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Maintaining High Levels of Energy Savings from Utility Energy Efficiency Programs: Strategies from the Southwest

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ABSTRACT

This paper discusses the main strategies that electric utilities in the Southwest are employing or proposing in order to meet increasing energy savings goals and standards, in spite of reduced savings potential (to utilities) because of recent federal efficiency standards and stronger building energy codes. These strategies include: 1) promoting behavior change in all sectors; 2) integrating demand response and energy efficiency efforts; 3) building the market for LED lamps; 4) implementing conservation voltage reduction in the distribution grid; 5) adding financing components to energy efficiency programs; 6) striving for deeper energy savings, higher program participation and continuous improvement; and 7) supporting building energy code adoption and implementation. In addition, the paper provides an estimate of the energy savings potential of these seven strategies for a representative utility in the region. We estimate that the seven strategies in combination could yield 5.3 percent energy savings by 2020 as a result of programs and measures implemented during 2015-2020.

Introduction

With encouragement from the Southwest Energy Efficiency Project (SWEEP), electric utilities in the Southwest greatly expanded their demand-side management (DSM) programs in recent years. As shown in Table 1, total funding for these programs was only about $29 million in 2002. Funding steadily increased to about $345 million in 2013. Of this total, approximately 88 percent was spent on energy efficiency programs and 12 percent on load management or demand response programs.

Table 1. Electric Utility DSM Spending in the Southwest, 2002-13

State	DSM program expenditures (million $ per year)						
	2002	**2004**	**2006**	**2008**	**2010**	**2012**	**2013**
AZ	4	4	19	45	94	127	124
CO	11	21	18	28	66	96	94
NV	3	11	30	55	46	38	39
NM	1	1	1	10	24	28	29
UT	9	16	27	36	51	47	55
WY	~0	~0	~0	~0	3	4	4
Region	**29**	**54**	**95**	**174**	**284**	**340**	**345**

Source: Southwest Energy Efficiency Project

The growth in DSM activity in the region has been heavily influenced by policies enacted in recent years. Table 2 summarizes the key policies affecting DSM efforts in each state. In short, there are many more "checks" in the chart today compared to five or ten years ago. Four states have adopted energy savings goals or standards for investor-owned electric utilities. Four states use the Utility Cost test, Societal Cost test, or a version of the Total Resource Cost (TRC) test that includes valuing non-energy benefits as the primary test for determining if energy efficiency programs are cost effective; the other two states use the standard TRC test. Integrated resource planning requirements are in place in all states except Wyoming. In addition, three states have adopted performance-based incentives to provide a financial incentive and/or mitigate any adverse financial impact that operating DSM programs has on a company's bottom line. Four states have adopted decoupling of energy sales or fixed cost recovery for gas utilities, but no state has adopted revenue decoupling of electricity sales for electric utilities.

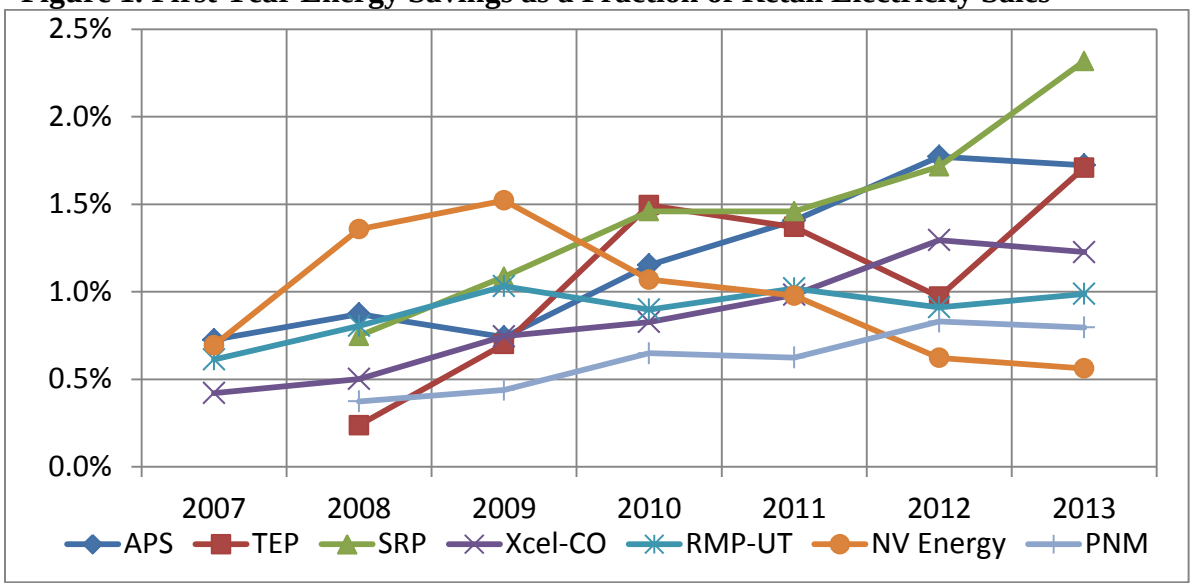
Table 2. Key Policies Influencing Electric Utility DSM Programs in the Southwest

Policy	AZ	CO	NM	NV	UT	WY
Energy efficiency goals or standards	✓	✓	✓	✓ (1)		
Integrated Resource Planning	✓	✓	✓	✓	✓	
Use of Utility Cost test, Societal Cost test, or TRC including valuation of non-energy benefits	✓	✓	✓		✓	
Convenient DSM cost recovery mechanism	✓	✓	✓	✓	✓	✓
Financial incentive for utility shareholders	✓	✓	✓			
Electric lost revenue recovery mechanism	✓			✓		
Natural Gas decoupling or lost revenue recovery	✓			✓	✓	✓
Industrial self-direction option	✓	✓	✓		✓	✓

Notes: (1) Energy savings are allowed to count towards clean energy standards.

There has been significant growth in energy savings resulting from electric utility energy efficiency programs implemented in the Southwest in recent years. Figure 1 shows the energy savings trends by major utility, using the metric of first-year energy savings as a fraction of retail electricity sales from programs implemented each year. As of 2013, the Salt River Project (SRP) achieved 2.3 percent savings in part because it includes the estimated savings from its pre-pay metering program in its total savings. Without including this, SRP achieved savings of about 1.4 percent of sales in 2013. Arizona Public Service Company (APS) and Tucson Electric Power (TEP), achieved 1.7 percent gross savings, and the main utility in Colorado (Xcel Energy) achieved 1.25 percent net savings (1.45 percent gross savings). The savings achieved by the main utility in Nevada (NV Energy) declined significantly since 2009 due to the strong recession experienced in the state, reductions in DSM program funding, and controversy surrounding a lost revenue recovery mechanism (Geller et al. 2012).

Figure 1. First Year Energy Savings as a Fraction of Retail Electricity Sales



Utilities in the Southwest, as in other regions of the country, are confronting a number of issues and challenges, some of which are pushing utilities to achieve greater energy savings while others are reducing savings potential for utilities. These issues and challenges include:

- the strong energy efficiency standards or energy savings goals adopted in states such as Arizona and Colorado;
- integrated resource planning processes that continue to demonstrate that energy efficiency is the least cost resource by far;
- loss of some energy savings potential from certain DSM measures, such as compact fluorescent lamps (CFLs) and T12-to-T8 fluorescent lamp conversions, due to federal energy efficiency standards;
- higher baselines that are reducing savings potential from utility new construction programs due to strengthening state and local energy codes; and
- environmental considerations including concerns about local and regional air pollution as well as proposed carbon dioxide emissions standards.

Strategies for Maintaining High Levels of Energy Savings

The remainder of the paper reviews seven strategies that electric utilities in the Southwest are starting to deploy to maintain or increase energy savings from utility programs in light of the issues and challenges just described. The seven strategies are:

1) promoting behavior change in the residential, commercial and industrial sectors;
2) integrating demand response and energy efficiency efforts;
3) building the market for LED lamps;
4) implementing conservation voltage reduction in the distribution grid;
5) adding financing components to energy efficiency programs;
6) striving for deeper energy savings, higher participation and continuous improvement; and
7) supporting building energy code adoption and implementation.

In addition, we estimate the energy savings potential of the seven strategies for a representative utility in the region and compare this to the loss of savings potential due to recent

federal lighting standards, strengthening building energy codes, and the increasing market penetration of CFLs.

Promoting Behavior Change

Most utilities in the Southwest are implementing Home Energy Reports pilot programs and finding that the programs are providing at least as much if not more energy savings than was projected at the time the pilot was designed. For example, Rocky Mountain Power (RMP) in Utah found that households receiving home energy reports reduced electricity use 2.3 percent on average in 2013, 39 percent more than what was projected when the pilot program was designed (RMP 2014). In addition, utilities such as Xcel Energy are finding that providing home energy reports increases participation in other hardware-based energy efficiency programs.

As a result, a number of utilities in the Southwest are proposing to scale up Home Energy Report programs. Xcel Energy has proposed providing reports to 500,000 households (about 43 percent of its total residential customer base) during 2015-17. RMP is proposing to increase the number of customers receiving reports by 200,000. The municipal utility in Fort Collins, CO has already begun to provide reports to all its residential customers based on the success of pilot programs. Scaling up home energy reports greatly expands the number of customers that achieve some level of energy savings, thereby reducing the number of non-participants in DSM programs as well as increasing cost-effective energy savings.

In Arizona, Salt River Project (SRP) offers a program that combines prepay elements with energy saving education and in-home display monitors (which are available in both English and Spanish). Three different independent impact studies found that participants reduce their annual energy consumption by 12 percent on average (SRP 2013). This program has more than 139,000 participants, and 94 percent of participants report that they agree or strongly agree that the program helps them use energy more wisely (SRP 2013).

Regarding behavior change in the commercial and industrial sectors, a few utilities in the Southwest are implementing or planning business energy reports pilot programs for small business customers, modeled on successful home energy report programs. For example, Xcel Energy is implementing a business energy reports pilot program in 2014 with 10,000 small businesses receiving print reports and 12,400 customers opting to receive electronic reports. Business energy use per unit of floor area will be compared to others in the same subsector; e.g., a restaurant will be compared to other restaurants. The utility is hoping to measure at least one percent electricity and natural gas savings on average for customers that receive print reports or access their electronic reports, compared to a control group (Xcel Energy 2013).

A few utilities in the region are starting to provide funding for commercial and industrial (C&I) energy managers as well as promote strategic energy management (SEM),[1] based in part on successful programs along these lines in the Pacific Northwest. In Utah, RMP is providing $0.025 per kWh of annual energy savings towards the salary and overhead of energy managers, up to 100 percent of salary and overhead, as long as the company or public sector entity achieves at least one million kWh of energy savings per year. This support is provided in addition to the normal rebates for energy efficiency measures. The program began in July, 2013 and supported five energy managers as of March, 2014.

[1] Strategic energy management involves setting energy savings goals, a commitment to ongoing energy efficiency improvements, and tracking progress towards the goals.

In Colorado, Xcel Energy is working with its largest customers to set medium and longer term energy savings goals and implement multi-year energy efficiency improvement strategies through the Process Efficiency program. This program also involves high level executive engagement, scoping studies to identify the largest energy savings opportunities, data mining and analysis, and project implementation support. It is exceeding targeted energy savings goals at a levelized cost of saved energy of 0.8-0.9 cents per kWh (Kennedy 2014). As of March 2014, approximately 15 percent of Xcel Energy's largest customers targeted for this service were participating in the program.

Integrating Demand Response and Energy Efficiency Efforts

Integrating energy efficiency and demand response (DR) is another step that utilities in the Southwest are starting to take to increase energy savings. NV Energy is a leader in this area with its residential HVAC optimization program, known as *mPowered*, in southern Nevada. The program involves installation of smart thermostats in conjunction with a cloud-based energy efficiency and demand response service. This service automatically makes small temperature adjustments without diminishing resident comfort, using continuous monitoring, thermal profiles and customer preferences tailored to each home.

The thermostats are also used by the utility to call demand response events in which the home is pre-cooled—according to the home's thermal properties—before the event. During the event the home's indoor temperature floats up by no more than four degrees above the normal set point. The technology automatically seeks a balance between enhancing load impact and reducing customer discomfort during a DR event. Customers are able to control their thermostat via a smartphone or the internet.

The program takes advantage of the smart meters that NV Energy has installed across its service area to enhance post-DR event measurement and verification, event forecasting, and to calculate customer-specific rebates for DR event participation. However, smart meters are not required for deploying the advanced thermostats. Participation is promoted through offering the smart thermostat, software, optimization service and thermostat installation at no cost to the customer. Energy and utility bill savings are stressed in program marketing, in contrast to the financial incentive in traditional load management or demand response programs.

The *mPowered* program was launched in October 2012. NV Energy had about 15,000 customers enrolled and 23,000 smart thermostats installed as of February 2014. Preliminary analysis indicates an average peak reduction of 3.5 kW per home during the first hour of a demand response event, higher than anticipated. Electric energy savings are 585 kWh per household per year on average, slightly above the projected savings of 500 kWh per household per year (Brown 2014). In Las Vegas, this is equivalent to about 10 percent cooling energy savings on average. Initial customer interviews showed that 86 percent of participants are very satisfied or somewhat satisfied with the program (Brown 2014).

NV Energy also launched a combined demand response and HVAC energy efficiency program for its commercial customers. Like the residential program, the commercial program includes a combination of HVAC control measures and a cloud-based software service that optimizes HVAC system performance. Early participants include one hotel/casino property, four state buildings, City of Las Vegas buildings, and the University of Nevada, Reno. Initial results are showing about 10 percent energy savings on average along with peak reductions when demand response events are called (Brown 2014).

During 2014, NV Energy hopes to add 14,000 households to the residential HVAC optimization program along with 30 new participants in the commercial program, with a target of

8 GWh per year of energy savings and 45 MW of peak demand reduction potential from new participants in 2014 (not counting peak demand reduction potential from the utility's legacy AC load control program).

In Arizona, APS is implementing a Home Energy Information Pilot to test a variety of communication devices, DR strategies, and "smart" home applications for the residential setting including web interfaces, smart phones, and programmable, Wi-Fi enabled thermostats (APS 2011). The pilot program is striving for both energy savings and peak demand reduction. The results of the pilot program will be used to design a future full-scale program. Similarly, SRP is exploring how programmable thermostats and time-of-use pricing may help limited income customers save energy.

In Colorado, Xcel Energy is planning to implement a Wi-Fi enabled smart thermostat pilot program starting in the second half of 2014. The goals will be to study the amount of electricity and natural gas savings after the smart thermostats and associated software are installed, assess the receptivity of thermostat owners and users to demand response program participation, and test various smart thermostat models and distribution channels with respect to ease of program implementation as well as customer response. The pilot program is not fully designed yet, but the preliminary target is 5,000 participants.

Building the Market for LED Lamps

LED lamps offer the potential for large scale energy savings in all sectors—residential, commercial and industrial. As energy savings from utility promotion and incentives for CFLs decline due to factors such as the federal lamp efficiency standards, increasing CFL market penetration and declining net-to-gross energy savings values, utilities are ramping up promotion of LED lamps. This is occurring at the same time that LED lamps are rapidly improving in performance and declining in cost.

Many utilities in the Southwest are providing upstream incentives in order to reduce the retail price of LED lamps, targeting a final price to the consumer of around five dollars per lamp. These programs (or program components) are scaling up very fast. For example, Xcel Energy is targeting purchase of 265,000 discounted LED lamps in 2014, compared to 86,000 LED lamps purchased through its in-store discount program in 2013. NV Energy has a target of 250,000 LED lamps in 2014, the first year of its residential LED lighting program. RMP expects that LEDs will provide over 50 percent of the energy savings from its residential lighting program in 2014 (RMP 2014).

Including an LED lamp in the kit provided through school education programs is another strategy that utilities in the Southwest are starting to employ to increase awareness and promote adoption of LED lamps. In Colorado, Black Hills Energy started doing this in 2013 and Xcel Energy began doing so in 2014.

Utilities in the Southwest are also scaling up the promotion of LED lighting in the commercial and industrial sectors. Utilities are adding new LED products, such as LED troffers and LED fixtures for parking garages, to prescriptive rebate programs. This in turn facilitates promotion of LED lamps and fixtures by trade allies as well as adoption by businesses and public sector entities. In addition, some utilities in the region are planning to offer upstream incentives to lighting distributors in order to increase the supply of LED lamps and their sale to businesses.

As a result of these actions, some utilities in the region are expecting increased savings from C&I lighting programs in the near future, in spite of the removal of T12-to-T8 lamp conversions from utility programs due to the federal fluorescent lamp and ballast standards. For example, Xcel Energy is targeting savings of 101 GWh per year from its C&I lighting efficiency

programs in 2014, compared to 88 GWh per year of savings achieved in 2013 when T12-to-T8 lamp conversions still provided energy savings (Xcel Energy 2014).

LED street lighting is being implemented on a large scale in some areas in the Southwest. Taking advantage of rebates from NV Energy, the City of Las Vegas has replaced 45,000 street lights (over 80 percent of all street lights in the city) with LED lamps. These lamps are providing 30-40 percent electricity savings on average (Vellota 2014). In Colorado, Xcel Energy has proposed an LED street lighting program for utility-owned street lights that municipalities pay to operate and upgrade. The projected annual energy savings is 60 GWh by 2020 (Sundin 2013).

Implementing Conservation Voltage Reduction in the Distribution Grid

Some utilities in the Southwest are considering enhanced control and optimization of voltages in distribution feeders as a means of providing additional energy savings for consumers of all sizes. By lowering and flattening voltage levels along distribution feeders through continuous monitoring and use of capacitors, utilities can ensure that consumers experience voltages in the range of 114-120 volts (for low voltage consumers) rather than voltages in excess of 120 volts at times. This in turn reduces the energy consumption of a wide range of devices including incandescent and fluorescent lamps, motors, and many devices powered by motors including refrigerators, clothes washers and air conditioners. Xcel Energy conducted tests of conservation voltage reduction (termed distribution voltage optimization, or DVO, by the utility) in feeders served by two substations. In this pilot, customers experienced 2.5 percent energy savings on average with virtually all consumers experiencing some level of energy savings (Bloch 2013). Consumers did not notice any change in energy service levels.

Based on this positive experience, Xcel Energy has proposed implementing DVO system-wide during 2015-2020. The cost is estimated to be $92 million with projected energy savings of 506 GWh per year (1.8 percent of total electricity consumption) and peak demand reduction of 56 MW at the end of the five-year build out (Bloch 2013). Furthermore, the utility is projecting net economic benefits of $307 million for customers and a benefit-cost ratio of 4.3 from the TRC test perspective (Petersen 2013).

Xcel Energy is proposing to implement DVO as a DSM program because the vast majority of the benefits are the energy savings experienced by customers, even though the investment is made in the utility's distribution system. Adding DVO as a DSM program would increase energy savings during 2015-2020 by 21 percent relative to the energy savings goals for Xcel Energy's traditional DSM programs during this period. The Colorado Public Utilities Commission has approved including DVO in the utility's 2015-16 DSM programs plan.

In Nevada, NV Energy is planning a conservation voltage reduction pilot project in 2015 that would affect about 50,000 customers on up to six distribution feeders. Implementation will be facilitated by the fact that the utility has already adopted AMI for all its customers. The pilot project, if approved by the Public Utilities Commission of Nevada, will be funded and implemented outside of the utility's portfolio of DSM programs.

Adding Financing Components to Energy Efficiency Programs

To help customers minimize the upfront capital costs of energy efficiency investments while lowering ratepayer costs for energy efficiency program delivery, utilities in the Southwest are adding financing components to various efficiency programs. In many cases this is being done in partnership with traditional lenders.

In Arizona, APS has partnered with the National Bank of Arizona to offer financing options for both residential and non-residential customers including schools, municipalities and small businesses. Under the residential program, customers who participate in the utility's Home Performance with ENERGY STAR® program can access financing at below-market rates for several energy efficiency measures such as insulation, qualified HVAC equipment and duct sealing. APS provides a loan loss reserve that enables the bank to offer loans to households with only a moderate credit rating. While the total number of residential loans issued remains small, likely because the interest rates and terms are not much more attractive than financing in the market, APS reports that no customers have defaulted in the program (APS 2014).

In Colorado, Xcel Energy is implementing an energy efficiency financing pilot program. Rather than offering financing directly or partnering with a particular financial institution, Xcel tries to ensure that all of its customers have some sort of financing option available through private or public sector entities. Also, the utility provides outreach and marketing support (e.g., ensuring that its trade allies are promoting the financing options) to help increase the number of energy efficiency loans that are made. The pilot program is funded at the modest level of $200,000 per year. While this approach is promising, it remains to be seen whether it will be effective in increasing "deal flow" and providing significant incremental energy savings.

Striving for Deeper Energy Savings, Higher Participation and Continuous Improvement

Utilities in the southwest are developing and implementing strategies to support deeper energy savings, higher program participation and continuous energy improvement among their residential and business customers. The Xcel Energy Process Efficiency program described above is one example of this.

Numerous programs in the region offer sliding scale rebates and financial incentives to encourage customers, program contractors, and builders to pursue higher levels of energy efficiency and deeper energy savings. For example SRP's ENERGY STAR homes program provides builders with $500 for constructing homes with a HERS Index of 70 and an additional $50 per HERS Index point below 70. Such scaled incentives have caused several developers to offer homes with HERS ratings of 55 or below. And APS's commercial new construction program has five tiers of incentives starting at $0.06 per annual kWh saved for new buildings that are 10-20 percent better than code, increasing to $0.14 per annual kWh saved for buildings that are at least 50 percent better than code (APS 2012).

In Colorado, Xcel Energy requires customers to implement air sealing, insulation and CFLs/LEDs (at a minimum) and achieve at least 20 percent whole house energy savings in order to be eligible for rebates within its Home Performance with ENERGY STAR program. This led to much greater energy savings per participant compared to the results prior to the utility adopting these requirements (Xcel Energy 2013).

SRP offers concierge and facilitation services as well as industry-specific technical support to large customers in key industries such as mining and semi-conductor production. These services are offered at no charge to the customers. As a result, several very large customers have developed multi-year plans and projects for increasing energy efficiency and meeting other sustainability objectives, with a focus on continuous energy improvement.

APS developed a sophisticated market segmentation strategy that enabled targeted marketing messages to different types of households. This led to a three-fold increase in responses to direct mail marketing (Hines 2012). APS also overhauled its customer tracking system for its Home Performance with ENERGY STAR program in order to improve post-audit

follow-up and thereby achieve increased measure implementation and greater energy savings per participant. The APS program has a fairly high conversion rate of around 40 percent.

A number of utilities in the region are planning or considering upstream incentive programs in order to increase energy savings. Xcel Energy, for example, is exploring upstream incentives for distributors in order to boost adoption of LED lamps as well as high efficiency packaged HVAC equipment in the C&I sectors. Experience in California, Massachusetts and Vermont has shown that upstream incentives can greatly increase the adoption of these energy-efficient technologies (Quaid and Geller 2014).

Finally, utilities throughout the Southwest have expanded their program offerings in order to increase participation and overall energy savings. A number of utilities, including Xcel Energy and Public Service Company of New Mexico, are adding building tune-up programs to complement traditional C&I prescriptive rebate, custom rebate and direct installation programs. In Utah, RMP has expanded its energy management services for its business customers. And a number of utilities have launched or are planning programs for multifamily housing. Of note, APS's multifamily program saved 9.5 GWh per year in 2013, more than half as much savings as was achieved in the utility's single family home retrofit program (APS 2014).

Supporting Building Energy Code Adoption and Implementation

Several southwestern utilities are implementing or developing programs to promote the adoption and support the implementation of state-of-the-art building energy codes. In Arizona, a home rule state, SRP's Building Energy Code Initiative provides information, training, and technical assistance to municipal building code officials, building code advisory board members, and elected officials around the adoption of the International Energy Conservation Code (IECC) and the ASHRAE 90.1 standard (SRP 2013). SRP also provides code books and other materials to local jurisdictions and offers training and educational support to builders, architects, and contractors. Since the launch of the SRP program, nine of the 15 jurisdictions in SRP's electric service territory adopted the 2012 IECC. SRP reported energy savings of 7.8 GWh per year from its building code support work during the 2013 fiscal year (SRP 2013).

APS supports building energy code implementation through its Energy Codes and Appliance Standards Initiative. For example, in 2013, APS developed two energy code training curricula: "Success with the 2009 IECC" and "Success with the 2012 IECC" (APS 2014). These trainings aim to teach builders, architects, and contractors the requirements of the code by illustrating real building situations, building science details, and code requirements (APS 2014).

Other utilities in the region, including RMP, Questar Gas Company in Utah, and Public Service Company of New Mexico, are funding training of code officials, architects, builders and contractors but without taking any energy savings credit for doing so.

Energy Savings Potential

In order to quantify the potential energy savings that these newer technologies and program strategies could provide, we use Xcel Energy as an example.[2] Xcel Energy serves about 1.2 million residential customers and 210,000 business customers in Colorado, with total retail electricity sales of about 29 TWh per year. Electricity sales are expected to increase to about 31 TWh per year by 2020, including the effects of planned energy efficiency programs. Our back-

[2] Xcel Energy is aware of but has not approved or endorsed this analysis.

of-the-envelope estimates of savings potential by 2020 are explained below; key assumptions are based on Xcel-specific data wherever possible. All estimates are gross energy savings.

Behavior Change – Residential: Assume Home Energy Reports are provided to all customers by 2020 either in paper or electronic form with 2 percent savings on average; savings maintained over time if the reports start prior to 2020. *Total savings in 2020 = 180 GWh per year*.

Behavior Change – Business: Assume Business Energy Reports, SEM and other strategies to improve O&M practices are provided to all businesses by 2020 with 1 percent savings on average; savings maintained over time. *Total savings in 2020 = 200 GWh per year*.

Integrated DSM/DR Using Wi-Fi Enabled Smart Thermostats: Assume 40 percent central air conditioner (CAC) saturation and 2,000 kWh per year of electricity use per CAC unit on average by 2020. Assume Wi-Fi enabled smart thermostats provide 10 percent savings on average and are used by 25 percent of households with CAC systems by 2020. *Total savings in 2020 = 27 GWh per year*.

Conservation Voltage Reduction: Based on Xcel Energy's proposed DVO initiative. *Total savings in 2020 = 506 GWh per year*.

LED Lamps – Residential: Assume 30 watts savings on average relative to EISA-compliant lamps; lamp use of 870 hours per year on average; ramp up to purchase of two million LED lamps per year through in-store discounts with a total of 9 million LED lamps purchased during 2015-2020. *Total savings in 2020 = 234 GWh per year* (19.5 percent of projected residential lighting electricity use).

LED Lamps – Commercial/Industrial: Projected C&I lighting electricity use in 2020 absent LEDs is 6,400 GWh per year. Assume LEDs provide 5 percent savings on average by 2020. *Total savings in 2020 = 320 GWh per year* (53 GWh per year on average during 2015-2020).

LED Lamps – Street Lighting: Based on Xcel Energy's proposed LED Street Lighting initiative. *Total savings in 2020 = 60 GWh per year*.

Other New Strategies – Increase Residential Retrofit: Ramp up single family retrofit and add a multifamily retrofit program, add financing and other features to increase customer uptake. *Total savings in 2020 = 20 GWh per year* (additional 3.3 GWh per year).

Other New Strategies – Upstream Incentives for Commercial HVAC Equipment: Triple savings compared to achievements in the commercial cooling program in recent years. *Total savings in 2020 = 60 GWh per year* (additional 10 GWh per year).

Energy Codes Support: Assume half as much savings as SRP has achieved, due in part to less energy use per home or square footage of floor area. *Total savings in 2020 = 23 GWh per year*.

Table 3. Potential Energy Savings in 2020, Xcel Energy Example

Program Area	Savings in 2020 (GWh per yr)
Behavior Change – Residential	180
Behavior Change – Business	200
Integrated DSM/DR Using Wi-Fi Enabled Smart Thermostats	27
Conservation Voltage Reduction	506
LED Lamps – Residential	234
LED Lamps – Commercial/Industrial	320
LED Lamps – Street Lighting	60
Increase Residential Retrofit	20
Upstream Incentives for Commercial HVAC Equipment	60
Energy Codes Support	23
All	**1,630**

As shown in Table 3, we estimate a total energy savings potential of 1,630 GWh per year by 2020, equivalent to about 5.3 percent of Xcel Energy's forecasted electricity sales that year. With a six year implementation period, this is equivalent to nearly 0.9 percent savings per year on average. The main strategies for achieving this level of savings are ramping up behavior change programs, promoting adoption of LED lighting in all sectors, and implementing conservation voltage reduction.

In order to compare this level of additional energy savings potential with that lost to the utility as a result of recent federal energy efficiency standards, strengthening building energy codes, and increasing market penetration for CFLs, we use the average energy savings achieved by Xcel Energy during 2011-13 along with the following assumptions regarding how energy savings will change during 2015-2020 relative to savings during 2011-13:

- Loss of two-thirds of the energy savings from CFLs: -76.9 GWh/yr
- Loss of all energy savings from T12 to standard T8 lamp conversions: -17.7 GWh/yr
- Loss of the half the energy savings from both residential and C&I new construction programs: -13.4 GWh/yr

The total loss of energy savings during 2015-2020, compared to that achieved during 2011-13, is 108 GWh per year. Over the six-year time period, this accumulates to a loss of 649 GWh per year in 2020. Thus, the potential additional savings from innovative technologies and program strategies in 2020 is 2.5 times greater than the loss of savings from the factors noted above. With a net increase in savings potential of nearly 980 GWh per year (3.2 percent) by 2020, Xcel Energy (as well as other utilities) should be able to maintain total energy savings in the range of 1.5-2.0 percent per year during 2015-2020. Of course the values in Table 3 are estimates that could prove to be lower (or higher) in the real world depending on how well programs are funded and implemented, how newer technologies such as LED lamps evolve over time, and the level of customer response.

Conclusion

Utilities throughout the Southwest are implementing a number of strategies that could increase energy savings in the future relative to savings achieved in recent years. Most of the strategies–including promoting behavior change on a large scale; building the market for LED lamps; implementing conservation voltage reduction; and striving for deeper energy savings, higher program participation and continuous improvement–can be implemented by utilities anywhere in the U.S.

If these strategies are implemented in combination, they should add significant energy savings to utility efficiency programs in the 2015-2020 timeframe, thereby helping utilities to maintain or increase total savings relative to what was achieved in recent years. Our quantitative estimates for one utility in the Southwest suggest total savings potential of more than five percent of projected electricity use in 2020, or nearly 0.9 percent savings per year on average during 2015-2020. Furthermore, these innovative technologies and program strategies more than offset the loss of energy savings potential to utilities as a result of recent federal lighting standards, strengthening building energy codes, and increasing market penetration of CFLs.

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