plan, an EZ-3 plan offering time of use rates with a shorter peak period, and M-Power — SRP's unique pre-pay plan. SRP's basic plan uses seasonal rates with an inclining block rate above high usage levels.[89] The E-26 time of use rate has been offered for over 20 years, but has been selected by more customers as smart meters become available. EZ-3 is a newly introduced time of use rate which requires installation of a smart meter to enroll. SRP's M-Power program is the nation's largest pre-pay electricity program with over 100,000 customers enrolled, leaving many utilities looking to SRP as a pre-pay success story. SRP's dynamic pricing programs are all voluntary, opt-in programs.

TIME OF USE RATES

SRP's standard time of use rate, E-26, charges higher peak prices during 1pm to 8pm from May through October, and from 5am to 9am and 5pm to 9pm during November through April.[90] On-peak pricing varies throughout the seasons. Pricing information available through smart meters along with more accurate metering offers consumers the opportunity to save more with TOU pricing. Since the advanced rollout of smart meters, SRP has seen a 20 % increase in voluntary TOU

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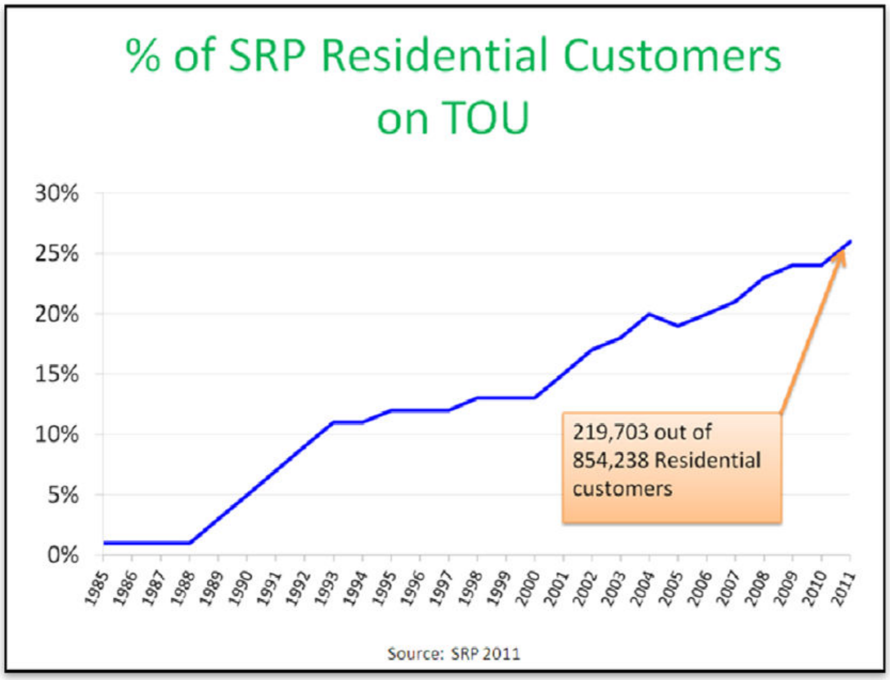
[88] http://www.srpnet.com/electric/home/smartmeterfaqs.aspx#7.

[89] *See* http://www.srpnet.com/prices/home/basicfaq.aspx#1 (listing the exact rates of the Basic Plan).

[90] SRP, E-26 Standard Price Plan for Residential Time of Use Service *available at* http://www.srpnet.com/prices/pdfx/ResTOU0111.pdf.

program participation. As of early 2011, SRP had 219,703 customers in the TOU program. The TOU program has verified peak load reduction rates of 95.7 MW in 2010.[91]



EZ-3 RATES

The EZ-3 rate is a new rate design that SRP introduced with its smart meter deployment. In 2010, 6,127 customers were enrolled, but SRP planned to enroll 36,000 customers in 2011. It is a voluntary rate program, but it requires participating customers to install a smart meter.[92] The EZ-3 rate employs a smaller peak price period from 3pm to 6pm Monday through Friday. It also has seasonal prices from May through October and November to April. The rates in the EZ-3 plan are higher than the TOU plan, significantly so for summer months.[93]

The EZ-3 plan was designed to encourage greater amounts of peak shaving with the deployment of smart meters. According to Scott Trout, manager of the ADAM program, the EZ-3 program has produced measureable savings in peak demand. SRP reports for 2010 show 9.2 MW in load reduction as a result of the EZ-3 plan, and project 54 MW reduced in 2011 if enrollment increases to the projected level of 36,000 customers. For the program to work well for customers, a programmable thermostat is essential. Arizona is a summer-peaking state with large air conditioning loads. To account for, and take advantage of the small peak period in this rate, customers need to pre-cool their home before 3pm, and then raise their thermostats during the 3pm to 6pm time block.[94] On average, customers on this plan use only 10% of their energy

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[91] *Id.*

[92] Interview with Scott Trout, March 21, 2011.

[93] *See* SRP E-21 Price Plan for Residential Super Peak Time-of-use Service *available at* http://www.srpnet.com/prices/pdfx/EZ3Jan2011.pdf.

[94] *See* http://www.srpnet.com/prices/home/ez3faq.aspx#5 (describing how to pre-cool in this program).

during on-peak hours.. The success of SRP's TOU rates offers evidence that voluntary dynamic pricing programs can attract participants and reduce peak demand.

M-POWER

SRP has the largest pre-pay electric service program in the nation serving over 100,000 customers.[95] The program started in 1993 with 100 residential customers and has grown at a rapid rate.[96] Other utilities from across the country have expressed great interest in the M-Power program. While the pre-paid program is not necessarily a full blown Smart Grid technology, M-Power does use advanced data and is an excellent customer behavioral pricing program. By accessing information from an in-home display unit and monitoring spending with smaller transactions, customers on M-Power have more control of their electric consumption and have reduced their usage by an average of 12%.

M-Power customers use User Display Terminals ("UDT") in their homes, corresponding Smart Cards, and 95 PayCenters across the SRP service territory.[97] When a customer initiates service under the M-Power program, a technician installs a new AMPY Landis + Gyr meter which is linked to the UDT and two Smart Cards. The Smart Cards are unique to the customer's UDT and account; they will not work in another customer's system.[98] To add more money to the account, a customer takes a Smart Card to any SRP PayCenter, inserts the card, and deposits the desired amount of cash (as low as $1) onto the account. The customer then returns home and inserts the Smart Card into the UDT. The full credit is immediately transferred through the UDT to the meter and drawn down as the customer continues to use electricity.

Source: SRP

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[95] Interview with Joe Nowaczyk, Dec. 6, 2010.

[96] Scott M. Gawlicki, *Got Prepaid?* 148 No. 7 PUB. UTIL. FORT. 10, 2 (2010).

[97] *Paying Upfront: A Review of Salt River Project's M-Power Prepaid Program*, 1-2, EPRI, Palo Alto, CA: 2010. 1020260.

[98] *Id*. at 2-2.

The key to the M-Power system on the customer side of the meter is the UDT. The UDT displays valuable information, including the following:[99]

- The current rate per hour displayed as dollars/hour, based on the amount of electricity used the previous hour
- The rate charged displaying as a kWh rate
- Today's cost (estimated)
- Yesterday's cost
- Cost this month
- Cost last month
- An estimated number of days of service remaining with the current credit
- The remaining credit

The customer can toggle through this array of information on the UDT display. Usage information helps the customer budget usage and makes the customer very aware of consumption patterns. A customer can plainly see how running the air conditioner or doing laundry impacts electric usage, and more importantly, the customer's wallet. Of course, the UDT information is critical to notifying customers when their account balances are low. The UDT gives a beeping signal when the customer's account balance falls to $10.

On the utility end of the meter, SRP receives usage information through the Smart Card and PayCenters. While the M-Power meter is similar to a smart meter, it does not provide two-way communication to SRP. Instead, customer information is transferred from the Smart Card to SRP each time the customer purchases credits at a PayCenter.[100] SRP did not develop this unique M-Power back-office system until 2007.[101] Prior to that, SRP merged M-Power customers with their existing system, generating a monthly "bill" for record keeping purposes.

Most M-Power customers, save money under the pre-pay program. The most immediate benefit is reduced service initiation fees. An M-Power system requires a $99 deposit, as compared to the $275 deposit required for traditional service.[102] Additionally, M-Power customers spread their electric payments out throughout the month. Average M-Power customers deposit credits in the $20 range four times a month in the winter and seven times a month in the summer.[103] If a customer account is drawn to zero, service will be disconnected unless the account reaches zero during the "friendly credit"

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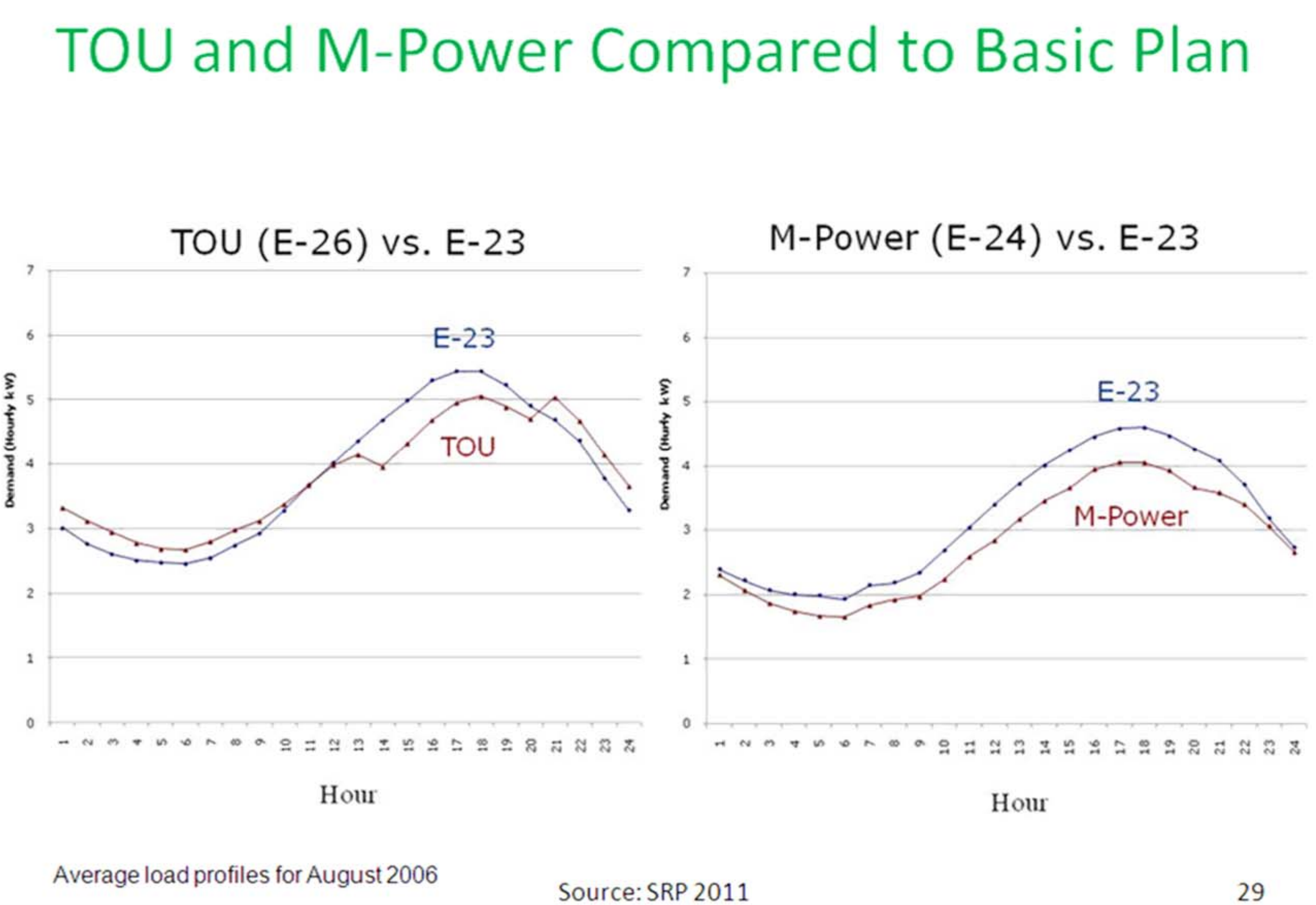
[99] *Id*. at 3-2.

[100] *Id.* at 2-4.

[101] *Id.* 1-4.

[102] *Id.* at 2-1.

[103] *Id.* at 1-3.



hours of 6pm to 6am. Because M-Power customers are not charged a disconnect or reconnect fee, they save additional money under the program. Traditional programs would charge $60 to $100 for reconnection of service.[104]

Despite the instant UDT rate and consumption information, M-Power service has a flat electric rate. M-Power customers cannot receive TOU rates. The M-Power kWh rate varies seasonally, similar to the basic rate plan. However, M-Power rates are slightly lower than the basic plan in summer months and slightly higher in the winter. M-Power also has a $15 dollar monthly service fee as opposed to the $12 service fee in the basic plan. The M-Power service fee is drawn down periodically throughout the month. Most M-Power customers experience lower overall electric costs because they tend to conserve electricity. However, a 2010 EPRI analysis shows that under equal consumption, M-Power customers could pay as much as $38 more per year than basic service customers.[105]

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[104] *Id.* at 2-3.

[105] *Id.* at 3-6.

One major criticism of the M-Power program is that it is aimed at low-income customers. Indeed, SRP launched pre-pay with a 100 home pilot program when the Arizona legislature encouraged new developments to assist low income residents.[106] However, in subsequent years, M-Power has grown to over 100,000 residents making it difficult to say that SRP is targeting low-income residents. Nevertheless, a 2010 EPRI report shows that 82% of M-Power customers earned less than $30,000 per year in 2010, compared to 64% earning below $35,000 in 1999.[107] Especially during the current economic recession, M-Power is well suited for customers with poor credit, living pay check to pay check, or who are in arrears. Customers in arrears can switch to M-Power, and SRP will apply 40% of their credit purchases toward their debt. As recently recognized by Mike Lowe, manager of customer services, SRP's bad debt write-off would likely be higher without M-Power.[108] The same EPRI analysis suggests that the arrears payment could skew price responses since a $20 purchase will only buy $12 in energy, sending a distorted price signal to the customer, equivalent to a 67% increase in prices.[109]

Despite the criticisms, the M-Power program is extremely successful. Between 83% and 96% of M-Power customers report being satisfied or very satisfied with their pre-pay service.[110] Most customers enjoy the ability to budget their energy costs, gain information from the UDT, and generally report a feeling of greater control over their energy use. SRP has also enjoyed the results of M-Power. The program won the National Energy Resources Organization award for energy efficiency,[111] and other utilities continually look to SRP as a successful model for pre-pay systems.[112]

	Montly Service Charge	Summer		Summer Peak		Winter	
		Peak	Off-Peak	Peak	Off-Peak	Peak	Off-Peak
Standard TOU	$ 15.0000	$0.1915	$0.0663	$0.2130	$0.0665	$0.1020	$0.0662
EZ-3	**$ 15.0000**	**$0.2977**	**$0.0779**	**$0.3507**	**$0.0788**	**$0.1238**	**$0.7290**
M-Power	$ 15.0000	$0.1050	$0.1050	$0.1097	$0.1097	$0.0934	$0.0934

[106] *Id.* at 1-1

[107] *Id.* at 4-6.

[108] Scott M. Gawlicki, *Got Prepaid?* 148 No. 7 PUB. UTIL. FORT. 10 (2010).

[109] *Paying Upfront: A Review of Salt River Project's M-Power Prepaid Program*, 5-4, EPRI, Palo Alto, CA: 2010. 1020260.

[110] *Id.* at 4-3.

[111] *Id.* at 1-1.

[112] Scott M. Gawlicki, *Got Prepaid?* 148 No. 7 PUB. UTIL. FORT. 10 (2010) (noting over 18 U.S. utilities have visited SRP in 2010 alone regarding M-Power).

In sum, the M-Power pre-pay program is a unique system with high customer satisfaction, significant conservation effects, and cost savings for both the customer and utility. The M-Power example, with its 12% average reduction in consumption, suggests that using today's technology to provide increased customer feedback and control can result in substantial improvements in energy conservation. While the M-Power program is not fully leveraginge Smart Grid technology as much as other TOU and smart meter programs do, it takes advantage of behavioral changes through increased access to rate and usage information – as smart meters are expected to do. The program is a valuable example of how increased access to usage information can affect customer demand. The degree to which pre-paid service can further leverage Smart Grid technologies is currently unclear. SRP's neighboring service provider, Arizona Public Service, recently filed a pre-paid service plan with the ACC which plans to leverage its expanding AMI.[113] Without a doubt, SRP's M-Power program is a national leader in pre-paid service and is deserving of the attention it has received.

DEMAND RESPONSE

One of the many promised benefits of the Smart Grid is increased demand response services. SRP offers a demand response program called the SRP PowerPartner. Under this program, SRP can call on participating facilities to voluntarily curtain their usage based on financial triggers or reliability constraints in exchange for annual payments. SRP can call up to 15 curtailment events per year for a total of 60 hours of actual load curtailment from the participant. Only two events were called in 2010. In 2010, the program had 42 participants, annual rebates of $742,493 and a load reduction of 21.1 MW.[114]

As part of its Smart Grid initiatives, SRP contracted with EnerNOC, an energy services company based in Boston, MA, to provide demand response services. Under the three-year contract with SRP, EnerNOC will provide 50 MW of verified demand response capacity, dispatchable within 10 minutes of an event. EnerNOC works with industrial and commercial facilities, installs automated demand response technology free of charge, and dispatches load curtailment events from its network operating centers. SRP expects this partnership to help manage peak load in a reliable, clean, and cost-effective way. SRP has not needed to fully utilize this program because of low load growth resulting from the economic downturn.

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[113] *Id.*

[114] SRP, 2010 Energy Efficiency Report (2010).

ELECTRIC VEHICLE INTEGRATION

As infrastructure investments are made in the T&D system, utilities must account for the projected increase in plug-in hybrid electric vehicle (PHEV) and electric vehicle (EV) ownership. SRP is planning for PHEV deployment as a part of its DFA initiative. SRP is monitoring locations within its service territory where customers are purchasing PHEV or EV cars. The reliability impact of fast charging is the largest concern for SRP and most utilities, but for now, SRP is not taking any immediate action.

SRP is confident that its distribution system can handle an increase in PHEV or EV charging without a threat to reliability because the transformers on SRP's system are rated to handle significant air conditioning load at the residential level. Therefore, near to medium term, SRP can support charging at 120 volts and 240 volts at the home with little to no system impact.[115] However, SRP does not currently encourage fast charging (one hour or less and greater than 6 or 7 kW) at the residential level and anticipates near term industry practice will be to limit fast charging to commercial sites. Fast charging, 20 kW, or more, would exceed the capacity of many service entrance sections.

Nor does SRP foresee changing pricing plans or incurring any additional costs from the integration of PHEVs in the near term. SRP will encourage customers to use current TOU pricing plans for vehicle charging, and the company and will not offer any special nighttime rates at this time. Furthermore, if customers want or need increased capacity to accommodate PHEVs, the customer will bear the cost of adding additional capacity out of the main panel to a sub panel, and a dedicated circuit (240 V) for the electric vehicle supply equipment. For the most part, SRP anticipates that challenges integrating PHEVs or EVs with the grid will not be an issue in the short term and the auto manufacturer will address many of the issues currently being discussed in the utility industry. SRP will evaluate the system impacts of the vehicles to determine if, longer-term, changes in pricing policy, design standards or other adjustments are necessary.

IMPLEMENTATION ISSUES

Building out the Smart Grid is a tremendously complex process with an array of challenges. Utilities must work to integrate many different operational systems, manage a flood of new data, ensure security of the system and information, and plan for new technologies. While SRP is a leader in many of its Smart Grid initiatives, barriers to full implementation still exist.

[115] Interview with Joe Nowaczyk and Jeff Younger, March 21, 2011.

As previously mentioned SRP does not face any of the regulatory approval or cost recovery barriers that other utilities have experienced. As a political subdivision of the state of Arizona, SRP is not subject to regulation by the ACC. The Board approves investments internally; therefore, SRP has a greater degree of flexibility to make investments – allowing SRP to build out the backbone of a Smart Grid system first to efficiently support future applications.

Although SRP's unique regulatory situation has prevented some barriers to Smart Grid implementation, the company faces several challenges in structure, technology, and standards. Back-office issues present a challenge to fully utilizing and integrating Smart Grid technologies. SRP is also working to overcome technological struggles to connect communications with the "last mile" of its distribution system and to link the AMI system with the DFA system. Lastly SRP notes several barriers created by a lack of, or slowly developing, federal standards.

The growing Smart Grid will allow utilities to gather more system information than ever before. Managing this wealth of data and connecting corporate departments with the information they need is a daunting challenge. SRP ranks the Enterprise Application Integration initiative as the most difficult, but highest impact section of its Smart Grid plan. This is an IT challenge that requires SRP to create systems for data exchange across departments to link all of its assets. SRP is planning and assessing its needs and designing an integration system. The system will utilize a common information model specific to SRP's needs and IEC standards.

SRP faces the challenge of automating and connecting the "last mile" of its distribution system from the residential meter to the substation. SRP is not alone in this challenge. Many utilities are struggling to find the right communications technology to create a secure, reliable connection at an efficient cost. SRP is considering whether to develop this technology itself or to use a third-party provider.

As a related issue, SRP notes that there are barriers to integrating the AMI system with the DFA system. The two systems use disparate communication technology with varying latencies and capacities. Adding 50 data points from each of one million smart meters along with the data flow requirements of ever increasing intelligent devices throughout the electric and water system is not currently feasible with the existing communication systems in place today. The current system cannot handle the latency and increased bandwidth requirements of linking these processes. Should SRP determine linking the AMI and DFA systems is in the best interest of SRP and its customers. SRP estimates that even the first stages of linking the AMI and DFA systems are five years out at minimum.

SRP has also noted two key standards issues. The first is related to the "last mile" communications infrastructure. Smart Grid technologies require two-way wireless communications between customers and the utility. Currently, the FCC controls dedicated spectrums for wireless, and utilities do not have a secure dedicated spectrum. SRP currently uses both licensed and unlicensed spectrum; however, unlicensed spectrums are subject to interference or interruption and are not secure enough for all applications. SRP notes that a common spectrum for utilities will allow for interoperability between vendors and raise competition in services.[116] SRP also notes that NIST cyber security standards should coincide more effectively with NERC CIP standards.

The recent economic recession has impacted SRP's Smart Grid initiatives. Many of the Smart Grid initiatives described in this report are becoming standards for new construction, but the demand for more energy and new projects has recently declined in Arizona. As a result, the development of the Smart Grid has slowed in SRPs service territory. Constrained capital budgets also make some projects difficult for SRP to execute. The ARRA grant for smart meter deployment helped to offset these new constraints on capital investment.

OBSERVATIONS AND CONCLUSION

SRP has enjoyed considerable success with its Smart Grid initiatives, and much of its work represents best practices in the field. SRP views the current priority of Smart Grid investments as building out the backbone of the system. Yet while SRP's Smart Grid investments are arguably more "utility centric" rather than customer focused, SRP remains committed to customer service. In fact, SRP has been awarded the highest score in customer satisfaction for residential and business electric services by J.D. Power and Associates for 11 of the past 12 years.

With programs such as M-Power, TOU rates, energy efficiency services, and smart meter deployment, SRP is enhancing value to its customers. M-Power has an enormous satisfaction rate of 89% or more, and most customers believe they are using energy more wisely which has been confirmed by internal and external analyses. Other programs at SRP give customers more access to real time energy information or simply more education about their electricity usage. SRP offers web-based tools about efficiency improvements, Kill A Watt meters, and a web account to monitor and control consumption. In sum, Smart Grid improvements ultimately give the customers greater control of their electric services.

[116] Presentation to National Science and Technology Council Subcommittee on Smart Grid, Aug. 23, 2010.

There are a number of valuable lessons from the SRP experience including:

1. SRP has been successful in a wide range of Smart Grid applications audits success has come through advanced planning and policy support, a successful partnership with EPRI, and a full system approach to Smart Grid technologies. SRP has emphasized the necessity to develop the technological backbone for the Smart Grid and has demonstrated its technological competency through its implementation.
2. SRP's longtime experience and leadership on voluntary time of use rates, which it has further leveraged with smart meter technology, offers promise that voluntary, opt-in approaches to dynamic pricing can be successful with good program design and strong credibility with your customers.
3. SRP's M-Power prepay program demonstrates that giving customers both current feedback on their electrical usage and the ability to control that usage through appropriate technology can lead to significant reductions in electrical usage and highly satisfied customers.

SRP is a unique utility with a deep history, but it is taking aggressive steps to modernize its electric system. Like other leaders in Smart Grid implementation, these efforts mark a starting point, rather than an ending point, in establishing a truly Smart Grid. To be sure, investment in smart meters and AMI represents an important step in Smart Grid implementation. Yet, in many ways, it is only the first phase in a complex process. The Electric Power Research Institute has estimated that fully implementing a smart electric grid nationally will cost between $1.3 and $2.0 trillion, with benefits likely exceeding costs by a factor of three or more.[117] The $3.4 billion in Smart Grid Investment Grants from the U.S. Department of Energy represents only a fraction of the total cost for a national-level Smart Grid build out.

Research from Pacific Northwest National Laboratory (PNNL) estimated that with full implementation of a smart electric grid by 2030 U.S. energy consumption and carbon emissions could be reduced by 12 %.[118] A smart electric grid allows utilities to expand energy efficiency and demand response services to all customers, and SRP's leadership in TOU rates and M-Power place it a step ahead of most other utilities. Yet, as noted previously, it will take time to develop and offer additional technologies and rates to customers. In some areas, the Smart Grid will allow customers to use electricity more conscientiously, by charging electric vehicles during off-peak hours for example, in order to achieve efficiency in total energy use across the economy.

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[117] Elec. Power Research Inst., Estimating the Costs and Benefits of the Smart Grid 1–4 (2011).

[118] Pacific Northwest Nat'l Lab., The Smart Grid: An Estimation of the Energy and CO2 Benefits 3.3 (2010).

Continued investment in automation of the utility distribution system will offer future opportunities for improving reliability and optimizing energy use. In order for electric vehicles to reach the levels of consumer adoption predicted in PNNL’s analysis, all levels of government must implement significant new policies , and utilities must build new infrastructure. Furthermore, as renewable energy grows to constitute a larger percentage of generation, utilities will need to invest in Smart Grid technologies in order to reliably and cost-effectively manage these intermittent resources.

At SRP, Smart Grid implementation is not only off to a productive start, but because of SRP’s long established leadership with TOU rates and pre-pay electric service its experience should be used as a model for other utilities’ planning and implementation. However, ongoing policy refinements, project development, and infrastructure investment will be needed in order to achieve the Smart Grid’s full, long-term potential.

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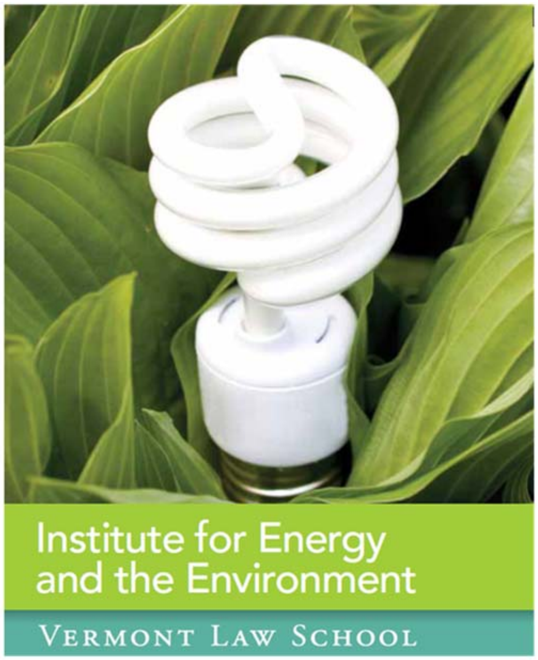

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