NEVADA ENERGY EFFICIENCY STRATEGY

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Southwest Energy Efficiency Project

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This study is available on the SWEEP (www.swenergy.org) and Nevada State Office of Energy (www.energy.state.nv.us) websites.

PREFACE

This project was initiated by Richard Burdette, Energy Advisor to Governor Guinn and Director of the Nevada State Office of Energy, along with the Renewable Energy and Energy Conservation Task Force established by the Nevada legislature. Funding for this project was provided by the Nevada State Office of Energy, Nevada Power Company, and the Energy Foundation.

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The views expressed in this report are those of the authors and of the Southwest Energy Efficiency Project (SWEEP), not of the funders or sponsors.

SWEEP is a non-profit organization working to advance energy efficiency in six states in the southwest region. For more information, visit SWEEP's website www.swenergy.org

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Nevada is the fastest growing state in the country in terms of population and energy consumption. Electricity use in Nevada increased nearly 70% from 16.4 TWh in 1990 to 27.8 TWh in 2000. Growth in electricity use slowed during the western energy crisis in 2001, but rebounded in 2002-2004. Rapid growth in electricity demand presents a number of challenges for the state including the high investment requirements in new generation, transmission and distribution facilities, increasing risk of power shortages, and increasing water consumption and pollutant emissions by power plants. In addition, Nevada has very limited fossil fuel resources and imports all of its natural gas and coal from other states.

Nevada has taken a number of steps to increase energy efficiency in recent years. These include reviving electric utility demand-side management (DSM) programs, forming a very effective program to encourage construction of ENERGY STAR® new homes, issuing an Energy Conservation Plan for State Government, and adopting legislation to facilitate use of performance contracting by the public sector. But much more could be done to increase energy efficiency in order to save money, reduce dependence on out-of-state resources, and cut water use and pollutant emissions.

In this report, we present 14 policy options for further increasing the efficiency of electricity and natural gas, and reducing peak power demand. The policy options include:

Utility Demand-Side Management Policies

1) Adopt Energy Savings Standards for Electric Utility Energy Efficiency Programs
2) Adopt a Public Benefits Charge to Fund Electric Utility Energy Efficiency Programs
3) Stimulate Natural Gas Utility Energy Efficiency Programs
4) Provide Clarification Regarding the Determination of DSM Program Cost Effectiveness

Buildings, Appliances and Industrial Policies

5) Upgrade Building Energy Codes
6) Adopt Residential Energy Conservation Ordinances to Upgrade the Energy Efficiency of Existing Houses
7) Adopt Appliance Efficiency Standards
8) Increase Funding for Low-Income Home Weatherization
9) Provide Technical and Financial Assistant to the Mining and Manufacturing Sectors

Energy Pricing Policies

10) Adopt Pricing and Demand Response Programs for Commercial and Industrial Customers – Demand Bidding and Critical Peak Pricing

11) Adopt Pricing Programs for Residential Customers – Expand Time-of-Use Rates and Explore Critical Peak Pricing

Public Sector Policies

12) Adopt Energy Savings Targets for State Agencies
13) Expand Use of Performance Contracting by the Public Sector
14) Increase Support for Energy Efficiency Upgrades in K-12 Schools

The 14 policy options could provide significant energy savings and peak demand reduction, as shown in Table ES-1.

Table ES-1 – Estimated Energy Savings and Peak Demand Reduction by Option

Option	Electricity savings (GWh/yr)		Peak demand reduction (MW)		Natural gas savings (bcf/yr)	
	2010	2020	2010	2020	2010	2020
1	1,478	4,633	591	1,853	--	--
2	1,345	3,947	536	1,577	--	--
3	--	--	--	--	3.0	10.6
4	--	--	--	--	--	--
5	1,005	3,489	402	1,395	1.2	4.0
6	150	450	68	205	0.75	2.25
7	160	450	49	158	0.4	0.8
8	20	60	9	27	0.2	0.6
9	390	1,800	60	272	0.4	1.3
10	--	--	165	165	--	--
11	--	--	216	216	--	--
12	42	61	19	28	0.2	0.3
13	--	--	--	--	--	--
14	65	100	30	46	0.2	0.3

Three policies stand out in terms of electricity savings and peak demand reduction potential: energy savings standards (option 1), a public benefits charge to fund energy efficiency programs (option 2), and new building energy codes (option 5). In addition, other policies are important for their targeted energy savings and benefits.

Table ES-2 shows the estimated net economic benefits for the various options. The economic benefits are the value of the energy savings over the lifetime of efficiency measures installed during 2006-2020, minus the cost of the efficiency measures and policies/programs that stimulate their adoption. Options 1, 2, 5 and 9 each offer net savings worth between $1-2 billion, while option 3 offers savings approaching $1 billion. These estimates do not include valuation of the non-energy benefits, which in some cases would be substantial.

Table ES-2 – Estimated Net Economic Benefits by Option

Option	Net economic benefit (million $)
1	1,700
2	1,450
3	820
4	--
5	1,860
6	400
7	350
8	20
9	1,220
10	27
11	18
12	39
13	--
14	36

Considering the magnitude of the energy and economic savings, extent of non-energy benefits, political viability, and the desire to implement a balanced set of energy policies, we recommend that policymakers in Nevada give highest priority to the following seven energy efficiency policies:

- **Adopt Energy Savings Standards for Electric Utility Energy Efficiency Programs** – large energy and economic savings potential, substantial non-energy benefits, more viable politically than adoption of a public benefits charge.
- **Stimulate Natural Gas Utility Energy Efficiency Programs** – moderate energy and economic savings potential, logical complement to electric utility programs, reasonable political viability.
- **Update Building Energy Codes** – large energy and economic savings potential, code deliberations underway, good prospects for adoption next year.
- **Adopt Appliance Efficiency Standards** – limited energy and economic savings, moderate water savings, but relatively straightforward to implement given that California has adopted these standards.
- **Increase Funding for Low-Income Home Weatherization** – low energy and economic benefits, but potentially significant social benefits.
- **Increase Support for Energy Efficiency Upgrades in K-12 Schools** – low energy and economic impacts, but potentially significant cost savings and non-energy benefits in this key sector.
- **Adopt Pricing and Demand Response Programs for Commercial and Industrial Customers** – reduces Nevada Power's needle peak and improves

system load factor, likely to be more cost-effective than a residential price response program.

The seven high priority policies would yield about $4.8 billion in net economic benefits for consumers and businesses over the lifetime of efficiency measures installed during 2006-2020. The high priority policies could save 8,730 GWh of electricity per year, 3,640 MW of summer peak demand, and over 16 billion cubic feet of natural gas per year by 2020. The gas savings are by final consumers; they do not include gas savings in electricity generation. Achieving these savings would mean lowering projected statewide electricity use in 2020 by nearly 22%, peak demand by 36%, and natural gas use by 19%. Since the reduction in peak demand is greater than the reduction in electricity use in percentage terms, the policies would improve the utilization of the electricity grid and reduce the risk of power outages.

The seven high priority policies would also provide substantial non-energy benefits including over 5 billion gallons of water savings per year by 2020, pollutant emissions reductions at power plants, enhanced comfort in homes, enhanced productivity in the workplace, cost savings and possibly improved student performance in K-12 schools, and economic development throughout the state. In addition, adopting the priority policies could enable Nevada to meet the 20% energy efficiency goal established by the Western Governors' Association. Given these wide-ranging benefits, we urge policymakers in Nevada to make a strong commitment to increasing energy efficiency.

I. INTRODUCTION

Nevada is the fastest growing state in the country in terms of population and energy consumption. Electricity use in Nevada increased nearly 70% from 16.4 TWh in 1990 to 27.8 TWh in 2000.[1] Growth in electricity use slowed during the western energy crisis in 2001, but rebounded in 2002-2004. Rapid growth in electricity demand presents a number of challenges for the state including the high investment requirements in new generation, transmission and distribution facilities, increasing risk of power shortages, and increasing water consumption and pollutant emissions by power plants.

Nevada has very limited fossil fuel resources and imports all of its natural gas and coal from other states. Considering direct fuel use along with the fuel used to generate electricity, Nevada imports more than 95% of its energy.[2] This means that a substantial amount of money flows to businesses and workers outside of the state.

Nevada was hit especially hard by the western electricity crisis in 2001. The state had increased its reliance on independent power producers, natural gas as a fuel source for electricity production, and spot market purchases.[3] This left the state very vulnerable to the market manipulation and high market prices that occurred in the West in 2001. Utility deregulation was repealed in Nevada in the wake of the western electricity crisis.

Energy prices have risen significantly in Nevada in recent years. The average electricity price in the state reached 9.4 cents per kWh in July 2004, compared to 6.2 cents per kWh in 2000 prior to the western energy crisis. Natural gas prices have risen even more dramatically in recent years. Households in Nevada were paying over $12 per thousand cubic feet for gas in mid-2004, about twice as much as households paid for gas in 2000. High and volatile natural gas prices are also affecting electricity prices and are expected to persist for a number of years.[4]

The pattern of electricity usage in Nevada is of concern. Summer peak electricity demand, driven by use of air conditioning, is rising faster than overall electricity use. This lowers the utility system load factor (the ratio of average-to-peak power demand), meaning utilities are not making good use of their power supply infrastructure. This in turn contributes to rising electricity prices.

Air quality is another concern in Nevada. The Las Vegas valley is currently designated by the U.S. EPA as a non-attainment area for particulates and carbon monoxide. This limits that ability to construct new or expanded facilities in the valley including on the Las Vegas Strip.

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[1] A terawatt-hour (TWh) is equal to a billion kilowatt-hours (kWh).
[2] *2003 Nevada Energy Status Report*. Nevada State Office of Energy, Office of the Governor, Jan. 30, 2003.
[3] See Reference 2.
[4] These energy prices are taken from various U.S. Energy Information Administration data bases and reports, www.eia.doe.gov.

Increasing the efficiency of energy use in Nevada will help to address all of these challenges and will provide a broad range of benefits including:

- saving consumers and businesses money on their energy bills;
- reducing dependence on out-of-state fuel sources;
- reducing vulnerability to energy price spikes;
- reducing peak demand and improving the utilization of the electricity system;
- reducing the risk of power shortages;
- supporting local businesses and stimulating economic development and diversification in the state;
- reducing water consumption by power plants; and
- reducing pollutant emissions by power plants, potentially providing emissions offsets that can enable continued economic expansion in the Las Vegas valley.

In short increasing energy efficiency is a "win-win strategy" for consumers, businesses, utilities, and the environment in Nevada. Nevada has taken a number of steps to increase the efficiency of energy use in recent years. These include reviving electric utility demand-side management (DSM) programs, forming a very effective program to encourage construction of ENERGY STAR® new homes, issuing an Energy Conservation Plan for State Government, and adopting legislation to facilitate use of performance contracting by the public sector. These and other initiatives are reviewed in our working paper *The Nevada Experience with Energy Efficiency Policy*, included as Appendix B to this report. In addition, improving the efficiency of electricity and natural gas use was one of the four strategic goals in the most recent Nevada state energy plan.[5]

The perspective that energy efficiency is important and should be actively promoted was embraced recently by the Western Governors' Association (WGA). In June 2004, the WGA adopted a "clean energy resolution" that includes a goal of increasing energy efficiency in the region 20% by 2020.[6] The resolution calls on the WGA to examine the feasibility and actions needed to meet this goal.

Much more can and should be done to increase energy efficiency in Nevada and other states. In this report, we present 14 policy options for increasing the efficiency of electricity and natural gas use, and reducing peak power demand. These two forms of energy account for close to 70% of total energy consumption in the state. Transport fuels represent the remainder of energy use but are outside the scope of this study.

The policy options are listed below and are grouped into four clusters—utility demand-side management policies, buildings, appliances and industrial policies, energy pricing policies, and public sector policies. The policy options represent a mix of actions directed to the Executive branch including state agencies, the Public Utility Commission of Nevada, and the legislature. For each policy option, we discuss the context, describe

[5] See Reference 2.
[6] *Clean and Diversified Energy Initiative for the West*. Resolution 04-13, adopted June 22, 2004. Denver, CO: Western Governors' Association. www.westgov.org/wga/policy/04/clean-energy.pdf

the proposal, estimate the energy savings that would result, and examine cost and cost effectiveness, environmental and social impacts, and political and other important considerations.

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- Provide Technical and Financial Assistance to the Mining and Manufacturing Sectors

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- Adopt Pricing and Demand Response Programs for Commercial and Industrial Customers – Demand Bidding and Critical Peak Pricing
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Public Sector Policies

- Adopt Energy Savings Targets for State Agencies
- Expand Use of Performance Contracting by the Public Sector
- Increase Support for Energy Efficiency Upgrades in K-12 Schools

The final section of the report summarizes the impacts that adopting these policies could have. In addition, we provide our recommendations regarding which policies should be given higher priority and which lower priority by policymakers in the state.

II. POLICY OPTIONS

Utility Demand-Side Management Policies

Option 1: Adopt Energy Savings Standards for Electric Utility Energy Efficiency Programs

Background

Nevada Power Co. (NPC) and Sierra Pacific Power Co. (SPPC) restarted energy efficiency and load management programs, also known as demand-side management (DSM) programs, in 2001. A DSM collaborative was formed to help the utilities with DSM program design and evaluation. The collaborative reached agreement on an expanded set of programs budgeted at $11.2 million per year ($9.2 million for NPC, $2.0 million for SPPC). The Public Utilities Commission of Nevada (PUCN) approved this proposal and NPC and SPPC launched this new set of DSM programs during the spring of 2003. For comparison, the two utilities spent about $2 million on DSM in 2001.

The new DSM programs have been relatively successful, exceeding initial projections of energy savings and peak load reduction for the programs as a whole. It is estimated that the programs resulted in about 35 GWh/yr of electricity savings and 16 MW of peak demand reduction during the first year of activity.[7] Furthermore, the programs as a whole are cost effective from a total resource cost (TRC) perspective. This result is impressive in part because there were considerable start-up costs in 2003.

For the two utilities combined, DSM program funding in 2003-04 was equivalent to about 0.4% of retail revenues. DSM program funding is expected to increase to about $15 million in 2005, but this still represents only about 0.5% of retail revenues. For comparison, the two utilities spent about 1.0% of revenues on DSM programs in 1994 prior to utility restructuring and the phase-out of DSM efforts. With a limited DSM budget, a number of the current rebate programs are stopped in mid-year because the utilities exhaust the funds allocated for a particular program. In addition, the limited DSM budget means that the utilities are not able to implement other DSM programs that are likely to reduce peak demand and save energy cost effectively.

Leading electric utilities in the country are spending 2-3% of their revenues on DSM programs. These programs in turn save the equivalent of around 1% of electricity sales each year. This means that these programs cut electricity use approximately 5% after five years of effort, 10% after ten years, etc. It is clear that much more could be done to stimulate the adoption of cost-effective energy efficiency measures in Nevada. Expanding utility DSM programs would provide economic benefits to customers, help the utilities reduce growth in peak power demand, reduce water consumption for electricity

[7] B. Balzar, H. Geller, and J. Wellinghoff, "The Rebirth of Utility DSM Programs in Nevada." *Proceedings of the 2004 ACEEE Summer Study on Energy Efficiency in Buildings.* Pacific Grove, CA, August 2004.

generation, and provide environmental benefits from less fossil fuel consumption by power plants.

DSM programs typically save electricity at a total cost of $0.02-0.03/kWh (utility plus participant costs), meaning improving end-use efficiency is the least-cost electricity resource. Also, many DSM programs reduce peak power demand more than they reduce electricity consumption in percentage terms, meaning the programs also improve the load factor for the utility system.

One way to stimulate expanded DSM programs is to adopt energy savings standards that require saving a minimum level of energy and/or peak load through these programs. This policy is in place in Texas where utility restructuring legislation adopted in 2002 requires investor-owned utilities to operate energy efficiency programs sufficient to save 10% of forecasted energy demand growth. This led the utilities in Texas to increase DSM program funding to the level of about $80 million per year as of 2003.[8]

Specific Energy Efficiency Proposal

This policy would adopt energy savings standards for the DSM programs implemented by NPC and SPPC as a means for expanding these programs and the energy savings and peak load reductions they provide. The energy savings standards could be either stand-alone standards, or combined with the state's renewable energy standards. The standards could apply to each utility separately, or be a combined standard for the two investor-owned utilities. Also, the standards could be expressed in terms of energy savings only, or include peak demand reduction as well as energy savings components.

If the energy savings standards are stand alone, we suggest they ramp up over a three-year period (2005-2007) to the level of approximately 1% of projected electricity sales. Given that projected electricity sales for NPC and SPPC is 29,000 GWh/yr in the 2006-2007 time frame according to each utility's Integrated Resource Plan, the proposed savings standard if expressed as a combined standard would be 290 GWh/yr starting in 2007. The suggested interim standards are 100 GWh/yr in 2005 and 200 GWh/yr in 2006. In addition, the energy savings standards could be increased at some modest level, say around 1% per year, after 2007 to account for population and load growth.[9]

If the energy savings standards are combined with the state's renewable portfolio standards, the RPS legislation could be modified to allow energy savings from utility DSM programs to qualify under the revamped renewable energy and energy savings standards. The current standards, which start at 5% in 2003/04 and ramp up to 15% by 2013, could be kept at these levels. Alternatively, the standards could be increased given that the utilities will be able to use a broader set of measures to meet the standards. If the modified renewable energy and energy savings standards are not changed in terms of

[8] Kushler, M., D. York, and P. Witte. *Five Years In: An Examination of the First Half-Decade of Public Benefits Energy Efficiency Policies.*Washington, DC: American Council for an Energy-Efficient Economy, April 2004.

[9] A 1% energy savings standard will eliminate a significant portion but not all of projected load growth.

their stringency during 2005-2013, they could be increased beyond 2013, say steadily increased to 25% by 2020.

The standards could include peak demand reduction requirements as well as electricity savings requirements. However, this adds complexity and is not compatible with the RPS which is expressed in energy terms only. If the standards do not include peak demand requirements, the utilities and PUCN should ensure that DSM programs emphasize peak demand reduction especially in southern Nevada.

In order to meet the energy savings standards, the utilities could implement a comprehensive set of ongoing and new DSM programs including:

- free or deeply-discounted electricity savings measures for low-income households,
- rebates for consumers that purchase ENERGY STAR products or undertake home retrofits,
- incentives for high-efficiency air conditioners, air conditioner tune-ups, and proper air conditioner sizing and installation,
- audits for and rebates to small businesses that upgrade the efficiency of their heating, cooling, and lighting equipment as well as their building envelope,
- technical and financial assistance to industries that are interested in improving the energy efficiency of their processes,
- grants to pay a portion of the cost for energy savings projects including daylighting projects in local government buildings, schools, and small businesses,
- training, certification, and outreach to increase the skills of builders, contractors, and energy efficiency service providers in Nevada,
- advertising and incentives to increase the availability and purchase of innovative energy-efficiency measures such as modern evaporative cooling systems or super-efficient windows,
- promotion of low-cost conservation measures such as enabling the power management capability of computer monitors,
- installation of load control devices, smart thermostats, and more sophisticated energy meters to facilitate pricing-related DSM initiatives,
- demand-side bidding to solicit energy efficiency projects from businesses and Energy Service Companies (ESCOs), and
- design assistance and incentives to builders and/or owners that construct highly energy-efficient new homes and commercial buildings.

Some of these programs are in place now but could be expanded; others would be new programs. All of the programs should pass the Total Resource Cost (TRC) test (see policy option 4) before they are implemented, as well as once they are implemented, in order to provide economic benefits for consumers and businesses. In addition, the bonus the utilities receive on their rate of return for DSM program expenditures should be factored into the cost effectiveness analysis.

Nevada has a substantial low-income population. Around 150,000 households, 17% of the total number of households in the state, are classified as low-income (i.e., earn less than 150% of the poverty level). A disproportionate share of the budget of the DSM programs launched by the utilities in 2003 support energy efficiency improvements in low-income households.[10] Given the large amount of income that these households devote to energy costs and the poor quality of much low-income housing, we recommend continuing this emphasis as the DSM programs grow.

The proposed energy savings standards would apply to the investor-owned utilities in Nevada. These utilities accounted for about 93% of total electricity sales and 88% of summer peak demand in the state as of 2003.[11] Municipal utilities and rural electric cooperatives are responsible for the remainder of the electricity sales. We recommend that municipal utilities and rural electric coops be urged but not required to expand their energy efficiency programs, in conjunction with adopting energy savings standards for investor-owned utilities (i.e., efficiency programs would be recommended but voluntary for the municipal utilities and rural coops).

We also suggest adding an industrial/large commercial customer self-direction option as the funding for utility DSM programs grows. This concept is presented and explained in Option 9 below. Adopting a self-direction option would help to achieve the ambitious energy and peak savings goals suggested here. It will also help to minimize objections to expanding DSM programs by large customers.

Energy Savings and Peak Load Reduction

In projecting energy savings, we assume the standards increase 1% per year after 2007 to account to some degree for population and load growth. In order to estimate summer peak demand reduction, we use a coefficient of 0.40 MW of peak reduction per 1 GWh/yr of electricity savings from DSM programs. This coefficient is similar to what the Nevada utilities achieved in 2003 and what other utilities such as Utah Power, the California utilities, and Xcel Energy have achieved. It implies that there is some emphasis on peak demand reduction within a comprehensive set of energy efficiency programs.

Table 1 shows the resulting levels of energy savings and peak demand reduction during 2005-2020, given the assumptions listed above. Cumulative DSM efforts would yield about 1,500 GWh/yr of electricity savings by 2010 and 4,600 GWh/yr of savings by 2020. The peak demand reductions reach 590 MW by 2010 and about 1,850 MW by 2020. Once again, these are for both of the investor-owned utilities. Savings from 2003-2004 DSM programs are not included in these estimates.

[10] Nearly 12% of the 2003-04 DSM budget of the two utilities funded activities aimed at improving energy efficiency among low-income households. These households account for about 5% of utility revenues and thus pay about 5% of the cost for the DSM programs.

[11] Personal communication with Mark Harris, Public Utilities Commission of Nevada, Carson City, NV, Nov. 18, 2004.

Table 1 – *Projected Electricity Savings, Peak Demand Reductions, and Corresponding DSM Budget Levels for the Proposed Energy Savings Standards*

Year	DSM funding level (Million 2005 $)	Electricity Savings from Programs each Year (GWh/yr)	Electricity Savings from Cumulative Programs (GWh/yr)	Peak Demand Reduction from annual programs (MW)	Cumulative Peak Demand Reduction (MW)
2005	18.0	100	100	40	40
2006	36.4	200	300	80	120
2007	52.7	290	590	116	236
2008	53.3	293	883	117	353
2009	53.8	296	1,179	118	471
2010	54.4	299	1,478	120	591
2011	54.9	302	1,780	121	712
2012	55.5	305	2,085	122	834
2013	56.0	308	2,393	123	957
2014	56.5	311	2,704	124	1,081
2015	57.0	314	3,018	126	1,207
2016	57.6	317	3,335	127	1,334
2017	58.2	320	3,655	128	1,462
2018	58.7	323	3,978	129	1,591
2019	59.3	326	4,304	130	1,721
2020	59.8	329	4,633	132	1,853

These relatively large savings levels result from assuming that 1% electricity savings can be achieved year after year starting in 2007. In fact it is difficult to project the long term savings potential and the extent to which energy savings markets will "saturate" as a result of robust DSM programs implemented year after year. In reality it would be preferable to update and revise the energy savings standards over time, say every five years, based on the savings being achieved and estimates of remaining savings potential. The PUCN could be responsible for making these revisions with input from all interested stakeholders.

In determining the cumulative energy savings, no savings degradation is assumed over the 16 years of program activity covered in the table. Most energy efficiency measures have a 16 year or greater lifetime. Those with less than a 16 year lifetime would likely be replaced with additional efficiency measures at the end of their useful life (e.g., a compact fluorescent lamp that burns out would be replaced by another compact fluorescent lamp).

Overall, this 16-year DSM effort would save 4.7% of NPC's and SPPC's total projected "base case" electricity sales (31,500 GWh) in 2010 in the absence of expanded DSM programs.[12] The DSM effort would save 12.5% of the projected electricity sales (37,000 GWh) in 2020. The energy savings standards would not eliminate all load growth in the NPC and SPPC service territories, but they would reduce load growth to much more manageable level; i.e., from about 1.8% to 1.0% per year on average. Furthermore, the peak demand reduction would be greater than the reduction in energy use in

[12] This base case sales projection is taken from recent NPC and SPPC integrated resource plans.

percentage terms, thereby helping NPC and SPPC increase their average system load factor.

If energy savings are added to the state's RPS, DSM programs at the level suggested here would result in about 7% electricity savings by 2013 relative to projected electricity use that year. Given that the RPS level that year is 15%, savings from DSM programs would meet just under half the requirement from the newly created renewable energy and energy savings standard.

Cost and Cost Effectiveness

Utilities with comprehensive, well-designed, and effective DSM programs typically save 4 - 7 kWh/yr per utility program dollar. This is higher than what NPC and SPPC achieved in 2003. But the 2003 NPC and SPPC programs were new and had significant start-up costs. Also, the programs were limited in scale; i.e., their planning, management, and marketing costs were a greater fraction of the total cost than would be the case if the programs were of larger scale. It is reasonable to assume that the savings coefficient would increase if the programs are expanded and operated for a number of years.

We assume that NPC and SPPC would save 5.5 kWh/yr per DSM program dollar if DSM efforts are significantly scaled up and implemented over many years. Table 1 includes the estimated DSM program funding levels in order to meet the proposed energy savings standards using this savings coefficient. DSM funding ramps up to about $53 million per year for NPC and SPPC combined by 2007. Funding increases gradually in subsequent years, reaching about $60 million per year by 2020 (in 2005 dollars). At the 2007 funding level, the utilities would be spending about 2% of their projected retail sales revenues on DSM programs. This is a reasonable DSM funding level considering that leading utilities (including Utah Power) are currently spending 2-3% of their revenues on DSM programs.

DSM programs enable utilities to purchase less fuel (and/or electricity) and reduce their investment in new power plants as well as T&D facilities over the lifetime of the efficiency measures. These benefits exceed the cost of the efficiency measures and the programs to stimulate their adoption, often by at least a factor of two. NPC estimated that their 2004 DSM programs as a whole would have a benefit-cost ratio of about 1.3 using the Total Resource Cost (TRC) test. This value was limited due to the modest scale of the programs and inclusion of a non-cost effective solar photovoltaic incentive program.[13]

Other utilities with well-funded, large-scale DSM efforts report overall benefit-cost ratios of two to three.[14] For the sake of analysis, we assume that large-scale, comprehensive DSM programs in Nevada would have a benefit-cost ratio of 2.0. This is a conservative assumption. Also, we assume that the DSM programs stimulate $2 of

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[13] *Integrated Resource Plan 2003. Technical Appendix 1.* Nevada Power Company, Las Vegas, 2003.
[14] See Reference 9.

investment in efficiency measures for each program dollar. This is also a conservative assumption; in some cases the ratio is closer to 3-to-1.

Based on these assumptions, the proposed $840 million (2005 dollars) of DSM program activity during 2005-2020 would stimulate about $1.7 billion of investment in energy efficiency measures. With an overall benefit-cost ratio of 2.0, the efficiency measures would produce $3.4 billion in gross economic benefits and $1.7 billion in net economic benefits over their lifetime. To put the net economic benefit figure in perspective, it is equivalent to about $2,000 for every household served by NPC and SPPC.

Environmental and Social Benefits

The DSM programs would lead to less operation of coal-fired and natural gas-fired power plants. This in turn will reduce water use and pollutant emissions by power plants. Assuming the avoided electricity generation comes from a mix of coal- and natural gas-fired plants, the water savings in Nevada would be at around 0.5 gallons per kWh.[15] Thus the savings standards suggested above would save approximately 0.75 billion gallons of water per year by 2010 and 2.3 billion gallons of water per year by 2020 from power plant operations alone. Additional water savings would result from the promotion of energy and water savings devices such as resource-efficient clothes washers.

The energy savings standards also would reduce SO_2, NOx, mercury, and CO_2 emissions by power plants. We estimate these impacts based on the regional electricity conservation potential study that SWEEP completed in 2002.[16] Table 2 shows the estimated emissions reductions in 2010 and 2020 assuming the electricity savings displace the operation of a combination of gas-fired and new coal-fired power plants. The SO_2 and NOx emissions reductions are relatively limited because these newer power plants are cleaner than older power plants. However, the reduction in CO_2 emissions is very large because CO_2 is not a regulated or controlled pollutant at the present time. CO_2 emissions are of growing concern because they are the primary cause of the greenhouse effect and global warming. The estimated reduction in mercury emissions is relatively small in physical terms, but mercury is a highly toxic substance.

Table 2 – *Estimated Emissions Reduction from the Proposed Energy Savings Standards*

Pollutant	Avoided emissions in 2010	Avoided emissions in 2020
Carbon dioxide (thousand tons)	1,070	3,600
SO_2 (tons)	120	560
NOx (tons)	480	1,150
Mercury (pounds)	5	20

[15] *The New Mother Lode: The Potential for More Efficient Electricity Use in the Southwest.* Boulder, CO: SWEEP, Nov. 2002.
[16] Ibid.

The energy savings standards will also yield a host of social benefits. First, robust DSM programs will improve the quality of the housing and commercial building stock in Nevada and will make homes and work places more comfortable. For example, sealing leaky HVAC ducts will improve cooling ability and reduce hot zones within a building.

Second, improving the energy efficiency of low-income housing will help occupants stretch their disposable income and will make it easier for them to pay their utility bills. This in turn will reduce utility arrearages, bad debt, and consumer shut-offs.

Third, energy efficiency improvements such as better lighting, better ventilation, or better controls for HVAC systems can result in productivity improvements in the workplace including less worker absenteeism and increased output per worker.[17] In addition, energy efficiency improvements in schools, particularly increased use of daylighting, enhances the learning environment and has been shown to produce better student performance on standardized tests.[18] Likewise, there is good evidence that use of daylighting helps to increase sales in the retail sector.[19]

Fourth, the energy savings standards will lead to a net increase in employment in Nevada. Selling and installing energy efficiency measures is relatively labor-intensive, while producing fossil fuels and electricity is not labor-intensive. In addition, consumers and businesses will respend their energy bill savings after efficiency measures are installed in ways that support more jobs in the local economy. For example, households will purchase a little more food, clothing, housing, entertainment, etc. on average, and these expenditures support more jobs than do electricity purchases. Based on the electricity conservation potential study mentioned above[20], we estimate that the proposed savings standards would result in a net increase of 590 jobs in the state by 2010 and 2,050 jobs by 2020. Job creation and diversification are important benefits for a state that is highly dependent on the tourism and gaming industries.

<u>Political and Other Considerations</u>

For a variety of reasons, the utilities are having a difficult time meeting the state's renewable energy standards. Consequently, there may be interest in opening up the

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[17] Romm, J.J. 1999. *Cool Companies: How the Best Businesses Boost Profits and Productivity by Cutting Greenhouse Gas Emissions*. Washington, DC: Island Press. Also, Imbierowicz, K. and L.A. Skumatz 2004. "The Most Volatile Non-Energy Benefits: New Research Results 'Honing In' on Environmental and Economic Impacts." *Proceedings of the 2004 ACEEE Summer Study on Energy Efficiency in Buildings.* Washington, DC: American Council for an Energy-Efficient Economy.
[18] L. Heschong and R. Wright 2002. "Daylighting and Human Performance: Latest Findings." *Proceedings of the 2002 ACEEE Summer Study on Energy Efficiency in Buildings.* Washington, DC: American Council for an Energy-Efficient Economy.
[19] R. Peet, L. Heschong, R. Wright, D. Aumann 2004. "Daylighting and Productivity in the Retail Sector." *Proceedings of the 2004 ACEEE Summer Study on Energy Efficiency in Buildings.* Washington, DC: American Council for an Energy-Efficient Economy.
[20] See Reference 15.

standards to energy savings from DSM programs in order to make it easier for the utilities to comply while maintaining many of the benefits of the standards (i.e., reduced reliance on fossil fuels for electricity generation). As noted above, it is unlikely that utility DSM programs would provide more than half the portfolio requirement in 2013, thereby leaving considerable room for expansion of renewable energy sources in Nevada.

Measurement and verification of energy savings is a key issue whether energy savings standards are adopted separately or are incorporated into the renewable energy standards. In particular, it will be important not to overstate energy savings from utility DSM programs. For example, the utilities should evaluate the net impacts of their programs taking into account both "free riders" and the spillover effect. The utilities should undertake thorough energy savings analyses of their DSM programs using well-established procedures such as the North American Energy Measurement and Verification Protocol. Furthermore, the PUC should review, audit, and if necessary adjust the energy savings claims of the utilities. All of these functions can be carried out effectively and at reasonable cost. In other words, energy savings analysis is something to pay attention to and carry out properly. Even though it is a challenge, savings analysis and estimation should not be used as an excuse for rejecting energy savings standards or greatly expanded utility DSM programs.

Option 2: Adopt a Public Benefits Charge to Fund Electric Utility Energy Efficiency Programs

Background

Nevada Power Co. (NPC) and Sierra Pacific Power Co. (SPPC) restarted energy efficiency and load management programs, also known as demand-side management (DSM) programs, in 2001. As noted previously, the two utilities spent $11.2 million per year on these programs as of 2003-2004 ($9.2 million for NPC, $2.0 million for SPPC). While this is much more than the utilities spent on DSM in previous years, it is still only about 0.4% of their total revenues. DSM program funding is expected to increase to nearly $15 million in 2005.

In order to expand energy efficiency programs and other "public benefit" activities, over 20 states and the District of Columbia have enacted a public benefits charge (PBC)—a small surcharge on all kilowatt-hours flowing through the transmission and distribution grid. The amount of the PBC varies from less than one-tenth of a cent per kilowatt-hour (kWh) in some states to up to four-tenths of a cent per kWh in others.[21] In some states, the PBC is equivalent to about a 2 or 3 percent surcharge on all electricity sold.

[21] See Summary Table of Public Benefit Programs and Electric Utility Restructuring (April 2004). Washington, DC: American Council for an Energy-Efficient Economy. www.aceee.org/briefs/mktabl.htm

The allocation of PBC funds varies from state to state. Some states such as California, Wisconsin, and Connecticut fund energy efficiency programs, assistance to low-income households, renewable energy implementation, and research and development (R&D). Other states apply PBC funds to only some of these purposes. In general, energy efficiency programs receive the largest portion of PBC funds.

The administration of energy efficiency programs funded through a PBC also varies from state to state. In most states, energy efficiency programs are implemented by distribution utilities. In a few states, the energy efficiency programs are implemented by either a state agency of a non-governmental program administrator. In Vermont, for example, an independent "energy efficiency utility" implements energy efficiency programs statewide using funds collected through the PBC.

A recent review of public benefits energy efficiency programs concludes these programs have been very successful.[22] No state has cancelled its public benefits energy efficiency policy, and at least four states have extended the effective period for its utility bill surcharge. The review also states that energy efficiency programs funded through this approach are cost-effective and producing substantial energy savings.

Specific Energy Efficiency Proposal

A PBC could be adopted in Nevada in order to scale up utility DSM programs and possibly other "public benefit" activities such as support for solar electric systems. A surcharge of 2 mills (two-tenths of a cent) per kWh, with 75% of this (1.5 mills) dedicated to DSM programs, would yield about $43 million per year for DSM programs given projected electricity sales levels in 2006. This funding level is based on the projected electricity sales by the investor-owned utilities (NPC and SPPC). In other words, it is assumed that the PBC applies to the investor-owned utilities only. They account for nearly 90% of the electricity sold in Nevada to retail customers.

This level of DSM program funding would enable the utilities to greatly expand their DSM programs. Increased funding could be used to expand current programs as well as initiate new programs, as suggested in the energy efficiency standards proposal. As noted in this other proposal, we recommend that a disproportionate share of the DSM budget continue to support energy efficiency improvements in low-income households considering the large fraction of income that these households devote to energy costs and the poor quality of much low-income housing.

Energy Savings and Peak Load Reduction

A $43 million annual DSM program budget is about 80% of the budget thought to be necessary to provide 1% electricity savings from DSM programs each year (see energy efficiency standards proposal). Thus, this level of DSM program funding would provide about 80% of the savings indicated in the efficiency standards proposal. Assuming programs ramp up during 2005-2007, the estimated savings from the PBC

[22] See Reference 8.

proposal are shown in Table 3. In making these estimates, it is assumed that electricity sales (and hence the amount of money collected) increases 1% per year once the DSM programs scale up.[23]

In this case, cumulative DSM efforts would yield about 1,345 GWh/yr of electricity savings by 2010 and 3,950 GWh/yr of savings by 2020. The peak demand reductions reach 536 MW by 2010 and about 1,580 MW by 2020. Once again, these are savings for both of the investor-owned utilities. The savings could be greater or lesser than these values if a different PBC amount were adopted.

In determining the cumulative energy savings, no savings degradation is assumed over the 16 years of program activity covered in the table. Most energy efficiency measures have a 16 year or greater lifetime. Those with less than a 16 year lifetime would likely be replaced with additional efficiency measures at the end of their useful life.

Table 3 – *DSM Funding, Projected Electricity Savings, and Peak Demand Reductions from Public Benefits Charge Policy*

Year	DSM funding level (Million 2005 $)	Electricity Savings from Programs each Year (GWh/yr)	Electricity Savings from Cumulative Programs (GWh/yr)	Peak Demand Reduction from annual programs (MW)	Cumulative Peak Demand Reduction (MW)
2005	25.0	139	139	55	55
2006	43.0	236	375	94	149
2007	43.4	239	614	95	244
2008	43.9	241	855	96	340
2009	44.3	244	1,099	97	437
2010	44.7	246	1,345	99	536
2011	45.2	249	1,594	100	636
2012	45.6	251	1,845	100	736
2013	46.1	253	2,098	101	837
2014	46.6	256	2,354	102	939
2015	47.1	259	2,613	104	1,043
2016	47.5	262	2,875	105	1,148
2017	48.0	264	3,139	106	1,254
2018	48.5	267	3,406	107	1,361
2019	49.0	269	3,675	107	1,468
2020	49.5	272	3,947	109	1,577

Overall, this 16-year DSM effort would save 4.2% of NPC's and SPPC's total projected "base case" electricity sales in 2010 in the absence of expanded DSM programs.[24] The DSM effort would save 10.7% of the projected electricity sales in 2020. The public benefits charge policy would reduce load growth from about 1.8% per year in the base case forecast to about 1.1% per year on average. Furthermore, the peak demand reduction would be greater than the reduction in energy use in percentage terms, thereby helping NPC and SPPC increase their average system load factor.

[23] It is assumed that the DSM programs eliminate a significant portion but not all of projected load growth.
[24] This base case projection is taken from recent NPC and SPPC integrated resource plans.

The same caveat applies to greatly expanding utility DSM programs through a PBC as through energy savings standards, namely that it is difficult to project long term savings potential and the extent to which energy savings markets will "saturate" as a result of robust DSM programs implemented year after year. If a PBC is adopted, it may be necessary to adjust the size of the PBC periodically based on the savings being achieved and estimates of remaining savings potential. Once again, the PUCN could be responsible for making these adjustments, with input from interested stakeholders.

Cost and Cost Effectiveness

DSM programs enable utilities to purchase less fuel (and/or electricity) and reduce their investment in new power plants as well as T&D facilities over the lifetime of the efficiency measures. These benefits exceed the cost of the efficiency measures and the programs to stimulate their adoption, often by at least a factor of two. NPC estimated that their 2004 DSM programs as a whole would have a benefit-cost ratio of about 1.3 using the Total Resource Cost (TRC) test. This value reflects the modest scale of the programs and inclusion of a non-cost effective solar photovoltaic incentive program.[25]

Other utilities with well-funded, large scale DSM efforts report overall benefit-cost ratios of two to three.[26] For the sake of analysis, we assume that large-scale, comprehensive DSM programs in Nevada would have a benefit-cost ratio of 2.0. This is a conservative assumption. Also, we assume that the DSM programs stimulate $2 of investment in efficiency measures for each program dollar. This is also a conservative assumption; in some cases the ratio is closer to 3-to-1.

Based on these assumptions, the proposed $720 million (2005 dollars) of DSM program activity during 2005-2020 would stimulate about $1.45 billion of investment in energy efficiency measures. With an overall benefit-cost ratio of 2.0, the efficiency measures would produce $2.9 billion in gross economic benefits and $1.45 billion in net economic benefits over their lifetime. To put the net economic benefit figure in perspective, it is equivalent to about $1,700 for every household served by NPC and SPPC.

Environmental and Social Benefits

The energy efficiency programs would lead to less operation of coal-fired and natural gas-fired power plants. This in turn will reduce water use and pollutant emissions by power plants. Assuming the avoided electricity generation comes from a mix of coal- and natural gas-fired plants, the water savings in Nevada would be at around 0.5 gallons per kWh.[27] Thus the public benefits fund policy would save approximately 0.67 billion gallons of water per year by 2010 and 2.0 billion gallons of water per year by 2020.

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[25] *Integrated Resource Plan 2003. Technical Appendix 1.* Nevada Power Company, Las Vegas, 2003.
[26] See Reference 8.
[27] See Reference 15.

The energy efficiency programs would also reduce SO_2, NOx, mercury, and CO_2 emissions by power plants. We estimate these impacts based on the regional electricity conservation potential study that SWEEP completed in 2002.[28] The avoided emissions are proportionate to the energy savings, and are thus about 80% of the values estimated for the energy savings standard proposal.

The energy efficiency programs would lead to a variety of social benefits. First, robust DSM programs will improve the quality of the housing and commercial building stock in Nevada and will make homes and work places more comfortable. For example, sealing leaky HVAC ducts will improve cooling ability and reduce hot zones within a house. In addition, improving the efficiency of low-income housing will help occupants stretch their disposable income and will make it easier for them to pay their utility bills.

In the commercial sector, energy efficiency improvements often result in productivity improvements including less worker absenteeism and increased output per worker.[29] In addition, energy efficiency improvements in schools (particularly increased use of daylighting) enhances the learning environment and has been shown to result in better student performance on standardized tests.[30] Likewise, there is good evidence that use of daylighting in helps to increase sales in the retail sector.[31]

The energy efficiency programs funded through a public benefits charge would lead to a net increase in employment in Nevada, in the same manner as would energy efficiency programs resulting from an energy savings standard. Based on the electricity conservation potential study mentioned above[32], we estimate that the proposed public benefits fund would result in a net increase of 490 jobs in the state by 2010 and 1,690 jobs by 2020.

<u>Political and Other Considerations</u>

Adoption of a public benefits charge is viewed by some as new “tax”. Therefore, it faces political obstacles. Also, utilities in Nevada already have a mechanism for funding and recovering the cost of DSM programs through rates. This policy also includes a financial incentive for utility shareholders. Consequently, we believe that adopting energy savings standards (either alone or combined with the renewable energy standards) is a more desirable policy for expanding utility DSM programs in Nevada than adopting a public benefits charge.

[28] Ibid.
[29] See Reference 17.
[30] See Reference 18.
[31] See Reference 19.
[32] See Reference 15.

Option 3: Stimulate Natural Gas Utility Energy Efficiency Programs

Background

Natural gas prices are high and rising in Nevada. According to the federal Energy Information Administration, the average residential retail gas price reached $12.87 per thousand cubic feet (tcf) in July, 2004. This includes commodity and distribution costs. The average home in Nevada consumed around 59 tcf per year as of 2001, meaning gas consumption per household is moderate in this generally warm climate. Nonetheless, at today's high gas prices, the typical household in Nevada is paying about $750 per year for natural gas.

There is considerable potential to increase the efficiency of natural gas use and do so cost effectively at today's natural gas prices. A gas energy efficiency potential study was recently completed in Utah. It showed that well-funded and comprehensive gas DSM programs operated for ten years (2004-2013) could reduce gas use in residential and commercial buildings by 20 percent at the end of this period. Furthermore, the study showed that realizing this gas savings would provide over $1.5 billion in net economic benefits to consumers and businesses in Utah.[33]

Natural gas distribution utilities in at least nine states and the Canadian province of Ontario sponsor gas conservation programs for their customers. These programs include consumer education, marketing, and financial incentives. Some states have adopted minimum spending requirements or public benefits surcharges that fund these gas conservation programs. A few states including California and Minnesota also have established minimum gas savings requirements or targets, and a few states including Massachusetts, Minnesota, and Ontario have adopted shareholder incentives to encourage utilities to implement effective gas DSM programs.[34]

Gas distribution utilities in Nevada are not implementing conservation programs for their customers at the present time. However, the main gas utility, Southwest Gas, is contemplating offering gas DSM programs in southern Nevada as well as in Arizona.

Gas DSM programs are justified using the Total Resource Cost test (or one of the other cost effectiveness tests) in the same manner that electricity DSM programs are justified. This means the benefits of the programs (i.e., the value of the gas savings) exceed the costs (i.e., the cost of the efficiency measures and programs) on a net present value basis. The cost of these energy efficiency programs is paid for by all gas consumers served by the utilities.

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[33] *The Maximum Achievable Cost Effective Potential for Gas DSM in Utah for the Questar Gas Company Service Area.* Marietta, GA: GDS Associates, Inc. June 2004.
[34] Kushler, M., D. York, and P. Witte. 2003. *Responding to the Natural Gas Crisis: America's Best Natural Gas Energy Efficiency Programs.* Washington, DC: American Council for an Energy-Efficient Economy.

Specific Energy Efficiency Proposal

This policy would stimulate gas utility DSM programs in Nevada through a number of mechanisms including more detailed analysis of the cost effective and achievable gas savings potential, a minimum program funding level or a minimum gas savings target, a DSM program cost recovery mechanism, a financial incentive for the gas utilities, and a gas DSM program collaborative. We prefer a savings target rather than a minimum spending requirement since energy savings is the central objective.

It is premature to establish definitive savings targets at this time prior to analysis of achievable savings potential. We recommend that gas utilities undertake this type of analysis working either individually or together. However, we believe that a target of around 1% gas savings per year may be reasonable for residential, commercial, and industrial customers that purchase their gas from traditional gas utilities (i.e., not from third party gas suppliers). This is half the gas savings level identified as achievable in the Utah gas conservation potential study.

With respect to cost recovery and utility incentives, we support adoption of decoupling of gas utility sales and revenues along with enabling utilities to capitalize and earn their allowed rate of return on gas DSM programs. These policies were recently endorsed by the American Gas Association and Natural Resources Defense Council.[35] However, the PUCN denied Southwest Gas's request to decouple gas sales and revenues in a recent rate case decision.[36] On the other hand, the PUCN did direct Southwest Gas to file a plan regarding energy conservation efforts and programs in this same order.

As an alternative to decoupling, gas utilities could be allowed to rate base their DSM programs and earn their allowed rate of return plus a bonus. In particular, they could be allowed to earn their allowed rate of return plus 5%, the same financial incentive adopted for electricity DSM programs in Nevada. If this is done, the DSM programs should pass the TRC test with the bonus included as a program cost.

If gas DSM is initiated, we recommend establishing a gas DSM program collaborative since the collaborative process has proven to be very useful for advancing electricity DSM in Nevada. The gas DSM collaborative could work on program design, accompany program implementation, and make recommendations to the PUCN on cost recovery and incentive issues.

The types of energy efficiency activities that gas utilities could implement in order to meet the gas savings targets include:

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[35] Environmental Group Teams with Natural Gas Utilities to Promote Innovative State Approach to Energy Efficiency. Joint Statement of the American Gas Association and Natural Resources Defense Council, July 12, 2004.
http://www.aga.org/Template.cfm?Section=AGA_News1&template=/ContentManagement/ContentDisplay.cfm&ContentID=14370

[36] Order in Docket No. 04-3011. Public Utilities Commission of Nevada. Aug. 26, 2004.

- Paying a portion of the cost of energy audits for households and smaller businesses;
- Certifying energy auditors and retrofitters, and helping to promote the services of certified auditing and retrofitting firms;
- Increasing funding for weatherization of low-income households;
- Financing major retrofit projects at low to moderate interest rates and over an extended time period (say 5-10 years) for all other households and for businesses;
- Providing financial incentives such as rebates to those purchasing proven gas efficiency measures including high efficiency gas furnaces and boilers, high efficiency gas water heaters, heating system tune-ups, air duct sealing, ENERGY STAR clothes washers and dishwashers in homes with gas water heating, and programmable thermostats;
- Giving away or selling at a discount low-cost gas conservation measures such as low-flow showerheads, faucet aerators, and water heater insulation wraps.

In homes that are air conditioned and also heated with natural gas, promoting more efficient home construction or home retrofit, energy savings measures such as improved insulation, duct sealing, or energy-efficient windows would save both natural gas used for heating and electricity used for cooling. In this case it makes sense for gas and electric utilities to co-fund fuel neutral energy efficiency programs.

Energy Savings

Gas distribution utilities in Nevada sell approximately 67 billion cubic feet (bcf) per year, so a 1% savings target implies about 0.67 bcf of gas savings from programs each year. If gas utilities begin DSM programs in 2006 and save 0.3 bcf that year, 0.67 bcf in 2007, and 1.5% greater savings each year after 2007 to account for population and economic growth, the savings from all installed efficiency measures would reach 3.0 bcf in 2010, 6.7 bcf in 2015, and 10.6 bcf by 2020.

These are relatively ambitious gas savings targets. Once again, it is difficult to project the long term savings potential and the extent to which energy savings markets will "saturate" as a result of robust gas DSM programs implemented year after year. If gas savings requirements are adopted, it would be desirable to revise the gas savings standards over time in the same way that electricity savings standards are revised. The PUCN could be responsible for making these revisions with input from all interested stakeholders.

Cost and Cost Effectiveness

Given the experience in other states, it is very likely that gas conservation programs will be cost-effective and beneficial in Nevada especially considering that gas prices are now relatively high and are expected to stay that way in the foreseeable future. But the economic feasibility of gas conservation programs in Nevada should be estimated in advance of program implementation and then evaluated again after implementation to confirm that the programs are cost-effective.

How much money might gas utilities in Nevada need to spend to reach the target of saving 0.67 bcf per year? Assuming the average retail gas price to residential and commercial customers is $11 per thousand cubic feet, the value of the gas savings would be about $7.4 million per year; i.e., $37 million per year after programs operate for five years, $74 million after ten years, etc. Assuming that efficiency measures have a three-year payback on average, that gas utilities pay one half the cost (or incremental cost) of the efficiency measures through their incentives, and that incentives represent 75% of the total DSM program budget, then gas utilities in Nevada would need to spend about $15 million per year on DSM programs in order to achieve the 1% per year savings target.

How cost-effective would this overall policy be? Consumers would invest about $22 million per year in gas conservation measures by 2007 (excluding utility incentive payments), meaning a total energy efficiency investment of $330 million during 2006-2020. Assuming an average measure lifetime of 15 years, no further increase in natural gas prices, and a 5% discount rate, the discounted value of energy savings over the life of the measures installed during 2006-2020 would be about $1.15 billion (consumer perspective). Thus, the net savings for consumers would be $820 million and the benefit-cost ratio nearly 3.5.

The overall benefit-cost ratio using the Total Resource Cost perspective depends on avoided gas costs. It will still be greater than one, but is likely to be less than the benefit-cost ratio from the consumer perspective. In the Utah study, the overall average benefit-cost ratio using the Total Resource Cost test was about 2.4.[37]

Environmental and Social Benefits

Stimulating more efficient gas use through gas DSM programs will provide other benefits besides the direct gas and energy bill savings. Some of the gas conservation measures mentioned above, such as energy-efficient clothes washers and dishwashers, will also save water and/or electricity. Some measures such as home retrofits and duct sealing will improve occupant comfort and reduce health problems such as mold formation. Other measures such as furnace tune-ups and replacement will enhance consumer safety as well.

Gas conservation efforts in low-income households will help these households stretch their disposable income. It also will make it easier for these households to keep up with utility bill payments, meaning fewer shut-offs, fewer bill arrearages, and less bad debt for gas utilities. Natural gas conservation also puts downward pressure on wholesale natural gas prices and helps businesses increase their productivity. In addition, conserving natural gas will result in environmental benefits due to less gas combustion.

[37] See Reference 33.

Political and Other Considerations

Gas utilities in Nevada (and elsewhere) have been experiencing declining gas sales per customer due to factors such as national appliance efficiency standards, building energy codes, and conservation efforts stimulated by rising gas prices. In order to get gas utilities to support and operate well-funded and effective energy efficiency programs, it is critical to remove the normal financial disincentive they have towards promoting less gas consumption by their customers. Consequently, it is very important to adopt sales and revenue decoupling.

Option 4: Provide Clarification Regarding the Determination of Energy Efficiency Program Cost Effectiveness

Background

Cost effectiveness tests compare the costs and benefits of energy efficiency measures and programs. There are five different tests that are commonly used to evaluate energy efficiency program cost effectiveness. These include: Total Resource Cost (TRC) test, Societal Cost (SC) test, Utility Cost (UC) test, Participant Cost (PC) test, and Ratepayer Impact (RIM) test. Here are brief definitions of each test, based on the California "Standard Practice Manual":[38]

- The TRC test measures the costs and benefits of energy efficiency programs as a resource option based on the total costs of the program, including both the participants' and the utility's costs. Benefits include the avoided utility capital investment in generation, transmission and distribution, avoided fuel purchases, and other utility O&M costs avoided during the lifetime of the efficiency measures.

- The SC test is similar to the TRC test, except it includes quantification of non-energy benefits including valuing the avoided pollutant emissions that result from the energy efficiency programs.

- The UC test measures the costs and benefits of energy efficiency programs as a resource option based on the costs incurred by the utility including incentive, marketing, and program administration costs, but excluding any net costs incurred by participants. The benefits are the same as with the TRC test.

- The PC test measures the quantifiable costs and benefits and costs from the perspective of participating customers. It uses retail energy prices to value the energy savings, and considers the net costs paid by customers for efficiency measures (net of any incentive paid by the utility).

[38] CA PUC and CA Energy Commission, *Standard Practice Manual: Economic Analysis of DSM Programs*, December 1987.

- The RIM test (also known as the non-participant cost test) measures the change in average customer rates as a result of the implementation of energy efficiency programs. It is based on changes in utility revenues, operating costs, and electricity sales. Also, it depends on the time of the day and year at which energy savings and demand reduction occur.

The TRC test considers the full set of costs and benefits that are readily quantifiable from a societal perspective. Programs that pass the TRC test will lower the total energy bills paid by customers in aggregate (also known as utility revenue requirements). Therefore, many states use the TRC test as the only test or as the primary test for determining whether or not a DSM program is cost-effective. In the West, the TRC test is used to determine whether or not DSM programs are cost-effective in California, Montana, Oregon, Utah, and Washington.

At the present time, there is not a clear policy on which test should be used to determine DSM program cost effectiveness in Nevada. As noted in our historical review, the PUC in the 1980s directed utilities away from use of the RIM test. But the utilities and PUC have some discretion to consider and rely on the various tests as they so choose. Recent PUC decisions concerning resource planning and DSM policy have been silent on the matter of cost effectiveness tests. This has created some ambiguity and use of different cost effectiveness tests by different parties involved in resource planning in Nevada.

There also is not a clear policy on how to value the energy savings and peak demand reduction from DSM programs. In particular, the utilities in recent years have not included an estimate of the reduced investment in the transmission and distribution (T&D) system as a result of DSM programs Other parties involved in resource planning proceedings and DSM program design and analysis, such as the Bureau of Consumer Protection and SWEEP, argue for including a value for avoided T&D investments when considering the long-term impacts of DSM programs.

Specific Energy Efficiency Proposal

This policy would clarify that the TRC test is the principal test for determining whether or not utility energy efficiency and other DSM programs are cost effective. The policy could allow consideration of other cost effectiveness tests, but would unambiguously state that the TRC is the principal test for deciding whether or not a utility should proceed with a particular program and whether or not the program was in fact cost effective once it has been implemented.

This policy also could indicate which costs and benefits are to be included in the analysis of individual DSM programs. In particular, the benefits should include avoided T&D costs as required in Nevada's recently modified resource planning regulations.[39] The benefits should also include avoided generation costs, along with avoided fuel and

[39] PUCN Docket No. 02-5030, Order dated April 28, 2004. Nevada Resource Planning regulation, Section 65 (3)(b).

O&M costs, over the lifetime of efficiency measures implemented as a result of DSM programs. Also, the policy could indicate that any changes in natural gas use and water use (either an increase or decrease) be quantified and valued in the determination of the cost effectiveness of electricity-oriented DSM programs. This is appropriate from the perspective of taking into account the full costs and benefits of DSM programs as long as they are readily quantifiable.

We are not suggesting attempting to estimate and quantify the value of reduced pollutant emissions due to DSM programs. It is difficult to estimate the amount of emissions that are avoided as this depends on which power plants are operated less as energy savings occur. Also, deciding on an appropriate monetary value for avoided pollutant emissions, including carbon dioxide emissions, is relatively controversial. Furthermore, most DSM options and programs will be cost effective in Nevada using the TRC test; i.e., it is not necessary to estimate the amount and value of avoided pollutant emissions in order to conclude that DSM programs are cost effective.

Energy Savings and Peak Load Reduction

These policy reforms will support the expansion of DSM programs in Nevada. But is very difficult to estimate what impact they would have on either DSM funding levels or energy savings. Making these policy reforms will facilitate the implementation of other policies such as the adoption of energy savings standards. However, we are not able to provide estimates of the energy savings or peak demand reduction that these policy reforms would have if they were adopted independently.

Cost and Cost Effectiveness

There would be little or no incremental cost related to the development or analysis of energy efficiency programs if these reforms were adopted. There would be costs and benefits, however, if these policy reforms lead to an expansion of utility DSM programs. It is fair to assume that the net effect would be economic savings for customers as a whole, but it is impossible to estimate the magnitude of these savings.

Political and Other Considerations

We do not anticipate any significant obstacles to the adoption of these policies. It is fairly common to use of the TRC test as the principal DSM cost effectiveness test and to include a broad set of costs and benefits (including avoided T&D costs) in performing DSM program cost-benefit analysis. Utilities and/or consumer advocates in some states prefer use of the more restrictive RIM test. But this is not the case in Nevada as far as we know.

Buildings, Appliances and Industrial Policies

Option 5: Upgrade Building Energy Codes

Background

Building energy codes specify minimum energy efficiency requirements for new buildings or existing buildings undergoing a major renovation. Nevada has a mandatory statewide energy code consisting of modified versions of the *1986 Model Energy Code* (MEC) for both new residential and commercial buildings. Only the legislature can revise the statewide mandatory building code. An attempt was made to update the statewide energy code in 1995, but the legislation died in committee.

Local jurisdictions in Nevada are allowed to adopt energy codes that are more up-to-date and more stringent than the statewide code. The 1992 version of MEC was adopted in the greater Las Vegas area. The 1995 version of MEC was adopted in Reno, Washoe County, Carson City and the City of Sparks. Reno, Carson City, and Washoe County are in the process of adopting the 2003 edition of the International Energy Conservation Code (IECC). Assuming this process is completed in early 2005, enforcement of the new code could start July 1, 2005. The IECC includes the latest residential and commercial model energy codes.

The 2003 IECC has been under review by Clark County and other jurisdictions in southern Nevada. Working groups were formed by the Southern Nevada Home Builders Association and Associated General Contractors to review their respective portions of the code and draft proposed amendments. Their recommendations are expected by the end of 2004. The various jurisdictions anticipate proposing new building codes to their governing bodies in January 2005, with an effective date in mid-year.[40]

In 2002 the State Public Works Board adopted the American Society of Heating, Refrigeration and Air Conditioning Engineers, Inc. (ASHRAE) energy code for commercial buildings, ASHRAE/IESNA 90.1-1999. The adoption of this code ensures at least moderate levels of energy efficiency in the design and construction of new state buildings. In addition, the Public Works Board requires, prior to the construction of all buildings of more than 20,000 square feet, a detailed analysis of additional measures that could conserve energy.

The newest version of the IECC, which has been published as the 2004 Supplement, includes more stringent provisions than the 2003 version in some areas. The new version of the IECC also contains other simplifications to make it easier for builders and building code officials to use. In addition, the ASHRAE 90.1-2001 model standard is in the process of being updated, including a significant improvement in lighting energy

[40] Personal communication with Dave McNeil, Nevada State Energy Office, Carson City and Eric Borsting, Southern Nevada Home Builders Association , Las Vegas, August 2004.

efficiency requirements. Some of these changes were developed and adopted as addendum to the ASHRAE 90.1-2001 standard in recent years.

Specific Energy Efficiency Proposal

This policy would adopt a current version of the model energy code either statewide or in all of the major cities and counties where significant new construction is occurring. Our recommendation is to allow updating of the building energy code to go forward at the city and county level (including adopting codes in new high growth areas without energy codes at this time). However, if the energy code adoption at the city and county level bogs down, we suggest that the Nevada legislature consider adopting the IECC statewide. In addition, we urge policy makers to consider adopting either the 2003 IECC or the 2004 Supplement to the IECC as well as the lighting and other efficiency improvements in Addendum G to the ASHRAE 90.1-2001 model standard except for the gaming areas of casinos. Because building energy codes are updated infrequently, it is important to adopt the latest model codes.

Complying with either the 2003 IECC or 2004 supplement is not very difficult. Most new homes constructed in southern Nevada in recent years exceeded the energy efficiency levels of the 2000 IECC (which is similar to the 2003 version), although some new homes (including low end homes) are not in compliance with the IECC.[41] On the other hand, relatively few homes constructed in northern Nevada in recent years met the energy efficiency levels of the 2000 IECC.

The 2003 IECC has been adopted in a number of other jurisdictions including New Mexico, Idaho, Utah, and the cities of Denver and Phoenix.[42] Also, California has adopted statewide mandatory building codes (the so-called Title 24 standards) that are at least as stringent as the IECC, and California is in the process of tightening its building energy codes.

As part of this policy, the state energy office and possibly the utilities should support implementation of the new building codes through training of architects, builders, contractors, and local code enforcement officials. The U.S. Department of Energy offers grants to state energy offices for these types of activities, and Nevada has received grants in this area in the past.

In addition, the state energy office and utilities should continue to encourage construction of highly efficient new homes and commercial buildings that go well beyond the minimum code requirements. One way this could be done is to require that all new homes be highly energy-efficient (say at least 25% more efficient than minimum code in

[41] *Final Report – Volume 1. In-Field Residential Energy Code Compliance Assessment and Training Project*. Report prepared by the Brit/Makela Group, Inc. for the Nevada State Office of Energy, June 2003.
[42] See *Status of State Energy Codes*. Washington, DC: Building Codes Assistance Project. http://www.bcap-energy.org/backissues.html

terms of heating and cooling requirements) in order to qualify for a solar PV electric system incentive.[43]

Energy Savings and Peak Load Reduction

We estimated the energy savings and peak demand reduction from upgrading building energy codes by making assumptions about the construction rates in the state during 2006-2020, the fraction of new homes and commercial buildings that would be affected by new energy codes, and the energy savings per home and per unit of floor area in commercial buildings, in homes and commercial buildings influenced by the codes. In particular, we assume 48% of new single family homes statewide and 15% of new commercial floor space already meet or exceed the energy efficiency levels of the 2003 IECC and therefore are not affected by the new codes.[44] In addition, we assume electricity savings levels of 26% in new homes and 32% in new commercial buildings, for those buildings affected by the codes.[45] Also, we assume natural gas savings of 11% in new homes and 33% in new commercial buildings, for those buildings affected by the codes.

Table 4 shows the resulting electricity savings and peak demand reductions in 2010, 2015, and 2020 based on these and other assumptions. The electricity savings could reach nearly 3,500 GWh/yr and 1,400 MW of peak demand by 2020. More than 80% of the electricity savings come from new commercial buildings and less than 20% from new homes. It should be noted that these savings projections consider single family homes only; they do not include savings from new apartment buildings.

Table 4 – Projected Electricity Savings and Peak Demand Reduction from Updated Building Energy Codes

Sector	Electricity savings (GWh/yr)			Peak demand reduction (MW)		
	2010	2015	2020	2010	2015	2020
Residential	208	386	623	83	154	249
Commercial	797	1789	2866	319	716	1146
All	1005	2175	3489	402	870	1395

Table 5 shows the resulting gas savings in 2010, 2015, and 2020. The gas savings could reach nearly 4 billion cubic feet per year by 2020. In this case 73% of the savings come from new commercial buildings and 27% from new homes.

[43] Utilities in Nevada are offering incentives of $5 per watt to stimulate the adoption of solar PV systems. See www.solargenerations.com
[44] These assumptions were made by SWEEP with input from Dave McNeil, Nevada State Office of Energy, October 20, 2004.
[45] We assume the new codes include the lighting efficiency requirements in the 2003 Addendum to the ASHRAE model standard, except for in casino gaming areas.

Table 5 – Projected Gas Savings from Updated Building Energy Codes

Sector	Gas savings (bcf/yr)		
	2010	2015	2020
Residential	0.36	0.67	1.08
Commercial	0.80	1.80	2.88
All	1.16	2,47	3.96

Cost and Cost Effectiveness

Upgrading the energy efficiency of new homes and commercial buildings is very cost effective.[46] We estimate that upgrading the energy efficiency of a new home in order to comply with the code will cost about $1,500 on average but will result in about $400 in annual energy bill savings, meaning a simple payback of less than four years. Likewise, we estimate that upgrading the energy efficiency of commercial buildings to comply with the code will cost about $1.60 per square foot but will result in about $0.68 per square foot of energy bill savings per year, meaning a simple payback of about 2.4 years.

We estimate that adopting new energy codes as suggested above will lead to about $930 million in investment in energy efficiency measures during 2006-2020. The resulting energy bill savings could reach $104 million per year by 2010, $223 million per year by 2015, and $358 million per year by 2020 (2004 dollars). Assuming the energy requirements have a discounted benefit-cost ratio of 3.0 on average, the gross savings over the lifetime of efficiency upgrades made during 2006-2020 would reach $2.79 billion, and the net savings would be $1.86 billion.

Environmental and Social Benefits

By reducing the amount of electricity consumed, up-to-date building energy codes would reduce water consumption and the pollutant emissions from operating coal- and gas-fired power plants. We estimate the codes would reduce water consumption in the state approximately 310 million gallons per year by 2010 and 1.75 billion gallons per year by 2020. Furthermore, we estimate the codes would reduce CO_2 emissions approximately 0.78 million tons per year by 2010 and 2.7 million tons per year by 2020.

Political and Other Considerations

As noted above, efforts are underway to upgrade building energy codes at the city and county level in both northern and southern Nevada. There is a good chance that new building codes will be adopted in 2005 and implemented by the beginning of 2006, if not sooner. Perhaps the biggest challenge will be to adopt comprehensive state-of-the-art

[46] For example, the commercial and industrial new construction program run by utilities in Connecticut has a benefit-cost ratio of 5.7 using the Total Resource Cost test, making this program the most cost-effective among 18 different DSM programs in the state. See *Energy Efficiency: Investing in Connecticut's Future*. New Britain, CT: Energy Conservation Management Board. Jan. 31, 2004.

codes, including the new commercial building lighting requirements approved by ASHRAE.

While some builders still oppose the adoption of the IECC, most of the building community supports or accepts it. Most builders recognize that the up-to-date code leads to better customer satisfaction and lower energy bills, even if it means a slightly higher construction cost. The will of a minority of builders should not be allowed to dictate state policy, especially when it runs contrary to what is cost effective in Nevada and increasingly the norm throughout the United States.

Training and assisting architects, builders, contractors, and code officials is critical to the successful implementation of new building codes. Studies show that such efforts can significantly improve code compliance.[47] Training and technical assistance should be provided in a variety of areas including integrated building design, proper sizing and installation of HVAC systems, proper air tightness and insulation procedures, and use of other state-of-the-art technologies. The Nevada utilities should consider co-funding training and code enforcement efforts as part of their DSM programs. Experience in California shows that this can be very cost-effective in terms of the energy savings achieved per utility program dollar.[48] This training could be provided in conjunction with the new construction programs that the Nevada utilities are already carrying out or are planning for 2005.

Option 6: Adopt Residential Energy Conservation Ordinances To Upgrade the Energy Efficiency of Existing Homes

Background

Approximately 75,000 existing homes are sold each year in Nevada, compared to construction of about 40,000 new homes (single family, muti-family, and mobile homes combined). A number of jurisdictions in the United States have adopted and successfully implemented residential energy conservation ordinances (RECOs) for the purpose of upgrading the energy efficiency of existing housing. RECOs require homeowners and landlords to implement specific energy efficiency measures, if necessary, at the time a house or rental property is sold or renovated. RECOs are designed to bring the existing housing stock up to a minimum level of energy efficiency. In some cases, the emphasis is on multi-family or rental housing.

RECOs are in place and operating reasonably well in San Francisco, Berkeley and other communities in California. In California, RECOs pertain to all types of housing.

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[47] Kinney, L., H. Geller and M. Ruzzin 2003. *Increasing Energy Efficiency in New Buildings in the Southwest*. Boulder, CO: Southwest Energy Efficiency Project.

[48] Stone, N., D. Mahone, P. Eilert and G. Fernstrom. 2002. "What's a Utility Codes and Standards Program Worth, Anyway?" *Proceedings of the 2002 ACEEE Summer Study on Energy Efficiency in Buildings.* Vol. 9, pp. 341-351. Washington, DC: American Council for an Energy-Efficient Economy.

The cities of Burlington, VT and Ann Arbor, MI, and the state of Wisconsin have adopted RECOs that apply only to rental property. In some cases, there is a cost ceiling on how much a property owner has to spend because of the RECO. San Francisco, for example, limits the expenditure to 1% of the sales price.[49]

RECOs usually list required energy efficiency measures such as a minimum level of attic insulation, duct sealing and insulation, water heater tank and pipe insulation wrap, and water saving measures. The city or state inspects and certifies that homes or rental units meet the requirements. The City of Berkeley contracts with a community-based non-profit organization to do the inspections.

The Wisconsin statewide program for rental property gives the buyer up to one year to meet the standards. Inspections are done by either a state or private inspector. The state has four people administering the program and recovers the entire cost of the program through modest fees charged to parties responsible for complying with the standards. Nearly 60,000 rental properties were affected during 1985-95.[50]

RECOs are desirable in Nevada in part because building energy codes were outdated for many years. Consequently, there are many inefficient homes and apartment buildings in the housing stock.

<u>Specific Energy Efficiency Proposal</u>

This policy would adopt RECOs either at the state or local level. It might be preferable to begin with a statewide RECO for rental property which could be modeled on the Wisconsin program. Rental property owners have little incentive to upgrade the energy efficiency their property if tenants pay the energy bills. As a result, renters often live in inefficient dwellings. If a statewide RECO pertains only to rental property, local governments could be urged (but not required) to adopt RECOs for owner-occupied housing. We suggest including the following energy efficiency requirements in RECOs in Nevada:

- Minimum attic insulation level (R-19) in accessible attics
- Double pane low solar heat gain low-E windows, reflective low-E window film, or window shade screens on west-facing windows
- Air conditioner tune-up including refrigerant charge adjustment
- Sealing and insulating accessible heating and cooling ducts
- Caulking, weatherstripping, and other building envelope air sealing
- Programmable thermostat
- Installing at least 5 compact fluorescent lamps in commonly used light sockets
- Low-flow showerheads and faucet aerators

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[49] Suozzo, M., K. Wang, and J. Thorne. 1997. *Policy Options for Improving Existing Housing Efficiency.* Washington, DC: American Council for an Energy-Efficient Economy.
[50] ibid.

The state energy office could implement the RECO for rental property and/or could help local governments that adopt RECOs through training and other assistance. Utilities in Nevada could support the RECOs by offering rebates and/or low-interest financing for energy efficiency upgrades. Lenders could support RECOs by adding the cost of the energy retrofit into the mortgage for a home or apartment building. Also, proposed federal tax credits for home retrofit, if enacted, would facilitate the implementation of policies such as RECOs at the state or local level.

The adoption of RECOs is likely to be more effective if there is training and certification of the contractors performing home upgrades. This is due in part to the need to upgrade the skills and work quality of many insulation, HVAC, and other home retrofit contractors in Nevada.[51] Utilities could co-fund contractor training and certification at either the state or local level. Implementing such training and certification will lead to increased energy and cost savings in homes that are retrofit broadly, not only in those impacted by RECOs.

Experience elsewhere has shown that rigorous tracking and enforcement mechanisms are critical to the success of RECOs.[52] If RECOs are adopted in Nevada, the home energy rating (HERS) infrastructure could be used to inspect homes and apartment buildings and certify compliance.

Energy Savings and Peak Load Reduction

There is very little information on the energy savings resulting from the implementation of RECOs in other jurisdictions. One report indicates that San Francisco's RECO is reducing average household energy consumption by more than 15%.[53] This seems on the high side if it applies to total household energy consumption; the 15% savings value could refer to heating and cooling energy use only.

Assuming 10% overall energy savings on average in Nevada to be more conservative, the savings would be 1,200 kWh and 60 therms per year in an average household. Furthermore, we assume that a RECO for rental property is enacted statewide and that some but not all local jurisdictions adopt a RECO for owner-occupied housing. In total, we assume that one-third of the housing units sold in Nevada each year are affected and comply.[54] This means about 25,000 homes would be affected each year, yielding 30 GWh/yr of electricity savings and 1.5 million therms (150 million cubic feet) of gas savings per year. Assuming the savings start in 2006, the electricity savings from homes upgraded cumulatively would reach 150 GWh/yr by 2010, 300 GWh/yr by 2015, and 450 GWh/yr by 2020. Assuming the average load factor (the ratio of the average-to-peak electricity savings) is 0.25, the estimated peak demand reductions would be 68 MW

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[51] Personal communication with Dave McNeil, Nevada State Office of Energy, November 19, 2004.
[52] See Ref. 48.
[53] See Ref. 48.
[54] This estimate takes into account that some households will be sold more than once over a 10-15 year period.

by 2010, 137 MW by 2015, and 205 MW by 2020. In addition, the natural gas savings would reach .75 bcf by 2010, 1.5 bcf by 2015, and 2.25 bcf by 2020.[55]

Cost and Cost Effectiveness

We estimate that the cost of the required upgrades would be about $750 in a housing unit that does not need attic insulation but needs all or nearly all of the other measures. Of course the cost will be less if a house or apartment building has some of the efficiency measures already. If insulation is needed, the cost will increase by about $800 on average. Assuming one-third of the affected housing units need attic insulation but two-thirds do not, the average upgrade cost is about $1,000 per home.

Based on the energy savings estimates provided above, a household's energy bill (gas and electric) would be reduced by about $200 per year on average given current retail energy prices in Nevada. This means a typical payback period of five years based on the energy savings alone. In addition, there would be some water savings in housing units where low-flow showerheads and faucet aerators are installed. Assuming a 15-year lifetime for the efficiency measures on average, the undiscounted net economic benefit would be $2,000 per household. With a 5% real discount rate, the net economic benefit would be about $1,075 per household. In aggregate, this implies net economic benefits of $0.75 billion (undiscounted) or $0.4 billion (discounted) for the 375,000 housing units that we estimate could be affected during 2006-2015.

Environmental and Social Benefits

RECOs will reduce high energy costs and the burden they place on low-income and working class households. This will increase disposable income as well as make it more likely that these households can pay their utility bills. RECOs will also improve the quality of housing, indoor comfort levels, and resale value. Cooling systems in particular will be more effective if solar gain is reduced and duct leaks are repaired.

By reducing the amount of electricity consumed, RECOs would reduce water consumption and the pollutant emissions from operating coal- and gas-fired power plants. RECOs also would reduce direct water use by households due to installation of low-flow showerheads and faucet aerators. We estimate that adopting RECOs to the extent assumed above could reduce water consumption in the state approximately 0.7 billion gallons per year by 2010 and 2 billion gallons per year by 2020.[56] Furthermore, we estimate that RECOs could reduce CO_2 emissions approximately 115,000 tons per year by 2010 and 350,000 tons per year by 2020.

[55] In making these estimates, we exclude both the potential degradation in energy savings over time and the potential increase in savings due to growth in home sales.
[56] Most of this water savings is from the installation of low-flow showerheads and faucet aerators.

Political and Other Considerations

It is likely that many apartment building owners and realtors will oppose the adoption of RECOs. Also, cities may view the adoption and implementation of RECOs as overly time consuming and burdensome. In order to increase the chance of success politically, it is important to involve these groups in RECO development from the outset. Also, it may be easier to gain the support of the real estate community if simple and easy to implement energy requirements are adopted. It may be necessary to compromise on stringency in order to gain broader support and ultimately approval.

Adopting a RECO is just one step towards achieving energy savings in existing housing. Once the ordinance is adopted, it is very important to educate building owners, contractors, auditors, and local building inspectors on the requirements and on how they can be met. In addition, it is important to enforce the ordinance and do so in a rigorous yet flexible manner (e.g., allowing extra time for compliance before any fines are levied).[57]

Option 7: Adopt Appliance Efficiency Standards

Background

The federal government has adopted minimum energy efficiency standards on a wide range of products including refrigerators, clothes washers, air conditioners, furnaces, water heaters, fluorescent lamps and ballasts, HVAC equipment used in commercial buildings, and motors. But the U.S. Department of Energy is many years behind schedule in their review of existing standards and is not considering adopting standards on new products except for transformers. States are preempted from adopting efficiency standards on products already regulated by the federal government, but states can adopt efficiency standards on products not covered by the national standards.

Because of this situation, California adopted state standards on nine products in 2002. The products include transformers, commercial packaged air conditioning equipment, commercial refrigerators and freezers, commercial clothes washers, exit signs, torchiere light fixtures, and traffic signals. In 2004, California adopted efficiency standards on 17 additional products.[58] In addition, new state appliance efficiency standards were adopted recently in Maryland, Connecticut and New Jersey.

The Appliance Standards Awareness Project (ASAP – www.standardsasap.org) prepares model state standards legislation and assists states by analyzing the impacts that the model standards would have. It is logical to consider adopting these standards in Nevada since California has adopted all of the standards in the ASAP model bill, and Nevada borders on California.

[57] See Reference 48, pp. 51-53.
[58] For a summary of the new standards adopted in California, see http://www.energy.ca.gov/releases/2004_releases/2004-12-15_appliances.html

Specific Energy Efficiency Proposal

This policy would adopt minimum energy efficiency standards on 15 products not covered by national energy efficiency standards. Products sold in Nevada would have to meet these minimum efficiency requirements once the standards take effect say on January 1, 2008. The exact standards would be derived from the latest ASAP model bill that quite a few states are likely to consider in 2005.

The products in the model bill include swimming pool pumps, digital TV adapters, torchiere-type portable light fixtures, metal halide lamps, reflector lamps, exit signs, traffic signals, low-voltage dry-type transformers, large packaged air conditioners and heat pumps, commercial refrigerators and freezers, ice makers, commercial clothes washers, unit heaters, pre-rinse spray valves used in commercial kitchens, and external power supplies. These products offer significant energy savings potential using established criteria for what defines an energy-efficient product, such as the standards adopted by other states or the ENERGY STAR criteria adopted by the U.S. EPA or Department of Energy.

The standards are not very onerous. Manufacturers already produce numerous products that meet the standards. And if the standards do not take effect until 2008, vendors would be given adequate time to clear out their current inventory of non-complying products.

Energy Savings and Peak Load Reduction

ASAP estimates that adopting this package of appliance standards in Nevada would reduce electricity use in 2010 by 160 GWh/yr and peak demand by 49 MW. By 2020, the savings would grow to 450 GWh/yr and 158 MW of peak demand as the stock of energy-efficient products expands.[59] In addition, there would be some natural gas savings from unit heaters, more efficient commercial clothes washers, and more efficient pre-rinse spray valves. We estimate these savings would be approximately 0.43 bcf by 2010 and 0.78 bcf by 2020.

Cost and Cost Effectiveness

Appliance efficiency standards have proven to be very cost-effective for consumers with the energy bill savings far exceeding any increased first cost. ASAP estimates that the payback period for any increase in first cost for most of products in the model bill is two years or less. Furthermore, ASAP estimates that this set of standards would provide about $350 million in net economic benefits for Nevada's consumers and businesses.[60] This estimate is based on products influenced by the standards and purchased during the 2008-2030 time period.

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[59] Personal communication with Andrew DeLaski, Appliance Standards Awareness Project, Boston, MA, Sept. 8, 2004.
[60] ibid.

Environmental and Social Benefits

By reducing the amount of electricity consumed, the efficiency standards would reduce water consumption, as would the efficiency standards on commercial clothes washers and pre-rinse spray valves. The estimated total water savings are 0.3 billion gallons per year by 2010 and 1.2 billion gallons per year by 2020. During 2008-2020, the standards would reduce water consumption in the state by an estimated 7.5 billion gallons.

The efficiency standards would reduce electricity generation by coal-fired and natural gas-fired power plants and thereby reduce emissions of sulfur dioxide, nitrogen oxides, mercury, and carbon dioxide. Thus, the efficiency standards would have a beneficial effect on public health and would help the state meet its air quality goals.

Political and Other Considerations

Manufacturers and/or vendors have opposed the standards on some of the products (e.g., TV set top boxes and commercial clothes washers) in other states. But given that California and other states have gone forward with the standards in spite of this opposition, the manufacturers and vendors may no longer oppose the standards as long as they are consistent across states.

If the appliance standards are adopted, it will be necessary to monitor compliance and enforce the standards. This does not need to be onerous. The model appliance standards bill requires manufacturers to certify that qualifying products do in fact meet the standards. In Nevada, this can be based on the certification process adopted in California (i.e., Nevada rules could state that certification in California is sufficient for a product to be sold in Nevada).

The Nevada state energy office could allocate a small amount of money and staff time to: a) informing relevant vendors such as hardware stores, lighting distributors, and electric supply houses about the standards, and b) conducting spot checks in these establishments to ensure that only complying products are sold. If a non-complying product is found, both the vendor and manufacturer should be told to stop selling the product. No product testing is required to implement or enforce the standards.

Option 8: Increase Funding for Low-Income Home Weatherization

Background

Energy prices in Nevada have risen significantly over the last several years. Those most vulnerable to the increased costs are seniors, disabled persons, and families with young children on low- and fixed- incomes. Inadequate cooling and heating, electric disconnections, and unaffordable energy costs can seriously disrupt a household's ability to maintain self-sufficiency and contribute to the community.

Nevada's low-income households often spend a considerable portion of their limited income on natural gas and electricity.[61] In some cases, other essential needs such as food and health care are sacrificed. Housing conditions are often substandard, in part due to energy-wasting homes, equipment and appliances. Loss of utility service can result in extreme risks to health and safety. Households are most vulnerable during the winter heating months in the north, and during the summer cooling months in the south. Heat-related illnesses including death particularly affect the elderly.

The 2001 Nevada Legislature created a special revenue fund – The Nevada Fund for Energy Assistance and Conservation, to assist eligible Nevadans in maintaining essential heating and cooling in their homes. The fund augments the federal Low-Income Home Energy Assistance Program (LIHEAP), administered by the State Welfare Division, and Weatherization Assistance Program (WAP), run by the State Housing Division, with money received through the new state Universal Energy Charge (UEC). This enables the state agencies to expand the energy bill assistance and energy efficiency services offered to low-income households.[62]

The UEC is collected through an assessment of $0.00039 per kWh and $0.00330 per therm sold at the retail level by most electric and natural gas utilities in the state. For 2004, the UEC is projected to generate over $11 million. The UEC monies are by statute allocated 75% to energy bill assistance and 25% to home weatherization. In addition, Sierra Pacific and Nevada Power provide funds to weatherize customers who are between 150% of the poverty level and 60% of median income, commonly referred to as "gap" customers.

Historically, the UEC weatherization funds have always been fully used. However, the UEC energy bill assistance funds have not been fully used. The surplus from unused funds topped $14 million as of 2004. However, the problems of stimulating requests for funds, qualifying low-income households, and disbursing the bill assistance funds appeared to be disappearing in late 2004. Due to the Welfare Division's recent energy assistance public awareness campaign, first quarter FY 2005 energy assistance applications are up 77%.

The Welfare Division is projecting that for FY 2005, it will spend $16.5 million in energy bill assistance, depleting its carryover and using a portion of its FY 2005 allocation. If the increased applicant rate carries into FY 2006, the Welfare Division projects that it will use up energy assistance monies available that year.

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[61] "Low-Income households typically spend 14 percent of their total annual income on energy, compared with 3.5 percent for other households." "Governor Guinn Proclaims Weatherization Day", Press release Gov. Guinn's office, October 29, 2002.
[62] The income criterion is 150% of the federal poverty level.

There are about 150,000 low-income dwelling units (single family, multi-family, and mobile home) in Nevada, with 70% of eligible households residing in Clark County, 17% in Washoe County, and 13% in rural areas of Nevada. Based on available federal and state funding, the Housing Division projects it will be able to weatherize up to 1,500 homes in FY 2004, and about 1,000 homes in FY 2005.

Due to funding constraints, the Housing Division can only retrofit a limited number of low-income dwellings each year. Also, there are limits on the amount of money spent per household. Within these spending guidelines, some cost-effective energy saving measures such as energy-efficient windows, HVAC systems, and/or refrigerators are not installed in homes serviced unless existing units are not working, or present a health or safety hazards.

Energy Efficiency Proposal

The Welfare Division is preparing a proposal that would authorize the Welfare Division to transfer any carryover UEC energy assistance funds to the Housing Division for home weatherization. We support this action and urge its adoption. But given the recent progress in obtaining requests for energy bill assistance and disbursing the funds, there may be limited or no carryover funds in the future.

This policy suggests other mechanisms to increase funding of low-income home weatherization, separately or together with transferring carryover UEC funds to the Housing Division for home weatherization. We suggest a target of weatherizing 2,000 homes per year, in addition to those currently weatherized through the LIHEAP and UEC allocation. Here are some suggestions for how this could be achieved:

1. Change the current 75/25% allocation of UEC monies between energy assistance and home weatherization, since weatherization provides a more permanent solution to the problem of high and burdensome energy bills in low-income households.

2. Increase the current UEC assessment of $0.00039 per kWh and $0.00330 per therm sold. The current assessment is less than one-half of one percent of the average cost of electricity and natural gas in the state.

3. Secure additional utility funding for low-income home weatherization. This could be done in conjunction with adopting a public benefits charge or energy savings standards, as suggested in other proposals.

In conjunction with increased funding, efforts should be made to ensure the Nevada weatherization program is as effective as possible. Other states have found it is practical and cost-effective to install electricity savings measures such as compact fluorescent lamps and efficient refrigerators, at the same time the building envelope and

HVAC system are addressed.[63] These or other modifications in program design should be considered, if necessary using utility funds to supplement federal and state funds.

Energy Savings

Residential energy efficiency improvements, commonly referred to as weatherization and/or conservation, are investments in reducing future energy needs and resultant utility bills. Upgrading the energy efficiency of homes, equipment and appliances are an important way to stretch the dollars available to low-income households. Weatherization of low-income households nationwide saves about 29 MBtu of energy per home annually, about 30% of pre-weatherization space heating energy consumption.[64] In Nevada where the winter is very mild but a considerable amount of electricity is consumed for cooling in the summer, low-income weatherization saves 2,013 kWh and 190 therms (18,500 cubic feet) of natural gas on average.

Retrofitting an additional 2,000 low-income homes each year would save 4.03 GWh of electricity and 37 million cubic feet of natural gas per year at the average savings levels indicated above. Assuming this level of additional weatherization starts in 2006 and continues year after year, the total electricity savings would reach about 20 GWh/yr by 2010 and 60 GWh/yr by 2020. Assuming these savings have an average load factor of 0.25, the peak demand reduction would be 9.1 MW by 2010 and 27.4 MW by 2020. In addition, the natural gas savings would reach 185 million cubic feet by 2010 and 555 million cubic feet by 2020.

Cost and Cost Effectiveness

The average cost to weatherize low-income dwellings in Nevada in FY 2002-2003 was about $2200. This figure includes diagnostic tests, carbon monoxide detectors, health and safety measures and minor home repair, which do not save energy but often have to be done before the energy saving measures can be installed. To weatherize an additional 2,000 homes per year would require $4.4 million annually or $66 million (current dollars) over the 2006-2020 time period.

As part of the federal weatherization program guidelines, the Housing Division is required to demonstrate that the value of the energy savings over the life of the efficiency measures is greater than the cost of the energy efficiency measures. Nationwide, the weatherization assistance program has a benefit-cost ratio of about 1.3 considering only the direct energy bill savings. If this benefit-cost ratio holds in Nevada, investing $66 million in home weatherization during 2006-2020 would yield $86 million in gross benefits and $20 million in net benefits. But when other non-energy benefits such as employment benefits, increased property value, and reduced bill arrearages are included,

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[63] PacifiCorp recently developed and received approval for a DSM program in Utah focused on installing electricity savings measures in households that are undergoing low-income home weatherization. This DSM program passed the Total Resource Cost test in a state with relatively low avoided costs.

[64] Berry, L. and M. Schweitzer. 2003. *Metaevaluation of National Weatherization Assistance Program Based on State Studies, 1993-2002*. ORNL/CON-488. Oak Ridge, TN: Oak Ridge National Laboratory.

the benefit-cost ratio rises to 2.7.[65] The same relationship no doubt exists in Nevada—there is a much higher benefit-cost ratio when a broad range of impacts and benefits are taken into account.

Environmental and Social Benefits

Improving the energy efficiency of housing occupied by low-income households will provide social benefits by making more income available for buying food, medical care, child care, etc. It will increase property values, make homes more comfortable and safe, and reduce utility bill arrearages. In addition, home weatherization results in a net increase in employment and reduces pollutant emissions.

Political and Other Considerations

Efforts to increase the UEC allocation for home weatherization may be difficult at a time when there has been a tremendous upsurge in requests for energy bill assistance. Attempting to increase the current UEC assessment may be viewed as a tax increase on consumers and possibly subject to strong opposition. Securing additional utility funding for low-income home weatherization may be the most practical strategy, in conjunction with an overall increase in utility energy efficiency programs.

Option 9: Provide Technical and Financial Assistance to the Mining and Manufacturing Sectors

Background

Mining and manufacturing are important sectors in terms of energy use in Nevada. As of 2002, the industrial sector (including mining) accounted for 44% of electricity use for Sierra Pacific Power Co. and 36% of electricity use for Nevada Power Co. Statewide, the industrial sector accounted for 17% of natural gas use in 2001 (excluding natural gas use for electricity generation). Manufacturing and mining contributed $4.2 billion towards the state's total economic output of $81 billion in 2002 (gross state product). These sectors are especially important in terms of employment and income generation in the northern part of the state.

There is considerable room for improving the energy efficiency of Nevada's small and medium-sized manufacturers, light industries, and mining industry, and doing so cost effectively. SWEEP, for example, estimated that widespread adoption of cost-effective energy efficiency measures in the industrial sector in Nevada could result in up to 34% electricity savings by 2020.[66] Likewise, recent energy audits in some of Nevada's mining operations indicate 18-37% cost-effective electricity savings potential.[67] The cost-

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[65] ibid.
[66] See Reference 15.
[67] Personal communication with Douglas Prihar, Management Assistance Partnership (MAP) program, Reno, NV, Dec. 2004.

effective savings potential is particularly large given the increases in both electricity and natural gas prices that have occurred in recent years. Reducing energy use in manufacturing and mining facilities can increase profits and enhance competitiveness, thereby helping to keep these companies in business and contributing to the state's economic viability and diversity.

The most common barriers to increasing energy efficiency and eliminating energy waste in the manufacturing and mining industries include: (1) lack of awareness of energy savings options and their cost effectiveness; (2) lack of trained staff for implementing energy savings projects and measures; (3) lack of priority placed on energy consumption and ways to reduce it; and (4) lack of or limited capital for energy savings projects. All of these factors lead industries to typically implement energy efficiency projects that have a two-year payback or less, if such projects are implemented at all.[68]

There are a number of ongoing and emerging federal, state government, utility, and industry partnerships providing energy efficiency education and training to manufacturing and mining companies in Nevada. These efforts are also helping plant and mine managers identify cost-effective opportunities to eliminate energy waste.

The Management Assistance Partnership (MAP)[69] offers energy audits and technical assistance to the mining and manufacturing industries in Nevada. This program is funded through federal grants, in-kind support from the state university system, and fees for services. In addition, MAP, Nevada Power Co., and the Community College of Southern Nevada have formed the Nevada FOCUS Program to develop in-state resources for facility manager and building and plant operator energy education in southern Nevada. Nevada FOCUS offers a series of tuition-based classes at the UNLV campus on O&M and energy efficiency that are recognized state-wide through continuing education or professional development credit.

The NSOE is launching through the Great Basin College in Elko an Industrial Energy Efficiency (IEE) 2-year Degree/Certification Program that will provide training for industries that consume a high level of energy. This project is funded until 2006 through a grant from the U.S. Department of Energy's Industries of the Future program. The IEE Program will work with the MAP, Nevada Mining Association, Nevada Manufacturer's Association, Newmont Mining Corporation, and Sierra Pacific Power Company.

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[68] DeCannio, S. 1993. Barriers with Firms to Energy-Efficient Investments. *Energy Policy*21: 906-14. Jordan, J.A. and S.M. 1993. Nadel. *Industrial Demand-Side Management Programs: What's Happened, What Works, What's Needed.* Washington, DC: American Council for an Energy-Efficient Economy.

[69] MAP is the industrial extension program of the University and Community College System of Nevada. MAP works directly with Nevada manufacturing, construction and mining companies to streamline operations, apply the most up-to-date and sophisticated technology, provide managerial assistance, and train the workforce. http://www.mapnv.com

Specific Energy Efficiency Proposal

First, there is a need to maintain if not expand these ongoing education, training and audit activities. We recommend that the state of Nevada as well as the utilities provide partial funding so that there is continuity as well as less dependence on federal grants which have a tendency to “come and go”. In particular, we suggest the state and utilities together provide approximately $500,000 per year for technical assistance and training for the manufacturing and mining industries. Both electric and gas utilities could contribute to these programs as their DSM programs scale up. Of course the NSOE and program implementers should continue to seek federal grants and collect appropriate fees for services in order to diversify and expand the funding base for education and technical assistance.

Second and perhaps more important, we recommend offering financial incentives to manufacturers and mining companies in order to stimulate greater adoption of cost-effective energy efficiency measures. One way this can be done is to make sure that these businesses have an opportunity to participate in utility DSM programs. This can be done if there is a “custom incentive” option in these programs; i.e., fixed incentive payments per unit of peak demand reduction and electricity savings for specialized energy efficiency and load management projects, as well as prescriptive incentives for standard efficiency and load management measures. This approach is commonly taken by utilities with comprehensive DSM programs. In addition, it is important not to cap incentives since a large manufacturer or mining company may make large but infrequent investments in energy savings projects.

Another way to provide incentives to manufacturing and mining companies is to offer what is known as a “self-direction option” as part of utility DSM programs. This means that large customers who invest in energy efficiency projects but prefer not to participate in a utility program can “self direct” their normal utility DSM program payments (or a portion of them) to their own efficiency projects. In effect the industry reduces its payments to the utility to some degree, in return for implementing energy efficiency projects without assistance from the utility. This policy is usually supported by large industrial customers as the level and cost of utility DSM programs grows and exceeds 1% of the total utility bill. A self-direction option was adopted in 2003 as part of utility DSM policy in Utah.[70] In Nevada, it may be desirable to offer a self-direction option to large commercial customers (i.e., hotel-casinos) as well as large industries.

A third option for financial incentives would be to offer manufacturers and mining companies some form of tax incentive for investments that lead to lower energy consumption. For example, these firms could be given a 15% investment tax credit for any investment that leads to reduced energy intensity (energy consumption per unit of output). We believe this approach is preferable to listing specific energy efficiency measures or technologies that are eligible for tax credits since such a list would be limited and would become outdated. In addition, the tax credit could be extended to combined

[70] For details, see http://www.swenergy.org/news/UT_Industrial_Self_Direction_Policy.pdf

heat and power (cogeneration) projects that reduce energy intensity and conserve energy from a broader societal perspective.

Energy Savings

Although there is cost-effective potential for 20-35% energy savings in many mining and manufacturing facilities, businesses in Nevada (and elsewhere) tend to implement projects with a quicker payback and achieve only 10-15% savings on average.[71] We make the following assumptions in order to produce energy savings estimates from this policy option: 1) the adoption of the policies listed above stretches the average energy savings to 15% on average, 2) the policies stimulate facilities representing 20% of industrial electricity and natural gas use to implement energy savings projects by 2010 and facilities representing 75% of energy use to implement projects by 2020, 3) implementation starts in 2006, and 4) "base case" industrial energy use and peak demand increases 2% per year on average in the absence of new policies and programs.

With these assumptions, Table 6 shows the estimated energy savings and peak demand reduction. The savings reach 390 GWh of electricity, 60 MW of summer peak demand, and 0.4 bcf of gas by 2010. By 2010, the savings reach 1,800 GWh, 270 MW of summer peak demand, and about 1.3 bcf of natural gas. But much of this savings could overlap with savings from electric and gas utility energy efficiency programs especially if the utility programs greatly expand and include an industrial self-direction option.

Table 6 – Projected Energy Savings and Peak Demand Reduction from Technical and Financial Assistance to the Mining and Manufacturing Sectors

	2002	Base 2010	Savings in 2010	Base 2020	Savings in 2020
Electricity use or savings (GWh/yr)	11,200	13,100	390	16,000	1,800
Peak demand or demand reduction (MW)	1,700	1,990	60	2,430	270
Natural gas use or savings (bcf/yr)	11.7	13.7	0.41	16.7	1.32

Cost and Cost Effectiveness

Assuming the energy efficiency measures adopted by the mining and manufacturing industries have a 2.5 year simple payback period a 15-year lifetime on average and that current industrial energy prices in Nevada (about $0.09 per kWh and $6.50 per thousand cubic feet of gas) remain constant in 2004 dollars, this initiative would lower annual industrial energy costs about $38 million by 2010 and $171 million

[71] See Reference 67.

by 2020 (2004 dollars) with industries investing about $28 million per year in efficiency measures on average. Discounting of future energy savings, the net economic benefit over the lifetime of efficiency measures adopted during 2006-2020 would be about $1.22 billion.

Environmental and Social Benefits

Expanding investment in relatively quick payback energy efficiency projects will help manufacturing and mining operations in Nevada increase their profitability and viability in the face of rising energy prices. This in turn will support well-paying jobs and help to diversify Nevada's economic base. Energy efficiency investments in the industrial sector can also provide a variety of non-energy benefits including reduced materials waste or pollutant emissions, and increased labor or capital productivity.[72] These non-energy benefits can greatly improve the economic return for a project compared to considering only the energy savings.

Political and Other Considerations

This policy complements other policies in this strategy that are targeted to low-income households, schools, or state government. Adopting it would ensure that the energy efficiency strategy does not neglect a small but influential part of Nevada's economy, namely manufacturers and mining companies. Presumably these firms would support this particular policy. And hopefully they would be more amenable to supporting a combination of energy efficiency policies if there was "something in it" for them.

Energy Pricing Policies

Introduction

This section includes pricing and demand response strategies for commercial and industrial (C&I) and residential customers (Options 10 and 11). The premise is that time- and cost-differentiated retail prices will encourage customers to reduce electricity demand and usage. Past experience has indicated that, to varying degrees, electric customers can and often do modify their consumption in response to price signals.[73]

Pricing and demand response programs allow customers to participate directly in electric markets by reducing and/or shifting usage in response to high market prices, generally during peak periods. Customers can control their costs and moderate electric power costs, while utilities gain a long-range and/or short run dynamic resource for cost-effectively addressing system needs. Price-induced demand response can also provide some protection against market power abuse. The ability to exert market power is

[72] See Reference 17.
[73] Faruqui, Ahmad and S. George. *The Value of Dynamic Pricing in Mass Markets*, The Electricity Journal, July 2002.

reduced, though not necessarily eliminated, by customers reducing their demand, particularly in periods with high resource costs or supply shortages.

Seasonally differentiated time-of-use (TOU) rates and interruptible tariffs have been the status quo with Nevada Power Company (NPC) and Sierra Pacific Power (SPP) for medium and large commercial customers and all industrial customers for both utilities for many years. In 2003, NPC and SPP initiated trial program TOU rates for residential single family and multifamily customers.

As next steps in the process of increasing price-induced demand response[74] in Nevada, we recommend:

- Option 10: Critical Peak Pricing (CPP) and a Demand Bidding Program (DBP) for commercial and industrial customers.
- Option 11. Expanding Time-of-Use (TOU) rates and exploring Critical Peak Pricing for residential customers.

These options are described in their specific sections below.

Some of these pricing and demand response program concepts are relatively new, with customer participation and actual price response falling short of expectations in some states and regions. Therefore, we recommend that Nevada policy makers and stakeholders pay close attention to program objectives, program design details, which specific customer segments to target, and feedback from customers and customer representatives. We suggest that a pricing and demand response working group be formed to review experience and results from other states and to explore specific program concepts and program design details. The working group could also assist NPC and SPPC with economic analyses and development of "business cases" for C&I and residential pricing and demand response programs.

Because of NPC's high summer peaking need, its relatively low load factor, and the relative gap in load factors between NPC and SPPC, we recommend exploring and implementing the pricing and demand response strategies at NPC prior to implementation at SPPC.

Application of Pricing and Demand Response Strategies to Nevada Power Company

NPC's service area is summer peaking, with the peak season extending from mid-June through mid-September. The load profile has extreme peaks on an annual, monthly, and intra-day basis. For the three-month summer period, the average peak load doubles in comparison to the peak load in the shoulder months. The annual load factor – defined as the average hourly consumption as a percentage of the peak hourly consumption – is 45%. NPC's load factor is one of the lowest in the country, and compares to SPPC's load

[74] This section focuses on pricing and price-induced demand response. It does not address load response options developed solely or primarily for reliability needs and system emergencies, though several of the specific designs could be used or adapted to address both price and reliability needs. However, pricing strategies generally are voluntary, do not have penalties for non-performance, and do not include reservation or capacity payments.

factor of 71%. On a summer peak day, the hourly load shape is very challenging. NPC's system load can increase by about 2,700 MW over a 10 hour period – a doubling of the system load.

These factors create a serious "super peak" or "needle peak" issue. During a small number of summer hours, load in the system is substantially above what is required to meet the remainder of the summer needs for the system. In particular, NPC's load duration curve for 2005 indicates that there are only 100 hours when customer end-use peak demand will exceed 4,176 MW[75] compared to forecast 2005 customer end-use summer peak demand of 4,794 MW.[76] These 100 hours are distributed over less than 30 days in the summer. These 100 hours of super peak demand are also generally when supply costs are the highest, often about $100-$450/MWh.[77] A pricing and demand-response effort focused on reducing demand during these 100 hours would also help to hedge against any future price spikes.

For summer 2005 and future years, NPC should consider developing and implementing pricing and demand response programs targeted to reducing the amount of supply resources acquired to meet the approximately 100 hours of super or needle peak when customer end-use peak demand exceeds 4,176 MW.

In addition, we suggest that NPC consider developing a target for demand response resources, focused on its super peak needs. As an example, the California PUC decided that the utilities should rely on demand response resources to help serve customer load, and the PUC set targets for the California utilities to achieve demand response equivalent to 3% of annual system peak demand in 2005, increasing to 5% of peak demand in 2007. A target of 3% of customer end-use peak demand for NPC would be about 150 MW, and a 5% target for NPC would be about 250 MW.

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[75] NPC IRP 2003: Energy Supply Plan 2005-2007, Figure ESP-5, NPC Load Duration Curve 2005. The load duration curve shows that for only 100 hours does system peak demand exceed 4,598 MW, compared to a total system peak demand of 5,276 MW. The total customer end-use peak demand is 4,794 MW, with the difference between 4,794 MW and 5,276 MW being company needs and losses. For our analysis, we used the customer end-use peak demand of 4,794 MW and the proportional customer end-use peak demand floor of 4,176 MW, the customer peak demand except for the 100 hours when peak demand is highest.

[76] NPC IRP 2003: Energy Supply Plan 2005-2007, filed with the PUCN on September 1, 2004. The total customer end-use demand is 4,794 MW, with the difference between 4,794 MW and 5,276 MW being company needs and losses.

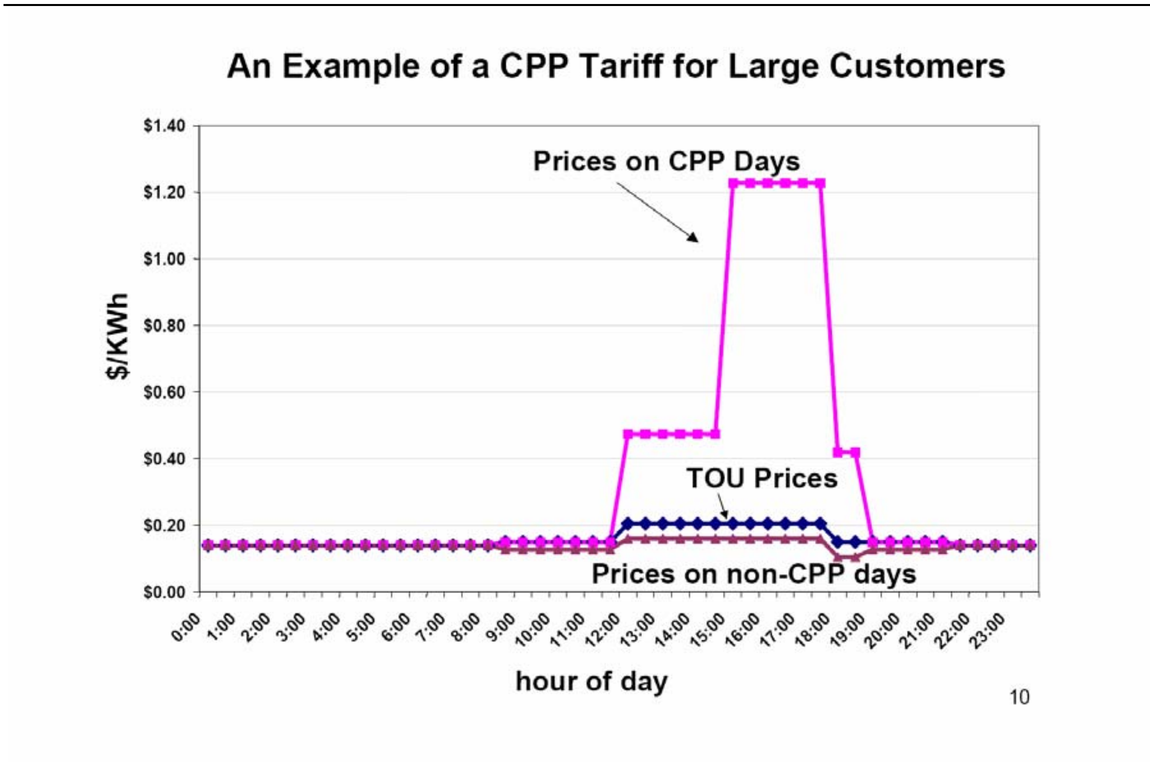
[77] Comparable data for California indicate that while incremental generation plant and power purchase costs are on average about $75/MWh, supply-side resource costs spike significantly in the summer season for very limited periods of time: around $220/MWh for 750 hours or less than 10% of the time, and between $400-450/MWh for 60 hours or less than 1% of the time (*A Forecast of Cost Effectiveness Avoided Costs and Externality Adders*, electronic worksheet prepared by E3 for the CPUC Energy Division; January 8, 2004). Equivalent supply costs are expected to be similar in Nevada, but should be further analyzed.

Option 10: Adopt Pricing and Demand Response Programs for Commercial and Industrial Customers – Demand Bidding and Critical Peak Pricing

Background

Two strategies for encouraging price-induced demand response by commercial and industrial customers are commonly being employed in California and other states: *Critical Peak Pricing (CPP),* a form of dynamic pricing, and *Demand Bidding (DB)*, one type of demand response program.

Critical Peak Pricing (CPP) is a *tariff* that provides increased prices during critical peak periods (during super peak hours for several days a year when energy is expensive or when system conditions are critical or near-critical) and reduced prices during non-critical-peak periods. CPP is an alternative to traditional time-of-use rates (See figure below).[78]



Demand Bidding (DB) is a *program* that provides opportunities for customers to provide load reductions during critical periods in exchange for a financial incentive offered by the utility or a bid price offered by the customer, by bidding load into the

[78] Figure from Art Rosenfeld, California Energy Commission, Presentation at ACEEE 2004 Summer Study on Energy Efficiency in Buildings, Pacific Grove, CA, August 2004.

utility system on a day-ahead and/or emergency basis based on established market threshold prices or emergency reliability requirements.

While experience, data, and actual results are limited compared to some of the other energy efficiency strategies described in this report (some of which have been implemented for over 20 years), the experience to date in other states indicates that these two strategies can be effective and cost-effective at encouraging price-induced demand response. The key is to design an approach that meets system objectives and is attractive to customers, and does so cost-effectively. Cost-effectiveness may be higher when the strategies are employed for larger C&I customers (200 kW and above). In particular, the implementation costs are lower for customers who already have interval meters.

Proposal

We recommend both CPP and DB in Nevada to encourage demand response from C&I customers. We recommend implementing the two strategies in parallel because the strategies have different features, customer response may vary (some customers may prefer one program approach over the other), we do not know exactly how the casinos and other large customers in Nevada will respond, and NPC customers and the NPC system could benefit from a significant amount of demand response – thereby justifying parallel efforts.

A ***Critical Peak Pricing*** tariff generally includes the following characteristics:

- Participation in CPP is voluntary, and the tariff is available to customers with an average load of 200 kW (California is also piloting CPP for small C&I and residential customers). CPP could also be implemented as the default tariff, with an option for the customer to opt out to a TOU rate.
- The utility notifies customers on a day-ahead basis of an upcoming CPP event, which is identified and activated based on forecasted temperatures or other system conditions indicating higher system costs.
- CPP events are limited in number, not to exceed a small number of days per summer (12 days currently in CA), for no more than 3-7 hours per activation (about 70 CPP hours currently in CA).
- Often there are two levels of CPP periods in the C&I customer tariffs. The effective energy charges in the high- and moderate-priced CPP periods are several times higher than the customer's summer on- and mid-peak energy rates under the otherwise applicable tariff (OAT), and lower during all other non-CPP periods. (Currently in CA: five to ten times higher CPP on-peak (over $1.00/kWh), and two to four times higher for the CPP mid-peak).
- Customers may elect a bill protection option (14 month period) to ensure that bill payments under the CPP program are no more than what would be paid under an OAT, provided the customer meets the minimum peak load reduction requirements. Under the bill protection option the customer is eligible for a bill protection credit equal to the CPP charges minus the OAT charges. Bill protection requires that

customers reduce their peak load by an average of 3 percent across all CPP events in order to be eligible.

- Customers must have an interval meter and internet access to the utility's web-based notification system.
- Customers with multiple meters at a single site may qualify.
- Generally, the utilities offer financial incentives to pay or help pay for technical assistance and necessary infrastructure (e.g., communication and notification systems) to increase the likelihood of customer participation and the ability of customers to respond to CPP events.

Demand Bidding program characteristics generally include the following:[79]

- Participation is voluntary, and DB is available to customers with an average load of 200 kW or greater. Customers must have an interval meter and access to the utility's notification and communication system.
- Customers bid to reduce their load a set minimum kW amount, for a set minimum number of hours, during the DB event. (Currently in CA, customers bid a minimum load reduction of 100 kW, for a minimum of two hours. California is considering reducing the minimum bid amount of load reduction to 50 kW.)
- There are two types of DB events in California. Day-ahead events may be called by the utility when its projected hourly energy costs exceed $0.15/kWh. The DB program price incentive during these events equals or exceeds the projected hourly energy costs. The day-ahead events are for four or more hours between noon and 8:00 pm. Customers bid their load reductions between 3:00 and 5:00 pm the day before. Day-of events may be called by the utility when its system reliability is threatened or when the ISO declares an emergency. Customers in California receive a fixed price of $0.50/kWh for actual load reductions in day-of events.
- Customers are paid the utility's set price per kWh. In California, customers must reduce their load at least 50% of their bid load reduction to qualify for payment in any hour, and can be paid for a maximum of 150% of their accepted bid load reduction.
- Actual hourly load reductions are determined by subtracting actual hourly usage from the customer specific energy baseline, which is calculated as the hourly average of the three highest energy usages on the immediate past ten days.
- Customers may designate a pre-bid amount, and they will be notified of a DB event only when that amount is reached.
- Generally, DB programs also provide technical assistance and infrastructure incentives.
- Because demand bidding periods are based on market price, there is no predetermined limit on the number of days per year that the DB program can be activated.

[79] Some of the specific program characteristics in this list are for the DB program designs in California; characteristics for DB programs in other states or regions may vary.

Peak Demand Reductions and Energy Savings

We recommend an initial C&I super peak demand reduction target for NPC of 40 MW in 2005, equivalent to about 2% of the C&I customer end-use peak demand (1,944 MW in 2005). This target could increase 1% (one nominal percentage point) per year, resulting in a super peak demand reduction of about 60 MW (3% of C&I customer peak demand) in 2006, about 85 MW (4%) in 2007, 110 MW (5%) in 2008, 135 MW (6%) in 2009, and 165 MW (7%) in 2010.

The pricing and demand response working group should consider and review the initial targets for C&I super peak demand reduction recommended above. For example, the targets for NPC could be increased if early implementation indicates a positive customer response leading to more demand (MW) being available as price-responsive load, through critical peak pricing, demand bidding, or both.

Cost and Cost Effectiveness

Price-induced demand response reduces system costs at super peak and other high cost/high price periods, thereby leading to reduced energy costs for participating customers and reduced prices for all customers in the energy market. Demand response can also be used to help ensure reliability during system emergencies, by reducing total system load and the probability of a rotating system outage. The strategies can also temper market power abuse through the participation of demand response in the market.

The cost of implementing CPP or DB ranges from $500 to $6,000 per C&I customer, depending on the demand response equipment required and the equipment already installed at the customer facilities (e.g., interval meters, energy management system or EMS). As an approximation, we estimate the benefits of price response to be equivalent to the avoided cost of peaking capacity, stated by NPC to be $73.60 per kW-year.[80, 81]

We estimate that achieving the 40 MW C&I target in 2005 would provide about $1.3 million in net economic benefits in 2005, based solely on the avoided cost of peaking capacity. To develop this estimate we assumed an average customer cost of $3,500 per customer (assumes an EMS is already in place); program, marketing, and evaluation costs of $500,000; an average incentive/customer price of $.30/kWh for 12 events of 5 hours duration each per year (60 hours total); with 120 large C&I customers participating in the program, and with 80 of those customers each providing about 500 kW of demand response for a given demand response event (i.e., the program would be targeted to very large customers such as large hotels or casinos).

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[80] NPC 2003 IRP, Volume V – Demand Side Plan, Cost-Benefit Analysis.

[81] We used the avoided cost of peaking capacity as a rough approximation of the benefits. As described in more detail in a paragraph below, we recommend that Nevada stakeholders develop more accurate estimates of the demand response benefits.

Assuming that the average cost per participant declines over time as does the peak demand reduction per participant, we estimate a total cumulative cost of $17.1 million during 2005-2010 in order to achieve the 165 MW target of C&I super peak reduction. On the other hand, the cumulative benefit during 2005-2010 would be $43.8 million at the avoided cost of peaking capacity of $73.60 per kW-year. This implies $26.7 million in net economic benefit and an overall benefit-cost ratio of 2.56 for the six-year effort.

The above estimates of net benefits do not include benefits such as reduced price spikes during super peak or high cost periods, or increased reliability – the benefits for which demand response programs are often designed and implemented to achieve. For example, targeting load reductions during the 100 hours of super peak demand (generally when supply costs are the highest) would reduce the market price and therefore the energy costs for all customers exposed to the market (not just for the program participants). In terms of reliability benefits, typical values for the value of lost load range from $1,000 to $5,000/MWh, with $2,500/MWh generally used as a mid-range value.[82] We recommend that the pricing and demand response working group consider the full range of benefits and develop more accurate estimates of the benefits of pricing and demand response in Nevada, including market price and reliability benefits.

Environmental and Social Benefits

Demand response programs reduce operation of the less efficient gas-fired combustion turbines, thereby providing some environmental benefits since these power plants can also have higher emissions relative to newer combined cycle power plants. In a system emergency, demand response programs may reduce the reliance on back up generators, thereby providing additional environmental benefits. However, since some customers may respond by using backup generators to reduce their load on the system, it is essential for any demand response program to clearly identify whether increased use of backup generation is allowed and eligible as a demand response strategy, and to determine the rules and conditions under which backup generation may be used.

Political and Other Considerations

Some of these pricing and demand response program concepts are relatively new, with customer participation and actual price response falling short of expectations in some states and regions (for example, in California, New England, and New York). In California, as of mid-2004, actual sign-ups were low across the board for CPP (around 60 accounts, representing 34 unique customers, estimated to provide about 16 MW of price response). DB sign-ups were higher (about 420 accounts, representing 186 unique customers, estimated to provide about 152 MW of price response), though still lower than expected.[83]

[82] Correspondence with Chuck Goldman and Galen Barbose, Lawrence Berkeley National Laboratory, Berkeley, CA, December 2004.

[83] Estimates from Rufo et al, Quantum Consulting, *WG2 Demand Response (DR) Evaluation: Phase 1 Report & Market Survey*, Presentation, June 2004; and Art Rosenfeld, California Energy Commission,

A process evaluation of California's C&I CPP and DB programs noted the following, "Although it is true that adoption takes time and these programs have been actively marketed only since late 2003, the results of this research provide evidence that the WG2 DR programs [the programs targeted to >200kW customers] -- in their current form and with current market conditions -- may not make as large a contribution to achieving overall DR goals as desired. The market appears to need stronger motivation, knowledge, and capability if the DR goals are to be attained."[84]

Because of the newness of the program concepts and the uncertainties regarding actual customer response and performance, we recommend that Nevada policy makers and stakeholders pay close attention to program design details, which specific customer segments to target, and feedback from customers and customer representatives. For demand response to be effective, the details really matter. In particular, it will be essential to consider the unique situations that the casinos and the 24 hour operations in those facilities present, and to carefully explore opportunities for demand response with those customers. Therefore, we suggest that a pricing and demand response working group be formed to review CPP and DB experience and results from other states, and to develop and analyze specific program concepts and program design details for Nevada.[85]

Below are some possibilities for increasing C&I customer participation, targeting customer segments, and keeping program costs low:

- One possibility for increasing customer participation might be to offer a bonus incentive to customers for demand response during the very highest cost hours (possibly the 20 or 30 hours with the highest costs).
- Target initial implementation to C&I customers that already have energy management and control systems and interval meters (to reduce program implementation costs).
- Target initial implementation to larger C&I customers (200 kW and above).
- Target initial implementation (through customer segmentation) to customers that have the best opportunities to reduce load during the super peak periods.

Presentation at the ACEEE 2004 Summer Study on Energy Efficiency in Buildings, Pacific Grove, CA, August 2004.

[84] According to the results of the process evaluation in California (Rufo et al, 2004), to a large extent the unfavorable risk/reward ratio in California is a result of the requirement that the current DR programs be revenue neutral: that is, the same amount of revenue is recovered from all eligible customers under the new tariff as under the old tariff. In the present context, this means that any savings for customers on the DR tariffs must be matched by a decrease in costs of serving customers on that tariff. Under revenue neutrality it is not possible to incent customers to participate in DR if that means other customers in the same class must pay more as a result; upside potential for participants is therefore limited.

[85] The working group should also identify the regulatory steps necessary to implement any tariffs or programs, including the possibility of modifying any existing tariffs. For example, from 1997 to 2001, NPC and SPP offered an "Optional Conservation Service" (OCS) voluntary curtailment tariff to customers with curtailable load of in excess of 500 kW. Participating customers were paid a "Market Credit" based on verified curtailed (hourly) demand multiplied by 50% of the short term market price. We understand that this rate schedule is still in place with both utilities, and it could provide one option or platform for revising an existing tariff.

Option 11: Adopt Pricing Programs for Residential Customers – Expand Time-of-Use Rates and Explore Critical Peak Pricing

Background

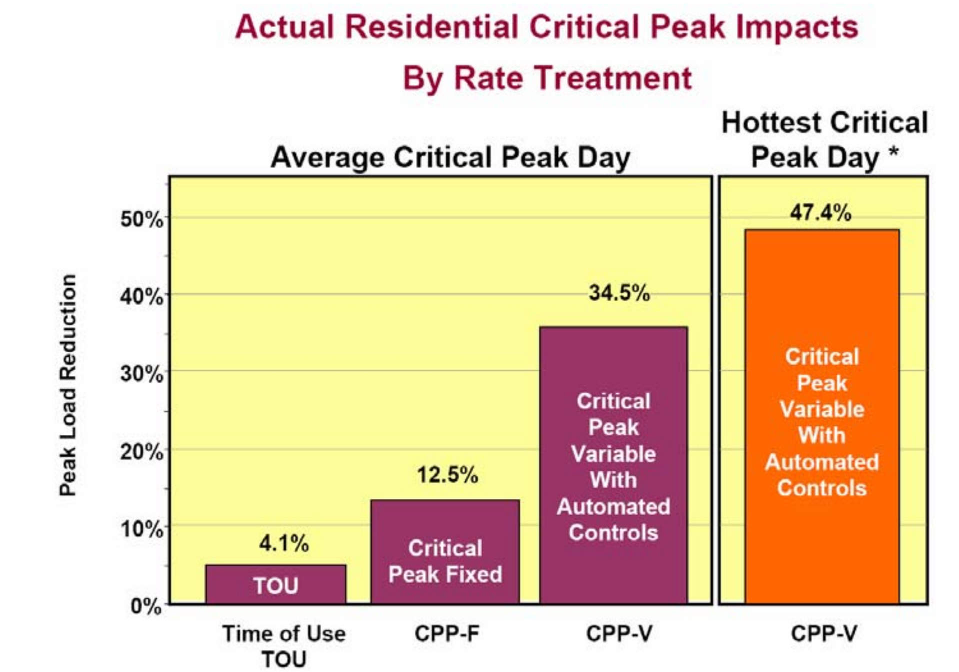
Prior studies have found that residential electric customers can and often do modify their consumption in response to TOU and other price signals. However, the results have varied significantly, with actual customer participation and price-response performance being based partly on the specific TOU rate design (e.g., on- and off-peak hours and days, differential between on- and off-peak prices) and partly on the other options available to the customers (e.g., the design of the default tariff).

In 2003, NPC and SPP initiated trial program TOU rates for residential single family and multifamily customers. For single family residential, on-peak hours are from 1:00 to 7:00 pm, and the rate differential is about $0.08/kWh in the summer ($0.152/kWh summer on-peak versus $0.070/kWh summer off peak). As trial tariffs, customer participation is limited explicitly (e.g., the NPC trial single family residential TOU tariff is limited to 1,000 new customers per month, or 12,000 annually). While these are labeled "trial" in the tariff sheets, NPC recently expanded the marketing of these TOU tariffs to their customers, and any residential customer can elect TOU as an optional rate.

Until recently, consideration of innovative or dynamic pricing for residential customers was limited primarily to inverted tier or TOU rate designs. In 2003, California embarked on a major research project (the Statewide Pricing Pilot or SPP) to test dynamic pricing for residential and small commercial customers (less than 200 kW). Beginning in the summer of 2003, 2,500 customers participated in various pricing pilots to test their response to three different tariffs:

1. Time-of-Use Rates (TOU): Traditional on- and off-peaking pricing with no demand response hardware.
2. Critical Peak Pricing Fixed (CPP_F): Similar to TOU pricing with the addition of a super-peak price of about 75 cents per kWh for up to 75 of the warmest hours per year. The time duration of the super-peak period is fixed between 2:00 and 7:00 p.m. Customers were not provided demand response hardware.
3. Critical Peak Pricing Variable (CPP_V): Similar to CPP_F with the exception that the super peak period can vary between 2 and 5 hours and thus is not fixed, and customers were provided with automated demand response hardware including automated ("smart") communicating thermostats.

The California SPP results from the summer of 2003 found residential response of about 12% for CPP_F during critical peak events, and up to about 45% for CPP_V with the automated thermostat (see figure below).[86] The summer 2003 results indicate that customers do respond to price even without any automated controls. However, demand response and expected savings are greater with automation than without automation (see figure below), and the combination of automation and a high price signal results in the highest savings.



Source: Statewide Pricing Pilot Summer 2003 Impact Analysis, Charles Rivers Associates, Table 1-3, 1-4, August 9, 2004.

* Hottest day impacts discussed on page 105.

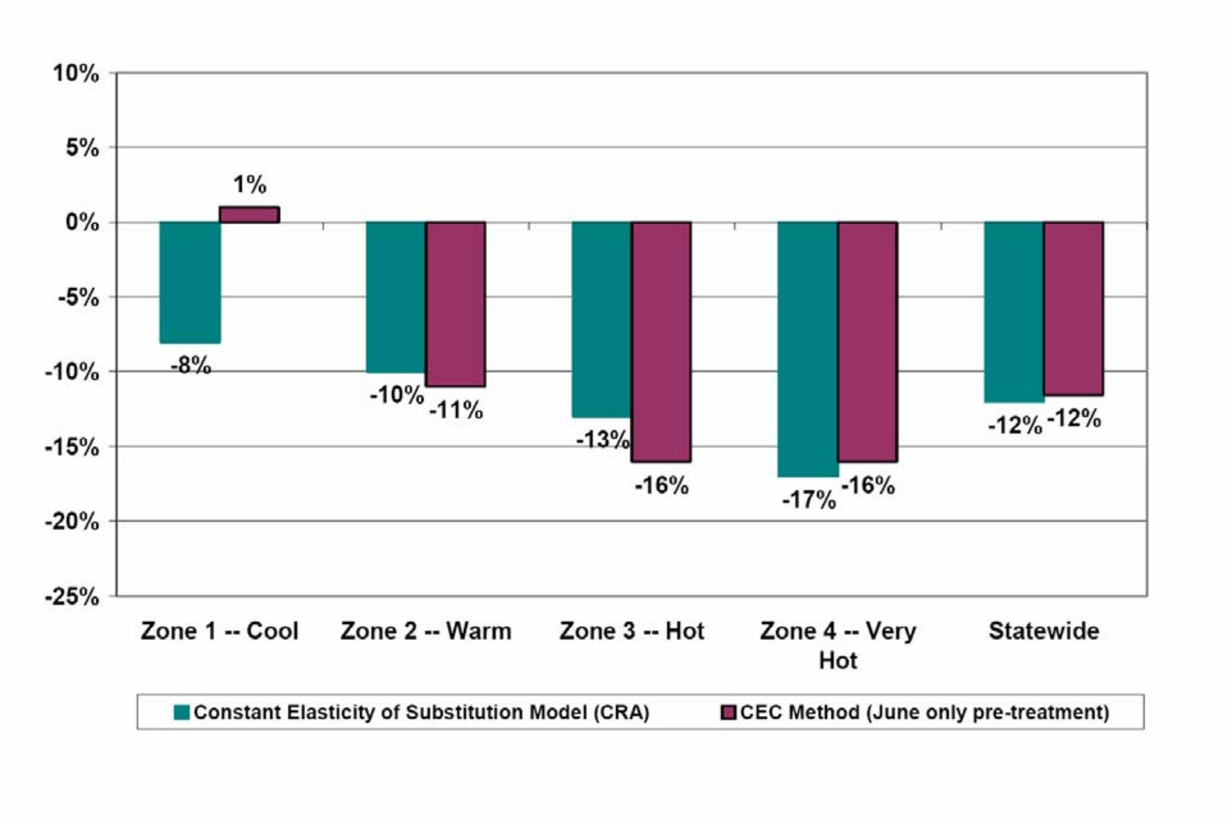
Time varying rates, whether TOU or CPP, also result in usage reduction or energy savings in excess of 10% on event days.[87] As the figure[88] below illustrates, the price-response reductions were greatest in two zones – hot and very hot (zones 3 and 4) – both in terms of absolute reductions and in terms of percentage reductions.

[86] See Reference 75 and *Statewide Pricing Pilot Summer 2003 Impact Analysis*, Charles River Associates, August 2004; both on the California Energy Commission SPP web site at www.energy.ca.gov/demandresponse/documents/index.html.

[87] *Statewide Pricing Pilot Summer 2003 Impact Analysis, Final Report*; Charles River Associates, August 2004.

[88] From McAuliffe, Pat and Arthur Rosenfeld, CEC; *Response of Residential Customers to Critical Peak Pricing and Time-of-Use Rates During the Summer of 2003*; September 2004.

Comparison of Two Analytic Methods: Change in Consumption During Peak Period for CPP_F Customers on Critical Peak Days -- Summer 2003



Proposal

We recommend that Nevada stakeholders review the CPP pilot results in California, and consider implementing a residential CPP tariff in Nevada, including automation, in addition to expanding and possibly revising existing TOU rates for residential customers. Residential demand response efforts should also be focused on the super peak period.

We recommend focusing on expansion of existing TOU rates by targeting larger usage residential customers (defined by annual usage, regardless of whether they are three phase or not) for TOU. In addition, we suggest that Nevada Power consider revising the existing TOU tariff by limiting the TOU peak prices to the peak period during the weekdays, rather than having the TOU peak prices apply seven days of the week including weekends and holidays. We suggest that the pricing and demand response working group review the results of any analysis of the trial TOU tariffs prior to implementing these recommendations.

Given the recently-released results of the statewide pricing pilot (SPP) in California, we also recommend testing a pilot CPP tariff for residential consumers, targeted to new homes that are expected to have high summer peak demand (equivalent to NPC strata 3, 4, or 5, i.e., new homes with expected summer peak load of 5-8 kW or higher). Conducting the CPP pilot in new homes in Las Vegas would help keep the metering and equipment costs low, with the total metering and equipment costs for the pilot being the incremental costs of the advanced metering and automation equipment (automated and communicating thermostats).[89] If the pilot is successful, we suggest that NPC further explore residential CPP, including considering implementation of residential CPP as the default tariff for all new residential customers (and possibly all residential customers), with TOU as an option for customers who opt out of CPP.

Our recommendations are based partly on the California SPP analysis, which concluded the following:[90]

- Residential CPP rates can, within five years of deployment, reduce California's peak load by 1,500 to over 3,000 MW.
- Dynamic rates [CPP] encourage greater conservation and peak demand impacts than conventional inverted tier or TOU rates.
- Residential and small to medium commercial and industrial customers understand and overwhelmingly prefer dynamic rates to existing inverted tier rates [though customer preference is about equal for TOU and CPP].

We recommend exploring and implementing the residential pricing and demand response strategies at NPC prior to implementation at SPPC, similar to our recommendation for the C&I price-response strategies. We note that NPC already has some experience with automation, including with the metering, communication, and automated thermostat equipment, through its GoodWatts load management pilot.[91]

<u>Peak Demand Reductions and Energy Savings</u>

We recommend a CPP pilot for at least 2,000 residential homes in 2005, which would provide about 6 MW in peak load reduction, assuming an average load reduction of 3 kW per home. The pilot should be targeted to new homes with higher peak loads (equivalent to strata 3, 4, and 5 in the NPC service territory, those new homes with expected summer peak loads of 5-8 kW or higher). If the pilot is successful, we would recommend an initial residential super peak demand reduction target for NPC of 24 MW in 2006, equivalent to about 0.8% of the residential customer end-use peak demand (which is 2,966 MW in 2006). Estimating about 3 kW peak load reduction per home, NPC would need to implement CPP at about 6,000 additional new homes in 2006, for a total of 8,000 homes on CPP in 2006.

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[89] A CPP pilot in new homes would not have the additional costs for metering and equipment changeouts. NPC would need to develop an approach to enroll new homeowners in the CPP pilot prior to the installation of customer metering equipment in order to avoid the duplicated effort of meter and thermostat changeouts.

[90] See CEC Staff, *Statewide Pricing Pilot (SPP): Overview and Design Features*, workshop presentation, October 5, 2004; and McAuliffe and Rosenfeld, 2004.

[91] The NPC GoodWatts pilot was expanded to 200 customers in 2004, and NPC is proposing a total of 300 customers in the pilot in 2005.

Assuming continued success, the residential CPP target could increase each year, resulting in a residential super peak demand reduction target of about 54 MW in 2007 (1.7% of residential customer peak demand, enrollment of 10,000 additional homes), about 96 MW in 2008 (3.0% of residential peak demand, 14,000 additional homes), 150 MW in 2009 (4.5% of residential peak demand, 18,000 additional homes), and 216 MW in 2010 (6.2% of residential peak demand, 22,000 additional homes enrolled), for a total of 72,000 homes on CPP in 2010. The residential CPP targets would be similar to the construct of the peak demand reduction goals we suggested for C&I customers. These residential targets should be considered only if the CPP pilot and early implementation efforts are successful and cost-effective.

Cost and Cost Effectiveness

For residential CPP, the current incremental cost for the advanced metering and automation equipment (communicating thermostats) is about $300-$450 per customer. The incremental cost is expected to decline to about $150-$300 per customer in the future, due primarily to technology cost reductions and larger-volume installations.

We estimate that achieving 6 MW in the residential CPP pilot in 2005 would provide about $442,000 in benefits based solely on the avoided cost of NPC peaking capacity.[92] Assuming metering and automation equipment costs of $400 per customer, and program, marketing, and evaluation costs of $700,000, the total cost in 2005 would be $1.5 million. The pilot program would not be cost effective in 2005 (single year analysis), but a multiple-year analysis and consideration of other market price and reliability benefits should lead to a cost-effective outcome (see multi-year estimate below). However, this is proposed as a pilot program in 2005, with per home metering and automation costs expected to come down in the future, and with the other benefits (super peak market price reductions and increases in system reliability) yet to be quantified.

Assuming that the average incremental cost of metering and automation per participant declines over time due to technology cost reductions and larger volume, we estimate a total cumulative cost of $21.8 million during 2005-2010 in order to achieve the 216 MW target of residential super peak reduction in 2010. The cumulative benefit during 2005-2010 would be $40.2 million based on the avoided cost of peaking capacity of $73.60 per kW-year. The net economic benefit would be $18.4 million and the overall benefit-cost ratio would be 1.85 for the six-year effort.

We recommend that the working group assist NPC and SPPC with conducting economic analyses of the residential CPP pilot, developing a plan for larger scale

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[92] This estimate is an approximation, and it is not based on the benefits of reduced super peak market prices for all customers exposed to the market, or the increased system reliability. Consistent with our recommendation in the section on C&I pricing and demand response strategies, we recommend that the Nevada pricing and demand response working group consider the full range of benefits and develop more accurate estimates of the benefits of pricing and demand response in Nevada, including market price and reliability benefits.

implementation of residential CPP in the future (assuming the pilot is successful), and exploring residential pricing and demand response programs in general.

Environmental and Social Benefits

Demand response programs that reduce super peak load reduce operation of the less efficient gas-fired combustion turbines, thereby providing some environmental benefits since these power plants can also have higher emissions relative to newer combined cycle power plants. In a system emergency, demand response programs may reduce the reliance on back up generators, thereby providing additional environmental benefits.

Political and Other Considerations

Because the application of CPP to residential customers is a relatively new approach, we recommend that Nevada policy makers and stakeholders form a pricing and demand response working group to review residential CPP experience and results from other states, particularly from the California Statewide Pricing Pilot (SPP), and to explore specific residential pricing and demand response program concepts and program design details for Nevada. We also recommend that residential CPP be piloted and evaluated in the NPC service territory to determine its effectiveness and cost-effectiveness prior to any full scale implementation of CPP in Nevada.

The working group could also evaluate the current TOU tariff, assess whether any revisions to the TOU tariff would increase its effectiveness and attractiveness, and explore the expansion of the existing or revised TOU tariffs.

Public Sector Policies

Option 12: Adopt Energy Savings Targets for State Agencies

Background

State agencies are housed in facilities comprising about 22+ million square feet of floor area statewide. About 20 million square feet are in buildings owned by the state and about 2 million square feet are leased. Buildings and facilities owned by the state include 7 million square feet in prisons and 7 million square feet comprising UNR and UNLV. Of the leased facilities, the State Buildings and Grounds Department manages about one-half.

In June of 2001, Governor Guinn issued the *Nevada Energy Conservation Plan for State Government* (NECP) to guide agencies in energy conservation measures (http://dem.state.nv.us/plangovsltr.htm). The Plan directs all state agencies to perform energy audits, incorporate energy efficiency guidelines for all new buildings, and perform conservation planning to reduce their energy consumption. In addition, Governor Guinn issued an executive order directing all state agencies to submit semi-annual reports with the Nevada State Office of Energy (NSOE) regarding agency efforts to comply with the NECP.

There are also efforts underway to train facility managers and building operators in both the public and private sectors on energy efficiency and energy management techniques. In particular, the Nevada FOCUS program, a collaboration between Nevada Power, the Community College of Southern Nevada, and the Management Assistance Partnership (MAP), sponsors such courses.[93]

The urgency during the western region energy crisis for state agencies to conserve energy has largely tapered off. While most state agencies do a reasonable job of basic O&M with the resources available, most do not have adequate funding to perform energy audits and develop conservation and efficiency plans. Limited capital improvement budgets and bonding authority further impede state agencies' ability to pursue energy saving measures. Also, state agencies, whether in owned or leased facilities, generally do not directly pay their own utility bills. This reduces the motivation to save energy since the benefits flow directly back into the state's general fund.

Energy Efficiency Proposal

This policy would adopt energy saving targets for state agencies and provide the funding and other support necessary to achieve the targets. Energy savings targets could be expressed as a reduction in energy usage per square foot of floor area. This normalizes the targets for expansion or contraction by different agencies.

There are precedents for this policy. Executive Orders have been issued establishing energy reduction targets for federal agencies. With support from the Federal Energy Management Program (FEMP), energy use per unit of floor area in federal buildings declined 24% during 1985-2000.[94] Arizona has established requirements for a 10% reduction in energy use per unit of floor area in state agencies by 2008 (with 2003 as the baseline), and an additional 5% reduction by 2011.[95] The State of Texas has a five year, 25% energy reduction target, with annual goals set at 5% per year. The Texas target includes all public sector entities (state and local government). In addition to buildings, the Texas targets cover street lighting, wastewater, and water treatment.[96]

We suggest replicating the Arizona goals in Nevada, namely to require agencies to reduce energy use per square foot 10% within five years (say by 2010) and an

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[93] For details, see the Management Assistance Partnership web site, www.mapnv.com/events.html.
[94] *Annual Report to Congress on Federal Government Energy Management and Conservation Programs Fiscal Year 2000*. Washington, DC: U.S. Department of Energy, Federal Energy Management Program, Dec. 13, 2002.
[95] Arizona 34-451. Energy conservation standards for public buildings. House Bill 2324, signed into law April 28, 2003.
[96] http://www.seco.cpa.state.tx.us/ Texas' compliance period is 2002-2007. The energy reduction targets in Texas are part of the state's larger efforts to reduce pollutant emissions for compliance with the federal Clean Air Act.

additional 5% by 2013. The targets could be the same for all state agencies, with flexibility for agencies with high levels of building thermal integrity and equipment efficiency already (i.e., agencies could be allowed partial credit for energy savings from efficiency projects implementing in the past few years). The targets could be based on total energy use (electricity and fuel purchases) for buildings and facilities, expressed in Btu per square foot of floor area. The energy savings targets could be established either through an Executive Order or through state legislation.

In conjunction with adopting the targets, all state agencies could be required to purchase equipment and appliances that have the ENERGY STAR label in areas where ENERGY STAR criteria exist, or are certified under the Federal Energy Management Program. This policy was included in the Arizona energy targets legislation. The Arizona legislation also instructs state agencies to use the procurement standards and technical assistance tools posted on the ENERGY STAR web site. ENERGY STAR procurement requirements are already part of the Governor's efficiency review process in Nevada. But this does not appear to be adequate motivation to get state agencies to routinely purchase ENERGY STAR products.

Meeting the energy saving targets will require the active and ongoing support by the legislature and various state agencies including but not limited to the NSOE, the State Division of Public Works, and the State Division of Purchasing. First, the state should develop improved reporting, data collection, and benchmarking procedures, and put these procedures into operation. State agencies will need the skills to adopt no- and low-cost conservation measures as well as the capability to pursue major energy efficiency retrofit projects. The legislature should make adjustments to state agency budgets to provide state agencies with sufficient resources to comply with the energy saving targets.

Compliance options would likely include adopting conservation measures (eliminating energy waste), efficiency measures (reducing the amount of energy consumed for a given task), retro-commissioning of buildings to ensure building HVAC and lighting systems and related control systems perform per original design, and adopting combined heat and power (cogeneration) systems. Here are some of the specific activities and measures that could be pursued:

1. Use EPA's ENERGY STAR benchmarking software tool to analyze, as Clark County School District has recently done, how energy efficient buildings are relative to the national average. This will help building owners to identify which buildings are the highest priorities for action.

2. Take advantage of no-cost and low-cost measures. For example, the Nevada Department of Information and Technology could install U.S. EPA's PC monitor power management software on all networked state computers. According to the EPA, installing this software saves an average of about 200 kWh per year per monitor.[97]

[97] Sierra Pacific and Nevada Power's 2005 "Sure Bet" commercial sector incentive program will include promotion of this software.

3. Hire and train staff to review all utility bills for billing errors, opportunities to reduce demand charges through better building occupancy/use scheduling, and fluctuations in energy use which can indicate O&M problems.

4. Train building and facility managers on energy conservation techniques, state-of-the art technologies, and strategies and resources for implementing energy efficiency projects.

5. Contract with building retro-commissioning experts to bring building energy efficiency performance back in line with original system design.

6. Make use of ESCOs and performance contracting, and tax-exempt lease-purchase agreements, in order to make significant investments in energy-saving technologies without funding from the state budget.

7. Where buildings are too small to attract the interest of the ESCO industry, commit the necessary funding to implement cost-effective retrofits directly.

8. Award construction contracts based on lifecycle cost analysis and prohibit construction change orders that would compromise energy-efficient design principles and energy saving measures.

9. Allow state agencies do keep a portion of the monetary benefits from energy saving projects.

We recommend that state agencies expand the use of tax-exempt lease-purchase agreements, more commonly referred to in Nevada as "installment purchase agreements", for financing energy-saving measures. This type of financing mechanism in effect allows public sector agencies to draw on dollars saved from future utility bills to pay for energy-efficient equipment today. This option is already authorized in AB 353 and is used to a limited extent. Because many public entities lease equipment, adding an energy project to an existing lease agreement may be surprisingly easy, especially if a Master Lease is in place with a lending institution.

Energy Savings

Electric, natural gas, and water utility expenses, along with ongoing plant and equipment maintenance costs, are absorbing an increasingly greater portion of precious state and local government budgets due to utility rate increases and increased energy use. The State Public Works Board's biannual energy use survey of state entities reports that with about 22 million square feet of state facilities, energy purchases are costing about $47 million per year, with about $36 million or 77% attributable to electricity costs. The 420 GWh of electricity and 23 million therms of natural gas consumed each year is equivalent to about 3.8 trillion Btus.

Working with our recommendation that Nevada replicate the Arizona goals by requiring agencies to reduce energy use per square foot 10% by 2010 and an additional 5% by 2013, the total savings would equal about 380 billion Btus by 2010 and 570 billion Btus by 2013. These estimates are conservative in that they assume no growth in floor area over the next eight years. If savings are proportionate to current electricity and gas use, the savings in 2010 would be about 42 GWh of electricity and 2.3 million therms (224 million cubic feet) of natural gas. The savings in 2013 and thereafter would reach 61 GWh of electricity and 3.45 million therms (337 million cubic feet) of gas. With an assumed peak-to-average load factor of 0.25, the estimated peak demand reductions are about 19 MW by 2010 and 28 MW by 2013 and thereafter.

Cost and Cost Effectiveness

We have estimated that it might cost $28 million (2004 dollars) to meet the energy savings targets, assuming an average payback period of four years. This means an investment of about $3.5 million per year during 2006-2013. Some efficiency measures will have a shorter payback than four years, others a longer payback. Assuming the efficiency measures have a 15-year lifetime on average, they will reduce energy bills by about $105 million over their lifetime, meaning a net savings for the state of about $77 million (undiscounted). The discounted net savings would be about $39 million (2004 dollars).

Environmental and Social Benefits

Improving O&M procedures and performing energy retrofits should help to meet comfort, health, and safety needs of building occupants. Implementing energy saving projects in many cases will enhance employee productivity and reduce absenteeism through better lighting and ventilation, for example. Also, these projects tend to be labor-intensive, thereby increasing local employment.

Political and Other Considerations

Adopting and complying with meaningful energy savings targets will require political will and cooperation throughout state government. This means securing a commitment to meet the targets on the part of department heads and budget directors. It also means getting cooperation from state employees, not just building and facility O&M managers. It will require a commitment to additional investment in staff, training, and software support. And it will require a sustained effort in order to get the job done.

Option 13: Expanding Use of Performance Contracting by the Public Sector

Background

In June of 2001, Governor Guinn issued a Nevada Energy Conservation Plan (NECPA) for State Government to guide agencies in energy conservation measures (http://dem.state.nv.us/plangovsltr.htm). The Plan directs all state agencies to perform energy audits, incorporate energy efficiency guidelines for all new buildings, and perform conservation planning to reduce their energy consumption.

NSOE has been working with the Energy Service Company (ESCO) industry to promote the use of energy savings performance contracts to finance and implement energy savings projects in state and other public buildings since 1997. But prior to 2003, state agencies found it very difficult to enter into performance contracts with ESCOs due to certain state procurement rules.

In 2003, the Nevada legislature passed AB 398 which was intended to remove these barriers and facilitate use of performance contracting for implementation of energy efficiency projects by both state and local governments. It enables agencies to enter into performance contracts with qualified ESCOs and pay back the ESCO over an extended period using a portion of the energy bill savings, with proper energy savings verification. Prior to AB 398, the state and local governments had limited experience with performance contracting.

The state Public Works Board utilitized performance contracting to some degree prior to the passage of AB 398, completing projects in the capitol and Stewart building complexes as well as the Sawyer building and UNLV projects in Las Vegas. AB 398 was intended to fill in the gaps in missing public entity authority for performance contracting. AB 398 does not usurp existing authority, but does provide a template for using performance contracting more widely.

The Western Nevada Community College (WNCC), through a competitive process facilitated by the Department of Administration, Division of Purchasing (State Purchasing), selected an ESCO for an efficiency retrofit project in 2004. In addition, the Nevada Department of Corrections is in the process of contracting with an ESCO for the retrofit of the Northern Nevada Correctional Facility and Stewart Conservation Camp. The Department of Corrections plans on using performance contracting to retrofit their remaining facilities as well. Also, State Purchasing has released the RFP for retrofitting the West Charleston mental health facility in Las Vegas.

Specific Energy Efficiency Proposal

Though AB 398 was meant to stimulate and overcome obstacles to performance contracting in existing government facilities, it did not solve all problems. There are a number of actions that could be taken to make the legislation more effective.

1. **Shorten the approval process.** Performance contract bid procedures are unduly complicated and time-consuming, and could be streamlined.

   RFQ Process: Current practice is that Public Works issues a Request for Qualifications from ESCOs for each energy efficiency retrofit. This very time-consuming practice could be changed to a periodic general RFQ process, with the allowance for using ESCOs for multiple retrofit projects once they are selected via the RFQ process. Individual projects would still be subject to the RFP process.

   RFP Process: Purchasing releases a project-specific RFP to the qualified ESCOs. The first three projects mentioned above involved 2-3 ESCOs each. Once proposals are reviewed, one company is selected to prepare the financial-grade audit. Upon completion of successful negotiations, an award is made to that company.

   Contract Process: An unintended consequence of AB 398 is the legal interpretation that these projects are subject to NRS 353, pertaining to lease purchase agreements, and require contract review by a number of state entities: the Interim Finance Committee (IFC); the State Board of Finance, State Lands, the Governor's Office, and either the Board of Examiners or Board of Regents, all review and approve the contract. The review process could be streamlined to just the Board of Examiners or Board of Regents, and State Lands (if land is involved such as for a biomass facility) providing contract review.

2. **Provide government entities with direct incentives to save energy.** Under AB 398, participating agencies do not share in the monetary benefit from cost- saving energy efficiency measures until the debt service on the performance contract is fully paid. Then related agencies may only benefit if they are allowed by the budget office to maintain and redirect savings achieved from their utilities expense general ledger of their agency budget. The state could consider various ways of allowing participating government entities to realize some direct financial benefit from successful energy efficiency retrofits.

3. **Ensure new construction government facilities are designed and built with all cost-effective energy measures based on lifecycle analysis.** Though the state Public Works Board is required by statute to perform lifecycle analysis for new buildings and renovations, the common practice of design-bid-construct often results in cost-saving design decisions or change orders that compromise energy efficiency. The statute could be amended to require that contracts for new buildings be awarded on the basis of lifecycle cost analysis. Also, the state administrative rules could be amended to prohibit construction change orders that compromise energy-efficient design or energy saving measures determined to be cost-effective based on lifecycle cost analysis.

4. **Provide state government with sufficient resources to facilitate performance contracting.** AB 398 requires the active and ongoing involvement of various state agencies, including but not limited to Public Works, Purchasing, and the Nevada State Office of Energy (NSOE). For instance, Purchasing has a responsibility to attend all meetings with agencies and potential ESCOs. While this is very time consuming, it helps to ensure a legal, competitive process. Identifying, educating, and assisting state agencies in this process and ensuring Nevada-based businesses have a chance to subcontract on these projects is also time-consuming.

   Even though the state Purchasing Division is dedicated to AB 398 implementation, it only has one person working on it. This is woefully inadequate in part because this person has other responsibilities as well.

   The legislature could consider adjustments to one or more state agency budgets to provide agencies with sufficient resources to meaningfully facilitate performance contracting. In funding these new positions, the agency could demonstrate that the net savings for the agency is greater than the cost of the position. If this is not the case, then the legislature could withhold funding in the future.

Energy Savings

Electric, natural gas, and water utility expenses, along with ongoing plant and equipment maintenance costs, absorb an increasingly greater portion of state and local government budgets. As discussed in Option 12, the State is paying about $44 million per year in energy costs, with $33 million or 77% attributable to electricity costs, for the 22+ million square feet of state facilities. Energy savings from performance contracting could help state agencies meet the energy savings targets called for in Option 12.

Table 7 summarizes the results of the technical audits conducted to date for state facilities since adoption of AB 398. The projects are: the Western Nevada Community College (WNCC), the Northern Nevada Correctional Center (NNCC), the Pershing County School District (PCSD), Pershing County (PC), White Pine County School District (WPCSD), and White Pine County (WPC).

Table 7 – Audit Results for Potential Performance Contracts in State Government Facilities

	Project Cost*	Total Annual Savings**	Annual Electric Savings (kwh)	Annual Natural Gas Savings (therms)	Annual Water Savings (gal)	Payback Period (years)
WNCC	$2,356,846	$135,994	863,131	44,653	3,569,970	6.9
NNCC	$4,050,858	$353,627	1,345,831	122,638	30,221	15
PCSD	$1,377,669	$101,889	636,376	16,283	3,858,400	5
PC	$161,644	$18,683	120,817	4,431	n/a	3
WPCSD	$2,439,747	$194,319	n/a	n/a	n/a	12
WPC	$62,481	$9,480	n/a	n/a	n/a	6.6
*includes principle and financing costs ** includes O&M savings						

Cost and Cost Effectiveness

The table above shows that it is cost-effective for state and local government to save energy costs through performance contracting. For example, the performance contracting project for the Western Nevada Community College, with a cost of about $2.4 million, will be paid for in energy savings in less than 7 years.

While financing energy efficiency out of capital improvement budgets would keep all of the cost-savings with government, this overlooks the practical reality that at least at the state level, the monies are just not available. For example, many capital improvement projects required by state law pertaining to fire, life, safety, and other codes have been on the state's "to fund" list for as many as six years.

An energy savings performance contract is a practical way for a public entity to acquire new energy-efficient equipment. The upgrades are made now – with no up-front capital provided by the public entity – and are paid for later through the energy savings that result. The public entity acquires new equipment and expertise from an energy service professional, ongoing maintenance services, the ability to eliminate deferred maintenance or equipment replacement costs from capital improvement budgets, and the ability to accomplish many needs all at once as part of a package. In addition, a minimum level of energy savings is guaranteed.

Environmental and Social Benefits

Implementation of energy saving projects such as lighting retrofits, HVAC system modifications, and better building controls in some cases improve employee productivity and reduce absenteeism. They also can improve occupant comfort, health, and safety.

Political and Other Considerations

Many public entities still resist performance contracting. They do not want to let third parties profit from cost savings due to energy efficiency improvements in the public sector. Some agencies object to the idea of locking themselves into a long-term contract for up to 15 years. However, performance contracting with proper energy savings verification is just an option, not a requirement, via AB 398. Some public entities may have access to capital for energy-saving energy measures, as well as the technical and engineering expertise to conduct efficiency retrofits in-house. Regardless, the legislature has adopted AB 398, and steps should be taken to maximize its practicality and effectiveness.

Option 14: Increase Support for Energy Efficiency Upgrades in K-12 Schools

Background

Clark County School District (CCSD) is the fifth largest school district in the country with over 300 schools, and is adding about ten new schools a year. Enrollment is approaching 270,000 students. Utilities – electric, gas, water, and sewer -- are CCSD's second largest expense after salaries. Utilities are projected to cost over $63 million for 2003-2004, with electricity at $41 million, or 65% of the utility expense. The District estimates that upwards of two-thirds of the electricity costs are due to space cooling requirements.

Washoe County School District (WCSD), one of the top 100 school districts in the country, is also growing rapidly as it approaches 100 schools, adding two new schools a year. Enrollment is at 64,000 students. Utilities – electric, gas, water, and sewer – are projected to cost $12 – 14 million for 2003-2004, with about one-half for natural gas and electricity for heating and cooling systems.

The NSOE has worked with the CCSD to form an energy task force to guide design and implementation of school scheduling and operational changes to save energy. These actions resulted in a total savings of approximately $6.7 million over a three-year period, with $4 million of savings in 2002-03 alone. An "Energy Smart Schools in Action" conference held in 2003 led to at least two of the 11 attending school districts implementing energy performance contracts to retrofit school buildings.

A second Energy Smart Schools conference in 2004 resulted in CCSD approving the hire of seven additional operations and energy technicians and inspectors, making it possible to have one building inspector for each of the five regions within the District. Building inspectors are visiting each of their 60 schools once a month to "listen and look" for conservation opportunities such as computers left on or air handlers running when not needed. The district inspectors leave an audit sheet for the principal, offering rebate money for conservation actions taken by each school. In addition, CCSD is creating an "Energy Conservation Department" within the Facilities Division.

WCSD has utilized performance contracting to implement lighting efficiency retrofits coupled with more limited HVAC and other equipment energy saving measures with an average payback of 12 years or less. The District realized significant savings in energy and O&M costs by focusing on the most cost-effective energy saving measures and using a portion of the 1998 Bond Fund to pay down the long term debt on the efficiency retrofits. Guaranteed annual savings are close to $1 million.

WCSD still has any number of cost-effective energy efficiency opportunities in HVAC systems and retrofits to their school buildings such as replacing single-pane windows. Going forward, the District has very limited ability to implement these projects since the 2002 Bond Initiative is strictly limited to funding new schools and retrofits associated with health, safety, and to a more limited extent, basic O&M. CCSD faces a similar situation. It is pursuing low-cost and no-cost energy conservation measures as noted above. But the District does not have the capital to undertake more costly energy savings retrofits or even preventative maintenance projects.

The school districts are receiving some help with their energy conservation efforts from outside sources. CCSD, WCSD, and four other districts participate in the U.S. Department of Energy's EnergySmart Schools Partnership program. This program provides information such as best practice manuals to school districts throughout the country.[98] CCSD has also benchmarked the energy performance of its schools through the U.S. EPA's commercial building energy performance rating program. Both Nevada Power Company and Sierra Pacific Power Company have recently proposed providing design and technical assistance to help school districts upgrade the energy efficiency of new and rebuilt school buildings.[99] In addition, the utilities offer school districts rebates on energy efficiency measures through their ongoing DSM programs.

Energy Efficiency Proposal

We are suggesting a multi-pronged approach to increase the adoption of cost-effective energy efficiency measures in K-12 schools throughout the state. This approach builds off of resources currently available and energy efficiency initiatives already underway.

1. School districts should make greater use of technical and financial resources already available such as rebates offered by the utilities, the school benchmarking software offered by the U.S. EPA, and the resources offered by the U.S. DOE Energy Smart Schools program. The benchmarking tool will help school facility managers and districts identify which buildings are the highest priority for action, and the utility rebates will help pay for retrofit measures. In addition, school districts should install the U.S. EPA's PC monitor power management software on all school and administration computers.

2. School districts should make greater use of ESCOs and performance contracting, and tax-exempt lease-purchase agreements, in order to make significant investments in energy-saving technologies without the issuance of school bonds or debt. School districts have had positive experience with performance contracting in the past. ESCOs are ready and willing to design, finance and implement comprehensive energy efficiency retrofits. ESCOs prefer projects that are at least $1 million in cost although there are many examples of ESCOs implementing projects valued at less than $200,000.[100]

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[98] See Energy Smart Schools website, http://www.rebuild.org/sectors/SectorPages/OverView_ess.asp?MktID=2

[99] The 2005 budget for Sierra Pacific's schools program is $450,000 and the budget for Nevada Power's program is $900,000.

[100] Osborn, J., C. Goldman, N. Hopper, and T. Singer. *Assessing U.S. ESCO Industry Performance and Market Trends: Results from the NAESCO Database Project*. LBNL-50304. Berkeley, CA: Lawrence Berkeley National Laboratory. Aug. 2002.

3. The legislature should amend AB 396 passed in the 2003 to allow energy efficiency projects to qualify for funding using the portion of CCSD's capital fund earmarked for renewable energy projects. This would give school districts more flexibility and enable them to get much greater "bang for the buck" if they so choose.[101]

4. The NSOE and/or utilities should provide school districts with a "plan check" for new school designs. The plan check would ensure the proposed building meets the minimum energy code and could also recommend additional cost-effective energy upgrades. This type of service is provided by the state energy office in New Mexico.

5. The state should consider establishing a revolving loan fund for energy efficiency measures. The loans could be offered at low interest such that utility bill savings exceed loan repayments. The loan fund could be managed either by a state agency or a private entity. Also, it could be set up in such a way that the loans are unsecured and not treated as debt on the books of the school districts.

6. School districts should develop cash reward programs for achieving high levels of energy savings at the district or individual school level. CCSD is already implementing this strategy.

7. Last but not least, school districts should establish energy savings goals. We suggest adopting similar goals to those proposed for state facilities, namely a 10% reduction in energy use per unit of floor area within five years and a further 5% reduction within eight years. Once savings goals are established, school districts should collect data and track progress towards meeting the goals.

Regarding the fifth recommendation, the loan fund does not need to come from the state budget. It could be provided by public utilities, employee retirement funds, state retirement funds, or socially responsible investment funds. There is precedent for utility financing in other states. For example, the water utility in Tucson finances and pays for water conservation measures implemented by the Tucson Unified School District (TUSD). TUSD repays the loan on the water bill as a water utility service, without assuming additional debt. Also, Texas established a successful loan fund for financing energy efficiency retrofits in state government, local government, and school district buildings. The program, known as the LoanSTAR Revolving Loan Program, has made 127 loans to public institutions since 1989 and has generated over $100 million in documented energy cost savings.[102]

Energy Savings

Nevada school districts have already achieved some energy savings from various energy conservation efforts and energy efficiency projects. This includes CCSD's school

[101] Energy efficiency measures typically save electricity at a levelized cost of 2-3 cents per kWh, while solar photovoltaic installations generate electricity at a cost of 20-30 cents per kWh.
[102] LoanSTAR Revolving Loan Program. www.seco.state.tx.us/ls.html

scheduling and operational changes that saved $4 million savings in 2002-03 alone and the performance contract implemented by WCSD that provided nearly $1 million in annual energy bill savings.

Vigorous pursuit of the policies recommended above could provide an additional 15% energy savings within eight years, if not sooner. This would mean about $10 million in energy bill savings statewide each year, with most of the savings for the CCSD and WCSD. Assuming three-quarters of this savings is in the form of electricity and one quarter is natural gas, the amount of electricity saved when the full 15% savings is realized is about 100 GWh per year. For analytical purposes, we assume that 65 GWh per year of savings is achieved by 2010 and the full 100 GWh per year by 2013 and thereafter. With an assumed peak-to-average load factor of 0.25, the estimated peak demand reductions are about 37 MW by 2010 and 57 MW by 2013 and thereafter. The estimated natural gas savings are 0.2 bcf by 2010 and 0.3 bcf by 2013 and thereafter.

Cost and Cost Effectiveness

Energy retrofits of schools, or adding efficiency measures to new schools, can have paybacks as short as one year or as long as 10-15 years. The cost effectiveness depends on the type of project. A national database of projects implemented by ESCOs indicates that projects in the institutional sector have a payback period of about seven years on average.[103] Nonetheless, the value of the energy savings over the lifetime of these projects exceeded the initial cost. In the Texas LoanSTAR program mentioned above, all projects must have a payback of ten years or less. In the first phase of the program, the average payback period was just 3.4 years.

We estimate that it might cost a total of $60 million to achieve the goal of 15% energy savings in K-12 schools throughout the state, assuming an average payback period of six years. Some efficiency measures will have a shorter payback than six years, others a longer payback. Assuming the efficiency measures have a 15-year lifetime on average, they will reduce energy bills by about $150 million over their lifetime, meaning a net savings of about $90 million (undiscounted). The discounted net savings would equal about $36 million.

Environmental and Social Benefits

The physical environment provided by school facilities plays an important role in achieving the overall educational objectives of the school. There is a growing body of research that shows that indoor air quality, ventilation, thermal comfort, and daylighting are all linked to educational achievement. Adding daylighting to schools, while controlling the solar energy gain in order to limit cooling costs, is especially valuable for improving the learning environment and student performance.[104]

[103] See Reference 100.
[104] See Reference 18.

Building design, daylighting, and energy efficiency should not be viewed as a panacea, however. As one document states, "Good school buildings contribute to good education just as bad school buildings interfere with it. Studies demonstrate the relationship between school infrastructure and student achievement, but this relationship is not straightforward, and a myriad of other variables go into making good schools. In other words, school infrastructure contributes to but does not decide the quality of a school. As such, infrastructure is not distinct from other issues of school reform or educational excellence; rather, school infrastructure decisions are a central component of whole-school reform."[105]

Political and Other Considerations

Nevada has one of the lowest levels of education funding in the country. School districts use state funds for all aspects of education, including operating costs (utilities) and capital renewal projects (retrofits, refurbishments). Improving the operational and energy performance of schools increases the availability of resources for teacher salaries, learning materials, and school activities. Consequently, the initiatives suggested here have broad political support. They should be feasible as long as the school districts are supportive and cooperative.

[105] Source: Planning Guide for Maintaining School Facilities, National Forum on Education Statistics and Association of School Business Officials International, p.14, February 2003.

III. CONCLUSION

The 14 policy options presented above offer a wide range of benefits including significant energy savings potential, net economic benefits, and various non-energy benefits. Table 8 summarizes the projected energy savings and peak electric demand reduction by 2010 and 2020. For simplicity, the options are referred to by number.

Table 8 – Estimated Energy Savings and Peak Demand Reduction by Option

Option	Electricity savings (GWh/yr)		Peak demand reduction (MW)		Natural gas savings (bcf/yr)	
	2010	2020	2010	2020	2010	2020
1	1,478	4,633	591	1,853	--	--
2	1,345	3,947	536	1,577	--	--
3	--	--	--	--	3.0	10.6
4	--	--	--	--	--	--
5	1,005	3,489	402	1,395	1.2	4.0
6	150	450	68	205	0.75	2.25
7	160	450	49	158	0.4	0.8
8	20	60	9	27	0.2	0.6
9	390	1,800	60	272	0.4	1.3
10	--	--	165	165	--	--
11	--	--	216	216	--	--
12	42	61	19	28	0.2	0.3
13	--	--	--	--	--	--
14	65	100	30	46	0.2	0.3

The energy savings and peak demand reduction estimates shown in Table 8 are not entirely additive. In particular, it would be reasonable to adopt either energy efficiency standards (option 1) or a public benefits charge to fund utility energy efficiency programs (option 2). If both were adopted, these policies would reinforce each other but combining the energy savings estimates would be "double counting". Also, the savings from technical and financial assistance for the industrial sector (option 9) is likely to overlap to a large extent with the savings from the utility energy efficiency program policies (options 1, 2 and 3). Savings are not provided for some of the options (options 4 and 13) because they are enabling policies or yield savings that are already included in other policies.

Three policies stand out in terms of electricity savings and peak demand reduction potential: energy savings standards (option 1), a public benefits charge to fund energy efficiency programs (option 2), and new building energy codes (option 5). In addition, other policies are important for their targeted energy savings and benefits. Stimulating natural gas utility energy efficiency programs (option 3) would provide significant gas savings in households and commercial buildings, increasing funding for home weatherization (option 8) would benefit low-income households, a residential energy conservation ordinance (option 6) would benefit renters, energy savings targets for state agencies (option 12) would help the state government lower its costs, technical and financial assistance (option 9) would benefit mining and manufacturing operations, and pricing and demand response programs (option 10 and 11) would help Nevada Power Company lower its needle peak demand.

Table 9 shows the estimated net economic benefits for the various options. The economic benefits are the value of the energy savings over the lifetime of efficiency measures installed during 2006-2020 (with discounting), minus the cost of the efficiency measures and policies/programs that stimulate their adoption. Options 1, 2, 5 and 9 each offer net savings worth between $1-2 billion, while option 3 offers net savings approaching $1 billion. These estimates do not include valuation of the non-energy benefits, which in some cases would be substantial.

Table 9 – Estimated Net Economic Benefits by Option

Option	Net economic benefit (million $)
1	1,700
2	1,450
3	820
4	--
5	1,860
6	400
7	350
8	20
9	1,220
10	27
11	18
12	39
13	--
14	36

Considering the magnitude of the energy and economic savings, extent of non-energy benefits, political viability, and the desire to implement a balanced set of energy policies, we recommend that policymakers in Nevada give highest priority to the following seven energy efficiency policies, and lower priority to policies listed below them.

High Priority

- **Adopt Energy Savings Standards for Electric Utility Energy Efficiency Programs** – large energy and economic savings potential, substantial non-energy benefits, more viable politically than adoption of a public benefits charge.

- **Stimulate Natural Gas Utility Energy Efficiency Programs** – moderate energy and economic savings potential, logical complement to electric utility programs, reasonable political viability.
- **Update Building Energy Codes** – large energy and economic savings potential, code deliberations underway, good prospects for adoption next year.
- **Adopt Appliance Efficiency Standards** – limited energy and economic savings, moderate water savings, but relatively straightforward to implement given that California has adopted these standards.
- **Increase Funding for Low-Income Home Weatherization** – low energy and economic benefits, but potentially significant social benefits.
- **Increase Support for Energy Efficiency Upgrades in K-12 Schools** – low energy and economic impacts, but potentially significant cost savings and non-energy benefits in this key sector.
- **Adopt Pricing and Demand Response Programs for Commercial and Industrial Customers** – reduces Nevada Power's needle peak and improves system load factor, likely to be more cost-effective than a residential price response program.

Medium and Lower Priority

- **Adopt Public Benefits Charge for Electric Utility Energy Efficiency Programs** – large energy and economic savings potential, but more controversial than energy savings standards. Also, there already is a funding mechanism for utility energy efficiency programs.
- **Provide Clarification Regarding Determination of Energy Efficiency Program Cost Effectiveness** – enabling policy, does not appear to be critical for expansion of energy efficiency programs in Nevada at this time.
- **Adopt Residential Energy Conservation Ordinances** – moderate energy and economic savings potential, large water savings potential, but could be difficult to enact and enforce at either state or local levels.
- **Provide Technical and Financial Assistance to the Mining and Manufacturing Sectors** – these sectors account for significant energy use but do not represent a very large portion of the state's economy.
- **Adopt Energy Savings Targets for State Agencies –** low energy and economic benefits, requires high level support and cooperation from state agencies.
- **Expand Use of Performance Contracting by Public Sector –** low energy and economic benefits, in addition performance contracting is occurring to some degree already as a result of legislation enacted in 2003.
- **Adopt Pricing Programs for Residential Customers** – could have a significant impact on peak demand, but impact and cost effectiveness need to be demonstrated.

The high priority policies would benefit households, businesses, utilities, and the public sector. The policies include regulatory, financial assistance, energy pricing, and technical assistance initiatives. Some of the policies require action by the state legislature, some by the PUC, and others by certain branches of state or local government. Also, some of the policies would be implemented by utilities, others by state or local government. The medium and lower priority recommendations still have merit and should be considered by policymakers as well. But we view these options as less important and/or more difficult to adopt than the high priority options.

What would be the overall impact of adopting the seven policies we suggest be given high priority? Table 10 shows the estimated energy savings and peak demand reduction in 2010 and 2020, as well as the net economic benefits, from all seven high priority policies. It is reasonable to sum the estimated benefits for each policy as they overlap to only a very limited extent. Building energy codes and appliance standards raise the floor on energy efficiency, while utility incentive and promotion programs stimulate the adoption of building designs and efficiency measures that go beyond the minimum requirements. However, a small portion of utility energy efficiency program budgets may be devoted to low-income home weatherization, K-12 retrofit projects, or support for codes an standards, implying a potential small overlap and "double counting" of savings.

Table10 – Overall Impact of the Seven High Priority Policies

	2010	2020
Electricity Savings (GWh per year)	2,730	8,730
Peak Demand Reduction (MW)	1,250	3,640
Natural Gas Savings (billion cubic feet per year)	5.0	16.3
Net Economic Benefit (billion dollars)	--	4.8

By 2010, the seven high priority policies could save 2,730 GWh/yr, 1,250 MW of summer peak demand, and 5.0 billion cubic feet of gas (excluding gas consumption for electricity generation). And by 2020, the seven policies could save 8,730 GWh/yr, 3,640 MW of summer peak demand, and 16.3 billion cubic feet of natural gas. The gas savings are by final consumers; they do not include gas savings in electricity generation. Moreover, the high priority policies could yield $4.8 billion in net economic benefits for consumers and businesses over the lifetime of efficiency measures installed during 2006-2020.

How significant are these potential savings? In their most recent base case forecasts, Nevada Power Company and Sierra Pacific Power Company together project 36,980 GWh/yr of retail electricity sales and 8,938 MW of summer peak demand by 2020. Since these two utilities account for about 93% of retail electricity sales and 88% of summer peak demand in the state, the statewide forecast is for approximately 39,800 GWh/yr of electricity sales and 10,150 MW of peak demand in 2020. For comparison, statewide electricity consumption is expected to be approximately 31,300 GWh/yr and peak demand about 7,600 MW in 2004.

Given these estimates of future "business-as-usual" electricity use and summer peak demand, the seven priority policies could lower projected statewide electricity use in 2020 by nearly 22% and peak demand by 36%. The priority policies could eliminate all of the projected growth in electricity consumption during 2004-2020 and about 143% of the projected growth in summer peak demand; i.e., the policies could produce a net decline in peak demand over the next 15 years. Since the reduction in peak demand is greater than the reduction in electricity use in percentage terms, the policies would increase the utilities' load factor, improve the utilization of the electricity grid, and reduce the risk of price spikes or power outages.

Gas distribution utilities in Nevada sold about 67 billion cubic feet (bcf) of natural gas as of 2003. This figure does not include gas consumption for electricity production or gas purchases from commodity providers by large consumers. Gas consumption has been rising in Nevada, but at a moderate rate due to factors such as national efficiency standards and price-induced conservation. Assuming base case gas demand increases 1.5% per year on average during 2003-2020, base case gas use in 2020 would be about 86 bcf. Thus, the seven priority policies could lower projected gas use in 2020 by 19%.

The estimated net economic benefit of $4.8 billion for the seven priority policies is equivalent to approximately 15 months of electricity and natural gas purchases by residential, commercial and industrial customers in the state. However, it should be recognized that these economic benefits will occur over many years following the installation of the energy efficiency measures.

In summary, Nevada would achieve wide-ranging and substantial benefits if its policymakers embrace the high priority policies, and possibly other policies, presented in this study. Electricity savings could reach 22% and natural gas savings 19% by 2020, meaning implementing these policies could enable Nevada to meet the energy efficiency goal established by the Western Governors' Association (excluding consideration of the transportation sector). The peak power demand reduction could be even greater in percentage terms, meaning the policies could reverse the decline in system load factor experienced by the utilities in recent years.

The high priority policies would also provide substantial non-energy benefits including over 5 billion gallons of water savings per year by 2020, pollutant emissions reductions at power plants, enhanced comfort in homes, enhanced productivity in the workplace, cost savings and possibly improved student performance in K-12 schools, and economic development and employment growth throughout the state. Given these wide-ranging benefits, we urge policymakers in Nevada to make a strong commitment to increasing energy efficiency.

Appendix A – Energy Efficiency Workshop Attendees

	Nevada Energy Efficiency Strategy Project		2004 Workshops Attended:	
	Name	Affiliation	10 Aug.	17 Nov.
1	Gary Bailey	Innovative Design & Solargenix	√	
2	Bob Balzar	Task Force* member/ Sierra Pacific & Nevada Power Companies	√	√
3	Terry Barnes	Centex Homes	√	
4	Dave Beake	Astoria Homes	√	
5	Anne-Marie Bellard	Public Utilities Commission of Nevada	√	
6	Dr. Robert Boehm	UNLV	√	
7	Craig Boice	Boice Dunham Group	√	
8	Eric Borsting	Southern Nevada Home Builders Association	√	√
9	Bob Bricca	Management Assistance Partnership (MAP) of Nevada	√	√
10	Richard E. Burdette, Jr.	Director, Nevada State Office of Energy	√	√
11	Larry Burton	Burton Consulting	√	
12	Bob Cooper	Task Force* member/ Nevada Bureau of Consumer Protection		√
13	Stephen Cullen	City of Henderson	√	
14	Craig Davis	Nevada Housing Division	√	
15	Neill Dimmick	Consultant		√
16	Eric Dominguez	Colorado River Commission	√	
17	Hector Dominguez	Paragon Consulting Services	√	
18	Ernest Figueroa	Bureau of Consumer Protection	√	
19	Jason Geddes	Nevada State Assembly	√	
20	Howard Geller	Southwest Energy Efficiency Project	√	√
21	J. Paul Gerner	Clark County School District	√	
22	Dave Gildersleeve	Mobius Risk Group	√	
23	Tad Greener	Empower		√
24	Geoffrey Groves	Lennox Industries	√	
25	Mary Jane Hale	National Renewable Energy Laboratory	√	
26	Doug Hampton	Nevada Power Company	√	
27	John Hargrove	Sierra Pacific Power Company	√	√
28	Ray Harkins	Executive Plumbing	√	

29	**Mark Harris**	**Public Utilities Commission of Nevada**	√	√
30	**Jeneane Harter**	**HiTech Communications/ Task Force* Consultant**	√	√
31	**Nat Hodgson**	**Pulte Homes**	√	
32	**Rick Hunsaker**	**G.C. Wallace**	√	
33	**Jim Hutchinson**	**Red Rock Mechanical**	√	
34	**Debra Jacobson**	**Southwest Gas**	√	
35	**Colleen Janes**	**Nevada Division of Purchasing**	√	√
36	**Joseph Johnson**	**Government Affairs Consultant**	√	√
37	**Jane Long**	**Task Force* member/ UNR faculty**	√	
38	**Eric Makela**	**Britt/Makela Group LLC**	√	
39	**Pat McInnis**	**Buildings & Grounds, Nevada Department of Administration**	√	
40	**Dave McNeil**	**Nevada State Office of Energy**	√	√
41	**Mike Messenger**	**Californi Energy Commission**	√	
42	**Elwood Miller**	**Renewable Energy & Energy Conservation Task Force**	√	
43	**Cynthia Mitchell**	**E3**	√	√
44	**Ernie Nielsen**	**Senior Law Project**	√	
45	**John Nielsen**	**Western Resource Advocates**	√	
46	**Dan O'Brien**	**Nevada State Public Works Board**	√	
47	**Kate Offringa**	**Alliance to Save Energy**	√	
48	**Robert Oliver**	**Robert R. Oliver LLC/ Task Force* Consultant**	√	√
49	**Rita Ransom**	**Southwest Gas**		√
50	**Randy Robison**	**National Federation of Independent Business (NFIB)/ Nevada**	√	
51	**Emily Sanchez**	**Nevada Power Company**	√	
52	**Ken Sawyer**	**Station Casinos**	√	
53	**Dale Scheideman**	**Clark County School District**	√	√
54	**Jeff Schlegel**	**Southwest Energy Efficiency Project**		√
55	**Fred Schmidt**	**Hale Lane**	√	
56	**Vivian Scott**	**Southwest Gas**	√	√
57	**Kathy Senseman**	**Southwest Gas**	√	
58	**Tom Smolarek**	**Cypress Consulting**	√	
59	**Dale Stransky**	**Bureau of Consumer Protection**	√	
60	**Connie Suckling**	**Southern Nevada Home Builders Association**		√
61	**Brad Townsend**	**MASCO/ Environments For Living®**	√	
62	**Jess Traver**	**Chief Building Official, Washoe County**	√	

63	**Thom Trocha**	**MASCO/ Environments For Living®**	√	√
64	**Luis Valera**	**Nevada Resorts Association**	√	
65	**Jon Wellinghoff**	**Western Resource Advocates**	√	√
66	**Rick Weston**	**Regulatory Assistance Project**	√	
67	**Tim Woolf**	**Synapse Energy**		√
68	**Fredric Zwerg**	**Southwest Gas**	√	√

***Nevada's Renewable Energy & Energy Conservation Task Force**

Appendix B – Historical Review of Energy Efficiency Policy in Nevada

The idea of viewing end-use energy efficiency improvements as a significant energy resource is not a new concept, and is being increasingly embraced throughout the United States. Funding for ratepayer-sponsored energy efficiency programs implemented by U.S. electric utilities (and independent program administrators in a few states) increased from about $0.9 billion in 1997 to an estimated $1.45 billion in 2003.[106] Energy efficiency improvement has been a serious energy resource in California, the Pacific Northwest, New England, and elsewhere for over two decades.

Numerous studies and extensive experience by utilities and regulators, federal, and state governments, and the private sector suggest that large amounts of feasible and cost effective energy efficiency improvements remain untapped in all energy sectors of our economy. One recent literature review concluded that the cost-effective, achievable electricity conservation potential in the 10 to 20 year timeframe is 24% (1.2% per year).[107]

The Nevada experience with efficiency policy and programs over the past twenty years encompasses utility energy efficiency and load management programs, regulatory policy with respect to these programs, electric utility rate design and pricing mechanisms intended to foster greater energy efficiency and/or peak load reduction, building energy codes and standards, and efforts to improve the energy efficiency of state and local government facilities as well as public schools. In this paper, we review the policies that were adopted and their results in each of these areas. This review will be used to inform the development and analysis of new or improved policies to further energy efficiency in Nevada.

I. Changing Utility Industry Economics and Regulatory Policy

The mid-seventies saw the electric utility industry turned on its head by a variety of economic conditions: skyrocketing energy prices due to the OPEC oil price shocks, generation plant cost overruns in (principally) the nuclear power industry, slowdowns in demand growth leading to excess utility plant capacity by wide margins, and diminished economies of scale in new generation.

These factors led to significant increases in the real rates charged for electric and natural gas service from the period of 1973 through the mid-1980's. As a direct result of

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[106] York, D. and M. Kushler. *State Scorecard on Utility and Public Benefit Energy Efficiency Programs: An Update.* Washington, DC: American Council for an Energy-Efficient Economy (ACEEE). Dec. 2002. Also, "State Energy Efficiency Programs Keep Growing, in Contrast to Federal Retreat." Press Release. ACEEE, April 25, 2003. http://aceee.org/press/0304steeprog.htm.

[107] Nadel, S., A.M. Shipley, and R.N. Elliott, *The Technical, Economic, and Achievable Potential for Energy Efficiency in the United States: A Meta-Analysis of Recent Studies.* Washington, DC: American Council for an Energy-Efficient Economy (ACEEE). 2004.

these unprecedented rate increases, the U.S. Congress, state regulators, consumers, and utility executives began to rethink a number of prevailing precepts of the electric utility industry. Some of the long held beliefs questioned included:

- Customers would not reduce demand in response to higher utility bills.
- Social welfare and economic growth was directly related to increased energy consumption.
- Increasing energy supply through new generation, transmission, and distribution, was the only technically feasible, economic, and reliable way of meeting increasing energy demand.

The regulatory process was changed by this questioning. The Public Utility Regulatory Policies Act (PURPA), passed in 1978, required state regulators to consider (in part) utility energy efficiency activities and programs, and innovative rate design principles (such as seasonal and time-differentiated tariffs) to moderate costly electricity demand growth. Some states or regions adopted resource planning rules that treated end-use efficiency improvements as a serious energy resource. Also, with support from the Federal government, most states established energy offices to work on building codes and standards, consumer education, training, etc.

II. Utility Energy Efficiency Activities and Nevada Regulatory Policy

Nevada adopted its first comprehensive statutory least-cost utility planning (now referred to as integrated resource planning, or IRP) process in 1983, drawing on the experience at the time of California and Wisconsin. The IRP process required all Nevada retail electric distribution utilities under the jurisdiction of the Public Service Commission[108] to file every two years a resource plan detailing their future 20-year resource acquisition strategy to meet customer growth. That plan, by statute, had to consider not only new generation options, but also the means to reduce load growth through energy efficiency and load management (also known as DSM programs). This led Nevada Power Company (NPC) and Sierra Pacific Power (SPP), the primary electric distribution utilities in Nevada, to implement an array of DSM programs from the mid-1980s through the mid-1990s.

These programs enjoyed moderate success. For example, the two utilities reported spending about $11 million per year on DSM in 1993 and 1994, and saving 350 GWh/yr as of 1994 due to cumulative DSM efforts.[109] Attachment 1 provides SPP and NPC DSM budgets, energy savings and peak load reductions achieved, DSM budget as a fraction of total retail sales revenues, and savings costs relative to utility electric system demand and annual energy sales for the period 1984-2003. The numbers are discussed below. These

[108] The Commission was then designated in statute as the Public Service Commission of Nevada or referred to as the PSCN, but it is now designated in statute as the Public Utilities Commission of Nevada or referred to as the PUCN.
[109] *U.S. Electric Utility Demand-Side Management 1994*. DOE/EIA-0589(94). Washington, DC: Energy Information Administration, U.S. Department of Energy.

twenty-plus years of Nevada electric utility energy efficiency activities are reviewed in four periods:

- Breaking New Ground: 1984 – 1989
- Taking Hold: 1990 – 1996
- Time Out: 1997-2000
- Rebirth: 2001- current

A. Breaking New Ground: 1984 – 1989

Getting not just electric utility DSM, but the entire Nevada IRP process off the ground was a Herculean task for the utilities, regulators, and stakeholders. The initial IRP procedural schedule asked SPP and NPC both to file IRPs in 1984, 1986, and 1989. Also, the Commission required refiled, amended, and/or updated DSM plans after each IRP.

The national experience with utility energy efficiency programs was rather limited in the mid-1980s. There was a lot to learn about how electricity was used, the technologies for achieving energy savings and peak load reduction, and the program options for stimulating higher levels of energy and demand savings.

Sierra Pacific, more so than Nevada Power, had a strong self-imposed requirement to collect and evaluate local demographic and end-use data prior to conducting utility-sponsored efficiency programs. Even though SPP's DSM efforts benefited from those data acquisition efforts, at the time it slowed the progress of achieving savings. There was also a tendency on the part of both utilities during this time to compartmentalize efficiency technologies into discrete pilot programs. These pilot programs were used to understand installation costs, load impacts, customer acceptance, operational characteristics, and savings retention over time.

Interwoven with DSM programs designed to reduce overall electricity use, NPC and SPP also supported DSM activities that would retain, increase, or shift energy usage on seasonal and daily bases. For instance, Nevada Power, with its extreme summer peak driven in large part by residential space cooling requirements, focused its early DSM efforts on promoting the installation of heat pumps in new construction and existing homes.[110] Use of a heat pump rather than a gas furnace increased total electricity use and improved the utility's load factor. Relatively little attention was paid to high efficiency central and room air conditioning units or evaporative cooling. Sierra Pacific Power, with slightly greater electricity use in the winter than summer, preferred efficiency measures that interrupted load and/or shifted load from peak to off-peak periods with limited reduction in overall electricity sales.[111]

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[110] NPC's pre-IRP heat pump program provided customer incentives for standard and high efficiency heat pumps. The PUCN required NPC to curtail rebates for standard units and promote only high efficiency units.
[111] Sierra Pacific 1986 Resource Plan, Docket 86-701.

Both utilities, but SPP more extensively, implemented conservation and efficiency improvements at its own facilities including power plants, central office and district office buildings, and water pumps during this early period.

1. Sierra Pacific Power

SPP filed its first DSM plan in 1984. The plan launched the "End Use Data Acquisition Project" (EUDA) with an initial annual budget of $1 million, in contrast to a DSM programmatic budget of about $850,000. The plan also included 17 distinct pilot programs. For example, there were three distinct residential electric water heating programs: conversion to gas, water heater wrap and pipe insulation, and efficient water heaters.

By 1986, SPP was experimenting with commercial interruptible/standby tariffs and offering incentives for commercial/industrial (C/I) lighting efficiency measures. With an annual DSM budget of about $2 million, SPP reported a peak load reduction of about 2 MW from its interruptible load program. Little energy savings was registered from installing more efficient lighting in a handful of customer applications.

Based on the pilot program experience, SPP proposed six full-scale DSM programs in its 1989 DSM Plan. These programs were projected to reduce peak demand by 51 MW during 1990-94, with the interruptible/customer standby program dominant at 30 MW, residential electric thermal storage and commercial cool storage contributing another 5 MW, and C/I lighting incentives expected to provide about 7.5 MW of peak load reduction. Of the almost $12 million DSM budget for this five-year period, the interruptible/standby program was budgeted at $4.6 million (39% of total) and electric thermal and cool storage at $2.0 million (17% of total).[112] The PUCN was critical of SPP's DSM efforts in the 1989 resource plan ruling, finding that "DSM planning was counterproductive and that program implementation was shrinking instead of blossoming."[113] Following the PUCN's Order, SPP filed a revised DSM plan that redesigned and improved its programs.

2. Nevada Power Company

NPC also filed its first DSM plan in 1984. But NPC already reported about 31 MW in savings from its ongoing residential air conditioning load management (cycling) program (ACLM) that was initiated in 1979. NPC also claimed 6 MW of demand reduction through swimming pool pump controls and 5 MW of demand reduction from residential home audits.

During this period, NPC and the Southwest Gas Corporation were fighting for heating fuel market share in the new homes market. NPC attributed its poor residential load factor (and resultant low system load factor) to the market share gains by gas space

[112] SPP 1989 DSM Action Plan.
[113] SPP Docket 89-676, decided October 6, 1989, PUCN at page 33.

heating.[114] NPC was focused on gaining market share through the installation of standard and high efficiency heat pumps in new and existing homes, including conversion of gas-heated homes to standard and high efficiency heat pumps. The 1984 DSM Plan projected 128 MW of peak load reduction by 1991, with 47 MW attributed to heat pumps.[115]

In its 1986 plan, NPC proposed extending incentives for high efficiency residential air conditioners as well as increasing the incentives for high efficiency heat pumps. With direction from the PUCN, NPC developed a plan for a multi-stage evaporative cooler test program. Also, the utility added a C/I lighting efficiency programs.

In 1989, NPC piloted a thermal electric storage program for residential space heating and a commercial cool storage program. Also at this time, the costs associated with the high efficiency heat pump program were moved to a shareholder expense (rather than a ratepayer expense) in an effort to mitigate PUCN scrutiny.

B. Taking Hold: 1990 - 1996

1. Sierra Pacific Power

From 1990 to 1994, SPP's annual DSM budget grew from $2.4 million to about $6 million. The latter represented about 1.2% of total utility revenues. As DSM progressed from technology testing to delivery mechanisms such as custom rebates, shared savings, and utility financing, energy savings and peak load reduction increased as well: from 2 MW in 1990 to a projected 11 MW per year in 1993-94, or about 1% of system peak. By 1993, utility energy efficiency activities had spread to SPP's Westpac natural gas division, which had a DSM budget of $1.5 million.

DSM also worked its way up the utility corporate ladder. SPP's 1992 DSM plan offered strategic goals of serving 25% of peak load growth, and 10% of annual energy growth, through efficiency improvements and peak load reduction. The strategy projected a winter peak demand reduction of 180 MW by 1997.

SPP's 1992 DSM plan took a significant leap forward by adding 17 new DSM programs and services to the existing five. New programs included agricultural pump efficiency, residential air conditioner rebates, a "good cents" new home and manufactured housing program, appliance rebates, a "good cents" commercial building program, low-interest financing for residential and small commercial efficiency projects, a shared savings approach for larger efficiency projects in the C/I sectors, and a competitive bidding structure for rebates provided to C/I efficiency projects.

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[114] In its 1984 Resource Plan, NPC claimed that of the 36,000 single family homes constructed since 1975, 75% were heated with natural gas. NPC claimed that these new homes added about 300 MW to system demand, but less than 500 GWH in annual sales, equating to a load factor of less than 20%.

[115] The projected peak load reduction assumed installation of standard and high efficiency heat pumps units replacing existing standard efficiency heat pumps or air conditioners in existing and new housing. The PUCN subsequently required that NPC curtail rebates for standard efficiency heat pump units.

Interruptible rate design also improved with options for different levels of customer participation: emergency program (100hrs/yr), stand-by generation program (500hrs/yr) and peak savings program (150-500hrs/yr).

By its 1995 resource plan, SPP was scaling back its energy efficiency efforts in anticipation of utility restructuring and increased competition. The utility planned to continue only two DSM programs – Interruptible Load and Custom Energy Solutions, both with an orientation towards retaining larger customers in the future world of competition. Interruptible load consisted of 10 contracts and SPP Plaza for about 27 MW. Customers received a reduced demand charge of $2.25 kw-month for interruption on an emergency-only basis only, for an estimated annual credit to these customers (and cost to the system) of about $700,000.

Custom Energy Solutions proposed lower incentives to C/I customers based on engineering estimates and final verification reports. This program also served as a brand name for related customer service activities for C/I customers. These include energy audits, billing analyses, power quality analyses and other activities designed to add customer value.

All natural gas DSM was also discontinued in1995, with any remaining activities carried out under customer service.

2. Nevada Power Company

NPC's energy efficiency efforts turned a corner in the early 1990s as the budget grew and the focus shifted away from heat pump promotion. The 1991 DSM plan included $700,000 for high efficiency residential air conditioner incentives out of a total incentive budget of about $1.1 million. NPC's total DSM budget increased from $1.6 million in 1994 to $6.5 million in 1994, the latter equal to nearly 0.9% of revenues. NPC's 1994 DSM plan included 1+ MW in savings from high efficiency AC systems that year, with projected steady gains in 1995-96 and up to 16+ MW of savings by 2010. NPC also offered incentives for other measures that would reduce residential cooling loads including radiant barriers for attics, attic ventilation, and high efficiency windows. Notably, the heat pump retrofit program was discontinued by 1994.

NPC also ramped up its residential AC load control program during the early 1990s. With 59,000 air conditioning load management (ACLM) receivers on more than 47,500 single family homes in 1994, the potential peak demand reduction had grown to 47 MW. The program was suspended 1995 so that NPC could research receiver technology that would offer more flexibility in direct load control.

NPC reported that its 1984 DSM programs provided significant energy savings in commercial lighting (11,000 MWh/yr), commercial custom incentives (16,000 MWh/yr), and residential AC replacement (3,000 MWh/yr). Demand reductions totaled 80 MW, with 47 MW attributable to residential air conditioner cycling and 26 MW to standby generators. Out of the $6.2 million DSM budget, $2.9 million was for ACLM, $1.5

million was for AC replacement, and $1.1 million for commercial lighting and custom incentives.[116]

NPC planned to further expand its DSM efforts during 1994-96, but DSM budget cuts occurred instead during this period for the same reasons they occurred at SPP (i.e., anticipation of deregulation and increased competition). According to data submitted to the federal Energy Information Administration, NPC's actual DSM budget fell to $2.5 million in 1995 and just $0.9 million in 1996.[117]

It is worth noting that NPC and Southwest Gas did cooperate in implementing some joint DSM activities in the early and mid-1990s including: low-income weatherization; seminars for realtors, and builders, architects, and engineers; school education; and a media campaign.

3. Southwest Gas Company

Southwest Gas Company (SWG) filed its first resource plan in Southern Nevada in 1991 and in Northern Nevada in 1992. In 1992, SWG began implementing two DSM programs in Southern Nevada: a commercial boiler retrofit program, and a residential weatherization program -- a joint program with NPC. In 1993 SWG and NPC also began work on a joint, fuel-neutral education program for builders, engineers, architects, and realtors. The Las Vegas Valley Water District (now Southern Nevada Water Authority, or SNWA) also assisted the utilities in developing a brochure on energy/water conservation issues, including water heater information. Through the rest of the 1990's SWG expanded its joint residential weatherization retrofit program and fuel-neutral education programs with NPC. SWGas collaboration with the SNWA included a joint Commercial Low-Flow Showerhead Program. These activities ceased in the late 1990s.

In 1996-1997, SWG began a Custom Rebate Program in Southern Nevada that focused on apartment complexes. This program ended in early 2000. SWG also implemented a low-income weatherization/conservation program, called Seniors Helping Seniors, that as a community services activity is currently funded through base rates. In 1996-1997, SWG began developing a High Efficiency Boiler Program for Northern Nevada. The program terminated in 1999. SWGas currently has no DSM programs in Northern Nevada. SWG spent a total of about $1 million on DSM programs during 1991-99.

C. Time Out: 1997- 2000

In the mid- to late-1990's, Nevada like many other states was swept up in the movement to create more competitive retail markets for electricity (generically termed "electric deregulation"). Electric restructuring legislation passed in 1999.[118] The PUCN

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[116] NPC Refiled 1994 Resource Plan, April 1996, Status Report, Volume 1.

[117] *U.S. Electric Utility Demand-Side Management 1996*. DOE/EIA-0589(96). Washington, DC: Energy Information Administration, U.S. Department of Energy.

[118] SB 438, 70th Legislative Session.

was responsible under the law for developing regulations to implement electric restructuring for Nevada Power Company and Sierra Pacific Power Company.[119]

As part of those regulatory determinations, the PUCN concluded that DSM programs were competitive and, therefore, were deregulated. Deregulating these programs meant the utility revenues derived from ratepayers were no longer available to fund such efforts. Sierra Pacific Resources (the holding company for both Nevada Power and Sierra Pacific Power at this time) decided to spin off its DSM programs into an unregulated subsidiary call “e-three”. That entity was solely funded outside of the revenues of its subsidiary utilities, Nevada Power and Sierra Pacific. As a result of this PUCN ruling, NPC and SPP halted ratepayer-funded DSM efforts in 1997.

D. Rebirth: 2001 to Current

In the spring of 2001 during the Western Electricity Crisis, electric restructuring was repealed in Nevada.[120] This motivated the PUCN and utilities to reinstitute IRP and customer-funded DSM programs. In the early spring of 2001, NPC also anticipated power supply shortages for the upcoming summer. In response, NPC formed a new department to launch its “Take Control” energy-efficiency effort. This effort was intended to educate customers on the efficient use of electricity and to stimulate immediate energy and peak load reduction. But DSM program scope and funding was relatively limited, about $2 million per year as of 2001 and $3 million in 2002.[121]

When it filed its Integrated Resource Plan (IRP) in 2000 and reinstituted limited DSM programs, the utilities also indicated that they would evaluate a wider range of DSM options. Other parties to the IRP proceeding suggested that potential DSM programs should be systematically examined. The PUCN agreed, which led to the formation of the DSM Collaborative in late 2001 as an adjunct to the IRP process. Members of the DSM collaborative included the utilities, staff of the demand growth. Some states or regions adopted resource planning rules that treated end-use efficiency improvements as a serious energy resource. Also, PUCN, the Attorney General’s Bureau of Consumer Protection (BCP), the public interest non-profit Land and Water Fund of the Rockies[122], the Southwest Energy Efficiency Project (SWEEP), Washoe County Legal Services, and other industry and higher education representatives.

The collaborative worked on DSM program design and analysis for about nine months, leading to a set of programs that passed the Total Resource Cost test and were supported by all members of the collaborative. The package of programs, with an estimated budget of $11.2 million per year ($9.2 million for NP, $2.0 million for SPP), was proposed to the PUCN via a stipulation from all the parties to the collaborative. This proposal was approved by the PUCN in October 2002. The utilities then worked on

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[119] Independent of, but coincident with the passage of the 1999 Nevada restructuring statute, Nevada Power and Sierra Pacific Power merged under one parent company, Sierra Pacific Resources in July of 1999.
[120] AB 369, 71st Legislative Session. Large Customers over 1 MWe were still provided the opportunity to acquire electricity through direct retail access. See AB 661, 71st Legislative Session.
[121] PUCN Docket No. 01-7016
[122] The Land and Water Fund of the Rockies has changed its name to Western Resource Advocates.

detailed program design, put out RFPs for contractors, and selected contractors. The new programs were launched in April 2003. The approved set of DSM programs included:

- High efficiency residential appliance and lighting incentives and promotion;
- Air conditioner load management controls;
- Second refrigerator collection and recycling;
- Commercial and industrial incentives;
- Support for low-income weatherization efforts.

These programs have been relatively successful, exceeding initial projections of first year energy savings and peak load reduction for the programs as a whole.[123] Some adjustments in program design and budget were made, and a few new DSM programs were developed and proposed in mid-2004.[124] Attachments 2 and 3 provide the DSM program results for the first year of activity.

It should be noted that while the amount of DSM funding for the two utilities combined (around $11 million per year) is close to the level in 1993-94 in nominal dollars, it is now a much smaller fraction of revenues due to load growth, energy price increases, and inflation over the past decade. For the two utilities combined, current DSM program funding is equivalent to about 0.4% of revenues, compared to about 1.0% of revenues in 1994 (see Attachment 1).

E. Nevada Regulatory Policy

Over the course of Nevada's experience with utility energy efficiency programs, there were and remain today three crucial regulatory policies that significantly effect the type and amount of DSM deemed cost-effective and implemented. These regulatory policies are: cost-effectiveness tests, avoided costs used to value the benefits of demand-side resources, and utility and shareholder incentives for energy efficiency.

1. Energy Efficiency Cost-Effectiveness Tests: Minimize Total Bills or Electricity Rates?

Energy efficiency cost effectiveness tests compare program costs to program benefits, with benefits quantified as the utility's seasonal and time-differentiated capacity and energy avoided costs, from four perspectives: Total Resource Cost (TRC), Utility Cost (UC), Participant Cost (PC) and Non-Participant Cost (NPC). The then-seminal and still relevant California "Standard Practice Manual" offers the following definition of each test:[125]

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[123] B. Balzar, H. Geller, and J. Wellinghoff, "The Rebirth of Utility DSM Programs in Nevada." *Proceedings of the 2004 ACEEE Summer Study on Energy Efficiency in Buildings.* Pacific Grove, CA, August 2004.
[124] Reference SPP 2004 Resource Plan.
[125] CA PUC and CA Energy Commission, "Standard Practice Manual: Economic Analysis of DSM Programs", December 1987.

- The TRC test measures the net costs of energy efficiency programs as a resource option based on the total costs of the program, including both the participants' and the utility's costs.

- The UC test measures the net costs of energy efficiency programs as a resource option based on the costs incurred by the utility (including incentive costs) and excluding any net costs incurred by the participant. The benefits are similar to the TRC benefits. Costs are more narrowly defined.

- The PC test is the measure of the quantifiable benefits and costs due to participation in a program. Since many customers do not base their decision to participate in a program entirely on quantifiable variables, this test cannot be a complete measure of the benefits and costs of a program to a customer.

- The RIM or ratepayer impact measure test (also known as the nonparticipant cost test) what happens to customer rates due to changes in utility revenues, operating costs, and sales, as a result of the program.

Per unit rates will go down if:
  - the increase in utility revenues is greater than the increase in utility costs; or
  - the decrease in utility revenues is less than the decrease in utility costs.

Conversely, rates will go up if:
  - the increase in utility revenues is less than the increase in utility costs; or
  - the decrease in utility revenues is greater than the decrease in utility costs.

The PUCN early on tried to direct the utilities away from using the RIM or nonparticipant cost test to screen energy efficiency programs.[126] The Commission went as far as detailing a "Nine-Step" cost-effectiveness evaluation process that used the TRC and UC tests to compare energy efficiency programs against equivalent supply-side resources (economic efficiency), with the RIM and PC tests used to develop a balanced portfolio of efficiency programs that maximized participation across all customer classes while minimizing rate impact to potential non-participating customers (distributional effects).

This policy has not been addressed by the PUCN in any of its IRP Opinion and Orders since the repeal of restructuring in Nevada in 2001. The Commission's current IRP regulation as revised in Docket 02-530 and adopted on April 28, 2004, is silent on the matter of cost-effectiveness tests.

2. Avoided Costs

In analyzing possible new power plants as part of their resource plans, NPC and SPP consider the facilities' fixed or capacity (capital investment) costs along with their

[126] PUCN Docket 86-701 O&O SPP 1986 Resource Plan, Findings and Conclusions.

variable or energy (fuel) costs.[127] Prior to the deregulation period, Nevada's resource planning regulation required NPC and SPP to evaluate DSM resources in the same manner as new power plants, with the benefits of DSM programs valued based on avoided energy supply costs. But the utilities generally "mixed & matched" the lower-cost fixed capacity costs of oil/gas peaking facilities with the lower energy costs of the coal/gas baseload/intermediate facilities. This created a lower cost-effectiveness standard for demand-side relative to supply-side resources. And even today, the utilities are not including avoided T&D investment costs in the avoided costs used to determine the cost effectiveness of DSM programs.[128]

In the 1980s and 1990s, the PUCN directed the utilities to use fully-weighted supply side costs for quantifying the benefit of capacity and energy avoided or saved through energy efficiency. However, NPC and SPP did not generally comply. The Commission's current IRP regulation as revised in Docket 02-530 and adopted on April 28, 2004, is silent on the matter of avoided costs for evaluating DSM resources.

Attachment 4 provides the avoided costs used in the cost-effectiveness assessment of DSM resources from SPP's 2004 IRP. The company also considered cost effectiveness using a second set of avoided costs including avoided transmission and distribution costs, offered by the BCP, SWEEP, and the Land and Water Fund of the Rockies.

3. Utility and Shareholder Incentives for Energy Efficiency

Starting in the late 1980s, policymakers, stakeholders, and utilities discussed and debated in various forums the reconciliation of the generally recognized conflict of financial interest between ratepayers and shareholders over essentially minimizing required utility revenues through efficiency. By 1994, 25 states and the District of Columbia had fully or partially removed the financial disincentives that utilities face when they implement aggressive and effective DSM programs.[129]

In an effort to align customer and utility shareholder interests with respect to DSM programs, the PUCN instituted a series of enhanced cost recovery and financial incentive mechanisms for utility energy efficiency and load management expenditures. What started out in 1988 as balancing account recovery for DSM expenditures was subsequently modified in 1993 to allow capitalization of DSM expenses. The PUCN decided to allow utilities to earn their ordinary rate of return plus 5% for full-scale DSM programs (beyond the pilot phase). In 2004, this policy was modified again so that utilities could earn their allowed rate of return plus 5% on all DSM programs (pilot and

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[127] At the time, new generation was often grouped in two general cost categories:

- Gas/oil peaking power plants: relatively lower facility/capacity cost & higher fuel/energy cost; and:
- Coal/gas baseload/intermediate power plants: relatively higher facility/capacity cost & lower fuel/energy cost.

[128] Regulatory requirement, see current IRP regulation as revised in Docket 02-530 and adopted on April 28, 2004, Section 65 (3)(b).

[129] Sioshansi, F.P. 1994. "Restraining Energy Demand: The Stick, the carrot, or the market?" *Energy Policy 22* (5):378-392.

full-scale).[130] This policy has increased the willingness of the utilities to implement meaningful DSM programs

III. Utility Rate Design and Pricing Mechanisms and Regulatory Policy

Changing electricity prices to more closely reflect production costs can have a significant impact on the consumption of electricity. Because of the unique characteristics of producing electricity, its *marginal* cost is higher than its *average* cost during many months of the year and hours of the day. Utilities can give consumers better price signals, reduce their peak load, and achieve a better load factor by adopting time-of-use rates (TOU) rates.[131]

The 1978 Public Utility Regulatory Policy Act (PURPA) required state regulators to consider (in part) innovative rate design principles (such as seasonal and time-differentiated tariffs) to moderate costly electricity demand. PURPA also required state regulators to consider the concepts of avoided or marginal costs in the design of rates. In 1982, the Nevada Commission issued General Order 33, adopting the PURPA rate design standards supporting time-of-use, seasonal, and interruptible rates.[132] The Commission and the utilities generally tried to accommodate the PURPA rate design standards into the IRP and DSM process, with only a moderate level of success.

Seasonally differentiated time of use (TOU) rates and interruptible tariffs have been the status quo for medium and large commercial customers and all industrial customers for both utilities for many years . Customers on NPC's residential air conditioning cycling program (1979-1995; 2001- current) are served by an interruptible tariff that provides the utility the right to interrupt electric service to the central AC unit not more than 12 minutes per half-hour during system peak load conditions from June 1 through September 30. The customer receives a credit of $2.30 per kW of connected AC capacity or $15.00 per month, whichever is greater.

Both utilities offer interruptible water pumping tariffs. NPC has three schedules depending on customer load. SPP has had an interruptible tariff for irrigation service that is about 50% than the firm service irrigation rate ($0.059 versus $0.114 per kwh) for many years.

From 1997 to 2001, NPC and SPP offered an "Optional Conservation Service" (OCS) voluntary curtailment tariff to customers with curtailable load of in excess of 500 kW. Participating customers were paid a "Market Credit" based on verified curtailed (hourly) demand multiplied by 50% of the short term market price as determined by the

[130] Reference current IRP regulation as revised in Docket 02-530 and adopted on April 28, 2004; Section 39.
[131] For instance, Oak Ridge National Laboratory (ORNL) *Financial Comparison of TOU Pricing with Technical DSM Programs and Generating Plants as Electric-Utility Resource Options*, Lawrence Hill, April 1994.
[132] Docket 2357, Opinion and Order, July 16, 1982.

Mead/Marketplace on peak index (Southern Nevada)[133], and the California-Oregon Border on peak index (COB) (Northern Nevada).

During this time, SPP also had Shared Savings Electric (Schedule SSE) applicable to customers installing energy savings equipment financed by SPP. Customers are charged according to the length of the agreement and the utility's installation and financing costs. University of Nevada, Reno, is the only active contract, but the tariff is still in place.

Residential rates have remained average price, with no seasonal or daily price differentiation, except for the current NPC residential single family, multifamily, and large residential TOU tariffs begun in 2003.[134] In March 2004, the PUCN approved NPC's proposed large single family residential service ("LRS") tariff. In creating the new service class, over 400 customers were removed from the existing SF residential class. The LRS class requires a three-phase transformer and meter while the RS class only a single-phase meter. In addition, the large residential group has a higher annual load factor and lower on-peak factor (and lower coincidence with peak) than the class from which they came. The result is higher customer and facilities costs but lower overall cost in comparison to the remaining single-family residential class.[135]

The NPC TOU program has three tiers: summer on-peak from 1 pm to 7pm, June through September, summer off-peak during all other times during the summer, and winter all other. The SPP TOU program has two tiers: winter/summer on peak from October-May from 5 pm to 10 pm, and June-September 10 am to 10 pm; and winter/summer off peak all other months and hours.

Tables B-1 and B-2 show the current rates for NPC and SPP residential TOU rates with the residential non-time differentiated rates for comparison.

Table B-1 – NPC Residential Average and TOU Rates

	Customer Charge	Summer On Peak	Summer Off Peak	Winter All Other	Average Rates
SF	$6.00				$0.09306
LRS	$50.00				$0.08707
SF-TOU	$7.30	$0.16573	$0.07160	$0.07682	
MF-TOU	$7.30	$0.16519	$0.07567	$0.07982	
LRS-TOU	$50.20	$0.16620	$0.07182	$0.07714	

[133] If the curtailed load is 10 MW or greater, then the market price was multiplied by 75%.
[134] In Docket No. 01-10001, NPC GRC, the PUCN rejected the utility's proposed TOU rates for residential and small commercial customers.
[135] Docket 03-10001, Opinion and Order, March 24, 2004. The PUCN ordered the creation of the LRS in Docket No. 01-10001.

Table B-2 – SPP Residential and Average TOU Rates				
	Customer Charge	Winter/Summer On Peak	Winter/Summer Off Peak	Average Rates
D-1	$4.00			$0.11018
DM-1	$3.00			$0.10840
OD-1-TOU	$5.00	$0.13820	$0.10146	
MF-TOU	$4.45	$0.12799	$0.09577	

IV. Building Codes and Standards

A. Building Energy Codes

Nevada has a mandatory state-wide energy code consisting of modified versions of the *1986 Model Energy Code* (MEC) for both new residential and commercial buildings. As of 2004, State-owned facilities must comply with the 2001 edition of ASHRAE 90.1. In addition, many local jurisdictions, including most where substantial numbers of new homes are being built, have adopted more recent versions of the MEC. The 1992 version of MEC has been adopted in the greater Las Vegas area. The 1995 version of MEC has been adopted in Reno, Washoe County, Carson City and the City of Sparks. Table B-3 gives the current state of code adoption as of the summer of 2004.

Table B-3 – Energy Code Adoption in Nevada, July 2004

Jurisdiction/Area	Residential Code	Commercial Code
State Buildings		ASHRAE 90.1 1999
Clark County	MEC 1992	MEC 1986
Las Vegas	MEC 1992	MEC 1986
North Las Vegas	MEC 1992	MEC 1986
Henderson	MEC 1992	MEC 1986
Mesquite	MEC 1992	MEC 1986
Boulder City	MEC 1995	MEC 1986
Reno/Sparks	MEC 1995	MEC 1986
Carson City	MEC 1995	MEC 1992
Lyon County	MEC 1995	MEC 1986
Washoe County	MEC 1995	
Balance of State	MEC 1986	MEC 1986

In 2002 the State Public Works Board adopted the American Society of Heating, Refrigeration and Air Conditioning Engineers, Inc. (ASHRAE) latest energy code for commercial buildings, ASHRAE/IESNA 90.1-1999. The adoption of this code ensures at least moderate levels of energy efficiency in the design and construction of new state buildings. In addition, the Public Works Board also requires, prior to the construction of all buildings of more than 20,000 square feet, a detailed analysis of additional measures that would conserve energy.

Only the state legislature can authorize changes in state-wide minimum standards for building energy efficiency. The last time they authorized changes was in 1985, resulting in the state's adoption of the 1986 MEC (McNeil 2002). An attempt was made to update these minimum standards in 1995, but the legislation died in committee.

The state legislature allows local jurisdictions to adopt more stringent energy codes, which has occurred as noted above. But many local jurisdictions now have outdated energy codes, including cities and counties in the metropolitan Las Vegas area. However, the City of Reno, Washoe County, and some nearby jurisdictions are planning to adopt the 2003 edition of the International Energy Conservation Code (IECC) in the near future. Enforcement of the new code is expected to start in January 2005 assuming code adoption occurs later this year. In addition, it is reported that Clark County is interested in adopting the IECC.[136] The IECC includes the latest residential and commercial model energy codes.

The NSOE completed a study in June 2003 on degree of code compliance at plan check and as-built stages, relative to a variety of different energy code editions in effect and/or under consideration for adoption. The NSOE is communicating these results to building departments as well as to the building industry in order to support objective information exchange as to the costs and benefits of of upgrading local or statewide energy codes to the 2003 IECC.

B. Other New Homes Energy Efficiency Efforts

There are very substantial above-code building efficiency promotion efforts in Nevada co-sponsored by the Energy Rated Homes organization, the U.S. DOE Building America Program, Environments for Living, the U.S. EPA's ENERGY STAR homes Program, the Nevada State Energy Office, and Nevada's utilities. Much of the focus is on promoting construction and sales of ENERGY STAR new homes. Only a few large builders in the Las Vegas area were involved in the ENERGY STAR program until a push was made to add others in 2002. At least 14 new builders, lenders, real estate agents, and others jumped on the Energy Star bandwagon The expanded partnership launched a web page (www.nevadaenergystarhomes.com) to further promote their support for Energy Star (or better) new homes.

As of July 2004, 47 builders were official ENERGY STAR partners in Nevada, (including 10 new partners in 2003, and 8 in 2004). At least 10 builders, including some larger builders, are only producing ENERGY STAR homes. Notably, 5 of the 18 new partners in 2003-04 are based in Northern Nevada, a portion of the state where ENERGY

[136] Personal communication with Dave McNeil, Nevada State Energy Office, Carson City, NV, June 2004.

STAR efforts were lagging previously. The primary electric utilities in Nevada, NPC and SPP, are also training builders and promoting the construction of more efficient new homes.

In the last 12 months (mid-2003 to mid-2004), over 10,000 ENERGY STAR new homes were built in Nevada. The estimated market share for ENERGY STAR homes in the Las Vegas metro area is around 50% in 2003-04, up from about 25% in 2002.[137] In addition, some builders are constructing new homes that use 10-20% less energy for space heating and cooling than those just meeting the ENERGY STAR threshold. The Nevada ENERGY STAR homes program received an award at the national ENERGY STAR awards ceremony in March 2004.

This growth in ENERGY STAR homes has been paralleled by growth in home energy ratings. There are 10 rating companies active in Nevada that have rated about 35,000 homes, with nearly one-half, or about 17,000 homes rated in the last 12 months. Builders' Choice is a Las Vegas-based rating company approaching 8,000 ratings since 1998. The company observes that six years ago only 3% of new buildings were rated, three years ago it was 15 to 17%, and now it's about 50%.

V. State Government Energy Efficiency Efforts[138]

The predecessor of the Nevada State Office of Energy (NSOE), the Nevada Department of Energy (NDOE), was established in 1978. Political support for Nevada's energy office began to languish in the 1980's, with the NDOE eliminated in 1983 and the agency's federal energy programs transferred to the Nevada Office of Community Services (NOCS). Governor Miller's state government reorganization in 1993 included dissolving the NOCS and transferring its energy programs to the Department of Business and Industry, but without formal recognition as a division or office of the department in state statutes.

A. Improving Energy Efficiency in Public Buildings

In June of 2001, Governor Guinn issued an Energy Conservation Plan for State Government. The Plan directs state agencies to perform energy audits, incorporates energy efficiency guidelines for all new buildings, and requires agencies to purchase Energy Star-labeled products. It also directs agencies to perform conservation planning and reporting.

NSOE has been working with the Energy Service Company (ESCO) industry to promote the use of energy savings performance contracts to finance and implement

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[137] Personal communication with Dave McNeil, Nevada State Energy Office, Carson City, NV, July 2004.
[138] NSOE/Office of the Governor, *The Status of Energy in Nevada: 2003 Nevada Energy Status Report*, January 30, 2003; updated.

energy savings projects in state and other public buildings since 1997. But prior to 2003, state agencies found it very difficult to enter into performance contracts with ESCOs due to certain state procurement rules.

In 2003, the Nevada legislature passed AB 398 which is intended to remove these barriers and facilitate use of performance contracting for implementation of energy efficiency projects by both state and local governments. It enables agencies to enter into performance contract with qualified ESCOs and pay back the ESCO over an extended period using a portion of the energy bill savings. As of June 2004, the State Public Works Board through a competitive process has selected an ESCO for an efficiency retrofit project at Western Nevada Community College (WNCC). Also, proposals have been received by the State Public Works Board for retrofits of other state government facilities. In addition, the Nevada Department of Corrections is attempting to contract with ESCOs for retrofits of a number of correctional facilities.

The NSOE has worked with the Clark County School District (CCSD), headquartered in Las Vegas, to form an energy task force. This task force has guided the CCSD in design and implementation of school scheduling changes and other operational changes to save energy. These actions resulted in a total savings of approximately $6.7 million over a three-year period, with $4 million of savings in 2002-03 alone. An "Energy Smart Schools In Action" conference held in 2003 led to at least two of the 11 attending school districts implementing energy performance contract projects to retrofit school buildings.

B. NSOE Residential Energy Efficiency Efforts

In 2001, Nevada Legislature created a special revenue fund – The Nevada Fund for Energy Assistance and Conservation, to assist eligible Nevadans in maintaining essential heating and cooling in their homes. The fund augments the existing federal Low-Income Home Energy Assistance (LIHEA), and Weatherization Assistance (WAP) Programs with money received through the new state Universal Energy Charge (UEC) to provide energy assistance and energy efficiency services to low-income households.

The UEC is collected through an assessment of $0.00039 per kWh sold. This generates $11+ million per year. The UEC monies are by statute allocated 75% to energy bill assistance and 25% to home weatherization. To date, the UEC weatherization funds have always been fully used, but the energy assistance fund is running a surplus of several million dollars.

The NSOE implements a number of other programs aimed at improving residential building energy efficiency in the state. These include assistance to the state's low-income weatherization program, funding of home energy rater training and certification, awards for excellence in new home construction, energy code training for local building officials and home builders, and builder training in advance home design and construction techniques. The details of these specific programs are beyond the scope of this energy efficiency policy review.

C. NSOE Commercial and Industrial Energy Efficiency Efforts

Like NSOE's residential efficiency promotion efforts, the office has pursued a multi-faceted approach to improving the energy efficiency of commercial buildings and industrial facilities. Efforts for the commercial sector include activities implemented through Nevada's *Rebuild America* program, building occupant energy education, industry stakeholder forums, support for energy efficiency efforts by school districts, and building energy auditing and retrofitting. Efforts for the industrial sector include an *Industries of the Future* program emphasizing the mining industry and energy management assistance for small businesses. The details of these specific programs are beyond the scope of this energy efficiency policy review.

Attachment 1: Sierra Pacific Power Company: Energy Efficiency Savings and Budgets

	1984	1988	1990	1991	1992	1993	1994	**1996	97-00	2001	2003
Efficiency MW	0		2.5	4.4	6.7	11.0	11.0	3.0	*no DSM*	4.3	1.83
Standby Generation		2	2					30.0			
Efficiency MWH	0	n/a	25,700	29,300	31,700	26,300	26,500				10,200
						projected					
Efficiency Budget (millions)	$850k	$2.2	$2.4	$2.1	$4.6	$5.3	$6.0			$2.1	$2.0
						$1.5 addtl gas DSM					
Utility System											
Peak Demand (MW)	704	908	989	961	1,063	1,074	1,130				
DSM % Total		0.2%		0.5%	0.6%	1.1%	1.0%			0.3%	0.1%
Annual Energy (GWH)	4,019	4,674	5,793	5,929	6,285	6,514	6,859	7,278		8,729	8,901
DSM % Total	0.0%	n/a	0.4%	0.5%	0.5%	0.4%	0.4%				0.1%
Total Revenues (millions)	$285	$327	$405	$382	$400	$472	$522			$1,400	$868
DSM % Total	0.3%	0.7%	0.6%	0.6%	1.2%	*1.1%	1.2%			0.15%	0.2%

*Does not include Westpac Gas $1.5 DSM or Westpac Gas revenues, 1993.

Nevada Power Company: Energy Efficiency Savings and Budgets

	1984	1986	1988	1991	1994	1995	1996	97-00	2001	2002	2003
Efficiency MW	52				80	94	112	*no DSM*	5	5.3	14.2
AC Cycling	31	27			47	75	83		1		
Standby Generation					26	19	29				
Efficiency MWH	n/a				37,000	96,000	148,000		8,000	16,500	24,580
						projected					
Efficiency Budget (millions)	$2.0			$1.6	$6.5	$2.5	$0.9		$3.0	$3.4	$9.2
						actual					
Utility System											
Peak Demand (MW)	1,537	1,883	2,248	2,373	2,920	3,066	3,332		4,412	4,617	4,808
DSM % Total		1.4%			2.7%	3.1%	3.4%		0.1%	0.1%	0.3%
Annual Energy (GWH)	6,648	8,319	9,890	10,159	12,305	12,677	13,649		16,799	17,197	17,959
DSM % Total					0.3%	0.8%	1.1%		0.05%	0.1%	0.14%
Total Revenues (millions)	318	383	409	538	764	749	805		$3,025	$1,901	$1,756
DSM % Total	0.6%			0.3%	0.9%	0.3%	0.1%		0.1%	0.2%	0.5%

Attachment 2

2003 DSM Program Results, Nevada Power Company

Program	Annual Budget (Million $)	No. of Units	Electricity Savings (GWh/yr)	Peak Demand Reduction (MW)
Low-income & Senior ACLM	1.10	4,447	0.16	5.3
Residential ACLM	1.40	3,464	0.13	4.2
High Eff. CAC with TOU rates	1.64	376	0.52	0.32
AC Tune-ups with TOU rates	0.625	1,033	0.41	0.26
AC Duct Seal with TOU rates	0.475	130	0.12	0.08
Second Refrigerator Collection	0.51	3,387	5.23	0.90
Residential CFL	0.20	32,649	1.85	--
Energy Star Appliances	0.55	4,240	1.42	0.13
Vending Miser	0.15	700	0.84	--
C & I Incentives	0.80	158	13.90	2.8
Low-income weatherization support	0.87	178	--	--
New homes	0.10	--	--	--
Other	0.78	--	--	0.17
Total	9.20	--	24.58	14.16

Source: Balzar, Geller and Wellinghoff, Reference 7.

Attachment 3

2003 DSM Program Results, Sierra Pacific Power Company

Program	Budget (Million $)	No. of Units	Electricity Savings (GWh/yr)	Peak Demand Reduction (MW)
Irrigation pump and motor education and rebates	0.16	8	0.24	0.26
Second Refrigerator Collection	0.19	1,591	2.44	0.38
Residential CFL	0.03	8,133	0.44	--
Energy Star Appliances	0.315	2,032	0.76	0.06
Vending Miser	0.04	36	0.04	--
C & I Incentives	0.33	86	6.26	1.12
Low-income weatherization support	0.45	117	--	--
New homes	0.10	--	--	--
Other	0.39	--	--	--
Total	2.00	--	10.18	1.83

Source: Balzar, Geller and Wellinghoff, Reference 7.

Attachment 4

SPP Avoided Costs ($/MWhr)

Season		2002	2003	2004	2005
	Peak Time				
Summer					
	On-Peak	56.30	38.67	42.98	43.47
	Off-Peak	27.11	27.18	30.59	31.37
	All Hours	44.09	33.88	37.88	38.57
Winter					
	On-Peak	36.38	35.90	35.30	38.50
	Off-Peak	23.19	28.65	28.04	29.37
	All Hours	30.83	32.86	32.23	34.75
Annual					
	Annual All Hrs	35.51	33.22	34.21	36.06

Source: 2004 Sierra Pacific IRP filing.