

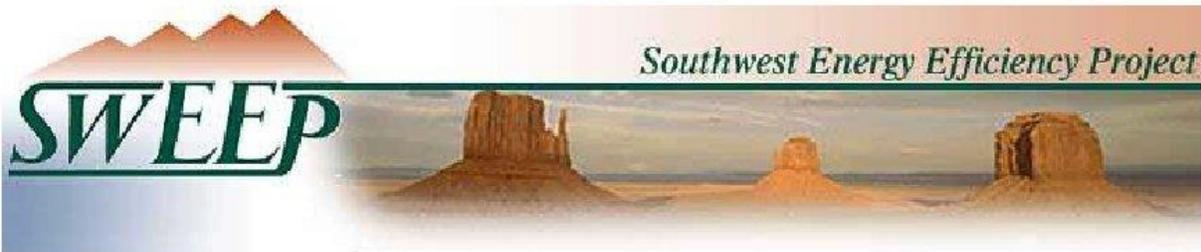
A REVIEW OF RESIDENTIAL RETROFIT PROGRAMS OFFERED BY UTILITIES IN THE SOUTHWEST

by
J.C. Martel

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Southwest Energy Efficiency Project
2334 N. Broadway, Suite A
Boulder, CO 80304
www.swenergy.org



The Southwest Energy Efficiency Project is a public interest organization dedicated to advancing energy efficiency in Arizona, Colorado, Nevada, New Mexico, Utah, Wyoming. For more information, visit www.swenergy.org.



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Acronyms

| | |
|---------|--|
| A/C | Air Conditioning |
| AFUE | Annual Fuel Utilization Efficiency |
| APS | Arizona Public Service |
| BPI | Building Performance Institute |
| BTU | British Thermal Unit |
| CFL | Compact Fluorescent Lighting |
| CFM | Cubic Feet per Minute |
| COP | Coefficient of Performance |
| DOE | Department of Energy |
| Dth | Dekatherm |
| EER | Energy Efficiency Ratio |
| EF | Energy Factor |
| EPA | Environmental Protection Agency |
| FCU | Fort Collins Utilities |
| GPM | Gallons per Minute |
| GSHP | Ground Source Heat Pump |
| HSPF | Heating Season Performance Factor |
| HPwES | Home Performance with ENERGY STAR® |
| HVAC | Heating, Ventilation and Air Conditioning |
| kWh | Kilowatt Hour |
| MEF | Modified Energy Factor |
| MSE | Media Saturation Effectiveness |
| NMGCO | New Mexico Gas Company |
| NREL | National Renewable Energy Laboratory |
| NVE | NV Energy |
| NPC | Nevada Power Company |
| NYSERDA | New York State Energy Research and Development Authority |
| PQC | Program Qualified Contractor |
| RESNET | Residential Energy Services Network |
| RMP | Rocky Mountain Power Company |
| SDHW | Solar Domestic Hot Water |
| SEER | Seasonal Energy Efficiency Rating |
| SPPC | Sierra Pacific Power Company |
| SPS | Southwestern Public Service Company |
| TEP | Tucson Electric Power |
| TRC | Total Resource (or Recovery) Cost Test |
| TXV | Thermal Expansion Valve |
| UCT | Utility Cost Test |
| WF | Water Factor |

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J.C. Martel is a Program Associate in the Buildings Program at SWEEP. Questions or comments about this report should be directed to Ms. Martel by email: jmartel@swenergy.org.

Executive Summary

By all accounts there is significant potential for cost-effective energy savings in existing homes. A study published by the U.S. National Academy of Sciences demonstrates that home retrofits can provide a 25-30 percent reduction in energy use at an average cost of 2.7 cents per kWh.¹ Given this very cost-effective energy savings potential, most utility demand-side management (DSM) portfolios include a variety of programs to promote home retrofits.

The purpose of this report is to review the experience of electric and gas utilities in the Southwest in promoting energy efficiency improvements in existing homes, in particular in the states of Arizona, Colorado, New Mexico, Nevada, Utah and Wyoming. These six states contained about 8.1 million housing units as of 2009. The report also highlights best practices and makes recommendations for improving energy efficiency retrofit programs in the Southwest.

This report examines the efforts of twelve gas and electric utilities in the Southwest. The combined Demand-Side Management (DSM) budget of these utilities is over \$400 million per year as of 2011 (Table ES-1 excludes Salt River Project and Questar Gas Company). Nearly \$100 million of this amount is specifically allocated to support residential retrofit programs, excluding programs dedicated to serving low-income households.² Some utilities have significantly increased retrofit program funding over the past few years. From 2009 to 2011, the New Mexico Gas Company's retrofit program budget grew 568%; for Southwestern Public Service Company the growth was 211%; for Tucson Electric Power it was 210%; and for Arizona Public Service Company it was 186%. The funding commitment to support residential retrofit in the Southwest is impressive and steadily growing.

For the purposes of this report, programs are classified into three types: Whole Home, Bundled Efficiency, and Single Measure. The primary difference between Whole Home and Bundled Efficiency is that a Whole Home program requires a home energy assessment and energy upgrades are based on the assessment, whereas a Bundled Efficiency program simply packages measures together unbound by an assessment. Single Measure programs provide rebates for one piece of equipment or building upgrade independent of other building systems. Table ES-2 shows the measures offered by utilities in any one of the three program models.

¹ National Academy of Sciences, *Real Prospects for Energy Efficiency in the United States*. 2010. http://www.nap.edu/catalog.php?record_id=12621.

² In this report, home retrofit is defined broadly and includes lighting, appliance, HVAC equipment, and building envelope measures and programs.

Table ES-1. Utility Residential Retrofit Budgets³

| State | Utility Company ⁴ | Total 2011 DSM Budget (\$ Million) | 2011 or FY Residential Retrofit Budget (\$ Million) | % of Budget |
|----------------------|---|------------------------------------|---|-------------|
| AZ | Arizona Public Service (APS) | 79.4 | 24.0 | 30% |
| | Tucson Electric Power (TEP) | 23.6 | 5.9 | 25% |
| CO | Public Service Company of Colorado (Xcel) | 83.2 | 10.0 | 12% |
| | Fort Collins Utilities (FCU) | 3.7 | 1.5 | 41% |
| NM | Southwestern Public Service Company (SPS) | 10.9 | 4.4 | 40% |
| | New Mexico Gas Company (NMGCO) | 3.3 | 0.7 | 21% |
| NV | Nevada Power Company (NPC) | 117.0 | 13.4 | 11% |
| | Sierra Pacific Power Company (SPPC) | 12.8 | 3.8 | 30% |
| UT | Rocky Mountain Power (RMP) | 51.8 | 15.2 | 29% |
| WY | Rocky Mountain Power (RMP) | 4.4 | 1.1 | 25% |
| Total/Average | | 390.1 | 80.0 | 26% |

Table ES-2. Measures Included in Programs Offered by Utilities

| State | Utility | Insulation & Air Sealing | Windows | Space Heating | Cooling Equipment | Duct Sealing & Insulation | Water Heating | Appliance | Lighting |
|-------|---------|--------------------------|---------|----------------|-------------------|---------------------------|---------------|-----------|----------|
| AZ | APS | ✓ | | | ✓ | ✓ | | ✓ | ✓ |
| | TEP | ✓ | | | ✓ | ✓ | | | ✓ |
| | SRP | ✓ | | | ✓ | ✓ | | ✓ | ✓ |
| CO | Xcel | ✓ | | ✓ | ✓ | | ✓ | ✓ | ✓ |
| | FCU | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| NM | SPS | ✓ | | | ✓ | ✓ | ✓ | ✓ | ✓ |
| | NMGCO | ✓ | | ✓ | | | ✓ | | |
| NV | NPC | | | | ✓ | ✓ | ✓ | ✓ | ✓ |
| | SPPC | | | ✓ ⁵ | | | ✓ | ✓ | ✓ |
| UT | Questar | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | |
| | RMP | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| WY | RMP | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

³ The Total DSM Budget column presents the entire portfolio, including program evaluations, marketing, administration costs and in some cases, performance incentives. Some Fiscal Years are not January to December so the data might not exactly represent 2011, but does represent one most recent year.

⁴ Table ES-1 does not include SRP and Questar Gas because data were not readily available.

⁵ Heating measures available only in the Reno-Sparks area where NV Energy provides natural gas.

Unlike new home construction programs, most of which include multiple tiers based on a Home Energy Rating System (HERS) rating metric, retrofit programs are not always comprehensively packaged to provide the customer with a full range of options. Single and bundled measure programs are most common in utility DSM portfolios in the region today. But interest in whole home retrofits has grown considerably, as shown in market demand and Home Performance with ENERGY STAR (HPwES) program participation data. Whole home programs vary in the measures that are included, as shown in Table ES-3, but all include insulation and air sealing. All of the whole home programs begin with an energy assessment and also include free installation of low-cost measures such as CFLs, low-flow showerheads, and faucet aerators. Best practices for whole home program design include starting with an instrumented energy audit, providing before and after performance testing, access to financing, quality assurance, trade ally network development, and contractor training.

Table ES-3. Whole Home Programs

| Utility | Name of Program | Measures Included |
|---------|------------------------|--|
| APS | Existing Homes Program | Insulation, air sealing, ducts, A/C, CFLs, faucet aerators, HVAC, showerheads, shade screens |
| TEP | Existing Homes Program | Insulation, air sealing, ducts, HVAC, CFLs, faucet aerators, smart strips, shades/window films |
| SRP | HPwES | Insulation, air sealing, ducts, A/C, HVAC, CFLs, faucet aerators, showerheads, shade screens |
| Xcel | HPwES | Insulation, air sealing, furnace or boiler, water heater, thermostat, refrigerator, dishwasher, clothes washer, CFLs |
| SPS | Home Energy Services | Insulation, air sealing, ducts, A/C |
| Questar | ThermWise | Insulation, air sealing, ducts, furnace, fireplace, water heater, windows, thermostat, clothes washer |

While there is significant variation in home retrofit programs offered by utility DSM programs in the Southwest, Questar Gas Company’s ThermWise program stands out. This program has achieved very high participation while demonstrating respectable energy savings and very positive benefit-cost performance. The program prequalifies contractors to install a comprehensive list of weatherization measures and unit-based rebates to offset the cost of installing these measures. Questar offers a full portfolio of retrofit programs allowing customers to select the program model that best suits their needs: Whole Home, Bundled Efficiency or Single Measure. Also of note, the municipal-owned Fort Collins Utilities offers a rebate for a wide range of retrofit measures, requires a home energy assessment, and provides quality assurance. Although FCU’s program is relatively new, results to date are very positive.

Almost every utility in the region offers Single Measure rebates for insulation and air sealing, refrigerator recycling, and efficient lighting and high efficiency air conditioning equipment. The least common measure is energy-efficient windows, only offered by Rocky Mountain Power, Fort Collins Utilities and Questar Gas Company. Arizona’s utilities, Arizona Public Service Company, Tucson Electric Power and Salt River Project, are experimenting with retrofit financing options for their customers.

Rebate levels for different measures varies considerably across the utilities in the region. This in turn affects participation rates; utilities with higher rebate amounts generally experience higher participation rates. The cost per unit of first year savings is most favorable in the programs offered by Tucson Electric Power, Nevada Power Company and Sierra Pacific Power Company. Nearly all of the programs reviewed in this report have benefit-cost ratios greater than 1.0 based on third party monitoring and evaluation. The benefit-cost ratio for the different programs is influenced by a wide range of factors including which cost effectiveness test is used, the utility's avoided costs, and the effectiveness of the programs.

SWEEP provides a number of recommendations for improving utility home retrofit programs throughout the southwest region. These include:

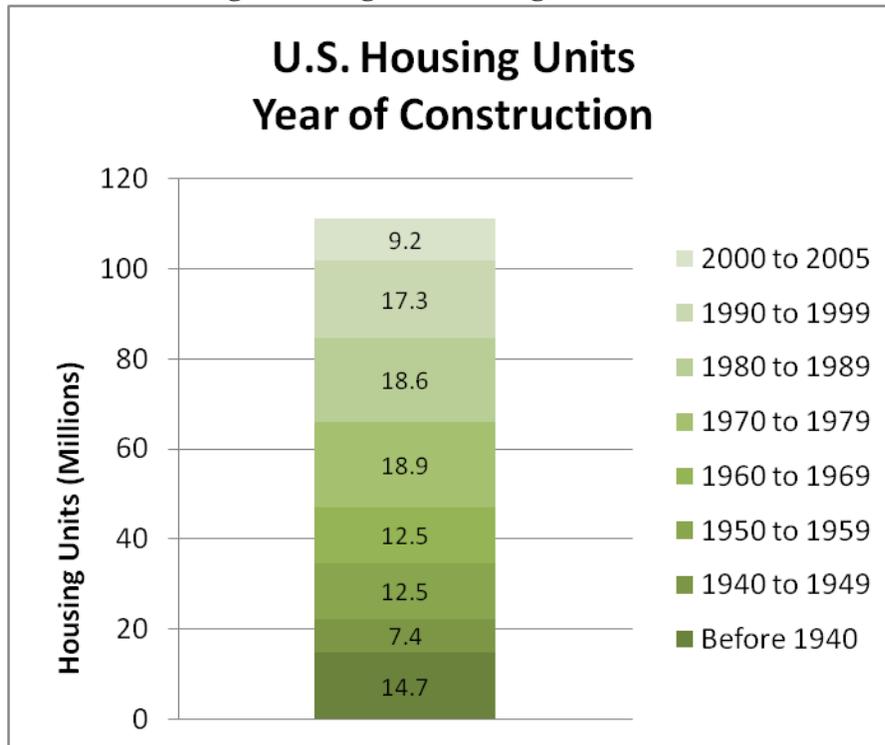
- *Offer flexible and comprehensive programs:* Continue providing incentives for single measures, while at the same time expanding support for whole home programs.
- *Develop a well-qualified contractor workforce:* Form a trade ally network and provide contractor training and certification.
- *Provide access to financing:* Financing of retrofit projects can be provided by the utility, a bank, or some other entity and should be easy to access, provide a positive cash flow to the homeowner, and be available to most if not all customers.
- *Collaborate across utilities:* By working together, electric and gas utilities can offer higher incentives to consumers, share costs, and facilitate deeper retrofit projects.
- *Consider supporting deep retrofits:* Utilities should examine deep retrofit programs, and if found to be cost effective, utilities should provide comprehensive support (technical assistance, rebates, financing, quality assurance, etc.) for homeowners who want to strive for 50% or greater energy savings in their dwelling.

I. Introduction

Retrofit Potential

A lot can be told about the energy efficiency of a building by looking at the year in which it was constructed. Approximately 60% of the existing housing stock as of 2005 was built before 1978 when Congress passed legislation that requires states to initiate energy efficiency standards for new buildings, and 92% was built before the publication of the first International Energy Conservation Code in 1998 (see Figure 1). Homes built before the 1970s are likely to have very little or no insulation, single pane windows and 60-65% efficient furnaces (unless the furnace has been replaced in the past 15 years). New construction building codes are advancing so quickly that any dwellings built before 2005 are at least 30% less efficient than ENERGY STAR® New Homes or homes built to meet the 2012 model energy code. These older homes need to be retrofitted to have energy usage comparable to relatively efficient new housing. In SWEEP’s six state region, Arizona, Colorado and Wyoming are “home rule” states in which local jurisdictions are not required by state law to adopt building codes; therefore, the energy efficiency of buildings in some jurisdictions cannot be determined by code history and are likely to be far below current model code. For all of these reasons, the retrofit potential in the Southwest is immense.

Figure 1. Age of Housing Stock⁶



⁶U.S. Energy Information Administration, “2005 Residential Energy Consumption Survey.” http://eia.doe.gov/emeu/recs/recs2005/hc2005_tables/detailed_tables2005.html. Accessed April 18, 2011.

In addition, existing housing is currently in higher demand than new construction. As a result of the economic recession, new home sales nationally were down 70% from 2006 to 2010 while existing home sales were down only 24% over those four years.⁷ More and more people are buying older homes rather than new; so now is a good time to focus policies and programs on retrofits.

Utility Demand-Side Management Residential Retrofit Programs

Utility demand-side management (DSM) portfolios include both energy efficiency programs and load management/demand response programs, and typically offer different programs for residential and commercial/industrial customers.⁸ The residential portfolio may include both new and existing homes programs, as well as behavior change, education, financing, energy monitoring, plug load and outdoor retrofit programs. This report includes only building retrofit measures that do not require income qualification; i.e., programs that are not targeted to homes occupied by low-income families. Table 1 shows the percentage of each utility’s DSM budget that is allocated to the aforementioned scope of residential retrofit programs. Utilities in the Southwest devote 11-41% of their total DSM budget to residential retrofit, with an average of 25%.

Table 1. Utility Residential Retrofit Budgets⁹

| State | Utility Company ¹⁰ | Total 2011 DSM Budget (\$ Million) | 2011 Residential Retrofit Budget (\$ Million) | % of Budget |
|----------------------|---|------------------------------------|---|-------------|
| AZ | Arizona Public Service (APS) | 79.4 | 24.0 | 30% |
| | Tucson Electric Power (TEP) | 23.6 | 5.9 | 25% |
| CO | Public Service Company of Colorado (Xcel) | 83.2 | 10.0 | 12% |
| | Fort Collins Utilities (FCU) | 3.7 | 1.5 | 41% |
| NM | Southwestern Public Service Company (SPS) | 10.9 | 4.4 | 40% |
| | New Mexico Gas Company (NMGCO) | 3.3 | 0.7 | 21% |
| NV | Nevada Power Company (NPC) | 117.0 | 13.4 | 11% |
| | Sierra Pacific Power Company (SPPC) | 12.8 | 3.8 | 30% |
| UT | Rocky Mountain Power (RMP) | 51.8 | 15.2 | 29% |
| WY | Rocky Mountain Power (RMP) | 4.4 | 1.1 | 25% |
| Total/Average | | 390.1 | 80.0 | 26% |

Utility DSM retrofit programs offered in the Southwest demonstrate significant variation in the actual cost of energy savings they deliver. Variations in the cost of delivered energy savings can be explained by differences in program design, service area demographics, contractor

⁷ National Association of Homebuilders, “New and Existing Home Sales, U.S.” http://www.nahb.org/fileUpload_details.aspx?contentID=55761. Accessed April 19, 2011.

⁸ A high percentage of Demand Side Management budgets are allocated to demand response and load management programs, in some cases up to 50%.

⁹ The Total DSM Budget column presents the entire portfolio, including program evaluations, marketing, administration costs and in some cases, performance incentives. Some Fiscal Years are not January to December so the data might not exactly represent 2011.

¹⁰ Table 4 does not include SRP and Questar Gas because data was not readily available.

performance, rebate levels and program maturity. However, the elements that effect retrofit program effectiveness are quite complex and not easily resolved. For comparative purposes Table 2 illustrates utility DSM retrofit program budgets, energy savings and cost per unit of first year energy savings for the 2010 program year.¹¹ The cost per unit of first year energy savings is significantly higher than the cost per unit of lifetime energy savings; but as the data shows in some cases even the cost per unit of first year savings is below the retail price per kWh paid by residential customers, which in the region ranges from \$0.086 per kWh for Rocky Mountain Power customers in Utah to \$0.14 per kWh for Sierra Pacific Power Company customers in Nevada.¹²

Table 2. 2010 Retrofit Budgets and Energy Savings¹³

| State | Utility Company ¹⁴ | 2010 Residential Retrofit Budget | 2010 Annual Residential Retrofit Savings | Site (S) or Generator (G) ¹⁵ | Cost per unit of first year savings (\$/kWh/yr or \$/therm/yr) |
|--------------|-------------------------------|----------------------------------|--|---|--|
| AZ | APS | \$17,710,604 | 148,700 MWh | S | \$0.12 |
| | TEP | \$3,246,930 | 59,846 MWh | S | \$0.05 |
| CO | Xcel | \$7,876,511 | 69,864 MWh | G | \$0.11 |
| | | \$4,389,042 | 247,840 Dth | S | \$3.79 |
| | FCU | \$943,616 | 6,122 MWh | S | \$0.15 |
| NM | SPS | \$3,892,183 | 26,716 MWh | G | \$0.15 |
| | NMGCO | \$646,998 | 17,775 Dth | S | \$3.64 |
| NV | NPC | \$6,034,037 | 121,296 MWh | S | \$0.05 |
| | SPPC | \$2,678,914 | 52,249 MWh | S | \$0.05 |
| UT | RMP-UT | \$20,735,778 | 82,644 MWh | S | \$0.25 |
| WY | RMP-WY | \$915,439 | 6,601 MWh | S | \$0.14 |
| Total | | \$98,474,994 | Average First Year \$/kWh | | \$0.10 |

Program Types

Residential retrofit programs range from comprehensive, whole-home retrofit programs to programs that offer incentives for single measures. Some utilities offer multiple tracks – the homeowner can choose to make all of the improvements at once, or scatter the improvements over time. Some utilities bundle rebates together for their program marketing and delivery

¹¹ Unfortunately most utilities report annual energy savings rather than lifetime energy savings for their programs so lifetime costs are very laborious to calculate for the purposes of this report.

¹² U.S. Energy Information Administration, “Electric Sales, Revenue, and Average Price 2009.” April 5, 2011. http://www.eia.gov/cneaf/electricity/esr/esr_sum.html. Accessed July 14, 2011.

¹³ The Total DSM Budget column presents the entire portfolio, including program evaluations, marketing and administration costs.

¹⁴ Table 5 does not include the Salt River Project and Questar Gas.

¹⁵ “Site” refers to the electrical savings created from the installation of energy conservation measures that is realized at the customer meter. “Generator” refers to the electrical savings created from the installation of energy conservation measures that is realized at the power plant which includes energy losses due to the inefficiency of electric transmission and transformer systems.

strategy and offer higher rebate levels to customers who install more than one measure. Offering various paths for the customer to choose allows for flexibility for the homeowner to adapt the program to a home retrofit scenario that works for them. Following are descriptions of the three retrofit program design types.¹⁶

- Whole Home
A “whole home program” comprehensively assesses a home’s energy usage, and incorporates building science principles to address how all the systems within the home interact. This assessment is then used to create a detailed work scope, or plan, to achieve the greatest energy savings for the home. A whole home program relies on a properly trained and certified work force. After the upgrades are implemented, the work is typically followed up with third-party quality assurance inspections.
- Bundled Efficiency
A “bundled efficiency program” targets consumers in existing homes by offering education and/or incentives on multiple end uses and/or systems in the home. A bundled efficiency program packages together program offerings into one touch-point with the customer but does not include a comprehensive assessment of a home’s energy usage.
- Single Measure
A “single measure program” involves only one measure and/or system within the home. Single measure programs typically do not require an energy audit or a whole-home assessment prior to making the retrofit and receiving the rebate, although many of the programs require testing for the single measure that is being rebated.

Table 3. Program Design

| State | Utility | Whole-Home | Bundled Efficiency | Single Measure |
|-------|---------|------------|--------------------|----------------|
| AZ | APS | ✓ | ✓ | ✓ |
| | TEP | ✓ | ✓ | ✓ |
| | SRP | ✓ | ✓ | ✓ |
| CO | Xcel | ✓ | ✓ | ✓ |
| | FCU | | | ✓ |
| NM | SPS | | ✓ | ✓ |
| | NMGCO | | | ✓ |
| NV | NPC | | | ✓ |
| | SPPC | | | ✓ |
| UT | Questar | ✓ | ✓ | ✓ |
| | RMP | | ✓ | ✓ |
| WY | RMP | | ✓ | ✓ |

¹⁶ Foster, Rebecca. Consortium for Energy Efficiency, “Existing Home Programs Guide.” June 2010 http://www.cee1.org/resrc/news_items/ExistingHomesGuide.php3 Accessed on May 10, 2011. Definitions for Whole Home and Bundled Efficiency Programs were taken from this document.

Table 3 presents the program design types that are implemented by the southwest utilities. Single and bundled measure programs are offered by most utilities in the region, while only five out of twelve of the utilities offer whole home programs.

Table 4 presents all of the measures offered by the utilities in any of the three program design types. Lighting, insulation and air-sealing, appliances and cooling measures are the most widely offered, followed by water heating. Duct sealing and insulation and heating equipment rebates are not presently offered in Arizona; duct sealing and insulation remains an opportunity to optimize the efficiency of central air conditioning. Window rebates are offered only by utilities in Utah and Wyoming, and by Fort Collins Utilities in Colorado.

Table 4. Measures Included in Programs Offered by Utilities

| State | Utility | Insulation & Air Sealing | Windows | Heating | Cooling | Duct Sealing & Insulation | Water Heating | Appliance | Lighting |
|-------|---------|--------------------------|---------|-----------------|---------|---------------------------|---------------|-----------|----------|
| AZ | APS | ✓ | | | ✓ | ✓ | | ✓ | ✓ |
| | TEP | ✓ | | | ✓ | ✓ | | | ✓ |
| | SRP | ✓ | | | ✓ | ✓ | | ✓ | ✓ |
| CO | Xcel | ✓ | | ✓ | ✓ | | ✓ | ✓ | ✓ |
| | FCU | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| NM | SPS | ✓ | | | ✓ | ✓ | ✓ | ✓ | ✓ |
| | NMGCO | ✓ | | ✓ | | | ✓ | | |
| NV | NPC | | | | ✓ | ✓ | ✓ | ✓ | ✓ |
| | SPPC | | | ✓ ¹⁷ | | | ✓ | ✓ | ✓ |
| UT | Questar | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | |
| | RMP | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| WY | RMP | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

Home Performance with ENERGY STAR® (HPwES) is the leading national model retrofit program that promotes comprehensive retrofits and best practices. Some version of HPwES is currently being offered in all six southwestern states covered in this report.¹⁸ In Utah and Wyoming the programs are offered by the state governments rather than the utilities. Table 5 shows the measures that are included in the whole home retrofit programs to illustrate the variety of measures offered by this type of program design.

¹⁷ Heating measures available only in the Reno-Sparks area where NV Energy provides natural gas.

¹⁸ EPA, "HPwES Locations."

http://www.energystar.gov/index.cfm?c=home_improvement.hm_improvement_hpwes_partners. Accessed April 19, 2011.

Table 5. Whole-Home Programs

| Utility | Name of Program | Measures Included |
|---------|------------------------|--|
| APS | Existing Homes Program | Insulation, air sealing, ducts, A/C, CFLs, faucet aerators, HVAC, showerheads, shade screens |
| TEP | Existing Homes Program | Insulation, air sealing, ducts, HVAC, CFLs, faucet aerators, smart strips, shades/window films, |
| SRP | HPwES | Insulation, air sealing, ducts, A/C, HVAC, CFLs, faucet aerators, showerheads, shade screens |
| Xcel | HPwES | Insulation, air sealing, furnace or boiler, water heater, thermostat, refrigerator, dishwasher, clothes washer, CFLs |
| SPS | Home Energy Services | Insulation, air sealing, ducts, A/C |
| Questar | ThermWise | Insulation, air sealing, ducts, furnace, fireplace, water heater, windows, thermostat, clothes washer |

Best Practices

Beyond offering incentives, utilities can put in place program infrastructure to boost their program’s success, such as offering energy audits, testing procedures, access to financing, a trade ally network, quality assurance and a public advisory group. An energy audit involving diagnostic testing and a prioritized list of potential efficiency improvements is an essential first step in the most successful programs. The contractor’s work scope will be based on the data collected during the audit. Testing procedures provide the homeowner with baseline and post-improvement data, as well as confirmation of healthy indoor air quality. The utility does not necessarily need to offer financing, but partnering with a government financing program or a financial institution provides the homeowner with access to the funding needed to make a comprehensive retrofit. A trade ally network that is well-trained and well-versed in program details can greatly help ensure the success of a program, since many programs rely on contractors for outreach to their customers. Contractors need to be engaged since they are the ones closing the deal. The most successful programs provide third party verification of energy savings as well as work quality. A public advisory group is a good source for market conditions, community perspectives on energy efficiency, and strategic partnerships.

Model Whole Home Retrofit Program

Home Performance with ENERGY STAR (HPwES) is a national model whole-home retrofit program that typically saves homeowners 20% or more on their energy bills.¹⁹ The U.S. Environmental Protection Agency (EPA) and Department of Energy (DOE) developed the HPwES program model in 1999 as a national effort to identify and promote a comprehensive approach to residential weatherization. A variety of sponsors promotes the HPwES program design and encourages the house-as-a-system approach. However, HPwES was slow to gain program sponsors and experienced difficulty in gaining a foothold in utility DSM portfolios. The New York State Energy Research and Development Authority (NYSERDA) was an early

¹⁹ EPA, “Home Performance with ENERGY STAR: A Cost-Effective Strategy for Improving Efficiency in Existing Homes.” http://www.energystar.gov/ia/home_improvement/HPwES_Utility_Intro_FactSheet.pdf. Accessed April 29, 2011.

adopter of the HPwES program design, accounting for the majority of early program activity. By 2008, the HPwES program design gained significantly more acceptance by sponsors, including many investor-owned utilities. Nearly 50,000 homes received energy saving retrofits under the HPwES program design in 2008, increasing to 75,000 homes by 2011.²⁰

HPwES starts with an energy assessment or audit of the home which becomes the basis of the work scope. An assessment includes measurement and evaluation of insulation in the attic, walls and crawlspace or floor; an evaluation of the heating, ventilation and air-conditioning (HVAC) efficiency and performance; duct leakage testing; lighting, appliance, hot water, and window inspections; blower door test and pressure diagnostics; and combustion safety testing.

The most significant advantage of using HPwES is that the program model incorporates building science principles and considerable testing and evaluation. HPwES requires test-in and test-out procedures, which provides the homeowner with baseline and post-improvement data. Combustion safety testing before and after the retrofit ensures that indoor air quality is maintained at a healthy level. In addition to best-practice testing procedures and quality assurance, HPwES can incorporate the DOE's Workforce Guidelines, the new Home Energy Scoring Tool, and technical lessons learned from the Building America program and the Better Building Grant program. Consumer brand recognition of ENERGY STAR is another enormous benefit for a utility to market the program.

Another advantage to using a whole home approach is that the decision to retrofit one building system might influence the retrofit of another building system. For example, if a homeowner installs insulation and air-sealing, they might be able to downsize the heating and cooling systems. Another example is the homeowner would not want to air-seal around windows if they plan to replace the windows. It is preferable to conduct a whole-home assessment prior to undertaking retrofits in order to understand these interactions and potential synergies.

HPwES differs from the standalone audit and retrofit programs by linking homeowners from the energy audit to the retrofit contractor and then back to the test-out audit in one comprehensive package. It is widely recognized in the energy efficiency business that an energy audit alone does not necessarily result in a retrofit. An integrated audit linked to contractor process, quality assurance and (in some cases) access to financing, is helpful to move homeowners seamlessly through the retrofit process.

The EPA estimates that a HPwES program can achieve a cost of conserved energy of \$0.05 kWh²¹ with peak electricity demand savings of 1.6 kW per home in the summer and 0.9 kW per home in the winter, with some projects achieving even better results.²² SWEEP reports that energy efficiency typically costs \$0.02-\$0.04 per kWh saved, which is in the range of 25% to 50% of the cost of supplying electricity from any type of power source.²³ This means that while

²⁰ EPA, "HPwES." http://www.energystar.gov/index.cfm?fuseaction=hpwes_profiles.showSplash. Accessed April 29, 2011.

²¹ EPA, "Benefits of Sponsoring a Local Program." http://www.energystar.gov/index.cfm?c=home_improvement.hpwes_sponsors_benefits. Accessed April 29, 2011.

²² EPA, Cost-Effective Strategy.

²³ Geller, Howard. "Energy Efficiency: Reducing Pollutant Emissions and Improving Public Health." Presentation to the EMPSI National Energy Symposium. April 26, 2011.

cost-effective, achieving electricity savings through a comprehensive whole home retrofit approach is slightly more expensive than other common electricity savings programs.

Summary

In summary, building code history tells a story about the efficiency of the existing housing stock, namely that many older homes are inefficient and thus retrofit programs offer significant energy savings potential. Utility companies offer three types of programs aimed at capturing this potential – whole home, bundled efficiency and/or single measure programs. Unlike new home construction programs, most of which include multiple tiers based on a Home Energy Rating System (HERS) rating metric, retrofit programs are not always comprehensively packaged to provide the customer with a known energy reduction goal. Single and bundled measure programs are most common in the DSM portfolios of southwest utilities today. But interest in whole home retrofits has grown considerably, as shown in market demand and HPwES program participation data, and they are now offered by five out of the twelve utilities examined in this report. Best practices for whole home program design include starting with an instrumented energy audit, providing before and after performance testing, access to financing, quality assurance, trade ally network development, and contractor training.

II. Arizona

Arizona Public Service Company

The Arizona Public Service Company (APS) provides electricity to more than 1.1 million homes and businesses in Arizona. The Pinnacle West Capital Corporation, the energy holding company of APS, projects that APS' service territory will grow by 65% to serve an additional 750,000 homes by 2030.²⁴

The existing homes program offered by APS features two components: Residential HVAC and HPwES. APS also offers refrigerator recycling and a consumer products program. The following metrics present the aggregated totals of all residential retrofit programs.

Table 6. Metrics for APS Residential Retrofit Programs

| | 2009 Actual ²⁵ | 2010 Target ^{26, 27} | 2010 Actual ²⁸ | 2011 Target ²⁹ |
|--|---------------------------|-------------------------------|---------------------------|---------------------------|
| Budget | \$8,408,924 | \$14,087,000 | \$17,710,604 | \$24,020,000 |
| Annual Energy Savings (MWh) | 100,376 | 148,700 | 138,389 | 131,000 |
| Annual Capacity Savings (MW) ³⁰ | 19.7 | 27.5 | 21.8 | 31.5 |

The residential HVAC component has offered two measures since 2006/2007; AC with Quality Installation, and Duct Test and Repair. In 2010, APS added a pilot residential diagnostic measure called the "Residential Advanced AC Tune-up Pilot". The HPwES component was approved for inclusion within the Existing Homes Program in January 2010 and was officially launched in March 2010. In the first year APS completed 2,363 assessments, far exceeding its target of

²⁴ Pinnacle West Capital Corporation, "2010 Annual Report."

http://www.pinnaclewest.com/files/annual/2010/PNW_2010_Annual_Report.pdf. Accessed July 14, 2011.

²⁵ APS, "Semi-Annual DSM Progress Report for the Period: July through December 2009." Docket No. E-O1933A-07-0402 and E-01933A-05-0650, Decision No. 70628. Arizona Corporation Commission.

<http://images.edocket.azcc.gov/docketpdf/0000108067.pdf>. Accessed May 1, 2011. Includes HVAC and Consumer Products Program.

²⁶ APS, "2010 EE Implementation Plan" (Budget Data). Docket No. E-01345A-08-0172, Decision No. 71460. Arizona Corporation Commission. <http://images.edocket.azcc.gov/docketpdf/0000107730.pdf>. Accessed May 1, 2011.

²⁷ APS, "2010 Energy Efficiency Implementation Plan" (Savings Data). Docket No. E-01345A-03-0d 7 & E-0345A-05-0526, Decision No. 67744. Arizona Corporation Commission.

<http://images.edocket.azcc.gov/docketpdf/0000123447.pdf>. Accessed May 1, 2011. Includes Existing Homes Program, Consumer Products Program, and Refrigerator Recycling Program.

²⁸ APS, "Semi-Annual DSM Progress Report for the Period: July through December 2010." Docket No. E-01345A-08-0172. Arizona Corporation Commission. <http://images.edocket.azcc.gov/docketpdf/0000100701.pdf>. Accessed May 1, 2011. Includes Existing Homes Program, Consumer Products Program, and Refrigerator Recycling Program.

²⁹ APS, "2011 Energy Efficiency Implementation Plan." Docket No. E-01345A-10-02 19, Decision No. 72215. Arizona Corporation Commission. <http://images.edocket.azcc.gov/docketpdf/0000123773.pdf>. Accessed May 1, 2011. Includes Existing Homes Program, Consumer Products Program, and Refrigerator Recycling Program. The data excludes 500,000 CFLs.

³⁰ Capacity refers to the total generation available to meet customers demand for electricity. Capacity savings refers to the amount of the total generation supply that is saved.

1000. Notably, APS was selected by the EPA as a 2011 ENERGY STAR[®] Sustained Excellence Award winner. Starting in January 2011, low-interest fixed-rate financing for energy saving home improvement projects became available thanks to a partnership between APS and the National Bank of Arizona. Loans are available from \$1,000 to \$20,000³¹ and financing can be used in combination with the rebates described below.

Table 7 shows the incentive (rebate) levels for different efficiency measures. All of the measures are optional; the customer is not required to install one measure in order to qualify for another. Assessments are mandatory for duct testing and optional to qualify for other measures. APS requires the participating installation contractors to abide by quality installation standards.

Table 7. Incentives for APS Residential Retrofit Programs

| Program Type | Measure | Criteria | Incentive |
|----------------|------------------------------|---------------------|--------------------------|
| Single Measure | A/C | 13 SEER/10.8 EER | \$175 |
| | A/C | 14-16 SEER/10.8 EER | \$425 |
| | A/C | 17+ SEER/10.8 EER | \$525 |
| | Ducts | Test/Repair | \$250 |
| | Ducts | Test Only | \$75 |
| | A/C Tune Up | Pilot Program | \$100 |
| Whole Home | Showerhead | 1.5 GPM | Free, 1 |
| | Faucet Aerator | 1.0 GPM | Free, up to 3 |
| | CFL | n/a | Free, up to 10 |
| | Ducts | Sealing/Repair | 75% of cost, up to \$250 |
| | Air Sealing/Attic Insulation | n/a | 75% of cost, up to \$250 |
| | Shade Screens | n/a | \$250 |
| | Energy Assessment | n/a | \$99 |

Utility Contacts:

James Wontor, Manager, DSM Programs
 602-250-3409
 James.Wontor@aps.com

Gavin Hastings, Program Manager
 602-250-3306
 Gavin.Hastings@aps.com

³¹ APS, "Financing." http://www.aps.com/main/green/choice/choice_136.html and <https://www.nbarizona.com/Specialty-Green>Returns.jsp>. Accessed May 10, 2011.

Salt River Project

The Salt River Project (SRP) provides electricity to nearly 934,000 retail customers in the Phoenix area. SRP's customers used 6,410 MW of power at peak demand, and SRP sold 26,747 GW of power in 2009.³²

SRP launched its HPwES program in November 2010, offering a comprehensive home energy assessment at a reduced participant cost of \$99. The assessment includes an evaluation of insulation effectiveness; heating, ventilation and air-conditioning (HVAC) performance; air-duct leakage and restrictions; construction integrity issues; "hot spots" in the ceilings, walls and other areas; lighting, appliance, hot water, and window inspections; blower door test and pressure diagnostics; and combustion safety testing. Customers receive an energy-efficiency kit containing 10 CFLs, a low-flow showerhead, and 3 low-flow faucet aerators. A Home Performance Report, provided to participants upon completion of the assessment, identifies energy-saving opportunities and applicable rebates and financing offers that the participant can pursue. SRP projects 1,400 program participants in FY 2011, increasing to 3,000 assessments to be completed in FY 2012.³³

Table 8. Metrics for SRP Residential Retrofit Programs³⁴

| | 2009 Actual ³⁵ | 2010 Actual ³⁶ | 2011 Target ³⁷ |
|--|---------------------------|---------------------------|---------------------------|
| Annual Energy Savings (MWh) | 48,453 | 69,805 | 58,789 |
| Net Coincident Peak (MW) ³⁸ | 9.57 | 15.31 | 14.01 |

Aside from the HPwES program, SRP also offers the A/C Cool Cash Rebate Program, Duct Test and Repair Rebate Program, Shade Screen Discount Program, Appliance Recycling Program, and Retail CFL Program. SRP will be evaluating the implementation of a third-party loan program for FY 2012.³⁹

³² Salt River Project, "Facts About SRP." <http://www.srpnet.com/about/Facts.aspx>. Accessed July 14, 2011.

³³ Kimberly, Debbie, "SRP Energy-Efficiency, Demand Response & Pricing Programs." Presentation. March 3, 2011. <https://www.srpnet.com/environment/earthwise/pdfx/spp/March3/8EnergyEfficiency.pdf>.

³⁴ The 2010 target energy savings data is not available.

³⁵ SRP, "FY2009 Energy Efficiency Portfolio Evaluation Summary." <http://www.srpnet.com/about/pdfx/Summary.pdf>. Accessed May 1, 2011. Includes Appliance Rebates and Recycling, Retail CFL Program, Cool Cash Rebate Program, Cooling System Check-Up, and Solar Shade Screens.

³⁶ SRP, "FY2010 Energy Efficiency Portfolio Evaluation Summary." <http://www.srpnet.com/environment/earthwise/pdfx/spp/FY10EE Portf Eval Sum Aug2010.pdf>. Accessed May 1, 2011. Includes 2009 programs plus Home Check-Up Pilot.

³⁷ SRP, "2010/2011 SRP Energy Efficiency Report." <http://www.srpnet.com/energy/2010EEreport.pdf>. Accessed May 1, 2011. Budget data was calculated by aggregating "annual rebate" amounts.

³⁸ Net coincident peak is the demand exhibited by a specific group of customers during the peak of electric demand for a specific operating system.

³⁹ Ibid.

Table 9. Incentives for SRP Residential Retrofit Programs

| Program Type | Measure | Criteria | Incentive |
|---------------------------|-----------------------------|--------------------------------|------------------------|
| Single Measure w/ Testing | A/C Units, Package Systems | 15 SEER; 12+ EER | \$200 |
| | A/C Units, Package Systems | 16 SEER; 12+ EER | \$300 |
| | A/C Units, Package Systems | 17+ SEER; 12+ EER | \$400 |
| | A/C Units, Split Systems | 17+ SEER; 13+ EER | \$400 |
| | Heat Pumps, Package systems | 15+ SEER; 12+ EER; 8+ HSPF | \$200 |
| | Heat Pumps, Package systems | 16+ SEER; 12+ EER; 8+ HSPF | \$300 |
| | Heat Pumps, Package systems | 17+ SEER; 12+ EER; 8+ HSPF | \$400 |
| | Heat Pumps, Split systems | 16+ SEER; 12.5+ EER; 8.5+ HSPF | \$300 |
| | Heat Pumps, Split systems | 17+ SEER; 12.5+ EER; 8.5+ HSPF | \$400 |
| | Duct Testing | | 75% of cost, \$75 max |
| | Duct Repair | | 75% of cost, \$175 max |
| Single Measure | Shade Screens | | \$0.80 sq/ft |
| Whole Home | Energy Assessment | | \$99 |
| | Showerhead | | Free, 1 |
| | Faucet Aerator | | Free, 3 |
| | CFL | | Free, 10 |

Utility Contact:

Deborah Kimberly, Manager, Energy Efficiency and Policy Analysis

602-236-2711

Debbie.Kimberly@srpnet.com

Tucson Electric Power

Tucson Electric Power (TEP), a subsidiary of UniSource, serves more than 402,000 customers in southern Arizona⁴⁰ and expects to grow to 420,000 customers by 2014.⁴¹ TEP currently has a generating capacity of 2,245 MW.⁴²

Since 2008, TEP's Residential HVAC program, called the "Efficient Home Cooling" program, has promoted the installation of high-efficiency air conditioning and heat pump systems. In December 2010, the program was renamed the "Existing Homes Program" and modified to expand incentives for HVAC equipment and provide incentives for other home performance services. The program also seeks to advance the building science skills of participating contractors. Notably, the new program is intended to be a precursor to the launch of the statewide Arizona Home Performance Program by the State of Arizona with federal funding to initiate HPwES in the state, which will leverage the programs offered by Arizona's utilities. Table 10 shows budget and energy savings details of retrofit programs offered by TEP.

Table 10. Metrics for TEP Residential Retrofit Programs⁴³

| | 2009 Actual ⁴⁴ | 2010 Actual ⁴⁵ | 2011 Target ⁴⁶ |
|------------------------------|---------------------------|---------------------------|---------------------------|
| Budget | \$1,919,316 | \$3,246,930 | \$5,949,455 |
| Annual Energy Savings (MWh) | 43,234 | 59,846 | 60,739 |
| Annual Capacity Savings (MW) | 8.02 | 6.22 | 8.38 |

The HVAC measures promote best practices in the industry, including proper sizing and matching of system condenser and coil, correct refrigerant charge, proper air-flow, and a Manual J system sizing test with an additional incentive for downsizing the equipment to at least 0.5 tons smaller. Customers who do not participate in HVAC Replace on Burnout (ROB) or Early Retirement can participate in prescriptive or performance-based duct sealing. The prescriptive approach references a checklist and the performance approach requires duct testing. The air sealing measure requires blower door and combustion safety testing. Higher incentive levels for

⁴⁰ UniSource Energy, "About Us." <http://www.uns.com/About/>. Accessed July 18, 2011.

⁴¹ UniSource Energy, "Investor and Analyst Meeting Presentation." April 5-7, 2011.

http://files.shareholder.com/downloads/UNIS/1328082616x0x456507/BC027456-B797-45B7-AA39-BDDD71C70188/Investor_Presentation_Apr-11_FINAL.pdf. Accessed July 18, 2011. 24.

⁴² *Ibid.*, 25.

⁴³ The 2010 target energy savings data is not available.

⁴⁴ TEP, "Semi-Annual DSM Progress Report for the Period: July through December 2009." Docket No. E-O1933A-07-0402 and E-01933A-05-0650, ACC Decision No. 70628. Arizona Corporation Commission. <http://images.edocket.azcc.gov/docketpdf/0000108067.pdf>. Accessed May 1, 2011. Includes Lighting and Efficient Home Cooling.

⁴⁵ TEP, "Semi-Annual DSM Progress Report for the Period: July through December 2010." Docket No. E-01 933A-07-0402 and E-01 933A-05-0650, Decision No. 70628. Arizona Corporation Commission. <http://images.edocket.azcc.gov/docketpdf/0000123435.pdf>. Accessed May 1, 2011. Includes Lighting and Efficient Home Cooling, and Existing Homes Programs.

⁴⁶ TEP, "2011-2012 Energy Efficiency Implementation Plan." Pending approval. Docket No. E-01933A-11-0055. Arizona Corporation Commission. <http://images.edocket.azcc.gov/docketpdf/0000122438.pdf>. Accessed May 1, 2011. Includes Efficient Products (formerly Lighting), Appliance Recycling, Existing Homes, REAP, and Financing Pilot.

attic insulation are available if the home starts with an R-13 or below. The solar shade screens/window film measure requires that shade screens/window film be installed at a minimum on the south and west exposure of the home. Screens/films must have a shading coefficient of less than or equal to .40 or equivalent to blocking of 80% of the sun's heat.

In conjunction with the Existing Homes Program, TEP also received approval in December 2010 to launch the Residential Energy Assessment Program (REAP), which features an assessment at a reduced cost for customers and provides information on incentives offered through the Existing Homes Program. REAP is considered a delivery mechanism for the comprehensive, whole-house efficiency measures offered through the Existing Homes Program.

In their 2011 Energy Efficiency Implementation Plan filed on January 31, 2011, TEP included a two-year Residential Energy Efficiency Financing Pilot Program that, if approved, may provide some customers with the capital needed to make cost-effective energy efficiency upgrades to their homes. Program approval is pending before the state regulatory commission (the ACC).

Table 11. Incentives for Approved TEP Residential Retrofit Programs

| Program Type | Measure | Criteria | Incentive |
|--------------|---|--|----------------|
| Whole Home | HVAC | Prescriptive, ROB, Downsizing, Ducts | \$750 |
| | HVAC | Performance, ROB, Downsizing, Ducts | \$1050 |
| | HVAC | Prescriptive, Early Retirement, Downsizing, Ducts | \$1400 |
| | HVAC | Performance, Early Retirement, Downsizing, Ducts | \$1700 |
| | Duct Sealing | Prescriptive | \$350 |
| | Duct Sealing | Performance | \$650 |
| | Air Sealing | Requires blower door and combustion testing | \$250 |
| | Air Sealing/ Attic Insulation | Requires blower door and combustion testing | \$800 |
| | Solar Shade Screens/ Window Films | Install on south and/or west exposure; have shading coefficient of less than or equal to .40 or equivalent to blocking of 80% of the sun's heat. | \$250 |
| | Energy Assessment | n/a | \$99 |
| | CFLs | n/a | Free, up to 10 |
| | Power Strip | n/a | Free, 1 |

Utility Contact:

Denise Smith, Director of Demand Side Resources
 520-918-8339
 DRichersonSmith@Tep.com

III. Colorado

While Colorado has 65 electric and gas companies, the Public Service Company of Colorado, a subsidiary of Xcel Energy, is by far the largest utility in the state. Xcel serves over 1.15 million electric and 1.20 million natural gas customers in its residential market in Colorado.⁴⁷ For profiles on Colorado's 65 utilities, see the 2010 Colorado Utilities Report.⁴⁸

Xcel Energy

DSM activity for the company dates back to the 1996 Integrated Resource Plan Settlement Agreement when Xcel committed up to \$10 million to DSM over four years.⁴⁹ Steadily increasing funding throughout the past fifteen years, the company's total 2011 DSM budget is \$83.2 million;⁵⁰ nearly \$10 million is budgeted for residential retrofits.⁵¹

Approximately one half of Xcel's \$26 million residential program budget during the 2011 program year has been allocated to the load management program, Saver's Switch, in which Xcel attaches a device to the A/C unit that cycles the equipment on and off at short intervals.⁵² For the purposes of this summary, only building retrofit measures are reported; programs such as Saver's Switch and the Indirect Products program are not included. The company uses third party implementers for the energy audit and refrigerator recycling programs.

Table 12 shows the aggregated 2009 and 2010 actual results along with the aggregated 2010 and 2011 targets for the company's portfolio of existing home retrofit programs. Energy Efficient Showerheads, Evaporative Cooling Rebate, Heating System Rebate, High Efficiency A/C, Home Lighting & Recycling, Home Performance with ENERGY STAR, Insulation Rebates, Refrigerator Recycling, and Water Heating Rebates are shown.⁵³

Overall goals in 2010 were significantly exceeded for gas DSM retrofit programs but fell slightly short for electric. Both the Insulation and Water Heating programs achieved approximately 300% above the original energy savings goals, while the comprehensive whole-home program, HPwES, fell short of its goal by 76% in the gas program and 32% in the electric program. The budgets for both gas and electric DSM retrofit programs have been reduced in 2011 from the 2010 program year. Notably, the HPwES program has reduced goals from 1,000 participants in 2010 to 100 in 2011 after only 242 customers participated in the program in 2010.⁵⁴

⁴⁷ Xcel Energy, "2011 Demand Side Management Plan." July 2010. 7.

<http://www.xcelenergy.com/staticfiles/xcel/Regulatory/Regulatory%20PDFs/2011-CO-DSM-Plan.pdf>. Accessed March 17, 2011.

⁴⁸ 2010 Colorado Utilities Report." Prepared by Navigant Consulting for the Colorado Governor's Energy Office. August 2010. http://rechargecolorado.com/images/uploads/pdfs/2010_Colorado_Utilities_Report_7-26-10.pdf.

⁴⁹ Xcel 2011 DSM Plan, 3.

⁵⁰ *Ibid.*, 1.

⁵¹ *Ibid.*, 105.

⁵² *Ibid.*, 151.

⁵³ Does not include ENERGY STAR® New Homes or School Education Kits which are also part of the Residential Program portfolio but not specifically for retrofit measures; Based on the original 2011 DSM proposal and does not include adjustments for settlement agreements or changes to the program through the 60-day notice process.

⁵⁴ Public Service Company of Colorado, "2010 Demand-Side Management Annual Status Report: Electric and Gas." April 1, 2011. 12.

Table 12. Metrics for Xcel Residential Retrofit Programs⁵⁵

| Activity | 2009 Actual ⁵⁶ | 2010 Target ⁵⁷ | 2010 Actual | 2011 Target ⁵⁸ |
|--|---------------------------|---------------------------|--------------|---------------------------|
| Total Budget for Gas and Electric Retrofit Measures | \$8,283,132 | \$11,852,575 | \$12,265,553 | \$9,991,172 |
| Electric Only | | | | |
| Budget ⁵⁹ | \$5,619,495 | \$8,856,376 | \$7,876,511 | \$7,585,248 |
| Annual Demand Savings (Net Generator kW) ⁶⁰ | 7,286 | 8,477 | 13,262 | 12,522 |
| Annual Energy Savings (Net Generator kWh) | 62,396,184 | 58,916,434 | 69,864,104 | 59,944,385 |
| Gas Only | | | | |
| Budget | \$2,663,637 | \$2,996,199 | \$4,389,042 | \$2,405,924 |
| Annual Energy Savings (Net Dth) | 150,332 | 114,197 | 247,840 | 115,921 |
| Annual Energy Savings (Dth/\$M) | 56,439 | 38,114 | 56,468 | 48,181 |

The HPwES program is available to customers who have both gas and electric service. The customer must start with an energy audit and then install three mandatory and at least two optional measures from a list of eleven gas and electric savings options. The mandatory measures are attic insulation, air sealing, and lighting.⁶¹ Optional measures include wall insulation, thermostat, furnace, boiler, water heater, refrigerator, dishwasher and clothes washer. While the whole home retrofit approach is a commendable program model, the program fell way short of its goals in 2010. Xcel determines that reasons for the low participation levels include overall economic conditions, the higher upfront cost to the homeowner relative to that for other programs, the long time period needed to install the chosen package of retrofit measures, and the lack of contractor engagement.⁶² Other barriers include relatively low rebate levels and the minimum requirements for participation in the program (customer must have an attic and specific pre-improvement insulation values).

⁵⁵ Does not include ENERGY STAR® New Homes, School Education Kits or ENERGY STAR Retailer Incentive.

⁵⁶ Public Service Company of Colorado, “2009 Demand-Side Management Annual Status Report.” April 5, 2010. 12.

⁵⁷ Xcel 2010 DSM Report, 9-12.

⁵⁸ Xcel 2011 DSM Plan, 105.

⁵⁹ The 2009 residential program portfolio included an ENERGY STAR® Retailer Program which has since been moved to the Indirect Product category. The Retailer program results are not included in Table 1 because the program was not specifically for building retrofit measures, hence the 2009 budget is lower than the 2011 budget.

⁶⁰ Demand savings refers to the energy saved during a specific period of time when customers use the most amount of energy. This time period may include a specific time of day, month or year, depending on location, temperature and utility.

⁶¹ Xcel Energy, “Consumer Programs.” http://responsiblebynature.com/save_energy_money/co. Accessed March 2, 2011.

⁶² Xcel 2010 DSM Report, 49.

Table 13. Incentives for Xcel's Residential Retrofit Programs⁶³

| Program Type | Measure | Criteria | Incentive |
|----------------|---------------------------|--|---------------------------|
| Whole Home | Air Sealing/Weather-strip | Mandatory | \$150 |
| | Insulation | Mandatory; attic and bypass sealing | \$350 |
| | Lighting | Mandatory; CFL | \$50 |
| | Wall Insulation | Optional; above grade | \$650 |
| | Thermostat | Optional; set back | \$15 |
| | Furnace | Optional; 92+ AFUE | \$120 |
| | Furnace | Optional; 94+ AFUE | \$160 |
| | Boiler | Optional; 84+ AFUE | \$120 |
| | Furnace | Optional; electrically efficient | \$130 |
| | Water Heater | Optional; tankless; EF 0.82+ | \$50 |
| | Water Heater | Optional; power vented | \$100 |
| | Dishwasher | Optional; ENERGY STAR | \$15 |
| | Clothes washer | Optional; ENERGY STAR | \$50 |
| | Refrigerator | Optional; ENERGY STAR | \$50 |
| Single Measure | Energy Audit | Standard | \$60 |
| | Energy Audit | With blower door | \$90 |
| | Energy Audit | With blower door and infrared | \$120 |
| | Insulation | Attic, wall, air-sealing, weatherstrip | \$300 max/ 20% of cost |
| | Furnace | Gas only, 92+ AFUE | \$80 |
| | Furnace | Gas only, 94+ AFUE | \$120 |
| | Boiler | Gas only | \$100 |
| | Refrigerator Recycling | Must work | \$50 |
| | Lighting | CFL | discount |
| | Water Heater | EF 0.62 | \$25 |
| | Water Heater | EF 0.65 | \$70 |
| | Water Heater | EF 0.67 | \$90 |
| | Water Heater | Electric only, tankless, EF 0.82+ | \$50 |
| | Water Heater Heat Pump | Electric only | \$450 |
| | Central A/C Tune Up | Electric only | \$150 |
| | Central A/C | 14 SEER; <12 EER; with trade-in | \$500 |
| | Central A/C | 14.5 SEER; 12 EER; with trade-in | \$750 |
| | Central A/C | 15 SEER; 12.5 EER; with trade-in | \$850 |
| | Central A/C | 16 SEER; 13 EER; with trade-in | \$1000 |
| | Evaporative Cooler | 2,500+ CFM | \$200 |
| | Evaporative Cooler | MSE 85%+ | \$ 500 |
| | Evaporative Cooling | MSE 85%+; whole home ducts | \$1000 |
| | Ground Source Heat Pump | Electric;, 3.3+ COP, 14.1+ SEER | \$300 per ton |
| Showerhead | 1.5 GPM | Free | |

⁶³ Xcel website, Consumer Programs.

Training contractors is Xcel's key strategy to reach 2011 program goals for HPwES. In 2010, a challenge Xcel faced was that contractors were not performing post-improvement test-out procedures to verify air leakage reduction of at least 15% as required by the program. Therefore, the contractors had a high compliance failure rate. In response, Xcel offered Building Performance Institute training to the contractors in the program and that has greatly improved contractor's performance. In addition, Xcel offered an incentive to contractors and auditors who signed up customers for the program. Customer rebate levels increased from 2010 to 2011 and will increase even more in 2012 and 2013, as will the program participation goals (100 in 2011; 200 in 2012; and 300 in 2013).⁶⁴

The company continues to research and evaluate measures that are not currently included in the DSM plan mostly due to cost-effectiveness reasons.⁶⁵ Measures that Xcel has considered include condensing storage tank water heaters, radiant cove and radiant floor heating, variable speed fan motor retrofits for furnaces, solar tube and LED lighting, airtight CFL down lights, condensing boilers, solar water heating for electric and gas, smart power strips, and windows. The company has also evaluated the percentage of incremental cost per measure for which to incentivize.⁶⁶ These measures may be included in future years if they become cost-effective.

Utility Contacts:

Kate Warman, Supervisor, Product Portfolio Manager
303-294-2163
Kate.Warman@xcelenergy.com

Jackie Ducharme, Associate Product Manager
303-294-2208
Jackie.Ducharme@xcelenergy.com

⁶⁴ Ducharme, Jackie, Associate Product Manager, Xcel Energy. Phone conversation, June 14, 2011.

⁶⁵ Xcel 2011 DSM Plan, 107.

⁶⁶ KEMA, Inc., "Colorado DSM Potential Market Assessment Final Report." March 12, 2010.

<http://xcelenergy.com/SiteCollectionDocuments/docs/CODSM-Report.pdf>. Accessed March 17, 2011.

Fort Collins Utilities

Fort Collins Utilities (FCU) is a municipal utility that provides electric service to over 65,000 homes and businesses in the City of Fort Collins. The FCU Home Efficiency Program (HEP) requires a whole home energy assessment that qualifies the customer for single measure rebates. According to FCU, customers are becoming more aware of the program in 2011 and the metrics in Table 14 below reflect dramatic increases in participation and energy savings. During 2010, 466 homes received energy audits, with 15.8% of homeowners opting to perform at least one upgrade. During the first half of 2011, 261 homes received energy audits and 132 homes chose to make energy efficiency improvements, for a conversion rate of 50.6%. The following metrics present the aggregated totals for all residential retrofit programs.

Table 14. Metrics for FCU Residential Retrofit Programs⁶⁷

| | 2009 Actual | 2010 Target | 2010 Actual | 2011 Target |
|------------------------------|-------------|-------------|-------------|-------------|
| Budget | \$510,200 | \$925,000 | \$943,616 | \$1,528,750 |
| Annual Energy Savings (MWh) | 2,782 | 10,000 | 6,122 | 10,000 |
| Annual Capacity Savings (MW) | 0.3 | n/a | 0.7 | n/a |

FCU started home performance programs twice previously with little success. Whole home programs typically rely on a single contractor as the point of contact for the customer throughout the home improvement process. The utility learned that many customers were unclear about the single contractor model, and that many of the contractors were not cross-trained in all of the necessary trades. FCU attempted to address these issues in their third and current program design.

The HEP now supports a traditional contractor network, allowing the contractors and homeowners to focus on single measures instead of an integrated whole home model. Improvements must be installed by participating contractors of the Program.^{68, 69} FCU requires the contractors to install measures in accordance with Installation Standards⁷⁰ of the program, and third party quality assurance (QA) is performed to verify installation of each measure. Onsite QA is required on the contractor's first 10 projects, and then on a minimum of 10 percent of each contractor's subsequent installations. If air sealing and insulation are installed, a blower door test must be performed as part of the QA verification. Other measures may also trigger the use of a blower door during the QA process.

Air sealing and insulation improvements lead the list of measures performed in both 2010 and the first half of 2011, with percentages of 58.5% and 59.5% respectively. The average number of

⁶⁷ Data does not include refrigerator or lighting programs because the data was not readily available.

⁶⁸ FCU, The Home Efficiency Audit and qualified contractor information.

<http://www.fcgov.com/utilities/residential/conserves/energy-efficiency/home-efficiency-program/audits>. Accessed June 17, 2011.

⁶⁹ FCU, Contractor Resources, <http://www.fcgov.com/utilities/residential/conserves/energy-efficiency/home-efficiency-program/contractors/resources>. Accessed June 30, 2011.

⁷⁰ FCU, Contractor installation standards and checklists, <http://www.fcgov.com/utilities/residential/conserves/energy-efficiency/home-efficiency-program/contractors/resources>. Accessed June 30, 2011.

measures incorporated into a house is approximately 2 measures for both 2010 and the first half of 2011. Thirty-three contractors are participating in the program.

Utility Contacts:

John Phelan, P.E., Energy Services Manager
970-416-2539
jphelan@fcgov.com

Kim DeVoe, Energy Services Specialist
970-221-6749
kdevoe@fcgov.com

Table 15. Incentives for FCU Residential Retrofit Programs⁷¹

| Program Type | Measure | Criteria | Gas Heated Homes | Elec Heated Homes |
|---------------------------|---------------------------------|--|--|---|
| Single Measure w/ Testing | Air Sealing | Tiers based on air leakage reduction of 25%, 33%, 50% | Tier 1, 25% ^a - \$200 Tier 2, 33% ^a - \$300 Tier 3, 50% ^a - \$400 | Tier 1, 25% - \$300 Tier 2, 33% - \$400 Tier 3, 50% - \$500 |
| | Crawl Space Insulation | Must seal/insulation rim joist, foundation wall, and moisture/soil gas barrier | \$0.30/sq.ft.-\$1.00/sq.ft, max \$250-\$500, depends on area & type | \$0.45/sq.ft.-\$1.50/sq.ft, max \$375-\$750, depends on area & type |
| | Basement Wall Insulation | Rim joist – R-10 minimum of closed cell or spray foam, air seal foundation plate | \$0.50-\$1.00/sq.ft, max \$300-\$550, depends on area & type | \$0.75-\$1.50/sq.ft, max \$450-\$900, depends on area & type |
| | Cantilever or Floor over Garage | Air seal exterior and interior cantilever; R-11- in garage | \$0.50/ sq.ft., max \$200 | \$.75/ sq.ft., max \$300 |
| | Frame or Masonry Wall | R-9- in frame wall; R-10+ in masonry wall | \$0.50/sq.ft. (net wall area), max of \$500 | \$.75/sq.ft. (net wall area), max of \$750 |
| | Flat Ceiling | Add R-25+ | \$0.30/sq.ft., max \$500 | \$0.45/sq.ft., max \$750 |
| | Cathedral | Dense pack rafter cavity | \$0.50/sq.ft., max \$500 | \$.75/sq.ft., max \$750 |
| | Window | ENERGY STAR® qualified | \$2.50/sq.ft., max \$750 | \$3.75/sq.ft., max \$1,000 |
| | Window Film | ENERGY STAR | \$1.50/sq.ft., max \$300 | \$1.50/sq.ft., max \$300 |
| | Blower Motor | n/a | \$150 | \$150 |
| | Gas Furnace | Existing 83%- AFUE | Tier 1: 90%+ AFUE, \$300 Tier 2: 92%+AFUE, \$500 | N/A |
| | Gas Boiler | 85%+ AFUE | \$300 | N/A |
| | AC | Use CheckMe® | \$250-\$550 | \$250-\$550 |
| | Heat Pumps | SEER 14.5 & HSPF 9.0 | N/A | \$500 |
| | Whole House Fan | Must have motorized, insulated dampers | \$250 per household | \$250 per household |
| | Evaporative Cooler | New or replacing existing AC with evaporative cooler | \$500 | \$500 |
| | Mechanical Ventilation | Mechanical Ventilation | 20% of cost up to \$400 | 20% of cost up to \$400 |
| | Gas Water Heater | Tier 1 & 2 - EF \geq 0.62+ Tier 3 – Tankless EF \geq 0.80 | \$100-\$400 | N/A |
| | Duct Sealing and Insulating | Must be performed by HEP HVAC duct sealing specialty contractor | \$200 per system | N/A |
| | Single Measure | Refrigerator/ Freezer | Must work; must be 10-27 cubic feet | \$35 |
| Dishwasher | | ENERGY STAR | \$35 bill credit | \$35 bill credit |
| Clothes Washer | | ENERGY STAR | \$50 bill credit | \$50 bill credit |
| Lighting | | CFL | Discount | Discount |

⁷¹ FCU, “Discover Your Home's Potential, Low-Cost Energy and Water Audits, Approved Contractor Lists and Rebates, and specific details of upgrade measures.” <http://www.fcgov.com/utilities/residential/conserves/energy-efficiency/home-efficiency-program/rebates>. Accessed June 30, 2011.

IV. New Mexico

Southwestern Public Service Company

The Southwestern Public Service Company (SPS), a subsidiary of Xcel Energy, began offering incentives for demand reduction in 2001.⁷² The programs were voluntary and unguided by the New Mexico Public Regulation Commission (NMPRC) until 2006.⁷³ Program expansion began in 2008 with initiation of Lighting, Evaporative Cooling and Air Source Heat Pump programs. In 2009, the utility added Home Energy Services (HES), Refrigerator Recycling and education programs. The Water Heating program replaced the Air Source Heat Pump program in 2010. Consumers and project sponsors (contractor, retailer or energy service company) can participate in the HES program.⁷⁴

Program results in 2010 were favorable, as the overall effort was under budget while the energy savings and participation targets were exceeded (see Table 16). The Electric Water Heating Rebate program attracted no participants in its first year of operation, 2010. Meanwhile the Home Lighting and Home Energy Services (HES) programs (with high cost-effectiveness ratios of 5.01 and 3.33, respectively) exceeded the target participation levels, lending to 2010's overall favorable results.⁷⁵ Notably, the participation goal for HES increased from 420 in 2009 to 4,345 in 2011. The latter value is significant given that SPS serves only about 90,000 residential customers.

Table 16. Metrics for the SPS Residential Retrofit Programs⁷⁶

| Activity | 2009 Actual ⁷⁷ | 2010 Target ⁷⁸ | 2010 Actual ⁷⁹ | 2011 Target ⁸⁰ |
|---|---------------------------|---------------------------|---------------------------|---------------------------|
| Total Budget | \$1,422,947 | \$4,037,797 | \$3,892,183 | \$4,431,962 |
| Total Annual Energy Savings (Net Generator kW) | 1,913 | 1,751 | 2,651 | 1,607 |
| Total Annual Energy Savings (Net Generator kWh) | 8,366,839 | 16,121,183 | 26,716,030 | 13,772,370 |

⁷² Xcel Energy, "New Mexico Program." <http://www.xcelefficiency.com/NM/index.html>. Accessed March 28, 2011.

⁷³ Mahoney, Lisa and Peter Narog. "Load Management and Energy Efficiency: Southwestern Public Service Company." PowerPoint. <http://www.xcelenergy.com/SiteCollectionDocuments/docs/IRPEnergyEfficiency-LoadMgmt.pdf>. Accessed March 30, 2011.

⁷⁴ Xcel Energy, "Residential and Low Income Home Energy Service." http://www.xcelefficiency.com/NM/RES_HTR/index.html. Accessed March 28, 2011.

⁷⁵ Southwestern Public Service Company, "Application for Approval of the 2010/2011 Energy Efficiency and Load Management Plan: Response to Third Bench Request." Exhibit BR 3-1. Case No. 09-00352-UT. Colorado Public Utilities Commission. January 19, 2011.

⁷⁶ Data includes Evaporative Cooling, Refrigerator Recycling, Lighting, Home Energy Services as well as Air Source Heat Pumps in 2009 and 2011 and Water Heaters in 2010 and 2011.

⁷⁷ Xcel Energy, "Southwestern Public Service Company: Energy Efficiency and Load Management Annual Report." August 1, 2010. 4.

⁷⁸ SPS Response, Exhibit BR 3-1. Case No. 09-00352-UT. Colorado Public Utilities Commission. January 19, 2011.

⁷⁹ Ibid.

⁸⁰ Southwestern Public Service Company, "Certification of Stipulation." Exhibit B. Case No. 09-00352-UT, Colorado Public Utilities Commission. <http://www.swenergy.org/news/news/documents/file/SPS%20DSM%20plan%20certification%20of%20stipulation%202-18-11.pdf>. Accessed April 5, 2011.

The HES program is designed differently than most of the other programs in the region, as it is based on projected savings of installed measures. Insulation, air and duct sealing and air conditioning equipment are eligible measures; however no air conditioning units were replaced in 2009.⁸¹ In the HES program, the Project Sponsor can reserve up to \$30,000 per project and a project may include more than one household, with a minimum rebate of \$250.⁸² HES is designed to give incentive payments for “deemed” or “prescriptive” energy savings at the rates of \$0.095 per kWh of first year electricity savings and \$275 per peak kW reduced.⁸³ Deemed savings assumption and equipment baseline and upgrade requirements are available online.⁸⁴ A second program available to contractors is the Air Source Heat Pump program, offering a rebate of \$70/ton to \$200/ton.⁸⁵

Three measures are available to consumers for single measure rebates: evaporative cooling, water heating and refrigerator recycling. Two rebate levels are available for the Evaporative Cooling program. Equipment must have a minimum media saturation rate of 85% or higher with remote thermostat control and periodic purge water control to qualify for the \$1000 rebate. Permanently installed direct, indirect or two-stage units with a minimum airflow of 2500 CFM can qualify for the \$200 rebate. The Evaporative Cooling program has the indirect goal to promote the equipment to area retailers since many do not carry the units.⁸⁶

Approximately 40% of SPS’s customers use electric domestic hot water heating.⁸⁷ Effective April 1, 2010, residential electric customers were eligible for a water heater rebate. Although the program had no participants in 2010, the company hopes to gain more participation in 2011 by expanding its marketing and outreach.⁸⁸

The following changes were made in 2010/11:⁸⁹

- Goals were reduced for the Air Source Heat Pump program to more accurately reflect potential customers who will switch to ASHPs.
- The rebate for Refrigerator Recycling was increased from \$50 to \$75 per unit, and the program budget by \$12,500, from \$123,550 in 2010 to \$136,050 in 2011.⁹⁰
- Water Heating rebate program was added.
- Evaporative Cooling and Home Energy Services goals and budget were increased.

⁸¹ Schiller, Steve. “Review of 2009 New Mexico Energy Efficiency Program Evaluations and Recommendations for Future Evaluation Infrastructure.” October 25, 2010. 23.

http://www.naruc.org/Publications/SERCAT_New_Mexico_2010.pdf Accessed on April 5, 2011.

⁸² Southwestern Public Service Company, “Program Manual for the 2010 Home Energy Services Program.” March, 2010. Page 8. http://www.xcefficiency.com/NM/RES_HTR/Xcel_HES_Manual_2010.pdf Accessed March 28, 2011.

⁸³ Ibid, Page 1 and Page 8.

⁸⁴ Xcel Energy, “Appendix A Deemed Savings for 2009 Home Energy Services Program for Xcel New Mexico.” http://www.xcefficiency.com/NM/RES_HTR/AppendixA.pdf Accessed March 28, 2011.

⁸⁵ Xcel 2011 DSM Plan as filed, 28.

⁸⁶ Ibid., 31.

⁸⁷ Ibid., 30.

⁸⁸ Southwestern Public Service Company, “Settlement Agreement for the 2011 Demand Side Management Plan.” 16. <http://www.swenergy.org/news/news/default.aspx?Year=2011#324>. Accessed March 30, 2011.

⁸⁹ Xcel 2011 DSM Plan as filed, 28-43

⁹⁰ SPS, Certificate of Stipulation, 2-5.

- Lighting participation goals increased in 2010 and will decrease in 2011 to account for the new federal lighting standards.
- Program costs per light bulb decreased from \$14 per bulb in 2008 to \$6 per bulb.
- A showerhead component was added to the Home Energy Services program.

Table 17. Incentives for SPS Consumer Residential Retrofit Programs⁹¹

| Program Type | Measure | Criteria | Incentive |
|--------------------|--|------------------|----------------|
| Single Measure | Evaporative Cooling | MSE 85+% | \$1000 |
| | Evaporative Cooling | 2500 or less CFM | \$200 |
| | Water Heater | EF 0.95 | \$40 |
| | Water Heater Heat Pump | n/a | \$450 |
| | Water Heater Solar | n/a | \$450 |
| | Refrigerator Recycling | n/a | \$75 |
| | Lighting | CFL | \$1 per bulb |
| | Air Source Heat Pump | n/a | \$70-\$200/ton |
| Bundled Efficiency | Insulation, air-sealing, duct sealing, A/C | Prescriptive | \$0.095/kWh |

Utility Contact:

Peter Narog, Manager, Energy Efficiency Programs
 303-294-2138
 peter.narog@xcelenergy.com

⁹¹ Xcel Energy, "Programs and Rebates in New Mexico."
http://www.responsiblebynature.com/save_energy_money/nm. Accessed March 28, 2011.

New Mexico Gas Company

New Mexico Gas Company (NMGCO) provides natural gas services to more than 500,000 customers in New Mexico. NMGCO's 2011 DSM budget is approximately \$3.3 million, with \$0.7 million allocated to residential retrofit programs. In 2009, a \$10 retailer rebate for water heater blankets was the only incentive for retrofit measures in NMGCO's DSM portfolio, aside from the Low-income weatherization program. The Water Heater Blanket program failed the cost-effectiveness test with a Total Resource Cost (TRC) of .49 and was discontinued.^{92, 93} Beginning in 2010, the Company launched incentive programs for High Efficiency Furnaces, Low-flow Showerheads, Water Heaters and Insulation. As shown in Table 18, the budgets from 2009 to 2011 increased by 570% while annual energy savings is projected to increase by 1100%.

Table 18. Metrics for NMGCO Residential Retrofit Programs

| Activity | 2009 Actual ⁹⁴ | 2010 Target ⁹⁵ | 2010 Actual ⁹⁶ | 2011 Target ⁹⁷ |
|-----------------------------------|---------------------------|---------------------------|---------------------------|---------------------------|
| Total Budget | \$107,472 | \$646,998 | \$512,169 | \$717,933 |
| Total Annual Energy Savings (Dth) | 1,438 | 17,775 | 6,679 | 17,275 |

The 2011 DSM plan includes changes to the Water Heating rebate program requirements, increasing from an Energy Factor (EF) 0.62 to EF 0.67 in accordance with the qualifying minimum of the national ENERGY STAR program.⁹⁸ The incentive for tank water heaters was raised from \$50 to \$100 (see Table 19). The programs are partially administered by third party entities, particularly for rebate processing.⁹⁹

Utility Contact:

Steve Casey, Manager, Energy Efficiency Programs
505-697-3586
Steve.Casey@nmgco.com

⁹²ADM Associates, "DSM Portfolio Evaluation for New Mexico Gas Company in Program Year 2009: Measure and Verification Report Draft #1." June, 2010. Prepared by ADM for New Mexico Gas Company. 1-2.

⁹³New Mexico Gas Company, "2011 Energy Efficiency Program Plan." 4.

⁹⁴New Mexico Gas Company, "DSM Portfolio Evaluation Program Year 2009 Measure & Verification Report, Draft 1." Prepared by ADM Associates. June, 2010. Appendix A. Note: 2009 Results only include the Water Heater Blanket program.

⁹⁵New Mexico Gas Company. Amended Application for Approval of Energy Efficiency Programs and Program Cost Tariff Rider Factor." Docket No. 09-00256-UT. New Mexico Public Regulatory Commission. 2.

⁹⁶New Mexico Gas Company, "2010 Energy Efficiency Program Annual Report." June 30, 2011. 4.

⁹⁷New Mexico Gas Company, "Direct Testimony and Exhibits of Steve Casey." New Mexico Public Regulatory Commission. September 29, 2010. 20. Includes High Efficiency Furnace, Low-flow Showerhead, Water Heater and Insulation programs.

⁹⁸Casey Testimony, 11.

⁹⁹NMGCO 2011 Program Plan, 17 & 20.

Table 19. Incentives for NMGCO Residential Retrofit Programs

| Program Type | Measure | Criteria | Incentive |
|----------------|--------------|--|-----------------|
| Single Measure | Insulation | Attic only, R-11 or less and install R-19+ | 25% up to \$500 |
| | Furnace | 90+ AFUE | \$200 |
| | Water Heater | Tank, EF 0.67+ | \$100 |
| | Water Heater | Tankless, EF 0.82+ | \$300 |
| | Showerhead | 1.5 GPM | \$7 |

V. Nevada

Nevada Power Company (NPC) and Sierra Pacific Power Company (SPPC) merged to become Sierra Pacific Resources July 1999 and later became known as NV Energy (NVE). The former utility providers are still regulated separately and NV Energy is not fully merged in the view of the Public Utility Commission of Nevada (PUCN). As of 2011, NV Energy operated separate DSM programs in northern and southern Nevada. The combined service area covers 44,424 square miles, providing electricity to 2.4 million electric citizens throughout Nevada as well as a state tourist population exceeding 40 million annually. They also provide natural gas to more than 145,000 citizens in the Reno-Sparks area.

Utility DSM programs expanded rapidly starting in 2006 after legislation was enacted allowing energy savings from DSM programs to qualify towards a portion of the utilities' renewable energy standards. State law also mandates lighting standards of 25 lumens per watt in 2012 for general service light bulbs.¹⁰⁰ When the lighting standards become effective, DSM energy savings are expected to decrease significantly since lighting contributed so heavily to DSM program savings in the past. The programs are already shifting in response to the state's lighting standards.

The Nevada Retrofit Initiative (NRI) was launched in 2010 by the Nevada State Office of Energy (NSOE), inspired by an employee of the City of Las Vegas. NV Energy is a program partner, along with Southwest Gas, Wells Fargo, Nevada State Bank, and others. NRI is the result of a \$5 million grant from the Department of Energy to expand HPwES programs in the state of Nevada, which hopefully will inspire a comprehensive home retrofit program from NV Energy.¹⁰¹ The goal of NRI is to implement HPwES and ultimately to retrofit 5% of Nevada's single family housing stock by 2021.¹⁰²

¹⁰⁰ This lighting standard is more stringent than the federal EISA lamp standards; however the state has not yet issued a regulation to implement the standard.

¹⁰¹ Nevada State Office of Energy, "Nevada Retrofit Initiative." <http://energy.state.nv.us/energy-efficiency/nri-initiative.html>. Accessed May 11, 2011.

¹⁰² Ibid.

Nevada Power Company (Southern Nevada)

To the consumer, NV Energy is branded as one entity, but NPC and SPPC conduct separate DSM planning, implementation, and reporting. Home retrofit DSM programs are slim; only refrigerator recycling, lighting and Solar Domestic Hot Water (SDHW) programs are offered throughout NV Energy’s entire territory. Notably, NPC significantly expanded the cooling program in 2011, offering substantial rebates for equipment upgrades and maintenance to optimize operational efficiency. NPC had offered HomeFree Nevada, a home audit and direct install program throughout 2010 and until the budget is exhausted in 2011. The program is being discontinued because it did not pass the cost-effectiveness criteria. The company made an attempt to pass the TRC by merging the HomeFree Nevada with another program to reduce administration costs, but results were still unfavorable. A solar thermal water heating program was also added in 2010.¹⁰³

Table 20. Metrics for NPC Residential Retrofit Programs

| Activity | 2009 Actual ¹⁰⁴ | 2010 Target ¹⁰⁵ | 2010 Actual ¹⁰⁶ | 2011 Target ¹⁰⁷ |
|-----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|
| Budget | \$13,091,771 | \$13,503,000 | \$6,296,917 | \$13,527,000 |
| Annual Energy Savings (kWh) | 140,675,883 | 98,386,656 | 87,106,675 | 90,924,303 |
| Demand Savings (kW) | 20,290 | 15,256 | 11,012 | 15,247 |

Table 20 presents metrics for NPC’s building retrofit programs. The 2009 annual energy savings was high due to the success of the Lighting program. The High Efficiency A/C program was more than \$4 million under budget in 2009,¹⁰⁸ although it had been quite successful the previous year, exceeding the projected 2008 budget by more than \$4 million.¹⁰⁹ The A/C program is in a process of redevelopment and was discontinued in 2010, but has been resumed in July 2011. The 2010 budget is lower than 2009 and 2011 due to the discontinuation of the A/C program.

Utility Contacts:

Larry Holmes, Director of Demand-Side Management
702-402-5845
LHolmes@NVEnergy.com

Michelle Lindsey, Energy Efficiency and Conservation
702-402-5402
MLindsey@NVEnergy.com

¹⁰³ NPC, “Integrated Resource Plan 2010-2029: Demand Side Plan 2010-2012.” 11.

¹⁰⁴ NPC, “Integrated Resource Plan 2010-2029: Demand Side Plan 2010-2012.” 54-56.

¹⁰⁵ NPC, “2011 Annual Demand Side Management Update Report.” 24-25.

¹⁰⁶ Ibid., 24-25.

¹⁰⁷ NPC, “2010 Annual Demand Side Management Update Report.” 31-32.

<http://www.swenergy.org/news/news/documents/file/NPC%202009%20DSM%20report%20vol%201.pdf> Accessed on April 14, 2011.

¹⁰⁸ Ibid., 13.

¹⁰⁹ NPC, “Program Data Sheet: Residential High Efficiency A/C.” January, 2010. 5.

Table 21. Incentives for NPC Residential Retrofit Programs¹¹⁰

| Program Type | Measure | Criteria | Incentive |
|----------------|---|--|-------------------|
| Single Measure | Refrigerator Recycling | Must work | \$30 |
| | Lighting | Purchase from participating retailer | Retailer discount |
| | SDHW | OG-300 or OG-100 PE stamp | \$1,500 |
| | Duct Sealing | 14% air leakage reduction | \$200 |
| | Duct Sealing | 50% air leakage reduction | \$500 |
| | A/C Refrigerant Charge | N/A | \$70 |
| | Indoor Coil Cleaning | N/A | \$40 |
| | Outdoor Coil Cleaning | N/A | \$25 |
| | Heat Pump Strip Heat Lock Out | Install | \$75 |
| | Heat Pump Strip Heat Lock Out | Reset | \$25 |
| | Western Cooling Control | Installation | \$80 |
| | Automatic BPM Fan Motor | Installation | \$300 |
| | Constant BPM Fan Motor | Must run fan all year; conduct req'd | \$600 |
| | A/C Replacement | From EER ≤ 8 to AC/HP SEER ≥ 14 < 16 | \$500 |
| | Heat Pump Replacement | From EER ≤ 8 to HP SEER ≥ 14 < 16 | \$700 |
| | A/C Replacement | From EER ≤ 8 to AC or HP SEER ≥ 16 (including GSHP and High EER evaporative cooling units) | \$650 |
| | Heat Pump Replacement | From EER ≤ 8 to HP SEER ≥ 16 (including GSHP) | \$850 |
| | Electric Resistance Furnace & A/C Replacement | From EER ≤ 8 to HP SEER ≥ 14 (including GSHP) | \$1000 |
| | HomeFree Nevada (Discontinuing) | Audit, CFL, Indoor & Outdoor Lighting Fixtures, Occupancy Sensors, A/C Tune-up, Duct Sealing, Door Sweep, Caulking | Free |

¹¹⁰ NV Energy, "Energy Efficiency Rebates." <http://www.nvenergy.com/saveenergy/home/rebates/>. Accessed April 25, 2011.

Sierra Pacific Power Company (Northern Nevada)

Sierra Pacific had previously offered the ENERGY STAR® Lighting and Appliance Program, but in 2011 the appliance portion was dropped due to the market penetration of ENERGY STAR products and the resulting freeridership. A Home Energy Audit program was available in 2010, but in 2011 it was cancelled due to a benefit-cost ratio of less than 1. Residential Retrofit and High Efficiency Window Replacement programs were explored but also had a benefit-cost ratio of less than 1.¹¹¹ The Solar Thermal Water Heating program was the only retrofit program added in 2011, accompanied by the Consumer Electronics and Plug Load program (not included in Table 22).

Table 22. Metrics for SPPC Residential Retrofit Programs

| Activity | 2009 Actual | 2010 Target | 2010 Actual | 2011 Target |
|--|----------------------------|----------------------------|----------------------------|------------------------------|
| Total Budget for Gas and Electric Retrofit Measures ¹¹² | \$2,709,999 | \$3,686,000 | \$2,914,017 | \$3,940,000 |
| Electric Only | | | | |
| Budget | \$2,517,529 ¹¹³ | \$3,246,000 ¹¹⁴ | \$2,678,914 ¹¹⁵ | \$3,280,000 ¹¹⁶ |
| Annual Energy Savings (kWh) | 37,196,335 | 54,996,300 | 27,594,748 | 43,499,000 |
| Demand Savings (kW) | 6,342 | 3,100 | 3,462 | 5,333 |
| Gas Only | | | | |
| Budget | \$192,470 ¹¹⁷ | \$440,000 ¹¹⁸ | \$235,103 ¹¹⁹ | \$660,000 ^{120,121} |
| Annual Energy Savings (Dth) | 9,495 | 13,600 | 7,424 | 6,490 |

Utility Contacts:

Larry Holmes, Director of Demand-Side Management
702-402-5845
LHolmes@NVEnergy.com

Michelle Lindsey, Energy Efficiency and Conservation
702-402-5402
MLindsey@NVEnergy.com

¹¹¹ SPPC, “Integrated Resource Plan 2011-2030: Demand Side Plan 2011-2013.” 20.

¹¹² Total Budgets for all years were corrected after the initial release of this report.

¹¹³ Ibid., p. 40.

¹¹⁴ NPC, “2011 Annual Demand Side Management Update Report.” 34-35.

¹¹⁵ Ibid., 34-35.

¹¹⁶ SPPC, “Demand Side Plan 2011-2013.” 43-47.

¹¹⁷ SPPC, “2010 Gas Conservation and Energy Efficiency Plan.” 23.

¹¹⁸ SPPC, “2011 Gas Conservation and Energy Efficiency Plan Annual Report.” 7-8.

¹¹⁹ Ibid., 7-8.

¹²⁰ SPPC, “2010 Gas Conservation and Energy Efficiency Plan.” 26-27.

¹²¹ SPPC, “Natural Gas Solar Thermal Systems Demonstration Program Annual Plan.” 17.

Table 23. Incentives for SPCC Residential Retrofit Programs¹²²

| Program Type | Measure | Criteria | Incentive |
|----------------|------------------------|--------------------------------------|---|
| Single Measure | Refrigerator Recycling | Must work | \$30 |
| | Lighting | Purchase from participating retailer | Retailer discount |
| | SDHW-Electric | OG-300 or OG-100 PE stamp | \$2000 |
| | SDHW-Gas | OG-300 or OG-100 PE stamp | Up to \$3000 or \$14.50/therm |
| | Water Heater Blanket | Gas only | Free |
| | Furnace | 60-100 kBTU/hr | \$50 (90 AFUE); \$75 (92 AFUE); \$100 (94 AFUE); \$125 (96 AFUE) |
| | Boiler | 61-100 kBTU/hr | \$75 (90 AFUE); \$100 (94 AFUE) |

¹²² Ibid.

VI. Utah

In the state of Utah, the primary existing home programs that serve the vast majority (80% and above) of the state are run by two investor-owned utilities: Rocky Mountain Power and Questar Gas Company. Rocky Mountain Power provides several existing homes programs including weatherization, efficient cooling, residential load control, and refrigerator recycling. Questar Gas provides three existing homes programs: weatherization rebates, appliance rebates, and a home energy audit.

Rocky Mountain Power

Rocky Mountain Power (RMP) is a division of PacifiCorp and provides three programs for existing homes: “Home Energy Savings” (HES), efficient cooling (“Cool Cash”), and refrigerator recycling (“See Ya Later, Refrigerator”). All RMP existing home programs are implemented by third party contractors. Participation in Cool Cash increased by 130% from 2009 to 2010 and electricity savings increased by 174% over the same time period. Evaporative cooling measures accounted for much of this growth, with a 400% increase in participation due to increased training of equipment dealers and installers.¹²³ Room A/Cs and duct insulation had the lowest level of participation in 2010.¹²⁴ Overall, HES has been very successful, with energy savings increasing 64% from 2008-2009.¹²⁵

Table 24. Metrics for RMP Utah Home Energy Savings Program

| Activity | 2009 Results ¹²⁶ | 2010 Actual ¹²⁷ | 2011 Target ^{128, 129} |
|---|-----------------------------|----------------------------|---------------------------------|
| Budget | \$28,278,046 | \$20,735,778 | \$15,184,709 |
| Annual Energy Savings at Site (kWh) | 108,413,508 | 82,643,641 | n/a |
| Annual Energy Savings at Generation (kWh) | 118,951,301 | 90,779,908 | 115,324,000 |

Since 2003, the Cool Cash program has been providing incentives for the purchase, best practice installation, and proper sizing of high efficiency air conditioning and evaporative cooling equipment. In March 2011, “rigid media” was added to the premium evaporative cooling equipment component of the Cool Cash program. This program offers incentives for the replacement or new installation of direct evaporative cooling units (which are well-suited for Utah’s arid climate), as well as a larger incentive for premium whole home ducted evaporative cooling systems, such as the *Oasis* and *Coolerado* systems. The program also contains a “proper

¹²³ RMP, “2010 Annual Energy Efficiency and Peak Reduction Report – Utah.” 25.

http://www.pacificorp.com/content/dam/pacificorp/doc/Energy_Sources/Demand_Side_Management/DSM_UT_Report.pdf. Accessed April 21, 2011.

¹²⁴ *Ibid.*, 31.

¹²⁵ RMP, “Demand-Side Management Annual Report for 2009 – Utah.” March 31, 2010. 7.

¹²⁶ *Ibid.*, 6.

¹²⁷ RMP, 2010 Annual Report, 6.

¹²⁸ RMP, “Projected DSM Program Expenditures and Revenues.”

<http://www.psc.utah.gov/utilities/electric/elecindx/2010/1003557indx.html>. Accessed May 15, 2011.

¹²⁹ RMP, “Utah DSM 2011 Projected Savings.”

<http://www.psc.utah.gov/utilities/electric/elecindx/2010/1003557indx.html>. Accessed May 15, 2011.

AC installation incentive,” which requires that the technician to be certified by North American Technician Excellence, Inc. (NATE). An additional incentive is available for AC systems that are “right sized.”

The incentive level for the HES insulation program was reduced in 2010 in response to a dramatic drop in the local price for insulation. With a combined rebate from Questar Gas and Rocky Mountain Power that often exceeded the incremental cost of construction, the program greatly exceeded its expected budget and participation levels in 2008, 2009 and early 2010. RMP also moved its part-time inspectors to full-time positions and trained 42 contractors on program details in 2010.¹³⁰ In the building envelope retrofit area (insulation and windows), 44,700 customers participated in the program in 2009 and 32,300 participated in 2010.

Currently, the incentive level and R-value requirement for the HES program’s insulation incentives vary depending on the amount of attic insulation installed and whether the home uses electric heating. An additional \$200 insulation “spiff” incentive is available to customers who insulate two areas of the home at the same time (attic/ceiling, floor and/or wall). Also for building shells, 571,579 square feet of energy-efficient windows were installed in 2009 which attributed to 109,659 kWh/yr of energy savings.¹³¹ The program also includes an incentive for AC and heat pump tune-ups.

Cost-Effectiveness

Rocky Mountain Power evaluates the cost-effectiveness of its DSM programs based on the California Standard Practice Manual methodology, and the Utility Cost test (UCT) is the main test used to determine cost-effectiveness in Utah. The overall benefit-cost ratio for all of Rocky Mountain Power’s DSM programs is 1.8 under the TRC and 1.8 under the UCT. All programs reviewed fall within 1.2 to 1.4 on the program level, while at the measure level some individual measures fall slightly below 1.0 and some exceed 2.6 under the UCT. The lighting incentive is RMP’s most cost-effective measure, rating just over 5.0 under the UCT and 2.1 under the TRC.

In 2011, RMP plans to build a stronger, localized, mid-market delivery system; make the customer the focal point; and strategically manage the market.¹³² To achieve these goals RMP will offer business development and sales support and materials for contractors, a practice which has been increasingly favored across the nation to develop an energy efficiency workforce with better sales ability. The company will conduct a market assessment to better understand changes in the local A/C and evaporative cooling market, and will work with dealers and installers to increase participation in the evaporative cooling market in Utah. In addition, RMP is investigating a new residential home comparison report program intended to educate customers on their energy usage and help them save energy and money.¹³³

¹³⁰ RMP 2010 Annual Report, 32.

¹³¹ RMP 2009 Annual Report, 33.

¹³² RMP 2010 Annual Report, 32.

¹³³ Ibid., 10.

Table 25. Incentives for RMP Utah Home Energy Savings Program¹³⁴

| Program Type | Measure | Criteria | Incentive |
|--------------------------------------|--------------------------|---|-------------------------|
| Bundled Efficiency or Single Measure | Insulation | Attic, electric heating; R-19 min | \$0.30 /ft ² |
| | Insulation | Attic, electric cooling; R-19 min | \$0.08 /ft ² |
| | Insulation | Attic, electric heating; R-30 min | \$0.40 /ft ² |
| | Insulation | Attic, electric cooling; R-30 min | \$0.15 /ft ² |
| | Insulation | Wall, electric heating; R-11 min | \$0.45 /ft ² |
| | Insulation | Wall, electric cooling; R-11 min | \$0.30 /ft ² |
| | Insulation | Floor, electric heating; R-19 min | \$0.25 /ft ² |
| | Insulation | Bonus if 2 Areas are Insulated | \$200 |
| | Water Heater | Electric; 40-49 gal, EF .93+; 50-65 gal, EF .91+; 60 gal, EF .89+ | \$50 |
| | Central A/C | SEER 15+; EER 12.5+ | \$150 |
| | Central A/C | Proper sizing; Manual J calculations | \$50 |
| | Central A/C | Proper installation; NATE certified | \$50 |
| | A/C Room | ENERGY STAR | \$30 |
| | Refrigerator | ENERGY STAR | \$20 |
| | Refrigerator Recycling | 10 cu. ft. min or freezer | \$30 |
| | Lighting Fixtures | ENERGY STAR | \$20 |
| | Dishwasher | EF .72+ | \$20 |
| | Ceiling Fan | ENERGY STAR | \$20 |
| | Clothes Washer | MEF 2.0-2.45; WF 6.0 or less | \$50 |
| | Clothes Washer | MEF 2.46 | \$75 |
| | Evaporative Cooler | New installation | \$300 |
| | Evaporative Cooler | Replacement | \$100 |
| | Evaporative Cooler | Whole home without ducts | \$500 |
| | Evaporative Cooler | Whole home with ducts | \$1000 |
| Ground Source Heat Pump | Tune-up; 350 CFM/ton min | \$75 | |

Utility Contact

Jason Berry, Residential Energy Efficiency Program Manager
 801-220-3443
 Jason.Berry@PacifiCorp.com

¹³⁴ Rocky Mountain Power, "Utah Incentives and Forms." <http://homeenergysavings.net/Utah/forms.html>. Accessed April 10, 2011.

Questar Gas Company

Questar Gas Company, a division of Questar Corporation, supplies natural gas to approximately 870,000 customers in Utah, with another 130,000 customers in Wyoming, and Southeastern Idaho (about 870,000 are in Utah). Questar is Utah's only regulated investor-owned natural gas utility and offers a suite of programs for energy efficiency in existing homes. In 2007 the Utah Public Service Commission approved full revenue decoupling on a three-year pilot basis for Questar Gas in Utah through a "Conservation Enabling Tariff." The Tariff also required the development of a comprehensive natural gas energy efficiency effort, which became known as ThermWise®. In June of 2010, the Commission approved the Tariff on an ongoing basis. The ThermWise programs for existing homes include a home energy audit, appliance rebates, and a weatherization program. These three retrofit programs constitute 79% of the total energy efficiency budget for ThermWise in 2011. The programs have been in place since 2007 and are implemented by a third party contractor with Questar administration and management.

Table 26. Metrics for Questar Residential Retrofit Programs

| Activity | 2009 Actual ¹³⁵ | 2010 Actual | 2011 Target |
|-----------------------------|----------------------------|--------------|--------------|
| Budget | \$38,330,677 | \$30,348,558 | \$25,591,241 |
| Annual Energy Savings (Dth) | 676,584 | n/a | 1,221,790 |

The Home Energy Audit (HEA) program provides the option of a mail-in or in-home audit. The mail-in option requires homeowners to conduct a 30-60 minute walk-through audit. The in-home audit is a "clipboard" type audit and typically takes 90 minutes to 3 hours to complete. In both cases, information entered into the audit survey is used to create a customized report for the homeowner. A \$25 fee is charged for the in-home audit, which is refunded if the customer participates in any rebate program recommended by the audit report. HEA has consistently delivered lower participation than projected. The company has researched potential reasons for this low performance, including non-participant surveys and psychometric analysis. Findings include that Questar customers are reluctant to pay the \$25 audit fee and that some customers may be put off by the term "audit." This program is still being administered unchanged. Beginning in 2011, in-home auditors will acquire BPI certification.

The appliance rebate program includes two less common and more "cutting edge" measures: condensing gas storage and hybrid gas water heaters. These water heater technologies recover the heat from flue gases that would otherwise be wasted. Perhaps the most unique program measure included in the ThermWise® Appliance programs is a "solar assisted" water heating system. The solar water heating system must be an active solar heating system, must be certified as OG-300 system by the Solar Rating and Certification Corporation, and must include a back-up natural gas furnace or boiler. This system has low participation but relatively high annual gas savings per measure (17.5 Dth), for a projected 437.5 Dth of total savings for 2011.

With high rebate levels, very effective marketing, and a responsive provider network, the home weatherization program was extremely effective with a total of 234,800 participants during 2007-2009 (some customers may have participated more than once). As a result of Questar's

¹³⁵ The Cadmus Group, "Thermwise Evaluation." Prepared for Questar. June 24, 2010.

efforts, Utah was the top state in the nation in terms of gas utility energy efficiency spending per customer and energy savings per unit of gas sales as of 2009 according to ACEEE.¹³⁶

Recent changes to the weatherization program include significant reductions in the incentive levels for wall, attic, and floor insulation to respond to the dramatic drop in the local cost for insulation work. In addition, the duct sealing and insulation incentives were combined, reduced and modified slightly to ensure that contractors insulate all accessible ductwork in order to claim the incentive. In addition, effective March 1, 2011 contractors wishing to participate in the insulation and duct sealing/insulation incentive programs must complete an Authorized Contractor Agreement.

Cost-effectiveness

In its annual energy efficiency program application Questar Gas proposes a cost-effectiveness model that evaluates all programs together, using the California Standard Practice Manual cost-effectiveness methodology. The overall benefit-cost ratio for all of the ThermWise energy efficiency programs (plus its market transformation initiative) is 1.3 under the TRC test and 1.8 under the UCT. The Home Energy Audit program is 0.5 under both the TRC and the UTC, well below the required 1.0 minimum, whereas all other programs fall at or just above 1.0 under the TRC.

Utility Contact:

Steve Bateson, Director, Energy Efficiency
801-324-5047
Steve.Bateson@questar.com

¹³⁶ M. Molina et al. *The 2010 State Energy Efficiency Scorecard*. Washington, DC: American Council for an Energy-Efficient Economy. October 2010.

Table 27. Incentives for Questar’s Residential Retrofit Programs

| Program Type | Measure | Criteria | Incentive |
|--------------------------------|--------------------------|--|--|
| Whole Home, Bundled, or Single | Wall Insulation | R-11+ | \$0.30/sq. ft. |
| | Floor Insulation | R-19+ | \$0.20/sq. ft. |
| | Attic Insulation | Tier 1: R-19+ | \$0.20/sq. ft. |
| | Attic Insulation | Tier 2: combined with tier 1 to add R-11 or greater to achieve at least R-38 | \$0.07/sq. ft. |
| | Windows | U value .30- | \$0.95/sq. ft. |
| | Duct Sealing/ Insulation | n/a | \$100 plus \$5.25/linear ft. (up to \$450 max) |
| | Thermostat | Programmable; multiple settings | \$30 |
| | Water Heater | EF .62-.66 | \$50 |
| | Water Heater | EF .67+ | \$100 |
| | Water Heater | EF .90+, Condensing Gas Storage | \$350 |
| | Water Heater | Tankless, EF .82-.89 | \$300 |
| | Water Heater | Tankless, EF .90+ | \$350 |
| | Water Heater | High Efficiency Hybrid Gas, TE 90%+ | \$350 |
| | Water Heating | Solar Assisted Gas, Active System | \$750 |
| | Furnace | AFUE 90-91.9% | \$200 |
| | Furnace | AFUE 92-94.9% | \$300 |
| | Furnace | AFUE 95%+ | \$350 |
| | Boiler | AFUE 95%+ | \$600 |
| | Clothes Washer | MEF 2.60 | \$50 |
| | Fireplace | Direct-vent Gas, AFUE 70%+ | \$200 |
| | Audit | In-home | \$25 |
| | Audit | Mail-in | Free |
| | Pipe Insulation | With \$25 audit | Free |
| | Kitchen Sink Aerator | With \$25 audit | Free |
| | Faucet Aerator | With \$25 audit | Free |
| Showerhead | With \$25 audit | Free | |

VII. Wyoming

Wyoming's HPwES program is operated by the Wyoming Energy Council, a nonprofit based in Laramie. In association with the program, Wyoming has a Home Performance Alliance as a platform for collaboration among utilities, industry, nonprofits and government.¹³⁷ In addition to the state-funded HPwES program, Rocky Mountain Power offers retrofit programs.

Rocky Mountain Power

Rocky Mountain Power (RMP) serves approximately 133,770 customers in Wyoming and is by far the largest electric utility in the state.¹³⁸ The Wyoming Public Service Commission (PSC) granted authority to RMP to implement DSM programs starting in the latter part of 2008,¹³⁹ and RMP began offering programs to its Wyoming customers in 2009.¹⁴⁰ Included in the portfolio is Home Energy Savings (HES), which provides incentives to customers in existing homes, new construction, multifamily and manufactured homes. HES is administered by a third party.

Results for 2009 were approximately 65% below those initially forecast, while the expenditures were approximately 45% lower than forecast.¹⁴¹ The results are believed to be impacted by the country's economic situation, lack of consumer and contractor awareness of the programs, and the lag time between PSC approval and availability of the programs to customers. In 2010 the energy savings increased by 188%.¹⁴²

Table 28. Metrics for RMP Wyoming Home Energy Savings Program¹⁴³

| Activity | 2009 Results | 2010 Target | 2010 Actual ¹⁴⁴ | 2011 Target |
|-----------------------------|--------------|-------------|----------------------------|-------------|
| Budget | \$439,242 | \$1,002,243 | \$915,439 | \$1,107,277 |
| Annual Energy Savings (kWh) | 3,007,000 | 10,475,000 | 6,601,000 | 11,633,000 |

RMP incentivizes the bundling of home performance upgrades by offering an added bonus to customers who submit rebate applications for more than one measure.¹⁴⁵ The HES program has various technical requirements for rebate program eligibility. For the building envelope incentives (windows, insulation), homes must have an electric heating and cooling system serving at least 80% of the floor area. Electric cooling is defined as a permanently installed mechanical (compressor based) systems delivering cooling through a duct system. Electric heating is defined as permanently installed ducted electric furnaces, heat pumps or electric zonal

¹³⁷ Wyoming HPwES. <http://www.wyominghomeperformance.com/Alliance/index.htm>. Accessed May 4, 2011.

¹³⁸ Rocky Mountain Power, "Quick Facts." <http://www.rockymountainpower.net/about/cf/qf.html>. Accessed March 28, 2011.

¹³⁹ RMP, "2009 Demand-Side Management Annual Report – Wyoming." April 30, 2009. 6.

¹⁴⁰ *Ibid.*, 6.

¹⁴¹ *Ibid.*, 17.

¹⁴² RMP, "2010 Energy Efficiency Annual Report – Wyoming."

http://www.pacificorp.com/content/dam/pacificorp/doc/Energy_Sources/Demand_Side_Management/WY_DSM_Report_2010.pdf. Accessed May 4, 2011. 7.

¹⁴³ The Wyoming Home Energy Savings program is for both existing homes and new construction. Data could not be extrapolated and includes both.

¹⁴⁴ RMP, 2010 Annual Report – Wyoming, 6.

¹⁴⁵ RMP, 2010 Annual Report - Wyoming, 19.

heating systems. Pre-existing insulation depth in the attic and floor must be R18 or less and R19 or more must be installed. Pre-existing insulation depth in the walls must be R10 or less and R11 or more (or fill the cavity) must be installed.

For mechanical improvements, a Program Qualified Contractor must install the equipment. For air conditioners, equipment must meet an air flow of 350 CFM/ton and the refrigerant charge must be within 3 degrees of target subcooling for units with thermal expansion valves (TXV). A proper installation worksheet and Manual J or equivalent must be submitted with the incentive application. For heat pumps, the equipment must be an air-source split or packaged unitary with a cooling capacity of 65,000 BTU/hr (5.4 tons) or less.

Table 29. Incentives for RMP Wyoming Home Energy Savings Program

| Program | Measure | Criteria | Incentive |
|--------------------|----------------------|---|----------------------|
| Bundled Efficiency | Insulation | Attic, Walls, Floor; Living Quarters Only | \$0.35/sq.ft. |
| | Windows | U-Factor 0.35-, SHGC 0.33- | \$1.00/sq.ft. |
| | Water Heater | Electric, 40+ Gallon, EF 0.93+ | \$50 |
| | Central A/C | SEER 15+ & TXV | \$250 |
| | Central A/C | Installation of SEER 13 & TXV | \$50 |
| | Central A/C | Sizing of SEER 13 & TXV | \$50 |
| | A/C Tune-up | n/a | \$100, + \$25 to PQC |
| | Duct Sealing | n/a | \$150, + \$50 to PQC |
| | Heat Pump Upgrade | 8.2+ HSPF & TXV | \$350 |
| | Heat Pump Conversion | Electric Heat, 8.2+ HSPF & TXV | \$250 |
| | Evaporative Coolers | n/a | \$100 |
| | Refrigerator | n/a | \$20 |
| | Lighting Fixtures | n/a | \$20 |
| | Dishwasher | n/a | \$20 |
| | Ceiling Fan | n/a | \$20 |
| | Clothes Washer | MEF 1.72-1.99 | \$50 |
| | Clothes Washer | MEF 2.0+ | \$75 |

RMP educates consumers on “Hiring a Contractor” through the website, www.homeenergysavings.net. The company recommends that the customer obtain quotes from three contractors, confirm that the contractor has an appropriate license and insurance, and call the contractor’s references. RMP has retailer, home improvement, and heating/cooling hotlines for contractors. Contractors can receive free training and cooperative marketing.

Utility Contact:

Greg Stiles, Demand-Side Management Program Manager
 503-813-5153
Greg.Stiles@pacificorp.com

VIII. Conclusion

Program Design

Utilities throughout the Southwest are implementing retrofit programs shaped by the constraints of community demographics, contractor infrastructure, benefit-cost ratios and technical experience to capture cost effective energy savings in existing homes. For the most part, the utilities are offering a choice of multiple paths for the customers to participate in retrofit programs. The program designs range from whole-home assessments to single rebates-per-measure for high efficiency equipment or building upgrades. While some of the programs may encourage deep retrofits, deep retrofits are not the norm by any means. Utilities have to be responsive to regulatory requirements or goals that demand high overall energy savings, thereby leading utilities to want to make it very easy for customers to participate in the program. If the program entry requirements are too restrictive the utility is likely to experience low participation levels. Participation levels for whole home programs are generally very low compared to participation in single measure programs. Despite low participation, some utilities in the region are interested in whole home programs and in encouraging deeper retrofits in addition to providing incentives for single measures.

A few of the programs have achieved very high levels of participation, notably Questar’s ThermWise Weatherization Program. Questar is leading the nation in natural gas DSM; this success can be attributed to high rebate levels, very effective marketing, and a responsive home weatherization provider network.

Best Practices for Residential Retrofit Programs

Beyond offering incentives, utilities can put in place program infrastructure to boost their program’s success, such as testing procedures, access to financing, quality assurance, a trade ally network and a public advisory group. Table 30 shows which best practices are currently implemented by southwest utilities.

Table 30. Best Practice Services Offered by Utilities for Retrofit Programs

| State | Utility | Starts with an Energy Audit | Test in/Test Out | Quality Assurance | Access to Financing | Trade Ally Network | Public Advisory Group |
|-------|---------|-----------------------------|------------------|-------------------|---------------------|--------------------|-----------------------|
| AZ | APS | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | TEP | ✓ | ✓ | ✓ | Proposed | ✓ | |
| | SRP | ✓ | ✓ | | Evaluating | ✓ | |
| CO | FCU | ✓ | ✓ | ✓ | | ✓ | |
| | Xcel | ✓ | ✓ | ✓ | | ✓ | ✓ |
| NM | SPS | | | | | ✓ | ✓ |
| | NMGCO | | | | | ✓ | ✓ |
| NV | NPC | | | ✓ | | ✓ | ✓ |
| | SPPC | | | | | ✓ | ✓ |
| UT | Questar | | | ✓ | | ✓ | ✓ |
| | RMP | | | | | ✓ | ✓ |
| WY | RMP | | | | | ✓ | ✓ |

Criteria for Qualifying Measures and Rebate Amounts

Efficiency requirements for products that qualify for rebates vary considerably. There is an especially wide range of efficiency requirements for boilers, A/C equipment, and insulation. Only Questar and RMP offer rebates for energy-efficient windows. No rebates are currently offered for Energy or Heat Recovery Ventilators. TEP’s incentives for the performance path are significantly higher than for the prescriptive path, especially for duct sealing (\$650 compared to \$350, respectively). Shade screens and window films are offered by a few of Arizona’s utilities but not by other utilities examined in this report. All insulation rebate programs have minimum requirements for pre- and post-installation, although surprisingly no utilities offer higher incentives for installing above an R-40 insulation level in attics. Also, some utilities offer fixed incentive amounts for insulation work independent of home size, while other utilities provide incentives per square foot of retrofit area.

Table 31. Highest and Lowest Criteria for Qualifying Measures

| Measure | <i>Highest Criteria</i> | | <i>Lowest Criteria</i> | |
|--------------|-------------------------|----------|------------------------|---------------------|
| | Utility | Criteria | Utility | Criteria |
| Insulation | Xcel | R-40 | NMG | R-30 |
| Windows | Questar | U .30- | RMP-WY | U .35- SHGC .33- |
| Water Heater | SPS | EF .95 | Xcel | EF .62 |
| Furnace | NVE | 96 AFUE | NVE | 90 AFUE |
| Boiler | Questar | 95+ AFUE | Xcel | 84 AFUE |
| A/C | APS | 17+ SEER | RMP-WY | 13 SEER |

Table 32. Highest and Lowest Incentives per Measure Offered by the Utilities

| Measure | <i>Highest Incentive</i> | | <i>Lowest Incentive</i> | |
|---------------|--------------------------|-------------|-------------------------|---------------|
| | Utility | Incentive | Utility | Incentive |
| Insulation | TEP | \$800 | TEP | \$250 |
| Windows | RMP-WY | \$1 / sq ft | Questar | \$.95 / sq ft |
| Water Heater | Xcel | \$90 | Xcel | \$25 |
| Furnace | TEP | \$1,700 | Xcel | \$80 |
| Boiler | Questar | \$600 | Xcel | \$100 |
| A/C | APS | \$525 | RMP-UT | \$150 |
| Evap. Cooling | SPS & RMP-UT | \$1,000 | SPS | \$200 |
| Ducts | TEP | \$650 | APS | \$250 |
| Audit | Xcel | \$120 | Questar | \$25 |

Cost-Effectiveness of Residential Retrofit Programs

Utility companies use different inputs and benefit-cost tests, as directed by their state utilities commission, to determine the cost-effectiveness of their DSM programs. The Total Resource Cost (TRC) test is used in all states except Utah, where the Utility Cost Test (UCT) is the standard. Both tests require inputs of energy and demand savings, avoided costs, DSM costs, retail costs and environmental costs.¹⁴⁶ These tests largely determine whether or not the program will be offered by the utility. Programs with a benefit-cost ratio of less than 1 are unlikely to be implemented.

The cost-benefits test results for whole home, bundled efficiency and single measure programs vary by program. As an example of whole home programs, Xcel had projected a Modified TRC for the electric and gas HPwES program at 2.15 and 1.25 respectively, but actual results for both programs failed the TRC in 2010, which can be attributed to their low rebate amounts. Xcel explains, “The program had a very challenging year because of the high cost to participate, the long time period given to customers to make the improvements, and overall economic conditions.”¹⁴⁷ Increasing rebate amounts would increase program participation and could help the company achieve a higher benefit-cost score. SPPC evaluated a whole home retrofit program in 2010, but results achieved a TRC of less than 1 so the program was not extended into the 2011 DSM plan. Questar’s whole home ThermWise program, however, passed both the TRC with 1.3 and the UTC with 1.8.

RMP’s bundled efficiency programs passed the benefit-cost test with a TRC score of 1.089 in Wyoming¹⁴⁸ and UTC score of 1.09 in Utah.¹⁴⁹ Additionally, SPS’ Home Energy Services program achieved a TRC of 3.33, above the 3.06 that was originally projected for 2010.¹⁵⁰ Single measure insulation and air-sealing programs tend to achieve the highest benefit-cost scores along with lighting and refrigerator recycling programs; for example, Xcel’s insulation incentive program had a benefit-cost ratio of 3.4 (electric program) and 1.28 (gas program) in 2010.

¹⁴⁶ Shirley, Wayne. Regulatory Assistance Project, “Benefit Cost Tests for Energy Efficiency.” Presentation at the Kansas Corporation Commission’s Workshop on Energy Efficiency. March 25, 2008.

¹⁴⁷ Xcel, 2010 Annual Report, 49.

¹⁴⁸ RMP-WY, 2010 Annual Report, 12.

¹⁴⁹ RMP-UT, 2010 Annual Report.

¹⁵⁰ SPS, “Application for Approval of the 2010/2011 Energy Efficiency and Load Management Plan: Response to Third Bench Request.” Exhibit BR 3-1. Case No. 09-00352-UT. Colorado Public Utilities Commission. January 19, 2011.

IX. Recommendations

SWEEP provides the following recommendations on how to develop residential retrofit programs that will best serve customers needs, attract the greatest number of program participants, and result in maximum energy savings.

1. Offer flexible and comprehensive programs

Some homeowners enter a program with the intention to learn about their home and perhaps make one or two improvements. Others want to do a full remodel and are good candidates for a whole house retrofit. Offering various retrofit program options best serves the needs of a wide range of customers.

SWEEP recommends that utilities continue to offer incentives for single measures, while at the same time expanding their support for whole home retrofits. Experience has shown that the most successful whole home retrofit programs, in most cases based on the Home Performance with ENERGY STAR program model, include comprehensive energy audits, contractor training and certification, substantial rebates for achieving high performance, a financing option and robust quality assurance.¹⁵¹

The primary challenges with whole home retrofits are the high first cost, and achieving adequate energy savings to justify utility support for the retrofit given the cost effectiveness criteria that utility DSM programs must satisfy. Utility program staff (or more likely a utility contractor) can determine if there is adequate energy savings potential for a particular house to qualify for utility support under a whole home approach. Once a home is approved, the utility should facilitate contact between the homeowner and contractors that are qualified to perform high quality whole home work. Utility incentives for both the contractor and homeowner help to get the most retrofit work done.

2. Develop a well-qualified contractor workforce

The performance of a measure varies considerably depending on how the measure, such as insulation, a high efficiency cooling systems, or duct sealing, is installed. Forming a trade ally network provides a platform for developing and maintaining relationships between the utility and contractors and training contractors on best practices and new technologies. Many leading utilities require workforce training and certification, such as through the Building Performance Institute (BPI). Some well-performing programs adopt technical standards such as the National Renewable Energy Laboratory's (NREL) *Workforce Guidelines for Home Energy Upgrades*,¹⁵² BPI's *Technical Standards*,¹⁵³ or Residential Energy Services Network (RESNET) *National Standards for Home Energy Audits*.¹⁵⁴

¹⁵¹ P. Plympton et. al. 2010. "Retrofit Program Delivery Models for Home Performance with ENERGY STAR: The Climate for Retrofit is Now." Proceedings of the 2010 ACEEE Summer Study on Energy Efficiency in Buildings. 2-222 – 2-234.

¹⁵² National Renewable Energy Laboratory. "Workforce Guidelines for Home Energy Upgrades." http://www1.eere.energy.gov/wip/pdfs/workforce_guidelines_home_energy_upgrades.pdf.

¹⁵³ Building Performance Institute. "Technical Standards." http://www.bpi.org/standards_approved.aspx.

¹⁵⁴ Residential Energy Services Network. "National Standards for Home Energy Audits." http://www.resnet.us/standards/National_Energy_Audit_Standard.pdf.

3. Provide access to financing

While it is not necessary for the utility itself to provide financing, the most successful whole home retrofit programs involving retrofit costs of \$5,000 per home or more include a financing option for customers. Financing can be provided by the utility directly, a bank, or some other financing entity, with some form of credit enhancement provided by the utility. Offering a financing option helps contractors sell comprehensive retrofit projects and enables more homeowners to move forward with multiple measure or whole home work. Financing should be easy to access, of sufficient loan term to enable a positive cash flow to the homeowner, and available to most if not all customers, not just those with high credit rating.¹⁵⁵

4. Collaborate across utilities

As demonstrated by the experience in Utah, electric and gas utilities working in a collaborative manner can produce impressive results with benefits for customers, contractors and the utilities. Utility collaboration enables customers and contractors to receive higher incentive amounts. It can also facilitate deeper retrofit projects that involve both gas and electric building systems. In the case where utilities implement a joint program (as opposed to separate but coordinated efforts), utilities can benefit from sharing administrative and marketing costs. Contractor training and certification, as well as quality assurance, can be shared as well.

5. Consider supporting deep retrofits

A fourth program model that should be tested in the Southwest is to encourage Deep Energy Retrofits (DERs). A DER program strives for 50% or greater energy savings through the installation of comprehensive measures, advanced materials, and high performance weatherization approaches. DER requires energy modeling to accurately identify the energy savings potential of existing homes and requires a significant investment to complete the retrofit work, which can exceed \$20,000 per home. The whole home programs examined in this report do not qualify as Deep Retrofit programs as they do not strive for this level of investment or energy savings. To make the DER approach a success, the same program elements recommended for whole home retrofits, and maybe others, will be necessary. We urge utilities to examine DER programs and, if shown to be cost effective, to provide broad support (including technical assistance, rebates, financing, contractor training and quality assurance) for deep retrofits as one component in their suite of home retrofit programs.

¹⁵⁵ M.H. Brown and B. Conover. *Recent Innovations in Financing for Clean Energy*. Boulder, CO: Southwest Energy Efficiency Project. October 2009.
[http://www.swenergy.org/publications/documents/Recent Innovations in Financing for Clean Energy.pdf](http://www.swenergy.org/publications/documents/Recent%20Innovations%20in%20Financing%20for%20Clean%20Energy.pdf).