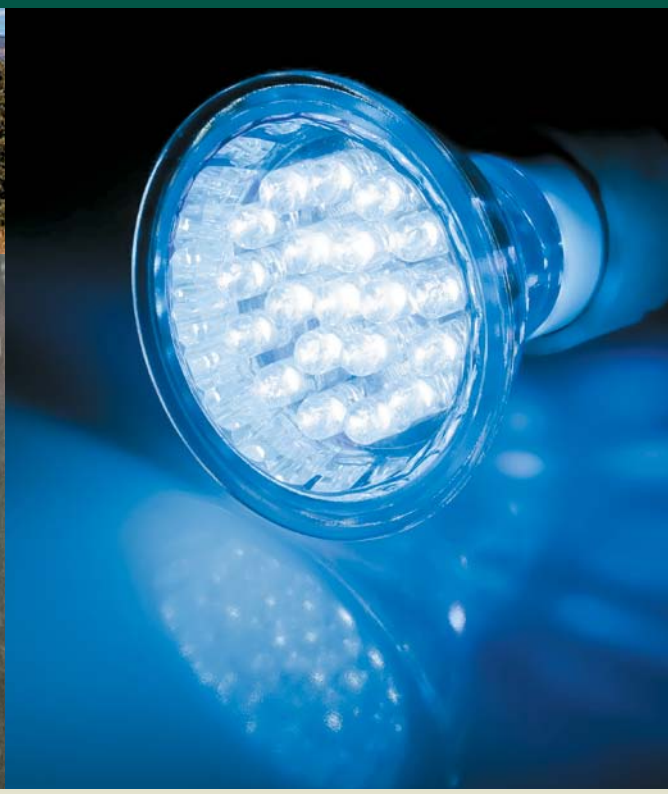
THE $20 BILLION BONANZA

Best Practice Electric Utility Energy Efficiency Programs and Their Benefits for the Southwest

EXECUTIVE SUMMARY



HOWARD GELLER

With assistance from:
Bruce Biewald, Marshall Goldberg, Steven Nadel, Maggie Molina, Max Neubauer, Jeff Schlegel, Rachel Wilson and David White

SWEEP
Southwest Energy Efficiency Project

OCTOBER 2012

By investing a total of $17 billion in best practice utility energy efficiency programs, the Southwest region could realize $37 billion in utility system and public health benefits - meaning $20 billion in net benefits or $2,650 for every household in the region today.

The $20 Billion Bonanza:

Best Practice Electric Utility Energy Efficiency Programs and Their Benefits for the Southwest

Executive Summary

Howard Geller

with assistance from:
Bruce Biewald, Marshall Goldberg, Steven Nadel, Maggie Molina, Max Neubauer, Jeff Schlegel, Rachel Wilson and David White

October 2012

Southwest Energy Efficiency Project

Acknowledgements

This report was conceived by and prepared under the leadership of Howard Geller, Executive Director of the Southwest Energy Efficiency Project (SWEEP). Dr. Geller wrote Chapters 1 and 5 and assisted with preparation of the other chapters. Chapter 2 was prepared primarily by Maggie Molina, Max Neubauer and Steven Nadel of the American Council for an Energy-Efficient Economy (ACEEE). Chapter 3 was prepared primarily by Bruce Biewald, David White and Rachel Wilson of Synapse Energy Economics, Inc. Chapter 4 was prepared primarily by Marshall Goldberg of MRG and Associates. The report was edited by Gene Dilworth of SWEEP. SWEEP appreciates the care and dedication provided by everyone who contributed to this report.

SWEEP thanks the following individuals for providing comments on a review draft of this report: Galen Barbose, Mathias Bell, Christine Brinker, Pete Cappers, Tomas Carbonell, Stacey Crowley, Keith Hay, Ian Hoffman, Mark James, John Phelan, Andy Satchwell, Alexander Scott, Annika Todd, Steve Wiel, Dan York, and Mark Zimring. In addition, SWEEP appreciates comments provided by the U.S. Department of Energy.

Funding for this report was provided directly or indirectly by the following foundations: Energy Foundation, Hewlett Foundation, Edwards Mother Earth Foundation, and a foundation that chooses to remain anonymous. SWEEP is grateful for the generous funding provided by these foundations for this report and our utility energy efficiency work in general.

SWEEP is solely responsible for the contents of the report.

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.

2334 North Broadway, Suite A • Boulder, CO 80304 • 303-447-0078 • www.swenergy.org

Executive Summary

A. Introduction

While significant progress has been made in ramping up utility energy efficiency programs in the Southwest region, much more could be done. The purpose of this study is to examine utility energy efficiency program "Best Practices" and the benefits that would result across the region from scaling up to Best Practice programs. We develop a comprehensive set of eighteen Best Practice utility energy efficiency programs based on experience in the region as well as elsewhere in the country. We analyze how much it would cost and how much energy and peak demand savings would result by 2020 from scaling up to Best Practice programs in each state, compared to a Reference scenario without utility energy efficiency programs.

We then model utility systems and analyze the economic savings that would result from implementing Best Practice energy efficiency programs. We also analyze of the impact that Best Practice utility energy efficiency programs would have on jobs, personal income and economic output in each state and across the region. In addition, we estimate the water savings and reductions in pollutant emissions that would result from implementing Best Practice energy efficiency programs, along with the public health benefits that would occur as a result of the reduced pollutant emissions. Finally, we review the policy and program framework affecting utility energy efficiency programs in each state and recommend additional policies that would help to move each state towards Best Practice programs and their benefits.

The results of the analysis are impressive. By investing $17.3 billion in Best Practice energy efficiency programs and measured during 2010-2020, we estimate that the southwest region could realize $37.1 billion in utility system and public health benefits — nearly $20 billion in net benefits. In addition, we estimate that 10,100 jobs would be added in the region by 2015 and 28,000 jobs would be added by 2020, and that significant air quality improvements and water savings would result. By implementing Best Practice energy efficiency programs, utilities can share in these benefits while reducing the risks associated with higher load growth. It's a bonanza the Southwest cannot afford to ignore.

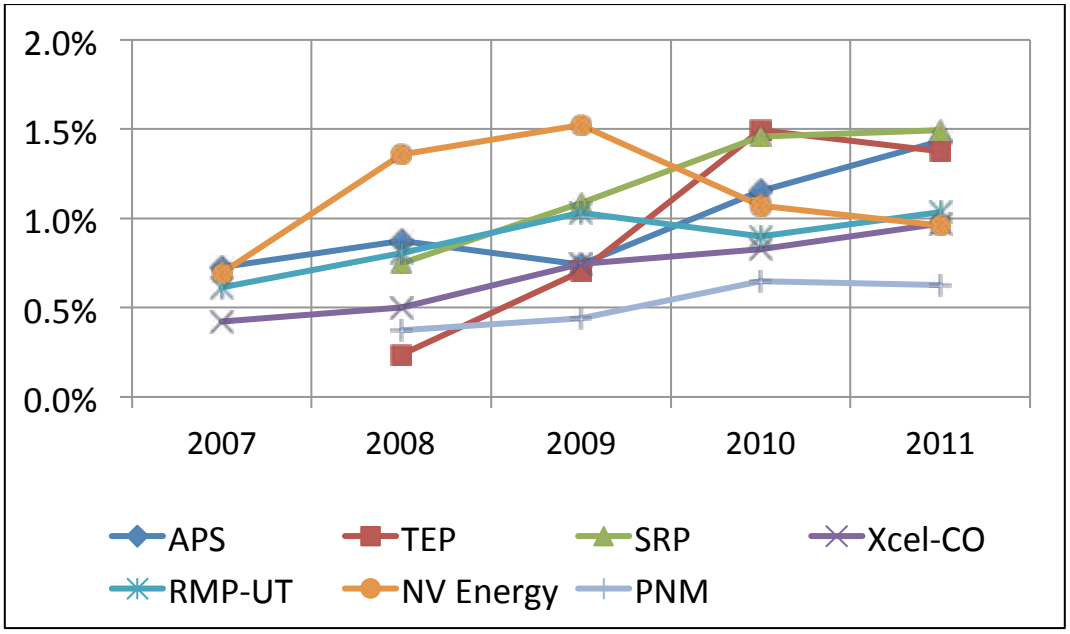
B. Historical Review

Electric utilities in the Southwest (Arizona, Colorado, Nevada, New Mexico, Utah and Wyoming) have greatly expanded their energy efficiency and other demand-side management (DSM) programs over the past decade. Total funding for these programs was only about $29 million in 2002, the first full year of activity for the Southwest Energy Efficiency Project (SWEEP). Funding steadily increased to approximately $318 million in 2011. In 2012, electric utilities in the region will spend about $370 million on DSM programs. Approximately 80% of the total amount spent on DSM goes to programs that have a primary goal of reducing electricity use; i.e., true energy efficiency programs. The remainder is spent on load management and demand response programs.

In conjunction with rising DSM budgets, there has been significant growth in the energy savings resulting from electric utility energy efficiency programs implemented in the Southwest in recent years. The seven major utilities in the region — Arizona Public Service Co. (APS), Tucson Electric Power Co. (TEP), Salt River Project (SRP), Xcel Energy in Colorado (Xcel-CO), Rocky Mountain Power in Utah (RMP-UT), NV Energy, and Public Service Company of New Mexico (PNM) — saved about 1,700 GWh per year from energy efficiency programs implemented in 2011. These seven utilities account for about 67% of total electricity sales and consumption in the region.

Figure ES-1 shows the energy savings by major utility as a fraction of retail electricity sales from programs implemented each year. As of 2011, the three Arizona utilities were achieving 1.4-1.5% savings as a fraction of sales; the main utilities in Colorado, Nevada and Utah were achieving around 1.0% savings; and PNM was lagging in achieving only about 0.6% savings. Saving 1.4-1.5% per year places the Arizona utilities in the top tier of utilities nationwide with respect to energy efficiency program performance.

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



Utilities in the Southwest are realizing substantial benefits for their customers and for their systems by implementing effective energy efficiency programs. For example, Xcel Energy, the principal electric utility in Colorado, estimates that households and businesses it serves will save $638 million net as a result of DSM programs implemented in 2009-2011. (Net means the value energy savings minus the cost of efficiency measures and programs.) Likewise, NV Energy, the parent company of Nevada Power and Sierra Pacific Power Companies, estimates that its customers will realize $470 million in net economic benefits as a result of DSM programs implemented during 2007-2011. The programs also help utilities to reduce water consumption and cut emissions.

C. Best Practice Energy Efficiency Programs

Each state analysis includes a Reference scenario for electricity sales and peak demand through 2020. The Reference scenario excludes the impacts of all utility energy efficiency programs, even those programs underway or planned by utilities. The analysis was structured in this manner in order to avoid double counting of savings in the High Efficiency scenario and to evaluate the full costs and benefits of utility energy efficiency programs — both existing and expanded programs — through 2020.

Our portfolio of model energy efficiency programs includes a comprehensive set of strategies for residential, commercial and industrial customers based on Best Practice program offerings from leading utilities and other program administrators in the Southwest and elsewhere. The programs were selected to maximize cost-effective energy savings by 2020. We develop ten residential programs and eight business programs, briefly described below and discussed in much greater detail in Chapter 2. For the purposes of this study, we do not include load management or demand response programs which are aimed primarily at peak demand reduction.

Residential Programs

1. Low-Income Weatherization

This program provides weatherization services, efficient appliance upgrades, and energy savings kits to income-qualified households on a no-cost basis. The program is administered by local community action agencies or state agencies and leverages funds from the federal government. Utilities pay 10-20% of the cost for home retrofits; the remainder is paid for through the funding that states receive from the federal Weatherization Assistance Program.

2. Multi-Family Retrofit

This program provides retrofit services for multifamily buildings. Services include initial energy assessments, education on energy savings opportunities, direct installation of low-cost measures, and the opportunity to install major measures at a reduced cost.

3. Residential New Construction and Code Support

This program offers training and financial incentives to builders who construct energy-efficient new homes. The program emphasizes the whole building approach to improving energy efficiency and includes field testing of homes to ensure high performance. Builders and contractors receive training on building science and energy-efficient construction techniques, while prospective homebuyers are educated about the benefits of an energy-efficient home. Additionally, the program trains builders, contractors and local code officials on building energy codes in order to improve code enforcement and compliance.

4. Home Retrofit

This program provides incentives and high quality retrofit services to owners of single family houses or manufactured houses, promoting both “light” and “comprehensive” retrofits. A light retrofit includes lighting measures, low-flow devices, and home-envelope air sealing. A comprehensive retrofit includes replacing appliances (clothes washers, dishwashers, water heaters,

and refrigerators/freezers), shell measures (insulation, home-envelope air sealing, and window replacement), and HVAC measures (AC tune-up, replacement, duct sealing and insulation).

5. Retail Products

This program provides midstream and upstream incentives to retailers and manufacturers for increasing sales of qualifying ENERGY STAR products including televisions, personal computers, laptops, computer monitors, clothes washers, dishwashers, refrigerators, room air conditioners, and high-efficiency pool pumps and timers. Other electronic products such as set-top boxes and game consoles may be included in the future.

6. Residential Lighting

This program provides education and financial incentives to encourage customers to purchase energy-efficient light bulbs, including standard and specialty CFLs and LED lamps, as well as services to assist consumers to dispose of CFLs in an environmentally friendly manner. Customers purchase energy-efficient lamps at a discount at local retailers or through mail-order sales.

7. Refrigerator and Freezer Recycling

This program takes less-efficient refrigerators and freezers out of use and recycles materials to the maximum degree feasible. The program is implemented on a turn-key basis by a qualified contractor.

8. Residential Cooling

This program provides incentives for the purchase, installation, and proper sizing of evaporative cooling equipment and high-efficiency compressor-based air conditioning equipment. Incentives are provided to both end-use customers and the contractors who install the equipment. The program also includes a tune-up component for existing central air conditioners.

9. Water Heating

This program encourages customers to purchase ENERGY STAR-qualified electric heat-pump water heaters and promotes greater adoption of low-flow showerheads and faucet aerators by households with electric water heating.

10. Home Energy Reports and Information Feedback

This program helps customers cut electricity waste by providing comparative reports through the mail and/or internet as well as suggested actions that each household can take to reduce its electricity use. The program also includes promotion of, and incentives for, in-home information feedback devices, particularly in the latter part of the decade when smart meters are likely to be commonplace.

Commercial and Industrial Programs

1. Commercial New Construction and Code Support

This program includes design assistance and incentives for energy-saving measures that exceed building code requirements for new commercial buildings. The program also promotes upgrades to state or local building energy codes and training to strengthen code enforcement and compliance.

2. Small Business Direct Install

This program hires contractors to audit smaller commercial buildings and then install cost-effective measures at a modest cost to the customer. The utility would pay about 70% of the installed cost for qualifying efficiency measures. Customers would pay the remainder, and would also be given a financing option for their share of the installed cost.

3. Prescriptive Rebates and Upstream Incentives

This program provides rebates to medium-size and larger businesses that purchase and install high efficiency lighting, air conditioning, motors, and other commonplace energy efficiency measures. Both new and existing buildings would be eligible. The program also provides upstream incentives to equipment distributors who increase their stock of high efficiency motors and AC equipment.

4. Custom Retrofits, Process Efficiency, and Self-Direct

This program provides technical assistance and incentives to large businesses for specialized projects requiring project-specific energy savings analysis. The program also promotes continuous energy improvement in order to promote deep and ongoing energy savings. In addition, large customers would be given a "self-direct" option involving utility bill credits against the company's energy efficiency programs surcharge rather than rebates. In this option, the customer is responsible for providing engineering work as well as documenting energy savings.

5. Computer Efficiency and Other Plug Loads

This program provides upstream incentives to computer and server manufacturers that produce and sell higher efficiency personal computers, monitors and servers to businesses. It also provides direct rebates to businesses that implement virtualization of their desktop computers.

6. Commercial Lighting Redesign

This program provides financial incentives to either building owners, property managers or tenants based on the amount of electricity saved from redesigning lighting systems at the time commercial space is remodeled and/or taken over by a new tenant. The redesign can include use of better light fixtures, appropriate lighting levels, use of task lighting, and better lighting controls.

7. Retrocommissioning

This program provides a free analysis of what can be done to increase the energy efficiency of existing equipment and systems through low-cost adjustments, followed by implementation of measures with relatively short payback periods. In effect, this program helps building owners and managers "tune-up" existing buildings.

8. Combined Heat and Power

This program provides incentives to customers who install on-site combined heat and power (CHP) systems that generate electricity and utilize waste heat for space and/or water heating or industrial process needs. Eligible CHP systems could run on natural gas or waste materials, waste heat, or excess pressure.

D. Program Analysis

For each program, we develop forecasts for the number of eligible customers statewide and then estimate participation rates based on Best Practice programs in the Southwest and elsewhere. Energy savings and peak demand impacts per participant are similarly estimated from Best Practice utility-specific programs as well as studies regarding different types of utility efficiency programs. Program costs and customer costs are estimated per participant or per first-year kWh saved, again based on specific programs in the region or Best Practice programs elsewhere in the country. Sources for all of these assumptions are provided in Chapter 2 and Appendix A.

Using the energy savings and cost estimates, we then analyze the cost-effectiveness of each program over the program time horizon. Estimates of gross program savings are based on a wide variety of sources from regional and national Best Practice programs. The net savings are calculated based on an assumed net-to-gross ratio for each program, which we estimate based on typical program assumptions and hold constant across all states. Like the energy savings estimates, cost estimates are drawn from a wide variety of regional and national Best Practice programs. For determining cost of saved energy and net present values of costs and benefits, we assume a 5% real discount rate. All costs and benefits are expressed in 2010 dollars.

Based on these detailed assumptions, we calculate an average cost of saved energy for each program. The cost of saved energy for residential programs ranges from $0.02 - $0.09 per kWh, with an overall average (weighted by energy saved) of $0.036/kWh. The cost of saved energy for commercial and industrial programs ranges from $0.01 - $0.05 per kWh, with an overall average of $0.022/kWh. These values are from the utility perspective; i.e., they do not include participant costs. Consistent with experience nationwide, we find that energy efficiency programs are the lowest cost utility resource by far.

Tables ES-1 and ES-2 provide the estimated electricity and peak demand impacts of implementing the Best Practice programs in each state. The savings are a result of programs implemented during 2010-2020, with savings in 2010 and 2011 based on actual utility efforts in those years. After 2011, we assume programs are expanded over time at a relatively rapid pace. Based on our assumptions, the total electricity savings in the High Efficiency scenario reach about 49,800 GWh per year in 2020. This is equivalent to the electricity use of 4.6 million typical households in the region.

The energy savings in 2020 equal or exceed 20% of sales that year in the High Efficiency scenario in all states other than Wyoming. For the region as a whole, the Best Practice programs result in 21% electricity savings and an 18% peak demand reduction by 2020, relative to projected electricity sales and peak demand that year in the High Efficiency scenario. Savings are lower on a percentage

basis in Wyoming in large part because utility energy efficiency programs in Wyoming were further behind those in other states as of 2010-12.

Achieving 20% or greater savings by 2020 is consistent with the energy savings requirements adopted by the Arizona Corporation Commission for investor-owned electric utilities in the state. It is also consistent with savings standards or targets adopted in Delaware, Maryland, Massachusetts, New Jersey, New York, Rhode Island and Vermont.

For the region as a whole, commercial and industrial programs provide 64% of the total energy savings in 2020, while residential programs provide 36% of savings. In the residential sector, lighting and home energy reports/information feedback are the single largest sources of energy savings in 2020. In the commercial and industrial sectors, prescriptive and custom rebate programs provide the most energy savings in 2020. However, all of the programs are needed to achieve the substantial energy savings represented by the High Efficiency scenario.

Table ES-1. Total Annual Electricity Savings by State in the High Efficiency Scenario (GWh)

State	Electricity Savings in 2010	Electricity Savings in 2015	Electricity Savings in 2020	Projected Electricity Sales in 2020	Savings in 2020 as % of 2020 Sales
Arizona	695	6,059	16,713	78,111	21%
Colorado	285	4,373	11,495	51,538	22%
Nevada	304	2,722	7,040	31,321	22%
New Mexico	87	1,863	5,110	21,370	24%
Utah	194	2,455	6,234	30,757	20%
Wyoming	17	1,143	3,238	20,771	15%
Total Regional Savings	**1,582**	**18,615**	**49,828**	**234,469**	**21%**
Reference scenario electricity use*	227,109	254,642	284,298	284,298	NA
High Efficiency scenario electricity use*	227,109	236,027	234,469	234,469	NA
**2010 sales are adjusted for savings generated by programs in the 2010 program year, so the sales in the Reference and High Efficiency scenarios are the same for 2010.*					

Table ES-2. Total Annual Peak Demand Reduction by State in the High Efficiency Scenario (MW)

State	Peak Demand Savings in 2010	Peak Demand Savings in 2015	Peak Demand Savings in 2020	Peak Demand in 2020	Savings in 2020 as % of Demand
Arizona	111	1,183	3,239	21,486	15%
Colorado	52	861	2,213	11,020	20%
Nevada	53	645	1,745	8,096	21%
New Mexico	10	351	973	4,719	20%
Utah	29	450	1,144	6,312	18%
Wyoming	1	132	367	2,561	14%
Total Regional Savings	**257**	**3,622**	**9,681**	**54,194**	**18%**
Reference scenario peak demand*	52,009	57,651	63,875	63,875	NA
High Efficiency scenario peak demand*	52,009	54,029	54,194	54,194	NA
**2010 peak load requirements are adjusted for savings generated by efficiency programs in the 2010 program year, so the peak load requirements in the Reference and High Efficiency scenarios are the same for 2010.*					

Table ES-3 shows the estimated utility program costs by state in the High Efficiency scenario. A rapid and large increase in program funding is required to achieve 21% energy savings region wide by 2020. Annual utility program costs increase to about $1.1 billion in 2015 and nearly $1.8 billion in 2020 in the High Efficiency scenario. These are large values but not impossible to envision given that electric utilities in the region had $20 billion in revenues from retail electricity sales as of 2010, and revenues are rising due to rate increases and other factors. Also, it is worth noting that southwest states demonstrated the ability to rapidly expand certain types of energy efficiency programs when funding was provided through the American Recovery and Reinvestment Act of 2009 (ARRA).

Table ES-3. Program Costs by State (Million dollars)

State	Annual Cost 2010	Annual Cost 2015	Annual Cost 2020	Net Present Value through 2020
Arizona	54	377	623	2,767
Colorado	43	257	404	1,918
Nevada	29	152	248	1,137
New Mexico	15	121	191	877
Utah	40	138	214	1,052
Wyoming	4	71	101	480
Total Regional Costs	**185**	**1,116**	**1,780**	**8,230**

Table ES-4. Program Plus Participant Costs by State (million dollars)

State	Annual Cost 2010	Annual Cost 2015	Annual Cost 2020	Annual Cost 2025	Annual Cost 2030	Net Present Value through 2030
Arizona	77	642	1,077	142	301	5,459
Colorado	89	464	749	80	215	4,104
Nevada	81	274	464	351	123	2,590
New Mexico	25	221	361	26	103	1,854
Utah	65	250	402	49	122	2,241
Wyoming	6	143	211	11	78	1,107
Total Regional Costs	**343**	**1,994**	**3,264**	**625**	**945**	**17,343**

It should be recognized that utility energy efficiency programs are evolving and that "Best Practices" change over time. This means that there is likely to be additional cost-effective savings potential later in the decade that has not been accounted for in this analysis.

E. Utility System Impacts, Net Economic Benefits and Avoided Emissions

Methodology

We created a model for calculating avoided electricity costs at the state level in moving from the Reference Scenario to the High Efficiency Scenario. The model begins with an analysis of actual electricity generation and cost data for a base year, and then develops a plan for meeting projected electricity demand each year in the two scenarios. The difference in costs between the plans represents the avoided costs (i.e., the utility system benefits) for the High Efficiency scenario. The utility system modeling extends through 2030 in order to capture the full benefits of utility efficiency programs implemented during 2010-2020.

Detailed assumptions regarding capital costs for different types of power plants, fuel cost assumptions, operating cost assumptions, avoided transmission and distribution costs, and other key values are provided in Chapter 3. Fuel costs for electric generation are based on the Annual Energy Outlook 2012 Early Release forecast prepared by the U.S. DOE Energy Information Administration.

The U.S. Environmental Protection Agency (EPA) has promulgated, or is in the process of promulgating, new pollution standards that are affecting utilities nationwide. Utilities are determining whether to retrofit older coal-fired power plants with necessary pollution control technologies, or to retire these units. Numerous coal plant retirements have already been announced by utilities in the Southwest, and those retirements are included in both the Reference and High Efficiency scenarios. Announced coal plant retirements in the region total approximately 1,911 MW.

In addition to these retirements, other coal-fired power plant retirements are likely, particularly in a scenario that combines higher levels of energy efficiency with proposed EPA regulations. We assume an additional 4,407 MW of coal capacity would be plausible to retire by 2020 in the High Efficiency scenario and provide a list of the specific units in Chapter 3. The avoided investment in pollution control equipment for these units is quantified and included as one of the benefits in the High Efficiency scenario.

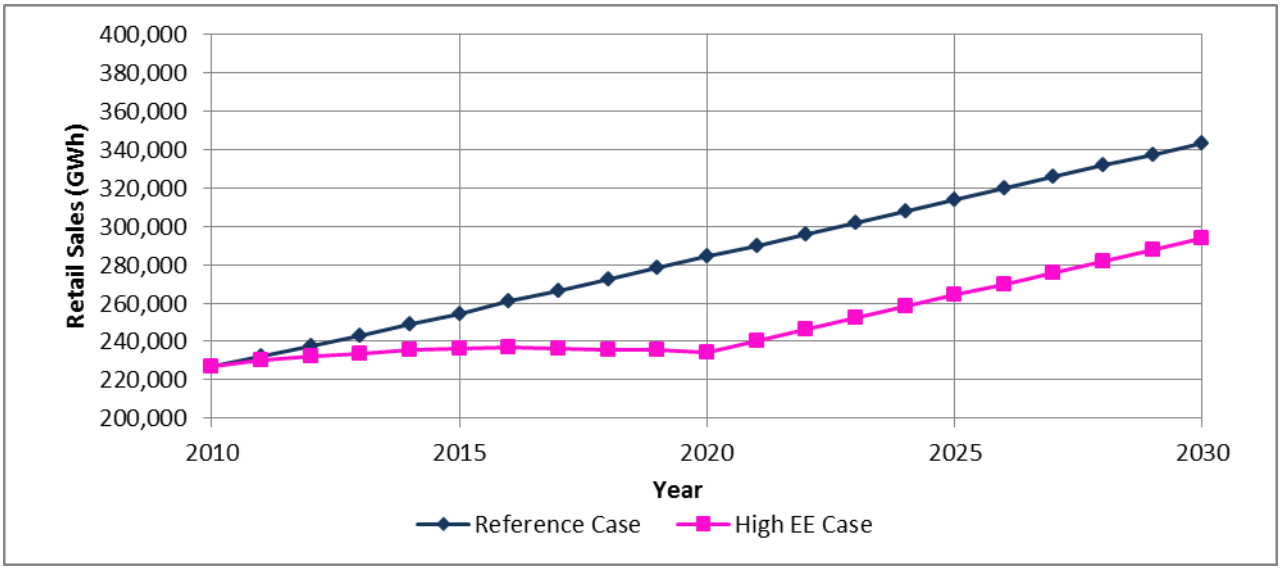
A number of southwest states have adopted renewable energy standards for electric utilities. These standards could be strengthened in the future. However, in this study we assume that existing renewable energy requirements are met but not increased since our objective is to analyze the costs and benefits of higher levels of energy efficiency.

The southwest states presently are net exporters of electricity to other regions. Overall 25% of the electricity that is generated in the Southwest is exported, with most of these exports going to California. In this study, we assume that state electricity imports and exports remain constant at the actual values in 2010.

Results

Figure ES-2 shows electricity consumption in the two scenarios through 2030 (excluding out-of-state sales). As noted previously, utility efficiency programs are only considered through 2020, when in reality they will continue beyond this year. Energy savings occurring in 2020 are maintained through customer investment in measure replacement as necessary during 2021-2030.

Figure ES-2. Electricity Sales in the Southwest Region



The generation mix for the Southwest region is currently dominated by coal, which accounted for 58% of the generation mix as of 2010. Natural gas made up 25%, nuclear 10%, and hydro and other renewable technologies accounted for the remaining 7% of generation. Figure ES-3 shows how the generation mix changes over time in the High Efficiency scenario for the region as a whole. The amount of generation and new capacity required is significantly reduced compared to the Reference scenario.

Figure ES-3. Generation Mix in the Region in the High Efficiency Scenario.

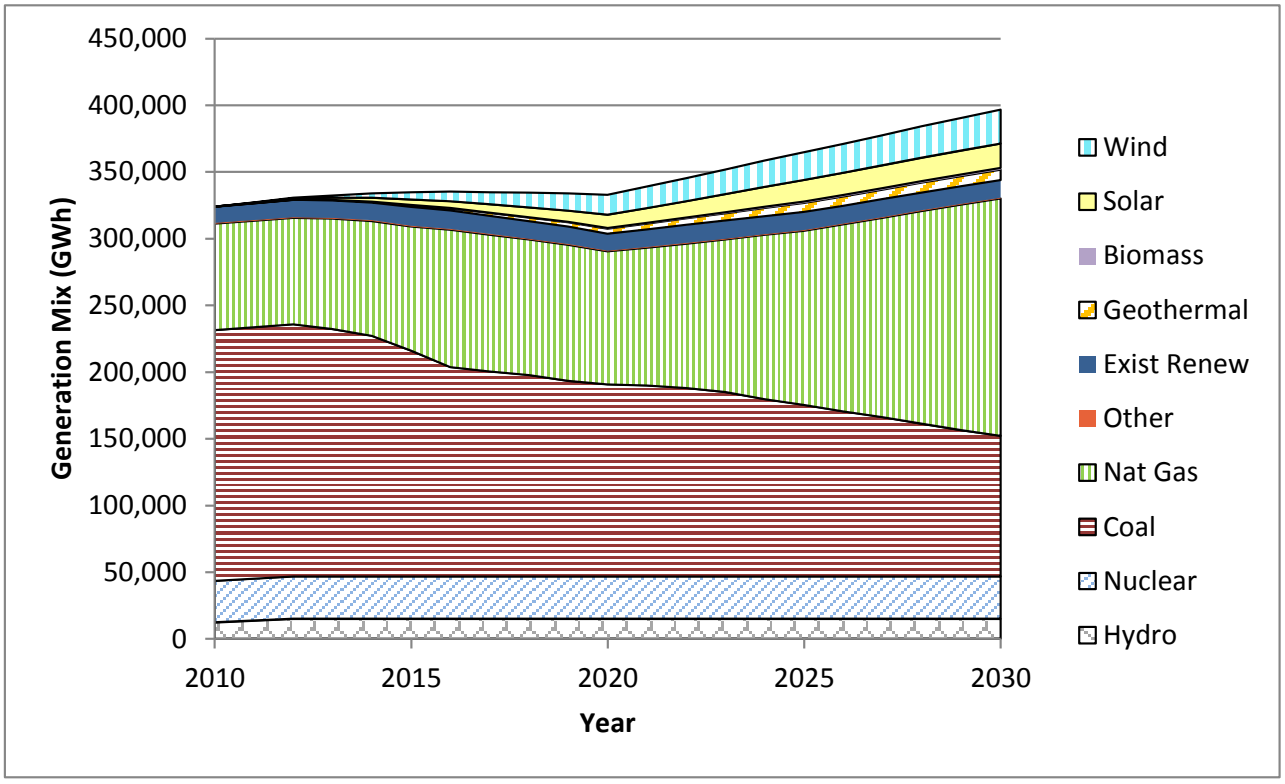


Figure ES-4 shows the avoided capacity in the region associated with the High Efficiency scenario as compared to the Reference scenario. The coal portion represents the retirement of older, dirty power plants described above. Most of the avoided new capacity is natural gas-fired, with almost 8,000 MW of capacity avoided in the High Efficiency scenario. In addition, there is a small amount avoided renewable power development in High Efficiency scenario, relative to the Reference scenario, due to the reduction in electricity demand. However, there is still substantial expansion of renewable energy generation in the High Efficiency scenario as shown in Figure ES-3. Of course renewable energy generation could be expanded further if renewable energy requirements are in fact strengthened. In total, the region could avoid or retire about 32 large (400) MW power plants if the High Efficiency scenario is pursued.

Figure ES-4. Avoided Capacity in the Region in the High Efficiency Scenario

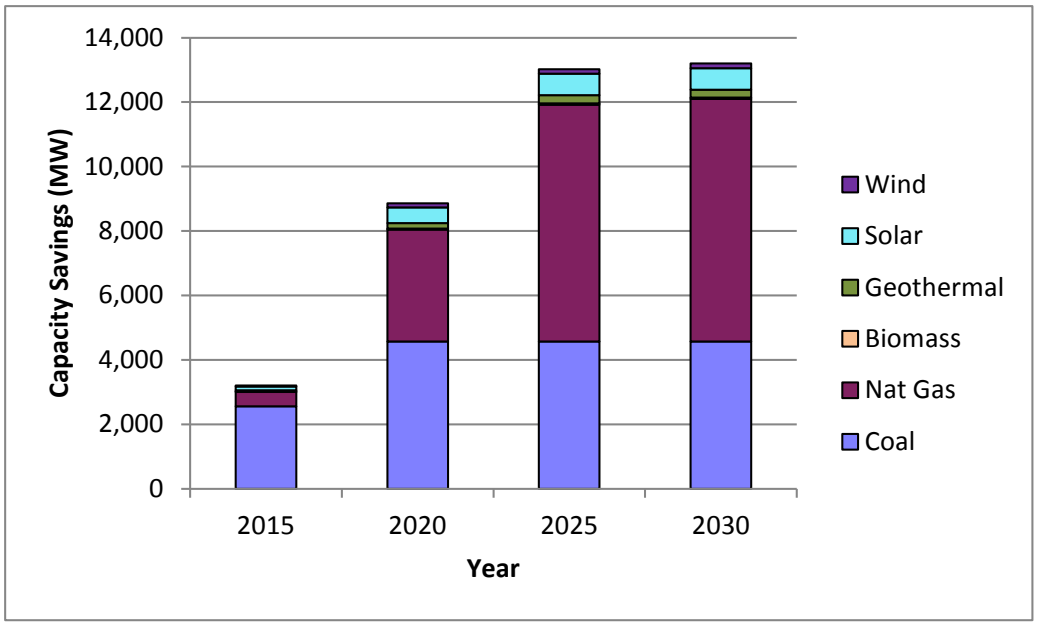


Figure ES-5 shows the avoided utility costs for the region in the High Efficiency scenario, relative to the Reference scenario, on an annual basis. The avoided costs reach about $4 billion per year (in 2010 dollars) in the early part of the next decade. The largest savings are avoided fuel costs and avoided investments in new power plants.

Figure ES-5. Avoided Utility Costs in the Region in the High Efficiency Scenario

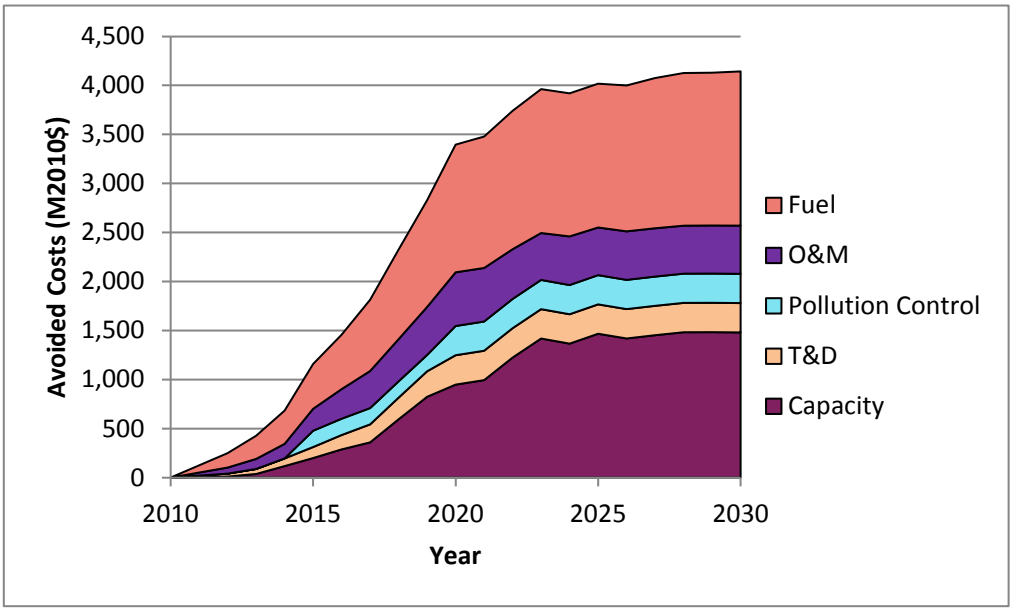


Table ES-5 shows the utility avoided costs and consumer benefits, in net present value terms, for each state and for the region as a whole. The consumer benefits include estimates of the avoided administrative costs, system maintenance costs, and taxes, in addition to the avoided costs shown in Figure ES-5. The consumer benefits also include valuation of public health benefits from reduced air pollutant emissions, as described in the next section. For the region as a whole, we estimate total consumer benefits of $37.2 billion on a net present value basis, compared to energy efficiency program and measure costs of $17.4 billion. This leads to the projected overall benefit-cost ratio of 2.14 and net economic benefits of about $19.8 billion. The benefit-cost ratio across the states rages from about 1.75 in Utah to 2.3 in Arizona and Nevada. The net economic benefits from pursuing the High Efficiency scenario equal about $7.3 billion for Arizona, $4.8 billion for Colorado, $3.4 billion for Nevada, $1.7 billion for New Mexico, $1.7 billion for Utah, and $0.9 billion for Wyoming.

Table ES-5. Benefit-Cost Comparison by State

	Net Present Value During 2010-2030 (Million 2010 $)						
	AZ	**CO**	**NV**	**NM**	**UT**	**WY**	**Region**
Utility Avoided Costs							
Capacity	3,571	2,570	944	486	597	153	8,320
T&D	782	551	417	243	293	95	2,380
Pollution Control	447	86	417	392	244	497	2,084
O&M	1,112	786	625	567	691	290	4,070
Fuel	3,717	2,718	1,960	667	966	538	10,566
Consumer Benefits							
Utility Bill Savings	12,583	8,857	5,957	3,406	3,879	1,929	36,611
Public Health Benefits	175	51	54	112	52	100	544
Total	12,758	8,908	6,011	3,518	3,931	2,029	37,155
Energy Efficiency Costs							
Utility	2,767	1,918	1,137	877	1,052	480	8,230
Participant	2,692	2,186	1,452	977	1,189	627	9,124
Total	5,459	4,104	2,590	1,854	2.241	1,107	17,354
Net Economic Benefits	7,299	4,804	3,421	1,664	1,690	922	19,801
Benefit-Cost Ratio	2.33	2.17	2.32	1.90	1.75	1.83	2.14

Table ES-6 shows the avoided CO_2, NO_x and SO_2 emissions in the High Efficiency scenario in 2020. For the region as a whole, CO_2 emissions decline by 15.5%, NO_x emissions by12%, and SO_2 emissions by 17% (reductions from projected utility sector emissions in the Reference scenario). The avoided CO_2 emissions in the High Efficiency scenario, 31.6 million metric tons per year in 2020, are equivalent to taking over six million passenger vehicles off the road. Clearly, pursuing the High Efficiency scenario would help states meet air quality and greenhouse gas emissions reduction goals. However, the percentage reductions vary considerably among the states depending on the types of power generation avoided, the emissions rates of specific plants, and whether states are net electricity exporters or importers.

Table ES-6 also shows the water savings in 2020 due to reduced operation of power plant cooling systems. In total, the region would save about 18.5 billion gallons of water per year by 2020 through implementing the High Efficiency scenario. Additional water savings would result if utilities promote use of energy and water-saving devices such as resource-efficient clothes washers, dishwashers and low-flow showerheads as part of their efficiency programs.

Table ES-6. Avoided Pollutant Emissions and Reduced Water Consumption in 2020 in the High Efficiency Scenario

	AZ	CO	NV	NM	UT	WY	Region
Avoided Emissions							
CO2 (Million metric tons)	9.6	5.4	4.4	6.2	2.4	3.5	31.6
NOx (thousand metric tons)	0.85	0.70	1.76	0.98	0.83	0.34	5.46
SO2 (thousand metric tons)	6.1	0.8	1.1	3.9	2.0	2.4	16.3
CO2 (%)	17	15	26	22	14	7	15.5
NOx (%)	10	9	15	18	18	5	12
SO2 (%)	22.5	9	43	31	18	7	17
Reduced Water Consumption							
Water (billion gallons)	4.1	2.5	2.4	4.6	3.2	1.8	18.5
Water (%)	8.0	11.7	27.5	25.4	16.4	7.2	12.9

Public Health Effects

Because higher amounts of energy efficiency result in decreased power generation and decreased air pollutant emissions, there are resulting public health benefits. These health benefits include less chronic bronchitis and asthma, fewer emergency hospital admissions for respiratory and cardiovascular diseases, and reduced premature mortality. The health benefits are quantified in this study based on coefficients (dollar value per unit of avoided pollutant emissions) and other factors in a 2009 report by the National Research Council, a part of the U.S. National Academy of Sciences (NRC 2009). It should be noted that we only consider the public health benefits from reduced operation of fossil fuel-based power plants. There are additional health benefits from reduced pollutant emissions in other parts of the fuel cycle, such as reduced emissions during coal and natural gas production and transportation.

Most of the health benefits in the High Efficiency scenario are from reduced SO_2 emissions with a smaller amount from reduced NO_x emissions. We were not able to estimate avoided particulate or mercury emissions in the study; therefore we could not quantify the health benefits associated with lowering these emissions. Nor did we assign any monetary value to reduced CO_2 emissions. Thus our estimates of avoided health damages are conservative.

With these caveats, the estimated net present value of the health benefits during 2010-2030 are $544 million for the region as a whole. This is equivalent to about 2.8% of the utility system net economic benefits. Table ES-7 shows the estimated health benefits by state. The health benefits compared to utility system benefits are larger in New Mexico and Wyoming, and are smaller in Colorado and Nevada. The relatively high values for New Mexico and Wyoming are due to large

amounts of older, dirty coal-fired power plants that are retired in those states in the High Efficiency scenario as well as the lower value of utility system benefits in the case of Wyoming.

Table ES-7. Comparison of Public Health Benefits to Utility System Net Economic Benefits

State	Net Present Value (NPV) of Public Health Benefits (million $)	Ratio of NPV of Health Benefits To NPV of Utility System Benefits (%)
AZ	175.1	2.5
CO	50.6	1.1
NV	53.9	1.6
NM	112.2	7.2
UT	51.8	3.2
WY	100.4	12.2
Southwest	**544.0**	**2.8**

In general, the southwest region tends to have a lower population density than in other parts of the United States, and power plants in the Southwest tend to be further away from population centers. These factors lead to lower public health benefits than might be seen in other parts of the country.

Other Benefits

Utility energy efficiency programs result in important non-energy benefits in addition to those analyzed in this study. For example, home retrofit programs can increase occupant comfort, health and safety, increase property value, and increase the capability of low-income households to pay their energy bills thereby reducing service terminations and reconnects. Commercial and industrial retrofit and new construction programs can increase worker comfort, enhance productivity, reduce waste in the production process, and/or lower environmental control costs. While valuing these non-energy benefits can be difficult, doing so even if approximate can significantly increase the cost-effectiveness of energy efficiency programs. In fact, some studies have found that the value of non-energy benefits can exceed the energy benefits by a factor of two or more, although the magnitude of the non-energy benefits varies with the type of program and the efficiency measures implemented.

Utility risk reduction is another benefit of vigorous utility energy efficiency programs. Utilities face a variety of risks from load growth and pursuit of new generation resources to meet that growth including possible construction cost overruns and delays, fuel and operating cost risks, risks associated with potential new environmental regulations, water constraint risks, and load forecasting and other planning risks. A recent study regarding these risks and mitigation strategies indicated that energy efficiency is not only a utility's lowest cost resource; it is also the lowest risk resource. Because the non-energy benefits and risk reduction potential of utility energy efficiency programs were not analyzed or included in this study, we believe our results are conservative.

F. Macroeconomic Impacts

This study does analyze the macroeconomic impacts — the impacts on employment, wage and salary compensation, and gross state product — that result from pursuing the High Efficiency scenario rather than the Reference scenario. To analyze the macroeconomic impacts, we used the IMPLAN model, an input-output model that accounts for interactions between all sectors of the economy as described in Chapter 4. The input-output analysis captures the full economic impacts of the investments in energy efficiency including:

- The *direct effect*: the on-site or immediate effects of installing energy efficiency measures in homes or businesses.

- The *indirect effect*: the increase in economic activity that occurs when a contractor or vendor receives payment for goods or services delivered; e.g., the effect on equipment manufacturer or wholesaler who provides energy-efficient technologies.

- The *induced effect*: the changes in spending that occur when households and businesses lower their electricity use and consequently are able to increase purchases of other goods and services such as food, clothing, appliances, or entertainment (in the case of households), and equipment, product development or marketing (in the case of businesses).

The sum of these three effects yields the total macroeconomic impact resulting from investment in utility energy efficiency programs designed to reduce electricity consumption in homes and businesses.

Table ES-8 shows the estimated macroeconomic impacts of the High Efficiency scenario for each state and the region as a whole in 2020. We estimate that pursuing the High Efficiency scenario rather than the Reference scenario would result in a net increase of 28,080 jobs in the region by 2020, and a net increase in wage and salary compensation of just over $1.0 billion (in 2010 dollars). The study also estimates that pursuing the High Efficiency scenario would result in a net increase of 10,120 jobs and an increase in wages and salaries of $317 million by 2015.

Gross State Product (GSP) rises $294 million region wide by 2020 in the High Efficiency scenario. However, GSP declines in three states in the High Efficiency scenario, relative to the Reference scenario, because the positive GSP impacts from the investments in efficiency are not sufficient to offset GSP losses in the utility, coal, natural gas and related industries.

Table ES-8. Macroeconomic Impacts in 2020 by State in the High Efficiency Scenario

State	Net Jobs Gain	Change in Wage and Salary Compensation (million $)	Change in Gross State Product (million $)
Arizona	10,400	382	44
Colorado	6,960	334	277
Nevada	4,680	246	284
New Mexico	2,330	32	(88)
Utah	3,100	89	(16)
Wyoming	610	(47)	(206)
Region	**28,080**	**1,036**	**294**

According to the U.S. Bureau of Labor Statistics, just over 8.9 million workers were employed in the region in May 2012, and about 787,000 workers in the region were unemployed. Given reasonable assumptions about employment growth, adding 10,120 jobs by 2015 will result in approximately a 0.1% increase in projected regional employment that year. Adding 28,080 jobs by 2020 will result in approximately a 0.3% increase in projected regional employment.

The construction and service sectors are the industries that benefit most directly as contractors are hired to install the new technologies and make the requisite efficiency upgrades. The retail trade and the service sectors benefit from the actual investments in energy efficiency programs and technologies. They also benefit from the higher level of goods and services sold as households and businesses spend their energy bill savings elsewhere in the economy.

G. Policy and Program Review and Recommendations

The growth of utility energy efficiency programs in the Southwest has been heavily influenced by policies adopted either through state legislation or state utility commission action. Table ES-9 summarizes the key policies affecting utility energy efficiency efforts in each state. All states have adopted a favorable cost-effectiveness test for determining whether energy efficiency programs are cost-effective as well as a convenient and timely cost recovery mechanism. Integrated resource planning requirements are in place in all states except Wyoming, and four states have adopted some form of energy savings goals or standards for investor-owned utilities. In addition, three states have adopted performance-based shareholder incentives and two states have adopted lost revenue recovery mechanisms to remove financial disincentives that utilities face. However, no state in the region has adopted decoupling of electricity sales and revenues.

Table ES-9. Key Policies Influencing Electric Utility Efficiency Programs in the Southwest

Policy	AZ	CO	NM	NV	UT	WY
Energy efficiency goals or standards (1)	✓	✓	✓	✓		
Integrated Resource Planning	✓	✓	✓	✓	✓	
Use of Total Resource Cost, Societal Cost, or Utility Cost test as sole/primary cost-effectiveness test	✓	✓	✓	✓	✓	✓
Public benefits funds supporting energy efficiency programs						
Convenient DSM cost recovery mechanism	✓	✓	✓	✓	✓	✓
Financial incentive for utility shareholders	✓	✓	✓			
Decoupling or lost revenue recovery mechanism (2)	✓			✓		
Collaboration in DSM program design/analysis	✓	✓	✓	✓	✓	
Industrial self-direction option	Partial	✓	✓		✓	✓
Notes: (1) Energy savings are allowed to count towards clean energy standards in Nevada. (2) Lost revenue recovery mechanism approved for Arizona Public Service Company; pending for Tucson Electric Power Company.						

Funding for utility energy efficiency programs will need to rise substantially in order to achieve at least 20% energy savings by 2020 (15% savings in Wyoming). The policy recommendations presented in Chapter 5, and summarized below, are intended to help each state scale up its utility energy efficiency programs and achieve the energy savings identified in the High Efficiency scenario.

Arizona Policy and Program Recommendations

Arizona is currently the leading state in the region with respect to utility energy efficiency policies as well as the level of energy savings being achieved. For the most part, Arizona is on track towards achieving the full energy savings and the $7.1 billion in net benefits indicated in the High Efficiency scenario in this study. SWEEP recommends adoption of the following policies to ensure that all utilities in Arizona stay on track and actually do reach 20% or greater energy savings by 2020:

1) The Arizona Corporation Commission (ACC) should adopt decoupling or a lost revenue recovery mechanism along with performance-based incentives for all investor-owned utilities, not just Arizona Public Service Company.

2) Electric utilities and the ACC should commit to fully fund cost-effective efficiency programs and to strive for maximum customer participation along with as maximum cost-effective energy savings. Energy efficiency program portfolios should be expanded to be as comprehensive and effective as possible.

3) The ACC should commit to approve energy efficiency implementation plans submitted by utilities in a timely manner.

4) Salt River Project (SRP), the state's large publicly-owned and unregulated utility, should continue to expand and fully fund cost-effective energy efficiency programs without arbitrary spending caps.

5) Other publicly-owned utilities and rural cooperatives should commit to implement strong energy efficiency programs.

Colorado Policy and Program Recommendations

Colorado is moving in the direction of comprehensive, well-funded utility energy efficiency programs, at least on the part of investor-owned electric utilities and a couple of publicly-owned utilities. In order to achieve the full energy savings and the $4.8 billion in net benefits indicated in the High Efficiency scenario in this study, SWEEP recommends adoption of the following policies:

1) The Colorado Public Utilities Commission (PUC) should strengthen energy savings goals for the investor-owned utilities it regulates while ensuring that utilities are rewarded financially when they implement effective efficiency programs for their customers.

2) Electric utilities and the Colorado PUC should commit to fully fund cost-effective efficiency programs and to strive for maximum customer participation along with maximum cost-effective energy savings. Energy efficiency program portfolios should be expanded to be as comprehensive and effective as possible.

3) The Colorado legislature should adopt energy efficiency program requirements for all utilities in Colorado so that households and businesses throughout the state receive the same (or similar) energy efficiency services as those provided by Xcel Energy and Black Hills Energy.

4) Many rural electric cooperatives in Colorado receive power from and are members of Tri-State Generation and Transmission Association. Tri-State should help its cooperative members implement well-funded, effective energy efficiency programs. Funding permitting, the Colorado Energy Office could offer assistance to the smallest utilities, say those with 10,000 customers or less.

Nevada Policy and Program Recommendations

Nevada's investor-owned utilities, which implemented some of the most effective energy efficiency programs in the nation as recently as 2009, have backtracked since then due to decisions made by the Public Utilities Commission of Nevada (PUCN) in response to the deep recession in the state and other factors. In order to get back on track and achieve the $3.4 billion in benefits for households and businesses and addition of 4,700 jobs in Nevada by 2020 as indicated in the High Efficiency scenario in this study, SWEEP recommends adoption of the following policies:

1) The legislature should remove energy savings from the Portfolio Standards and adopt separate energy savings requirements so that NV Energy resumes implementing comprehensive, well-funded energy efficiency programs.

2) The legislature should direct the utilities and the PUCN to fully fund cost-effective efficiency programs, strive for maximum customer participation, and maximize cost-effective energy savings.

3) The legislature should replace the unpopular lost revenue recovery policy with decoupling — a policy that assures that utilities receive their authorized fixed cost recovery per customer, and no more or no less. In addition, the PUCN should adopt performance-based incentives that allow utility shareholders to earn a reasonable profit when utilities implement effective energy efficiency programs for their customers.

4) All utilities in Nevada should implement efficiency programs so that households and businesses throughout the state receive the same (or similar) energy efficiency services as those provided by NV Energy. Funding permitting, the Nevada State Office of Energy could offer assistance to the smallest utilities, say those with 10,000 customers or less.

New Mexico Policy and Program Recommendations

The funding for and effectiveness of energy efficiency programs varies considerably across utilities in New Mexico. In order to ramp up savings and achieve the $1.6 billion in benefits for households and businesses as well as addition of 2,300 jobs in New Mexico by 2020, as indicated in the High Efficiency scenario in this study, SWEEP recommends adoption of the following policies:

1) The energy efficiency requirements for electric utilities are relatively weak. The legislature should increase the requirements to at least 15% savings by 2020, counting savings from programs implemented starting in 2010.

2) The New Mexico Public Regulation Commission (PRC) and utilities should fully fund cost-effective efficiency programs, strive for maximum customer participation, and maximize cost-effective energy savings. Energy efficiency program portfolios should be expanded to be as comprehensive and effective as possible.

3) The PRC should decouple electricity sales and fixed cost recovery per customer as has been proposed. In addition, the PRC should adopt performance-based incentives that allow utility shareholders to earn a reasonable profit when utilities implement effective energy efficiency programs for their customers.

4) All utilities in New Mexico should implement efficiency programs so that households and businesses throughout the state receive the same (or similar) energy efficiency services as those provided by Public Service Company of New Mexico (PNM), Southwestern Public Service (SPS), and El Paso Electric (EPE). Tri-State should help its members in New Mexico implement well-funded, effective energy efficiency programs. Funding permitting, the New Mexico Energy, Minerals and Natural Resources Department could offer assistance to the smallest utilities, say those with 10,000 customers or less.

Utah Policy and Program Recommendations

PacifiCorp, the only investor-owned electric utility operating in Utah through its Rocky Mountain Power (RMP) subsidiary, has significantly increased its energy efficiency and load management programs over the past eight years. In order to ramp up savings and achieve the $1.6 billion in benefits for households and businesses and addition of 3,100 jobs in Utah by 2020, as indicated in the High Efficiency scenario in this study, SWEEP recommends adoption of the following policies:

1) The Utah Public Service Commission (PSC) should act upon the 2009 legislative resolution and adopt energy savings goals for PacifiCorp. The goals should increase over time reaching 2% savings per year by the latter part of the decade.

2) PacifiCorp and the PSC should strive for maximum customer participation, and maximize cost-effective energy savings. Energy efficiency program portfolios should be expanded to be as comprehensive and effective as possible.

3) The PSC should decouple electricity sales and fixed cost recovery as has been done for Questar Gas Company. In addition, the PSC should adopt performance-based incentives that allow PacifiCorp's shareholders to earn a reasonable profit when the utility implements effective energy efficiency programs for its customers.

4) All utilities in Utah should implement efficiency programs so that households and businesses throughout the state receive the same (or similar) energy efficiency services as those provided by PacifiCorp. The Utah Associated Municipal Power Systems (UAMPS) should help its members implement well-funded, effective energy efficiency programs. Funding permitting, the Utah Office of Energy Development could offer assistance to the smallest utilities, say those with 10,000 customers or less.

Wyoming Policy and Program Recommendations

Wyoming has not enacted any legislation related to utility energy efficiency programs. PacificCorp, the largest investor-owned utility in the state, began implementing six programs in 2009 although the results have been quite modest so far. In order to ramp up savings and achieve significant benefits for households and businesses in Wyoming by 2020, as indicated in the High Efficiency scenario in this study, SWEEP recommends adoption of the following policies:

1) The Wyoming Public Service Commission (PSC) should adopt energy savings goals that reach 1.0% savings as a fraction of retail sales per year by 2015 and 1.5% per year by the latter part of the decade for the utilities it regulates.

2) Utilities and the PSC should strive for maximum customer participation, and maximize cost-effective energy savings. Energy efficiency program portfolios should be expanded to be as comprehensive and effective as possible.

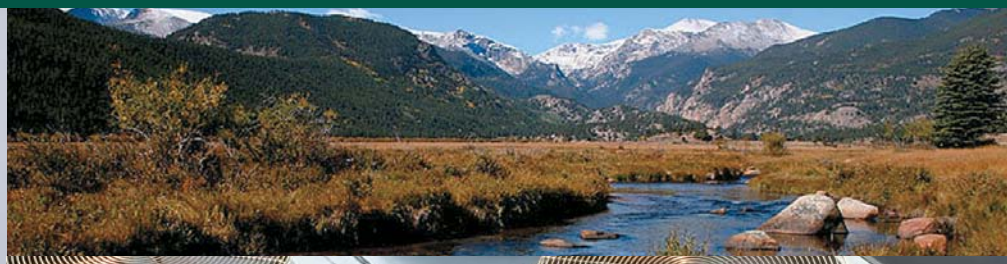
3) The PSC should decouple electricity sales and authorized fixed cost recovery as has been done for Questar Gas Company in Wyoming. In addition, the PSC should adopt performance-

based incentives that allow utility shareholders to earn a reasonable profit when the utility implements effective energy efficiency programs for its customers.

4) All utilities in Wyoming should implement efficiency programs so that households and businesses throughout the state receive the same (or better) energy efficiency services as those provided by PacifiCorp.

Electric utilities in the Southwest have made considerable progress in helping their customers save electricity and money through implementation of cost-effective energy efficiency programs. This progress has been driven in large part by the adoption of state policies including integrated resource planning, minimum energy savings goals or requirements, convenient cost recovery mechanisms, removal of disincentives and/or providing a financial incentive to shareholders for implementing well-performing efficiency programs. However, the adoption of these policies throughout the region is incomplete, and in some cases states have adopted weak versions of the policies.

Achieving 20% energy savings (15% in Wyoming) by 2020 presents a number of challenges including the need for rapid and large increases in energy efficiency program funding during the remainder of the decade. We believe these challenges can be overcome if adequate and comprehensive policies are put in place. We recommend adopting strong energy savings goals or requirements and policies to ensure that utility shareholders can earn a reasonable profit when they implement effective energy efficiency programs. Furthermore, we recommend extending these policies to all utilities, not just the large investor-owned utilities, and enhancing energy efficiency program portfolios to include the full set of Best Practice programs identified in this report. Doing so would provide tremendous economic, environmental and other non-energy benefits throughout the southwest region.



SWEEP

SOUTHWEST ENERGY EFFICIENCY PROJECT
2334 North Broadway, Suite A , Boulder, CO 80304
T: 303.447.0078 | Fax: 303.447.0158 | swenergy.org

Learn how Energy Efficiency can benefit your state:
www.20BillionBonanza.com