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June 22, 2006

Docket Control
Arizona Corporation Commission
1200 West Washington Street
Phoenix, AZ 85007-2996

Re: **Docket No. G-01551A-04-0876; Decision No. 68487**

Pursuant to Commission Decision No. 68487, dated February 23, 2006, and issued in Docket No. G-01551A-04-0876, Southwest Gas Corporation (Southwest) is required to docket within 120 days of the Decision, detailed descriptions of the DSM programs that would be subject to Commission approval. Southwest herewith tenders for filing an original and thirteen (13) copies of Southwest's "2006 Arizona Demand Side Management Program Plan".

If there are any questions regarding this matter, please contact me at (702) 876-7163.

Respectfully submitted,

Debra S. Jacobson
Director, Government & State Regulatory Affairs

- c Ernest Johnson, ACC
- Barbara Keene, ACC
- Jerry Anderson, ACC
- Brian Bozzo, ACC
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SOUTHWEST GAS CORPORATION

Docket No. _____

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**2006
ARIZONA
DEMAND SIDE
MANAGEMENT
PROGRAM PLAN**

In Compliance with Decision No. 68487
in Docket No. G-01551A-04-0876

June 26, 2006

**DEMAND SIDE MANAGEMENT
PROGRAM PLAN SUMMARY**

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INTRODUCTION

On February 23, 2006, the Arizona Corporation Commission (ACC or Commission) issued Decision No. 68487 in the Southwest Gas Corporation (Southwest or Company) general rate case. As part of the Decision, Southwest was granted an increase in the level of Demand Side Management (DSM) funding to \$4,385,000 annually. The Commission also approved the Company's proposal that its DSM programs be directed at all customer classes and directed Southwest to work with a DSM collaborative group (Collaborative) during the process of program development. Southwest was required to file detailed descriptions of its proposed DSM programs with the ACC within 120 days of the date of this Decision. The programs would then be subject to ACC Staff review and Commission approval.

In compliance with the Decision, Southwest met and solicited input and comments from members of the Collaborative. Members of the Collaborative included the ACC Staff, the Residential Utility Consumer Office (RUCO), the Department of Commerce Energy Office (AEO or Energy Office), the Southwest Energy Efficiency Project (SWEEP), and Western Resource Advocates (WRA). Other interested parties were also invited to attend the Collaborative meetings. Southwest held three meetings and numerous informal communications with the Collaborative during the DSM program planning phase.

This DSM Program Plan Summary provides an overview of the DSM programs that Southwest proposes to implement to improve energy efficiency in its Arizona service areas.

PROGRAM DESCRIPTIONS

The program portfolio includes a mix of programs designed to serve and benefit Southwest's major customer classes. Specific customer segments served include low-income residential customers, residential new construction, multi-family new construction, existing residential appliance consumers, commercial customers, and large/industrial customers.

This section includes a brief description of each proposed DSM program. Detailed program descriptions are provided in subsequent sections and include information on program concepts, target markets, baseline conditions, customer eligibility, program objectives, products and services provided, delivery strategy, program administration, communication, implementation plans, measurement and evaluation plans, program budgets, estimated energy savings, estimated environmental benefits, and cost-effectiveness. The proposed DSM programs include:

Residential

Low-Income Energy Conservation
ENERGY STAR® Home
Multi-Family New Construction
Consumer Products

Non-Residential

Commercial Equipment
Distributed Generation
Technology Information Center

Programs in the portfolio are similar to the preliminary programs that were proposed in Southwest's most recent general rate case, although some minor changes were made as a result of the DSM Collaborative program development process. The changes are as follows:

- Change the name of the ENERGY STAR® Home Certification program to ENERGY STAR® Home.
Reason: Simplicity and memorability purposes.
- Increase the funding of ENERGY STAR® Home from \$250,000 to \$450,000.
Reason: Expand the availability of this program to additional areas within Arizona.

- Merge the Residential Energy Conservation program with the ENERGY STAR® Appliances program, and rename the combined program as Consumer Products.
Reason: Improve cost-effectiveness by combining these two similar retail programs.
- Decrease the funding of the Consumer Products from \$1,000,000 to \$800,000.
Reason: By combining the Residential Energy Conservation and ENERGY STAR® Appliances program, economies of scale allowed \$200,000 to be reallocated to the ENERGY STAR® Home program.
- Reformulate the Efficient Commercial Building Design program.
Reason: Economies of scale and the ability to serve both new and existing commercial customers with one program.
- Combine the previous Efficient Commercial Building Design program and the Food Service Equipment program, and rename the combined program as Commercial Equipment.
Reason: Economies of scale and the ability to serve both new and existing commercial customers with one program.

Residential Programs

Low-Income Energy Conservation

The Low-Income Energy Conservation (LIEC) program is designed for low-income customers who require weatherization for their homes and/or rate assistance for their utility bills. The program includes both home weatherization and consumer education, in order to cost-effectively reduce energy usage in income-qualified residences. The LIEC program is a continuing DSM program that Southwest has been conducting since 1998. As a result of the recent general rate case Decision, funding was increased by \$100,000, and a bill assistance component of \$50,000 was added to this program. The LIEC program is administered by Southwest in conjunction with the Arizona Department of Commerce Energy Office (AEO), community action agencies (agencies), and other Arizona utilities. A detailed program description is provided in Section 2.

ENERGY STAR® Home

ENERGY STAR® Home (EStar) is an ongoing single-family new construction program which Southwest began conducting in 1996, as the Energy Advantage Plus program. The level of energy performance in the marketplace has increased during the life of the program, so that it is now confined solely to certification at the ENERGY STAR® level and above. EStar is designed to increase residential

energy efficiency through improved thermal shell construction, upgraded mechanical systems, and field verification. The program involves the recruitment of builders into the program, review of their home plans, consultation on effective construction techniques required to meet the guidelines, and inspection and testing of the homes for compliance. A detailed program description is provided in Section 3.

Multi-Family New Construction

This program is targeted at apartment builders to improve the installation of energy-efficient measures in multi-family units. Financial incentives will be provided directly to multi-family apartment builders to drive program participation and the resulting gain in energy efficiency. The initial emphasis will be in the Phoenix area where there is more apartment growth, and then in both Phoenix and Tucson during the second and third years of the program. The ultimate beneficiaries of the program will be the renters, who will benefit from lower utility costs throughout their rental life of the unit. These consumers have typically not been beneficiaries of high-efficiency DSM programs in the past, since they are difficult to reach and are not inclined, nor usually able, to make capital investments related to energy efficiency in a rental situation. Southwest will also work with the AEO to ensure that a portion of the participating Phoenix and Tucson builders in the program are serving the senior and low-income customer markets. A detailed program description is provided in Section 4.

Consumer Products

This program is aimed at residential consumers in the Company's Arizona service area who purchase either new or replacement high-efficiency water heaters, programmable thermostats, and clothes washer/dryer sets at retail stores. The goal is to increase the awareness and purchase of more efficient equipment. A variety of communications, such as bill inserts, newsletters, and website announcements, will inform consumers about the rebates that are available for higher efficiency appliance purchases. Point-of-purchase informational materials and educational events will also be available at retail stores. A detailed program description is provided in Section 5.

Non-Residential

Commercial Equipment

The Commercial Equipment DSM program is designed to encourage the purchase of higher efficiency water heaters, griddles, steamers, and fryers among both new and existing commercial customers. These customers could represent any establishments where such appliances are utilized, including restaurants, schools, and churches. In addition, for the first year of the program, the Company will partner with the Arizona Department of Water Resources to

provide free, high-efficiency pre-rinse water spray valves. These latter devices become mandatory in Arizona in 2008, thereby eliminating the need for this program measure after 2007. The commercial appliances to be included in the program use a very large amount of energy; therefore, the potential for energy savings is great. However, initial equipment cost is an obstacle. This barrier will be overcome with appropriate financial incentives, coupled with education on the benefits of greater efficiency. Program awareness will be accomplished through a variety of communication methods focused on commercial customers. A detailed program description is provided in Section 6.

Distributed Generation

This DSM program will achieve fuel savings for consumers by promoting high-efficiency electric generation, providing financial benefits during peak electrical demand periods, and potentially demonstrating the use of new natural gas technologies which are being brought to market. This program will encourage the installation of high-efficiency combined heat and power (CHP) technologies and is intended for a variety of large commercial/industrial customers, depending upon the potential application. The market potential for distributed generation and CHP is substantial and could contribute significantly to conserving energy in Arizona, as well as accruing significant societal and customer benefits. Peak-shaving technologies are also acceptable applications for this program, provided that some thermal energy is displaced during system operation. The use of new natural gas technologies, such as fuel cells and microturbines, will also be eligible to participate in this program. As with the peak-shaving technologies, the new technologies must also displace some thermal energy during system operation. A detailed program description is provided in Section 7.

Technology Information Center

The Technology Information Center program is intended primarily for industrial and transportation-eligible general service customers. The program consists of sending an e-mail newsletter containing technical information to customers, to provide advice on how to reduce energy usage and lower their utility bills, answer questions about energy-efficient technologies, and increase awareness of environmental issues. The newsletter will also provide general natural gas information of interest to large customers, but in particular will focus on specific energy savings or technology information that will help customers optimize natural gas resources. The information may be generic in nature or may apply specifically to customers in Southwest's service territory. The newsletter will also contain a link to an "Ask an Expert" hotline and an electronic research library. A detailed program description is provided in Section 8.

IMPLEMENTATION PLAN

Southwest anticipates that the proposed DSM programs will be implemented through both in-house and outsourced resources. This approach enables the Company to utilize less expensive, in-house resources whenever possible, and outsourced assistance when necessary. Southwest plans to integrate the DSM programs into a wide range of Company customer communications and outreach efforts. In all cases, Southwest will retain responsibility for program administration and reporting activities.

TIMELINE

Southwest utilized a three-year planning horizon for all of the DSM programs proposed in this filing, with a start date of 2007. Southwest anticipated that program development, review, and approval would most likely require the balance of year 2006. Actual implementation dates, however, will depend on the actual time needed for ACC Staff review and Commission approval.

It should also be noted that the three-year time frame was intended only for planning and budgeting purposes. Both Southwest and the Collaborative members recognize that the intent of DSM is to design programs of a continuing nature, so that energy savings and societal benefits will have an ongoing impact.

BUDGET

Consistent with Decision No. 68487, Southwest has prepared annual budgets for the proposed DSM programs that total \$4.385 million. The proposed funding maximizes the amount of program funds that go directly to customers through education, training, financial incentives, and technical assistance. The plan takes into account the realities of program start-up costs and the funds needed to adequately plan, develop, deliver, and evaluate the programs. After implementation, incentive levels and other program elements will be reviewed and modified as needed, in an effort to adjust to changes in the various markets and to optimize the DSM funding.

The overall budget for the programs presented in this filing is indicated in Table 1 below.

Table 1 – DSM Program Plan Budget

PROGRAM	FUNDING
Low-Income Energy Conservation	\$ 500,000
ENERGY STAR® Home	450,000
Multi-Family New Construction	1,200,000
Consumer Products	800,000
Commercial Equipment	1,000,000
Distributed Generation	400,000
Technology Information Center	35,000
TOTAL	\$ 4,385,000

COST RECOVERY

Cost recovery for the DSM programs proposed in this filing will be handled through the existing DSM Adjuster Mechanism (DSMAM), which was approved by the ACC in Docket No. U-1551-96-596 (Decision No. 60352). The DSMAM is designed to allow Southwest timely and ongoing recovery of its DSM program costs.

One recent modification to the DSMAM, however, is that the DSMAM now applies to all full-margin customer classes. In the past, the mechanism applied only to residential customers. Because the proposed DSM programs are no longer applicable only to residential customers, the Commission expanded the responsibility for payment of the surcharge to all full-margin customers (Decision No. 68487).

The projected surcharge rate for all customers is \$0.00705 per therm, which will allow for recovery of the \$4.385 million cost of conducting the DSM programs proposed in this filing.

PROGRAM COST-EFFECTIVENESS AND SOCIETAL BENEFITS

The DSM programs proposed by Southwest provide energy savings, water savings, and emissions reductions through energy-efficient products, services, and/or practices. The programs are designed to influence energy decisions by both residential and non-residential customers through a combination of education, training, financial incentives, and technical assistance. The proposed DSM program portfolio is expected to produce long-term energy savings, monetary savings, and positive environmental impacts.

Table 2 summarizes the expected total program net benefits and cost-benefit ratios over the lifetime of the equipment and measures installed. Values in the table are based on three years of program activity, from 2007 through 2009. Because the Technology Information Center program is more educational in nature, values for this program are not readily calculated.

Program net benefits are equal to the benefits less the costs. The present value of the total net benefits for the quantifiable programs in the DSM portfolio is \$111,957,838.

The cost-benefit ratio is equal to the benefits divided by the costs. Program ratios vary from 1.15 to 7.35, with a weighted average cost-benefit ratio for the portfolio of 4.52. In other words, for every dollar invested in DSM within Southwest's Arizona service area, Arizona customers will realize \$4.52 in total benefits, not counting the environmental and societal benefits, which are described in more detail below.

Table 2 – Total Program Net Benefits and Cost-Benefit Ratios, 2007-2009

PROGRAM	PRESENT VALUE BENEFITS	PRESENT VALUE COSTS	PRESENT VALUE NET BENEFITS	COST-BENEFIT RATIO
Low-Income Energy Conservation	\$ 1,297,188	\$ 1,124,283	\$ 172,905	1.15
ENERGY STAR Home	\$58,485,618	\$10,521,912	\$47,963,706	5.56
Multi-Family New Construction	\$ 7,571,560	\$ 3,495,700	\$ 4,075,860	2.17
Consumer Products	\$18,085,619	\$ 3,591,677	\$14,493,942	5.04
Commercial Equipment	\$21,881,616	\$ 2,975,334	\$18,906,282	7.35
Distributed Generation	\$30,857,254	\$ 4,512,111	\$26,345,143	6.84
Technology Information Center	n/a	n/a	n/a	n/a
TOTAL	\$138,178,855	\$26,221,017	\$111,957,838	4.52

Table 3 summarizes the expected total energy savings (kilowatt hours, kilowatts, and therms) that can be achieved over the lifetime of the equipment and measures installed. This table is based on three years of program activity, from 2007 through 2009. Although the Technology Information Center is educational in nature, and therefore not quantified in this table, it is anticipated that some energy savings will also be achieved from this program.

Overall, the portfolio of DSM programs is expected to save approximately 2.2 billion kilowatt hours, 44,233 kilowatts, and 62.2 million therms over the life of the equipment and measures, based on a three-year program time frame.

Table 3 – Total Program Energy Savings, 2007-2009

PROGRAM	KILOWATT-HOUR (KWH)	KILOWATT (KW)	THERMS
Low-Income Energy Conservation	18,451,048	450	600,210
ENERGY STAR Home	1,119,125,040	9,768	27,165,600
Multi-Family New Construction	334,839,966	5,940	(3,859,200)
Consumer Products	265,199,006	21,960	569,250
Commercial Equipment	121,160,230	4,015	15,735,690
Distributed Generation	336,186,900	2,100	22,063,200
Technology Information Center	n/a	n/a	n/a
TOTAL	2,194,962,190	44,233	62,274,750

Table 4 summarizes the expected total savings in air emissions and water over the lifetime of the equipment and measures installed. Values in the table are based on three years of program activity, from 2007 through 2009. As noted earlier, the Technology Information Center is educational in nature, and therefore not quantified in this table. However, it is anticipated that some environmental benefits will also be achieved through this program.

The environmental benefits from the proposed portfolio of DSM programs is significant. From the six quantifiable programs, a total of nearly 2.1 billion pounds of carbon dioxide emissions will be saved. In addition, the emission of 389,236 pounds of nitrous oxide and 9,730 pounds of sulfur dioxide will be avoided. As for water—a precious resource in the arid state of Arizona—a total of over 2.7 billion gallons of water will be saved (enough to meet the annual needs of over 40,000 Arizona residents).

Table 4 – Total Program Environmental Benefits, 2007-2009

PROGRAM	CARBON DIOXIDE (LBS)	NITROUS OXIDE (LBS)	SULFUR DIOXIDE (LBS)	WATER (GALLONS)
Low-Income Energy Conservation	16,919,611	3,174	79	4,299,094
ENERGY STAR Home	1,026,237,662	192,490	4,812	260,756,134
Multi-Family New Construction	307,134,080	57,609	1,440	78,039,521
Consumer Products	243,187,489	45,614	1,140	520,431,368
Commercial Equipment	173,403,202	32,525	813	1,794,059,919
Distributed Generation	308,283,387	57,824	1,446	78,331,548
Technology Information Center	n/a	n/a	n/a	n/a
TOTAL/AVERAGE	2,075,165,431	389,236	9,730	2,735,917,584

Table 5 assigns monetary values to the expected total savings in air emissions and water shown above. As before, these values represent the lifetime of the equipment and measures installed. Values in the table are based on three years of program activity, from 2007 through 2009.

Overall, the proposed portfolio of DSM programs provide major environmental value. The combined total value of the air emissions savings is almost \$35 million, while the water savings are approximately \$3.3 million. These benefits are in addition to the reported program net benefits reported in Table 1, and therefore cause the programs to be even more cost-effective than indicated.

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Table 5 – Value of Total Program Environmental Benefits, 2007-2009

PROGRAM	CARBON DIOXIDE	NITROUS OXIDE	SULFUR DIOXIDE	WATER
Low-Income Energy Conservation	\$163,845	\$41,515	\$77,494	\$5,116
ENERGY STAR Home	\$9,937,830	\$2,518,031	\$4,700,325	\$310,300
Multi-Family New Construction	\$2,974,210	\$753,601	\$1,406,721	\$92,867
Consumer Products	\$2,354,967	\$596,698	\$1,113,836	\$619,313
Commercial Equipment	\$1,679,193	\$425,471	\$794,213	\$2,134,931
Distributed Generation	\$2,985,340	\$756,421	\$1,411,985	\$93,215
Technology Information Center	n/a	n/a	n/a	n/a
TOTAL/AVERAGE	\$20,095,385	\$5,091,737	\$9,504,574	\$3,255,742

CONCLUSION

Southwest believes that the DSM programs proposed in this plan will benefit its customers, citizens in the state of Arizona, and the Arizona environment. The Company has included programs that serve all major customer classes—residential, commercial, and industrial, including some hard-to-reach and underserved segments within those classes. In addition, the proposed programs will reach customers throughout many areas within the state of Arizona.

With increased program availability and customer outreach, Southwest hopes to effect greater customer awareness and behavioral change with regard to energy efficiency. The estimated program results indicate cost-effectiveness and positive benefits for Southwest customers and Arizona in general. It is anticipated that these DSM programs will make a positive contribution in terms of saving energy resources, lowering customer utility bills, improving air quality, and conserving water.

Southwest looks forward to working with the ACC Staff during the program review period and, in turn, to Commission approval and successful DSM program implementation.

2

LOW-INCOME ENERGY CONSERVATION

LOW-INCOME ENERGY CONSERVATION

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APPENDICES

- A – Equipment and Measures
- B – Budget
- C – Historical Data
- D – Cost-Effectiveness Test Results

PROGRAM OVERVIEW

The Low-Income Energy Conservation (LIEC) program is aimed at low-income customers who require weatherization for their homes and/or emergency assistance for paying their utility bills. The program assists low-income families who lack the resources to invest in energy efficiency, and uses the most advanced technologies and testing protocols available in the housing industry.

The program includes both home weatherization and consumer education, in order to cost-effectively reduce energy usage in income-qualified residences. Weatherization provides a lasting solution by addressing the causes of high energy bills. Energy improvements, such as adding insulation to the walls and roofs, can last as long as the house stands. Furthermore, energy efficiency results can be counted on year after year.

The LIEC program is currently in its eighth year of operation. Southwest Gas Corporation (Southwest or Company), originated the program in 1998, as authorized in Decision No. 60976. The Arizona Corporation Commission (Commission or ACC) approved a two-year continuation of Southwest's LIEC program in July 1999 (Decision No. 61853). In June 2001, Southwest was granted an extension of the program through June 2004 (Decision No. 63844) at an increased funding level of \$350,000, as well as the addition of a health and safety category. The program was granted another three-year extension in June 2004 (Decision No. 67111) through June 2007.

This program is currently administered by Southwest, in conjunction with the Arizona Department of Commerce Energy Office (AEO), community action agencies (agencies), and other Arizona utilities. The AEO manages the Department of Energy's (DOE) Weatherization Assistance Program for Arizona and leverages funding from federal, state and utility programs. For the LIEC program, the AEO expands its current contracts with community agencies to include funding from Southwest.

The existing LIEC program has three main objectives: 1) promote the efficient use of energy and water; 2) partner with other funding sources to cost-effectively conserve energy and improve the health and safety of participating households; and 3) inform and encourage participants to apply for the Low Income Ratepayer Assistance (LIRA) program.

Southwest has added a new bill assistance component to the LIEC program. Rate assistance funding, totaling \$50,000, will be available for low-income customers to use in emergency situations for their natural gas bill. Southwest plans to contract with the Arizona Community Action Association (ACAA), the umbrella organization for the community action agencies throughout Arizona, to administer the bill assistance funds. Southwest explored the option of having the AEO administer the funds, but their office does not handle bill assistance funding.

Since the ACAA currently administers Arizona Public Service Company's Energy Wise low-income program, which has a bill assistance component, Southwest plans to model its bill assistance funding in a similar way. The details of the bill assistance program, such as the maximum allowed per home, eligibility requirements, administrative costs, and contracts with the agencies, will be developed in partnership with the ACAA during the upcoming weeks. Although Southwest expects the \$50,000 to be spent in full each year, any unspent balance would be allocated to the general LIEC program for weatherization. Southwest will closely monitor the bill assistance funds to ensure they are accounted for and spent appropriately.

TARGET MARKET

Southwest customers throughout the state with a household income up to 150 percent of the poverty guidelines established by the U.S. Department of Health and Human Services may qualify for assistance. Owner-occupied or rental units (with the consent of the owner) can also be weatherized.

Currently, there are approximately 30,000 customers participating in Southwest's LIRA program, which provides discounted rates for natural gas service to income-qualifying customers during the winter months. It is estimated that at least 30 percent (or 9,000) of these customers' homes are in need of weatherization assistance. Southwest expects to assist at least 300 homes per year with the increased funding of \$100,000 for weatherization, totaling an annual budget of \$450,000. Thus, the Company estimates serving approximately 25 percent of the target market within the next two calendar years. To date, Southwest has already assisted over 1,500 homes under the LIEC program since its inception.

Despite the existence of the national weatherization program since 1976, Oakridge National Laboratory (ORNL) found that only 16 percent (approximately 5.3 million) of eligible households have been served. Altogether, more than 27 million households in the United States are currently eligible for assistance. Since the program's inception in Arizona in 1977, more than 24,000 homes have been weatherized throughout the state.

ENERGY MEASURES

Eligible Measures

Allowable weatherization measures can be placed in four major categories: 1) duct repair; 2) infiltration control; 3) attic insulation; and 4) the repair or replacement of appliances which are not operational or pose a health hazard. Typical weatherization services include installing insulation, sealing and balancing ducts, tuning and repairing cooling and heating systems, and mitigating heat gain through windows, doors, and other infiltration points. Appendix A provides a full list of measures that may be completed in eligible homes.

An important component of any weatherization program is air flow through the house, which can have a powerful impact on air quality, energy expense, and comfort. As a result, pressure diagnostics are a key activity. A blower door test provides a way to quantify air flow and the resulting loss of conditioned air. It also pinpoints specific leaks. This method of air leakage testing and repair is considered essential for effective (and cost-effective) air sealing. The AEO's pressure diagnostic procedures provide agency personnel with guidance on the number of repairs that can be cost-effectively completed by climate zone.

For this filing, Southwest chose to evaluate the four measures most likely to be installed in the home utilizing Southwest funds. Those four measures are duct sealing, infiltration, attic insulation, and water heaters. Table 1 below summarizes the increased efficiency by measure.

Table 1 – LIEC Weatherization Measures Modeled for Cost-Effectiveness Testing

Measure	Existing Measure Efficiency	DSM Measure Efficiency
Duct sealing	20% leakage	6% leakage
Infiltration	.42 ACH*	.37 ACH*
Attic insulation	R-11	R-38
Water heater	.58 EF**	.62 EF

* Air changes per hour

** Energy Factor

Energy Savings

The DOE reports that, on average, weatherization reduces heating bills by 31 percent, and saves 15 percent overall on annual energy consumption. Southwest conservatively estimates that the average customer on the LIRA rate uses 365 therms of natural gas annually, and homes weatherized under the LIEC program reduce their usage by approximately 17.5 percent (or 64 therms) to 298 therms.

These findings are summarized in Table 2. A reduction in electric usage would also be expected to occur, especially for cooling.

Table 2 – Annual Energy Savings in Weatherized Homes

Measure	Energy Savings
Heating	31.0%
Natural gas consumption	17.5%
Total energy use	15.0%

IMPLEMENTATION PLAN

Program Administration

The AEO will continue to include funding from Southwest in its current contracts with agencies. Participants request assistance through the agencies, which screen respondents based on the criteria previously outlined. After participants have been selected, the agencies conduct energy audits to gather, record, and analyze data on the structures.

While in the home, agency personnel explain the measures that have been installed and offer a variety of no-cost/low-cost energy conservation tips. They inform participants who are not on the LIRA rate about the benefits of that program, and encourage them to apply. They also offer customers assistance in completing the LIRA application.

The current statewide weatherization program administered by the AEO uses some very detailed guidelines to optimize investment in energy efficiency through a systems approach. The State of Arizona is divided into six climate zones. Each of these zones has a corresponding priority list of known cost-effective weatherization materials/measures that can be installed. In cases where potentially cost-effective energy upgrades are not listed or are not approved safety measures, a computerized audit must be completed to develop a ranking of the energy upgrades, based on their savings-to-investment ratio. Diagnostic tools, such as a blower door and manometer, are used to detect and mitigate air infiltration and pressure imbalances. Crews also test heating and cooling units for carbon monoxide.

The DOE requires inspections on ten percent of the homes. The improper installation of weatherization measures can seriously reduce potential energy savings. The AEO strongly focuses on the proper installation techniques for weatherization measures. This greatly reduces the number of "call backs" and failed inspections.

The AEO invoices Southwest monthly for the weatherization projects completed during the prior month. The AEO also provides monthly statistics, including the number of customers served, the type of activities completed, and detailed activity costs by measure.

Southwest will also request monthly reports from the ACAA for the bill assistance portion of the LIEC program. These reports, categorized by agency, will list names and account numbers of the customers receiving bill assistance money, and the amount they received. Southwest will require the ACAA to allocate the funds throughout its service areas in the state, based on the demographics of each area.

Program Education and Outreach

Southwest uses various methods to communicate the LIEC program. These methods include quarterly bill inserts in English and Spanish, website promotion, sponsorship of an annual meeting with the agencies, and attendance at a variety of community events. In addition, annual reminder letters, along with supplies of LIRA applications, are sent to approximately 150 community agencies statewide. Southwest combines the educational and outreach activities for LIEC with the LIRA program. The LIEC/LIRA bill insert was recently revised to be more attractive, as requested by the Commission. In addition, the LIEC program is advertised on the websites of the AEO, the agencies, and the ACAA. Southwest plans to add information about the emergency bill assistance funds to the LIEC materials.

Training and Education

The weatherization program also enables states and local service providers who work in the homes of clients to provide educational materials on energy efficiency. The low-income sector of the public has proven difficult to reach for traditional energy programs; therefore, the personal, one-on-one education has been effective. DOE-sponsored evaluations have found that this type of education increases the savings among the weatherization clients and maintains the savings for longer periods. Weatherization providers have a convenient channel for providing energy education, since they perform work in these homes.

The AEO provides training to both field and administrative personnel of the agencies conducting the statewide program. Well-trained and experienced personnel are essential to a successful program; therefore, Southwest allocates a portion of the budget to support the AEO's ongoing training and monitoring of the LIEC program. The current program has an approved budget of \$10,000 for training. With the increased overall budget for LIEC, Southwest recommends raising the approved amount for this category to \$20,000 annually. Listed below is a sample of courses conducted.

Peer-to-Peer Training

The LIEC program leverages with the Arizona weatherization program's Peer-to-Peer Training Courses. These courses utilize the agencies that have the experience and skills needed to successfully implement the weatherization program. This knowledge is shared with other agencies throughout the state. The training consists of one-day classroom training and two to three days of field training. The crews being trained work and learn with other crew members. The peer-to-peer technical training includes Pressure Diagnostics, Health and Safety, and Applied Building Science.

Pressure Diagnostics – This section of the course provides classroom and field training on testing and repair of air leakage and pressure. The training includes the use of blower doors, manometers, smoke generators and duct air-tightness testing.

Health and Safety – This portion of the course provides classroom and field training on the testing and repair of possible safety problems. The training includes the use of blower doors and manometers.

Applied Building Science – This section of the course covers current building science theory and practical experience focused on building design, construction techniques, materials, and HVAC equipment. There is also a follow-up investigation to determine what effects these measures have on building occupants.

REM/Design® Software Training

Training is also provided to the agencies on the use of the REM/design residential analysis software. This training instructs the attendees on estimating annual heating, cooling, and water heating use, the potential savings of retrofit measures, and the cost-effectiveness of retrofit measures. The course is especially helpful for the Southwest program, because it is required to be cost-effective.

Peer-to-Peer Fiscal and Technical Procedures

The Arizona weatherization program has formed peer-to-peer working groups that allow the fiscal and technical staff from the agencies and the AEO to meet and discuss issues that arise in the program. Agencies are able to share solutions to common problems and other information.

On-line Training

The AEO's on-line training center provides outreach and education on energy-related issues. This website contains video training on a variety of building codes and building science issues.

MEASUREMENT AND EVALUATION

The contracted agencies use the AEO guidelines to determine which cost-effective measures may be installed in individual dwellings. The AEO has continued its efforts to ensure that the LIEC is a cost-effective program. At least ten percent of the weatherization projects are subject to an on-site inspection. Every project submitted for reimbursement is carefully reviewed for the accuracy of the work completed and the funding sources being charged. Southwest reports the results of this program in its semi-annual reports submitted to the Commission.

In addition, the AEO recently implemented a new data collection process by launching their weatherization program database. Agencies now enter the weatherization and client data directly into the database, thereby saving administrative time and paperwork. In addition, the database will allow for program analysis to be conducted in a timely, efficient manner. Southwest has access to this database and periodically reviews the available information.

Future Program Modifications

The Company views the LIEC program as a dynamic activity, one that would be most effective by staying focused on evolutionary changes within the building science industry. Accordingly, Southwest may suggest modifications to the LIEC program in the future. Such modifications might be the result of changes in construction practices, revised building codes, monitoring and evaluation findings, or other factors not yet considered. Southwest will submit any future program modifications to the ACC for Utilities Division Staff review and Commission approval.

BUDGET

The existing Commission-approved budget for this program is \$350,000 annually (July 1, 2004 through June 30, 2007). The program runs from July through June, as do the other federally-funded programs administered by the AEO.

The LIEC expanded budget, along with funding for bill assistance, was approved by the Commission on April 12, 2006, in the DSM Adjuster Rate filing (Decision No. 68649, Docket No. G-01551A-04-0876).

The AEO surveys all agencies each February, prior to the start of a new program year, to review their need and ability to use weatherization funds in the new program year. The preliminary amount of funds awarded to each agency annually will be based on the historical use of LIEC funds, the percentage of potential Southwest low-income customers in each area, and the upcoming program year needs of the agencies.

Special Projects

In order to increase the use and effectiveness of program funds, Southwest has allocated a portion (\$60,000 annually) of the LIEC funds for highly cost-effective special projects. The LIEC Special Projects category is designed to make funds available for large, multi-family projects. All projects must follow the established program guidelines. The higher-than-normal savings from these projects will help offset the less energy-efficient health and safety measures included in the program, and assist in keeping the LIEC program cost-effective overall.

Distribution of these funds is based on a competitive basis, using the following criteria: 1) cost-effectiveness of the projects; 2) partnerships with additional entities; and 3) agency production to date. A review committee, consisting of housing professionals from the AEO and Southwest who are not directly administering the program, carefully review all applications and determine which projects will be funded each program year.

Health and Safety

In addition to the energy conservation measures, community service referrals are made to appropriate agencies to address other health and safety needs observed in the participants' homes.

Southwest, the AEO, and all subcontracted agencies agree that the health and safety of homeowners and their families are very important. The AEO requires agency personnel to conduct a thorough safety check of each home and its appliances. Agency personnel also follow strict health and safety procedures while performing all weatherization activities, for the protection of the occupants and themselves.

The combination of measures in each home must follow the AEO procedural guidelines. Based on past performance, the AEO and Southwest agree that allowing agencies to spend up to 25 percent of the annual budget on health and safety measures without prior approval simplifies the process, while continuing to keep the overall program cost-effective.

Southwest encourages natural gas safety to the entire community through a variety of outreach methods, including brochures/pamphlets, bill inserts, and several media campaigns. This information is available in both English and Spanish. All Arizona residents, whether Southwest customers or not, may call any local Southwest office or the Company's toll-free Energy services number for assistance. Company personnel are available 24 hours a day to respond to any emergency.

Requested Program Budget

Southwest is seeking approval of \$450,000 annually for the next three program years (July 1, 2006 through June 30, 2009) for the LIEC weatherization program, and an additional \$50,000 for bill assistance, totaling \$500,000 per year. This represents approximately 11 percent of the total annual DSM budget of \$4.385 million. Table 3 outlines the annual budget by category.

Table 3 – LIEC Proposed Annual Budget – July 1, 2006 through June 30, 2009

CATEGORY	BUDGET
Program Costs	
Implementation	
Weatherization ¹	\$200,500
Health and Safety	93,000
Special Projects	60,000
Training and Monitoring	20,000
Program Support	
Agencies ²	45,000
Arizona Energy Office – Administration	22,500
Southwest – Information and Outreach	9,000
Bill Assistance Costs	
Emergency Assistance	50,000
TOTAL	\$500,000
¹ Includes expenses incurred by agencies that are necessary to deliver weatherization services to customers and which would not be incurred if those services were not provided.	
² The annual distribution of funds by agency will be determined according to the percentage of low-income customers, prior year spending, and the agencies' projected needs and ability to complete jobs.	

In the past, all costs (excluding administration) under the LIEC program, required to complete the needed activities, could not exceed \$1,500 per household unless prior approval was given. Southwest recommends raising this cap to \$3,000 per household. In comparison, Arizona Public Service Company's Energy Wise low-income weatherization program allows a maximum of \$6,000 to be spent per home. Approval will still be required if the amount exceeds the approved cap per home, and will only be granted if the total investment meets the statewide weatherization program cost-effectiveness requirements. Agencies must follow the AEO waiver process when seeking approval for investments that exceed the cap.

This program will continue to be funded through Southwest's DSM Adjuster Mechanism (Decision No. 60352), payable by all full-margin customer classes.

COST-EFFECTIVENESS TEST RESULTS

The cost-effectiveness test ratio for the LIEC program is 1.15. More detail, including the societal evaluation, is provided in Appendix D.

Southwest, in conjunction with the AEO, has conducted its own cost-effectiveness testing over the past eight years for the LIEC weatherization program. Past results, which have previously been submitted to the ACC, can be found in Appendix C.

DOE has also sponsored a comprehensive evaluation of the weatherization program in the early 1990s that was performed by ORNL and was based primarily on data collected from the 1989 program year. In more recent years, ORNL has conducted four meta-evaluations. In 1995, the DOE decided to undertake a new national evaluation of the program. ORNL has recently developed a new national evaluation that will be based primarily on data collected during the 2006 program year.

Societal Costs

Reducing residential energy demand decreases electricity generation and associated power plant emissions, which is a significant source of air pollution. This improves local air quality and reduces adverse health effects, such as asthma. Weatherization measures also reduce annual emissions of carbon dioxide by an average of one ton per weatherized home.

According to the DOE, when the energy and non-energy related benefits are added together, the cost-benefit ratio of energy reduction is \$3.71 for every \$1.00 invested in the program. This cost-effective approach ensures the proper investment of taxpayer/utility customer resources. Not only is this an investment in the lives of those in need, but also an investment in the economic and environmental well-being of the community.

Because the LIEC program is a joint program among the AEO, agencies, and various Arizona utilities, it provides the opportunity to build relationships on many levels throughout the state. By combining resources, the program is able to accomplish much more than could be accomplished by any of the entities acting alone.

Human Impacts

Energy expenses represent an economic drain on low-income communities. The DOE reports that, on average, low-income households typically spend 14 percent of their total annual income on energy, compared to 3.5 percent for other households. High prices make weatherization more important than ever. Since weatherization reduces home energy consumption on a continuing basis, it provides a long-lasting boost to the household's budget.

Weatherization reduces energy bills for low-income clients, thereby increasing their spending power, improving living conditions, increasing the values of local housing stock, and providing jobs in the home improvement industry. Customer benefits also include increased end-use efficiency, increased customer control over energy use and monthly bills, and enhanced comfort and safety.

By permanently reducing ongoing expenses, weatherization helps recipients become more self-sufficient. For example, low-income families who receive weatherization have a lower rate of default on their utility bills and require less emergency payment assistance. Furthermore, many energy efficiency measures require clients to change their behavior in order to maintain the savings. For example, increasing the insulation of a home allows the homeowner to keep the same level of comfort while using less energy. Such behavioral changes can produce permanent benefits from reduced energy consumption in this population.

LOW-INCOME ENERGY CONSERVATION

APPENDIX A
Equipment and Measures

APPENDIX A - Equipment and Measures - Low-Income Energy Conservation

ALLOWABLE MEASURES	
Cost Effective Measures	Code
Replacement of broken or missing window glass	YES
Repair/replacement of leaking hot water (controlling) valves (kitchen or bath)	YES
Complete replacement of deteriorated/worn out duct systems	YES
Installation of "Low flow" shower heads	YES
Replacement of heating system thermostats or relocation thereof	YES
Building Shell (wall, floor, ceiling) Thermal Envelope Insulation	CE
Install Insider (rigid) Plastic Storm Windows	CE
Repair/replace OPERABLE SEER < 7.0 A/C - "GAS PAC" with new SEER 12.0 "GAS PAC"	CE
"Pressure Envelope" patching & sealing repair materials	CE
Repair inoperable forced air natural gas (FANG) heating system **	CE
Repair inoperable natural gas, wall, floor, or free standing space heater **	CE
Repair inoperable A/C - "GAS PAC" with new SEER 12.0 "GAS PAC" **	CE
Install solar shade screens for houses with refrigeration cooling	GAS-PAC
Replacement of forced air system filters and filter racks	FANG
Replacement of evap cooler "roof Jacks" with damper system	FANG
Health and Safety Measures	Code
Replace inoperable forced air natural gas (FANG) heating system **	H&S
Replace inoperable natural gas, wall, floor, or free standing space heater **	H&S
Replace inoperable A/C - "GAS PAC" with new SEER 12.0 "GAS PAC" **	H&S
Replacement of worn out domestic water heater tank (DHW)	H&S
Replacement of kitchen stoves	H&S
Battery-powered smoke alarms	H&S
<p>Codes: Yes = Always Allowable CE = Must be Cost Effective GAS-PAC = Only allowable if a gas furnace/electric AC combo-unit is present FANG = Only allowable if a Forced Air Natural Gas heating system is present. H&S = AEO may allow up to 25% of the funds be spent on Health and Safety Measures ** = Unit must be repaired if it is cost-effective. If not cost effective, it may be replaced if the unit is causing an unhealthy or unsafe environment.</p>	

LOW-INCOME ENERGY CONSERVATION

**APPENDIX B
Budget**

**APPENDIX B - Estimated Budget - Low-Income Energy Conservation
For years 2007, 2008, and 2009**

Program Costs	Amount
Implementation	
Weatherization ¹	\$ 200,500
Health and safety	93,000
Special projects	60,000
Training and Monitoring	20,000
Program Support	
Agencies ²	45,000
Arizona Energy Office - administration	22,500
Southwest - information and outreach	9,000
Bill Assistance Costs	
Emergency Assistance	50,000
TOTAL	\$ 500,000

¹Includes expenses incurred by agencies that are necessary to deliver weatherization services to customers and which would not be incurred if those services were not provided.

²The annual distribution of funds by agency will be determined according to the percentage of low-income customers, prior year spending, and the agencies' projected needs and ability to complete jobs.

LOW-INCOME ENERGY CONSERVATION

**APPENDIX C
Historical Data**

Weatherization Assistance Program Executive Summary



MISSION AND OPERATION

The U.S. Department of Energy's (DOE) Weatherization Assistance Program (Weatherization) reduces energy costs for low-income households by increasing the energy efficiency of their homes, while ensuring their health and safety. The Program provides energy efficiency services to more than 70,000 homes every year.

In Arizona, the Energy Office is able to provide assistance to approximately 750-800 homes per year throughout the state. The Energy Office contracts with ten subgrantee organizations to install weatherization improvements. Weatherization subgrantee organizations are trained by the Energy Office in the use of sophisticated residential energy diagnostic techniques and computerized energy audit programs that allow technicians to analyze potentially cost-effective energy savings investments.

TECHNICAL APPROACH

Professionally trained weatherization crews use computerized energy audits and advanced diagnostic equipment, such as a blower door, manometer, or infrared camera, to determine the most cost-effective measures appropriate for each home. Typical measures may include: installing insulation; sealing ducts; repairing and replacing heating and cooling systems; mitigating air infiltration; and reducing electric base load consumption.

- Weatherization crews use advanced technologies to address whole-house energy use.
- Services are delivered to single-family homes, multi-family dwellings, and mobile homes.

Weatherization crews also perform health and safety tests that may include: testing heating units and appliances for combustion safety, carbon monoxide, and gas leaks; assessing moisture damage; checking electrical system safety; replacing unsafe heating and cooling systems; and installing smoke and carbon monoxide detectors.

- Weatherization agencies have established a professionally trained delivery system to provide quality energy efficiency services and materials.

The integration of advanced technologies and techniques has increased the program's impact. Over the past decade Weatherization measures achieved greater energy and dollar savings.

ENERGY SAVINGS

The Oak Ridge National Laboratory completed a study for DOE in February 2003, "*Metaevaluation of National Weatherization Assistance Program Based on State Studies 1993 – 2002*", which found the following:

- Weatherization reduces average annual energy costs by \$218 per household, at current prices.
- Weatherization returns \$1.30 in energy-related benefits for every \$1 invested in the Program. This cost-effective approach ensures the proper investment of taxpayer resources.

Analysis completed by the Energy Office on the energy saving achieved in Arizona support these findings.

Southwest Gas Low Income Program Year 1999/2000: This analysis looked at the costs and energy savings associated with individual weatherization measures completed with Southwest Gas Low Income funds. The savings amounts were determined using DOE approved (REM/Design) energy simulation software and measures results from filed studies.

The total amount of Southwest Gas Low Income funds spend in the fiscal 99/00 program year was \$166,218.58. \$123,295 was spent of measures that are included in the analysis. \$42,923 was spent on health and safety and other repairs. \$22,069 was spent on administration. Total present value for funds spent was \$536,422. Saving to investment ration for program is 3.22. (Technical study attached)

The saving to investment ratio is higher than the national studies because none of the Southwest Gas funds were used for program expenses not directly related to the work completed in the home, such as equipment purchases, vehicle purchases and expenses, rent, insurance and other associated operating cost. Presently the Federal DOE funds are used exclusively for these costs.

Maricopa County Multi-Family Project: Maricopa County completed a 50 units senior housing project in April and May of 2002. This project was jointly funded using federal and state utility (SWG and APS) funds. The project involved providing duct sealing, pressure balancing, attic insulation (R-11 to R-30) and replacing the gas packs (AC/furnace unit) on 30 of the units which were 20+ years old. The Energy Office collected and analyzed utility data to establish the energy saving resulting from this work. The total investment (DOE, LIEAHP and utility funds) for this project was \$90,000. Measured energy saving (electric only, gas data has not been collect yet) is approximately \$9,000 per year. The present value for only the electric savings (based on 15 year measure life) is \$103,500 for a SIR of 1.14.

Below are the combined utility bills for all 50 units for the period of 1997 to 2003. Work was completed in April and May of 2002.

End Date	1997	1998	1999	2000	2001	2002	2003
Jan	1870.68	1792.59	1580.9	1650.41	1717.51	1706.64	1576.79
Feb	1583.58	1604.55	1441.6	1511.78	1523.79	1485.37	1449.21
Mar		1830.86	1686.7	1904.13	1680.86	1744.15	1758.57
Apr	2472.22	2041.46	2064.6	2702.18	2434.62	2245.56	1756.26
May	4738.67	3336.06	3559	4304.16	4379.49	3065.68	3037.52
Jun	5775.41	5020.07	5383.4	5472.49	5056.97	4016.33	3491.86
Jul	6423.69	7137.35	6484.9	5429.73	5247.87	3860.77	3745.05
Aug	7011.6	7016.3	6361.1	6566.62	6050.38	4609.58	4705.3
Sep	5608.16	4826.82	5260.1	4952.66	5186.72	3832.81	3838.1
Oct	3803.74	3193.61	3050.5	3471.33	3518.97	2644.71	3003.6
Nov	1838.8	1770.75	2152.2	1727.36	2135.01	1681.74	2092.98
Dec	1759.89	1715.21	1668.7	1727.41	1780.71	1628	1795.61
Grand Total	42886.44	41285.63	40694	41420.26	40712.9	32521.34	32250.9

NON-ENERGY BENEFITS

The following information is from: Metaevaluation of National Weatherization Assistance Program Based on State Studies 1993 - 2002, Oak Ridge National Laboratory, February 2003. Full report is available at ORNL/CON-488.

- Weatherization measures reduce national energy demand by the equivalent of 18 million barrels of oil per year.
- Weatherization saves an average of 30.8% in gas space heating. This comprises a total fuel consumption reduction of 21.9%. Net savings for each home weatherized average 29.1 mbtu/year.
- Reducing energy demand decreases the environmental impacts of energy production. Weatherization mitigates approximately .23 metric tons of carbon per year in a home heated primarily with natural gas. This translates into nearly one metric ton (.85) of carbon dioxide emissions avoided. For homes heated by electricity, the savings are even higher: weatherization reduces .475 metric tons of carbon annually. Weatherization also reduces emissions of methane and nitrous oxide.
- Weatherization creates non-energy benefits as well, including the following, quantifiable benefits: increased property value, reduced incidence of fire, reduced arrearages, federal taxes generated from employment, income generated from indirect employment, avoided costs of unemployment benefits, environmental externalities. Taken together, for every \$1 invested in the program, Weatherization returns \$2.79 in energy and non-energy impacts.
- Additional benefits that are difficult to quantify include: improved health and safety conditions, increased comfort for the occupants, reduction in homelessness and mobility, extended lifetime of affordable housing

**SOUTHWEST GAS CORPORATION
LOW-INCOME ENERGY CONSERVATION
COST-EFFECTIVENESS**

A cost-effectiveness analysis for the Low-Income Energy Conservation (LIEC) program was conducted by the Arizona Department of Commerce – Energy Office with a sampling of actual utility bill savings for homes weatherized in metropolitan Phoenix in 2002, using the benefit-cost ratio¹ as the criterion.

For analysis purposes, combined gas and electric utility bill savings indicated in the attached table were used. The costs of measures that either save energy or provide health and safety were also utilized. The costs of the energy-saving measures paid for by both utility partners were included in the analysis, if they impact either gas or electric energy savings. It should be noted that some energy saving measures save both gas and electricity, while others save only gas or electricity. In addition to the gas and electric savings resulting from the weatherization program, there are also water savings. However, water savings are not included in this cost-effectiveness analysis.

Southwest's experience indicates that not all of the available measures are required in all homes. As a result, the Community Action Agencies only install those which are necessary. A cost effectiveness analysis was conducted for 12 separate homes weatherized. The attached table lists these scenarios, which vary in the number and type of measures installed, energy savings, utility bill savings and cost per household.

Two separate benefit-cost ratios were calculated for each home. First, a comparison of the present value savings to the energy measures' costs was completed. The ratios per home ranged from 1.47 to 5.13, with an average of 2.27. A second, more stringent, comparison of the present value savings to the total job cost was also conducted. While the second comparison shows lower ratios (ranging from 0.75 to 4.34), with an average of 1.84, it does not include the added societal benefits of the health and safety measures.

¹ The benefit-cost ratio is the ratio of total benefits to total costs.

BENEFIT-COST ANALYSIS
COMPLETED BY THE ARIZONA DEPARTMENT OF COMMERCE - ENERGY OFFICE
ON A SAMPLE OF HOMES WEATHERIZED IN METROPOLITAN PHOENIX IN 2002

House ID No.	Energy Saving Measures Installed	Costs			Annual ³ Utility Bill Savings	Present ⁴ Value Savings	Benefit-Cost Ratio ⁵ (Energy-Saving Measure Costs Only)	Benefit-Cost ⁶ Ratio (All Costs)
		Energy-Saving ¹ Measures	Health ² and Safety	Total				
1	* New HVAC (12 SEER) * Duct sealing * Shade screens * Infiltration	\$ 2,127	\$ 2,489	\$ 4,616	\$ 300	\$ 3,450	1.62	0.75
2	* Duct sealing * Attic insulation * Shade screens	\$ 619	\$ 86	\$ 705	\$ 100	\$ 1,420	2.29	2.01
3	* Attic insulation * Shade screens * Duct sealing * Infiltration	\$ 878	\$ 200	\$ 1,078	\$ 200	\$ 2,840	3.23	2.63
4	* Duct sealing * Energy Star Refrigerator	\$ 1,058	\$ -	\$ 1,058	\$ 300	\$ 3,450	3.26	3.26
5	* Attic insulation * New HVAC system * Duct sealing	\$ 3,592	\$ 1,108	\$ 4,700	\$ 700	\$ 8,050	2.24	1.71
6	* Shade screens * Duct sealing * Attic insulation * Infiltration	\$ 1,106	\$ 319	\$ 1,425	\$ 200	\$ 2,840	2.57	1.99
7	* New HVAC * Duct sealing * Shade screens	\$ 2,312	\$ 44	\$ 2,356	\$ 300	\$ 3,450	1.49	1.46
8	* New HVAC * Duct sealing * Shade screens	\$ 2,441	\$ 104	\$ 2,545	\$ 200	\$ 2,300	0.94	0.90
9	* Duct sealing	\$ 277	\$ 50	\$ 327	\$ 100	\$ 1,420	5.13	4.34
10	* New HVAC * Duct sealing	\$ 1,174	\$ 412	\$ 1,586	\$ 150	\$ 1,725	1.47	1.09
11	* Shade screens * Duct sealing	\$ 596	\$ 300	\$ 896	\$ 150	\$ 1,725	2.89	1.93
12	* Infiltration * Shade screens * Duct sealing	\$ 1,543	\$ 641	\$ 2,184	\$ 250	\$ 3,625	2.35	1.66
Average		\$ 1,363	\$ 443	\$ 1,806	\$ 227	\$ 2,792	2.27	1.83

¹ The energy-saving measure costs include funding from both Southwest Gas Corporation (Southwest) and Arizona Public Service Company.

² The majority of health and safety costs are funded through LIHEAP and DOE; however, Southwest allows up to 25 percent of the total annual budget to be used on health and safety measures.

³ The average combined (natural gas and electric) utility bill savings (rounded down to the nearest \$50) is based on bill history of two years pre-installation and one year post-installation.

⁴ The present value savings were calculated using a 15-year life for the HVAC equipment and 20-year life for envelope measures.

⁵ Benefit-cost based on the energy-saving measure costs only is a ratio of the present value savings to the energy-saving measure costs.

⁶ Benefit-cost based on the total cost per home is a ratio of the present value savings to the total costs. While this ratio includes all costs, it does not include the added societal benefits of the health and safety measures.

**Present Value Analysis
SWG Low-Income Weatherization Program
July 1, 1999 to June 31, 2000**

The total amount of Southwest Gas Low Income funds spend in the fiscal 99/00 program year was \$166,218.58 (WACOG June report still not in). \$123,295 was spent of measures that are included in the analysis. \$42,923 was spent on health and safety and other repairs. \$22,069 was spent on administration. Total present value for funds spent was \$536,422. Saving to investment ration for program is 3.22.

Below is a summary of how these figures were derived.

Average cost per measure:

The Southwest Gas Low-Income funds are used in conjunction with a number of other funding sources. This results in multiple funding sources being used in a high percentage of installed measures. This requires that an average costs per unit to complete a weatherization measure be determined, allowing these values to be applied to the Southwest Gas (SWG) funds spent on each measure. The following is a list of these average program costs for measures that used SWG funds.

Duct repair:

- Air Conditioned homes: 0.83 CFM50 per dollar.
- Evaporative cooling: 2 CFM50 per dollar.

Infiltration (air sealing and pressure balancing):

- Air Conditioned homes: 1.5 CFM50 per dollar.
- Evaporative cooling: 3.6 CFM50 per dollar.
- Pressure balancing: Approximately 3 Pascals average per home.

Attic insulation:

- Air Conditioned homes: Average existing insulation level of R-7, increasing to R-30 for \$.30 per square foot.
- Evaporative cooling: Average existing insulation level of R-2, increasing to R-19 for \$.25 per square foot.

Shade screens:

- \$3 per square foot

HVAC equipment replacement:

- AC/heating: 11.5 SEER AC and an 80% AFUE gas furnace (gas pack) average cost of \$2400.
- Heating only: 80% AFUE gas furnace average cost of \$1300.

Present value analysis

The next step was to determine present value for each of the measures listed above. The present value analysis presented used a discount rate of 3.7%. Life of measure used in present value analysis is listed with each measure.

Duct sealing: The following values were derived by utilizing the results from the APS study on duct leakage performed by Proctor Engineering. The saving values used are very conservative and could be as much as two times the value listed because of the interaction between duct leakage, house pressures, infiltration and system efficiency. Measure life of 20 years

Climate zone	AC/Forced air heating	Evap cooling/Forced air heating
II (Phoenix)	\$5.15 per CFM50 reduction	\$.65 per CFM50 reduction
III (Prescott)	\$3.3 per CFM50 reduction	\$2.50 per CFM 50 reduction
IV (Tucson)	\$3.70 per CFM50 reduction	\$.70 per CFM50 reduction
VI (Yuma)	\$9.00 per CFM50 reduction	\$.35 per CFM50 reduction

Infiltration: The following values were derived using REM/design Software. Measure life of 20 years

Climate zone	AC/Forced air heating	Evap/Forced air heating
II (Phoenix)	\$.29 per CFM50 reduction	\$.22 per CFM50 reduction
III (Prescott)	\$.59 per CFM50 reduction	\$.59 per CFM 50 reduction
IV (Tucson)	\$.26 per CFM50 reduction	\$.23 per CFM50 reduction
VI (Yuma)	\$.50 per CFM50 reduction	\$.14 per CFM50 reduction

Attic Insulation: The following values were derived using REM/design Software. Measure life of 20 years

Climate zone	AC/Forced air heating R-7 to R-30	Evap/Forced air heating R-2 to R-19
II (Phoenix)	\$1.02 per square foot	\$.23 per square foot
III (Prescott)	None completed	\$.70per square foot
IV (Tucson)	\$.85 per per square foot	\$.23 per square foot
VI (Yuma)	\$.98 per square foot	\$.20 per square foot

Shade Screens (AC only): The following values were derived using the REM/Design software. Measure life of 7 years

Climate zone	Shade Screens
II (Phoenix)	\$13 per square foot
III (Prescott)	None completed
IV (Tucson)	None completed
VI (Yuma)	None completed

HVAC Equipment Replacement: The following values were derived using the REM/Design software. Measure life of 15 years

Climate zone	11.5 SEER 80% AFUE	80% AFUE
II (Phoenix)	\$7685	\$745
III (Prescott)	None completed	None completed
IV (Tucson)	None completed	\$827
VI (Yuma)	None completed	None completed

Dollars per measure spent

By determining the total dollars spent per measure and applying it to the average cost of measure and present value amount, an estimate of the total present value for the SWG low-income program can be determined. To achieve this, the total dollar amount of SWG funds spent per measure is multiplied by the average cost to determine the total amount of the measures completed with SWG funds. The total amount of measure completed is multiplied by the unit present value of the measure to estimate the present value for each measure. *note, infiltration saving for pressure relief not included.

Climate zone II:

Measure	Dollars spent on measure	Units completed per dollar	Total units completed	Present value per unit	Present value for measure
Duct repair/AC	\$24,618	.83 CFM50	20,433 CFM50	\$5.15	\$105,230
Duct repair/Evap	\$24,326	2 CFM50	48,652 CFM50	\$.65	\$31,624
Infiltration/AC	\$3,682	1.5 CFM50	5,523 CFM50	\$.28	\$1,602
Infiltration/Evap	\$10,936	3.6 CFM50	39,370 CFM50	\$.22	\$8,661
Attic insulation/AC	\$10,949	3.3 sq. ft.	36,132 sq. ft.	\$1.02	\$36,854
Attic insulation/Evap	\$8,090	4 sq. ft.	32,360 sq. ft.	\$.23	\$7,443
Shade screens	\$1,950	.333 per sq. ft.	649 sq. ft.	\$.13	\$8,437
AC/Heating systems	\$14,682	.00041 (\$2,400 per system)	6	\$7,685	\$46,110
Heating systems	\$7,667	.00077 (\$1,300 per system)	5.9	\$745	\$4,396
Totals	\$106,900				\$250,357

Climate zone III:

Measure	Dollars spent on measure	Units completed per dollar	Total units completed	Present value per unit	Present value for measure
Duct repair/AC	None				
Duct repair/Evap	\$586	2 CFM50	1,172 CFM50	\$2.50	\$2,930
Infiltration/AC	None				
Infiltration/Evap	None				
Attic insulation/AC	None				
Attic insulation/Evap	\$302	4 sq. ft.	1,208 sq. ft.	\$.70	\$846
Shade screens	None				
AC/Heating systems	None				
Heating systems	None				
Totals	\$888				\$3,776

Climate zone IV:

Measure	Dollars spent on measure	Units completed per dollar	Total units completed	Present value per unit	Present value for measure
Duct repair/AC	\$63	.83 CFM50	52 CFM50	\$3.70	\$192
Duct repair/Evap	\$6,611	2 CFM50	13,222 CFM50	\$.70	\$9,255
Infiltration/AC	None				
Infiltration/Evap	\$278	3.6 CFM50	1001 CFM50	\$.23	\$230
Attic insulation/AC	\$100	3.3 sq. ft.	330 sq. ft.	\$.85	\$281
Attic insulation/Evap	\$2,990	4 sq. ft.	11,996 sq. ft.	\$.23	\$2,759
Shade screens	None				
AC/Heating systems	None				
Heating systems	\$3,475	.00077 (\$1,300 per system)	2.6	\$827	\$2,150
Totals	\$13,517				\$14,867

Climate zone VI:

Measure	Dollars spent on measure	Units completed per dollar	Total units completed	Present value per unit	Present value for measure
Duct repair/AC	\$104	.83 CFM50	86 CFM50	\$9.00	\$774
Duct repair/Evap	None				
Infiltration/AC	\$1,444	1.5 CFM50	2166 CFM50	\$.50	\$1,083
Infiltration/Evap	None				
Attic insulation/AC	\$442	3.3 sq. ft.	1,459 sq. ft.	\$.98	\$1,430
Attic insulation/Evap	None				
Shade screens	None				
AC/Heating systems	None				
Heating systems	None				
Totals	\$1,990				\$3,287

House of Refuge East

\$20,000 of SWG funds were transferred from the Tucson Urban League to the city of Mesa for the House of Refuge East project. This project was analyzed individually because of the specific information available for the project. A total of 86 homes were completed. The homes have AC and gas forced air furnaces. Duct repair, shade screen and pre-set thermostats were installed.

Present Value Analysis:

Duct repair: Duct leakage reduction was measured at between 150 CFM50 and 200 CFM50 per home. For the analysis, 150CFM50 reduction was used as an average per home.

- 86 homes X 150 CFM50 = 12,900 CFM50 total duct leakage reduction for the project.
- 12,900 X \$5.15 present value per CFM50 = \$66,435 present value for duct repair.

Shade screens: Shade screens were added to all homes where needed. A total of 3,300 sq. ft. of screens were install for \$10,000.

- 3,300 X \$13 present value per sq. ft. of screen = \$42,900 present value for shade screens.

Thermostats: All homes were equipped with a pre-set, non-adjustable thermostat at a total cost of \$4,900. The set points of existing thermostats were recorded during this project with majority set below 75°. The new thermostats are pre-set at 68° for heating and 78° for cooling. For this analysis, original set points of 70° for heating and 76° for cooling was used.

- Present value (10 year life) per home for a set back of 2° for heating and cooling equals \$1,800.
- 86 X \$1,800 = \$154,800 present value of pre-set thermostats.

The total present value for the House of Refuge East project is \$264,135.

Total Present Value

• Climate zone II	\$250,357
• Climate zone III	\$3,776
• Climate zone IV	\$14,867
• Climate zone VI	\$3,287
• House of Refuge	<u>\$264,135</u>
• Total	\$536,422

LOW-INCOME ENERGY CONSERVATION

APPENDIX D
Cost-Effectiveness Test Results

**Southwest Gas Corporation
Low-Income Energy Conservation
2007-2009**

COST-EFFECTIVENESS OVERVIEW	
Annual Budget	\$500,000
Present Value Benefits	\$1,297,188
Present Value Costs	\$1,124,283
Present Value Net Benefits	\$172,905
Cost-Effectiveness Ratio	1.15

UNITS		
2007	2008	2009
300	300	300

CUMULATIVE ENERGY SAVINGS (Three-Year Program)		
Kilowatt-hour (kWh)	Kilowatt (kW)	Therms (Th)
18,451,048	450	600,210

ENVIRONMENTAL BENEFITS [1]				
Annual Savings	CO ₂ (lbs)	NOx (lbs)	SOx (lbs)	H ₂ O (gallons)
2007	252,588	47	1	64,180
2008	252,588	47	1	64,180
2009	252,588	47	1	64,180
Lifetime Savings	16,919,611	3,174	79	4,299,094
Annual Avoided Costs	CO ₂ (\$)	NOx (\$)	SOx (\$)	H ₂ O (\$)
2007	\$ 2,446	\$ 620	\$ 1,157	\$ 76
2008	\$ 2,446	\$ 620	\$ 1,157	\$ 76
2009	\$ 2,446	\$ 620	\$ 1,157	\$ 76
Lifetime Avoided Costs	\$ 163,845	\$ 41,515	\$ 77,494	\$ 5,116

[1] Sources:

- Avoided emission costs data from National Renewable energy Laboratory January 2005 report on Emerging Markets for Renewable Energy Certificates Opportunities and Challenges, as augmented by Bill Schrand/Southwest Administrator/Environmental Programs, and as augmented and commented on by David Berry/WRA.

- Conversion factor for CO₂ from Rocky Mountain Institute website on Energy and Carbon Dioxide Conversion Factors (5/23/05).

- Water values from Central Arizona Water Conservation District/Central Arizona Project, City of Phoenix and City of Tucson websites.

- Environmental benefits (conversion factors per kWh) listed in APS' DSM Portfolio Plan 2005-2007 (7/1/05)

3

ENERGY STAR® HOME

ENERGY STAR® HOME

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APPENDICES

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PROGRAM OVERVIEW

Program Description

ENERGY STAR® Home (EStar) is an ongoing program which Southwest Gas Corporation (Southwest or Company) originated in 1996 as the Energy Advantage Plus (EAPlus) program. The level of energy performance in the marketplace has increased during the life of the program, so that it is now confined solely to certification at the ENERGY STAR level and above. This higher level of performance made the transition from the program name EAPlus to EStar appropriate.

The EStar program has a successful history of providing energy efficiency certification for single-family production homes. As a performance based, "whole-house" program, EStar is designed to increase residential energy efficiency through improved thermal shell construction, upgraded mechanical systems, and field verification.

Enhancements to EStar national guidelines which will be implemented over the latter half of 2006, will improve program inspection procedures, building shell specifications and construction practices, and require EStar appliances to be included in each home. Overall energy efficiency must be a least 15 percent greater for participating homes than for homes built to the International Energy Conservation Code (IECC), which is considerably more stringent than earlier codes.

As before, the program involves the recruitment of builders into the program, review of their home plans, consultation on effective construction techniques required to meet the guidelines, and inspection and testing of the homes for compliance. Homes which meet or exceed the guidelines are then certified as EStar. If approved, the plan is to spend the \$450,000 budget to certify 4,000 to 5,000 homes in the Tucson area, as well as the Benson and Sierra Vista areas of Cochise County. There are no incentives to participants in this program.

Objectives/Rationale

While the trend toward greater residential energy efficiency is well established in Arizona, continuation of EStar efforts through the next phase of energy-conserving enhancements is critical. EStar nationally has identified and laid out a cost-effective and detailed path to better home performance for 2006 and beyond. EStar will directly impact the number of builders to adopt these measures.

High level meetings have been held with program participants to review the EStar upgrades on the immediate horizon. Builders are now analyzing the budgetary, purchasing, scheduling, and trade contract implications of these changes, but some initial indications are positive. Southwest's objective is to

maintain participation through the year 2006 at 3,000 homes per year and, if budgeted to do so, increase participation in future years to the range of 4,000 to 5,000 homes by adding builders in Cochise County.

Expected Outcomes

Participation in EStar surged in 2005, with the commitment of 5,000 homes to the program. Another 2,500 homes to be built in subdivisions starting early in 2006 have been committed under current EStar guidelines. Hurdles in achieving the new EStar standards have prevented any new commitments based on those standards as of yet. It is expected that those hurdles will be overcome in many of the currently participating projects. Participation should reach the anticipated level of 3,000 finished homes for 2006, with a good representation of projects continuing on the new standards in 2007. This will leave an opportunity for increased participation of new projects heading into 2007.

Services Provided

EStar offers no products per se; instead, the program brings energy efficiency services directly to builders while their homes are being planned, and in the field as they are being built.

Plan Review and Analysis and Enhancement Measure Analysis

Model plans are input to REM/ Rate® residential energy software. Areas identified for likely improvement are recommended to the builder, and a final specification package resulting in the required efficiencies is agreed upon for all homes in a participating project.

Education and Training

Successful participation requires training of the builder's staff at several levels. Sales people are trained to understand and communicate the energy features of their homes. Site supervisors are instructed on framing requirements and insulation quality in groups, and one-on-one at their sites. Trade workers are given training, as required, on an ongoing basis. Presentations to large groups of construction staff and customer satisfaction representatives are offered so that technologies and practices are understood throughout the organization.

Field Testing and Inspection

Homes are tested and inspected in three categories under a 15 percent sampling protocol approved by EStar national guidelines, through the Residential Energy Services Network (RESNET®). Homes are inspected for proper installation of insulation, windows, and framing at the pre-drywall stage. Ductwork is tested for leakage at either the rough stage or with the mechanical equipment in place. Infiltration rates are checked with a blower door test. The total level of testing is expected to rise to 25 percent under new protocols.

Opportunities

Participation has been greatest among the higher-producing builders. With a softening of the new home market in current forecasts, it is anticipated that smaller production builders may soon need to step up to the plate in order to maintain market share. While not as easily or efficiently served as the larger builders, these homes represent an area which would benefit greatly from participation, particularly under the enhanced EStar guidelines.

New areas of increasing growth, while not readily served under the current budget, also present an attractive opportunity. Communities such as Sierra Vista and the Benson area would be likely venues for expansion.

Barriers to Program Acceptance or Deliverability

The primary obstacle to energy efficiency is the issue of first-cost. This is true with regard to the enhancements to ENERGY STAR that Southwest currently faces. The most profound challenge is EStar's thermal bypass checklist. This soon-to-be mandatory itemized inspection requires absolute alignment of air barrier and thermal boundary, and highlights a dozen or more areas of continual concern in production building. Cost estimates to comply with the checklist are over \$200 per home. Time required for the inspection and to perform needed corrections is also a concern.

Training of home raters and inspectors is an issue, and would be a hurdle for expansion of the program. On the positive side, RESNET is establishing a career path for raters, taking them from initial data gathering activities through the detailed experience and education required to master building science.

Sampling protocols will become much more stringent by 2007. The minimum number of tests will be increasing to the range of 25 percent. This increase is due to the consecutive testing required for as many as seven homes in each new project, and additional testing required upon any failures. This change may put a strain on resources or the ability to enroll new projects.

Low visibility of the program may also be a barrier to success. While there is no perceived need to return to the advertising incentives used in earlier years, some media presence announcing the availability and desirability of EStar homes would be beneficial.

Expansion to Cochise County will result in somewhat higher costs per home, due to increased travel time and costs.

Because of limited resources and the existing private home-rating infrastructure in the Phoenix area, program expansion to that market does not seem advisable at this time.

TARGET MARKET

Target Market Segment

EStar targets new single-family production homes. Due to budgetary limitations and the availability of other providers for EStar ratings in the Phoenix area, the program has thus far enrolled builders only in the Tucson area. However, with approval for program continuation, builders in Southwest's smaller service territories, such as Cochise County, will be encouraged to participate.

Program Eligibility

New production subdivisions with model homes featuring natural gas heating and water heating are eligible. Builders must sign up with the Environmental Protection Agency as EStar partners and agree to meet the program specifications.

Potential Customers

Based on data from John Strobeck's *Southern Arizona Housing Market Letter, Annual Report of the Tucson Housing Market* and Southwest's data for projected new customers, the number of potential customers in the Tucson area over the next three years is as follows:

2007: 6,300 homes
2008: 6,600 homes
2009: 7,000 homes

Including the higher growth areas of Cochise County, the number of potential customers for years 2007 through 2009 is as follows:

2007: 7,100 homes
2008: 7,600 homes
2009: 8,200 homes

Estimated Level of Program Participation

Including the higher growth areas of Cochise County, the estimated level of program participation is expected to be:

2007: 4,200 homes
2008: 4,500 homes
2009: 4,500 homes

ENERGY MEASURES

Baseline Measures

EStar homes achieve at least a 15 percent improvement in residential energy consumption over similar homes built to IECC 2004 standards. While certain facets of the IECC 2004 have been adopted by some permitting agencies, many local codes are based on older IECC 1998 standards or even older Model Energy Code standards. Performance is modeled with REM/Rate Version 12.2, and considers many factors. These include:

- Window area, U-factor, solar heat gain coefficient (SHGC), orientation, and shading
- Door R-value and size
- Wall cavity insulation R-value, cavity insulation quality, continuous insulation R-value and framing factors
- Ceiling insulation R-value and quality, and radiant barrier
- Floor insulation, cantilevers, over-garage area, etc.
- Water heater efficiency
- Lighting and appliance efficiency
- HVAC equipment efficiency, programmable thermostat
- Duct location and leakage
- Whole-house infiltration
- Site factors for heating and cooling degree days, wind
- Wall and roof color

For the purposes of this analysis, base case homes are considered to be IECC 2004 homes. Energy savings in comparison to actual codes may be higher, which indeed is often the case. Table 1 shows the REM/Rate energy analysis for an average home, based on plans of varying size submitted by participating builders.

Table 1 – Estimated Annual Loads per REM/Rate Analysis of 1,834 Square-Foot Home

	Heating MMBtu	Cooling MMBtu	Water Heating MMBtu	Lighting and Appliances MMBtu	Total MMBtu	Percent Savings over IECC
Standard 2004 IECC- Compliant Home	20.7	41.5	9.0	23.9	95.1	n/a
EStar Minimally- Compliant Home	17.6	35.3	7.9	20.3	81.1	14.7%
Typical EStar Home as Designed	12.9	31.5	8.1	22.3	74.9	21.2%

Note the higher level of performance in the typical as-designed home in the Southwest EStar program. If this program were not in place, it is expected that 6,300 homes within the target market would be constructed in 2007 based only on the lower performance level of the local code.

A complete list of energy measures is provided in Appendix A.

EStar (DSM) Measures

While the efficiency requirements for EStar certification can be met in any number of ways, certain typical case assumptions can be defined for the purpose of cost-benefit analysis. Improvements to the thermal shell and ductwork are assigned a useful life of 25 years, while lighting and appliances are assumed to have an average life of 12 years.

A typical ceiling insulation enhancement would increase from R-30 blown-in blanket insulation to R-38. This cost would increase from \$0.45 to \$0.56 per square foot. Including tax, the figure of \$0.12 per square foot was used for the typical 1,834 square-foot home. Compliance with the thermal bypass checklist will add an average of \$245 to the cost of each home. This figure, based on builder estimates gathered by Sam Rashkin (EPA National Program Director for EStar), is the best expert opinion currently available. Duct sealing adds approximately \$150 to the cost of each home, and programmable thermostats at \$50 per unit instead of \$36 are necessary mechanical improvement measures. A half-ton reduction in equipment size creates a savings of \$120 per home. Combined costs for thermal shell and mechanical improvements are summarized in Table 2.

Table 2 – Estimated Incremental Cost Per Home for EStar Measures to Upgrade Thermal Shell, Mechanical System, Lights, and Appliances

Measures	Standard Construction	EStar Construction	Incremental Cost
Insulation upgrades, thermal bypass compliance, duct sealing, and programmable thermostat	\$2,243	\$2,857	\$ 614
Water heater	310	365	55
Lighting and appliances including EStar-labeled dishwasher and light fixtures	420	480	60
Total	\$2,973	\$3,702	\$ 729

Heating load is dramatically affected by these improvements lowering from 207 therms to an estimated 129 therms per year. Cooling load is lowered from 12,160 kWh to 9,230 kWh. Electric demand due to equipment sizing is lowered from 4.21 kW to 3.7 kW per unit, and from 0.30 kW to 0.07 kW for lighting and appliances. This demand improvement would directly translate to lowered peak demand, as peak demand in hot climates is attributed primarily to air conditioning. This information is summarized in Table 3.

An improvement in water heater efficiency from an energy factor (EF) of 0.56 to an EF of 0.62, which is readily available on the market, raises the cost of a typical residential 50-gallon water heater from \$310 to \$355. There is no known difference in installation cost, useful life, or maintenance cost. The annual demand for water heating is lowered approximately 10 percent, from 90 to 81 annual therms. This information is also found in Table 3.

Table 3 – Estimated Savings Per Home from EStar Measures

Heating (Therms)	Cooling (kWh)	Water Heating (Therms)	Dishwasher and CFLs (kWh)	Electric Demand (kW)
78	2,930	9	468	0.74

An EStar lighting and appliance package, consisting of an EStar-rated dishwasher at an EF of 0.68 and 20 percent compact fluorescent light bulbs, is included as a suggested method to meet requirements for EStar. This is expected to cost approximately \$60 more per home, including some consideration for the longer lifespan of the light bulbs. REM/Rate shows that these measures result in a 468 kWh annual reduction. Other measures such as

EStar exhaust fans, ceiling fans, or package lighting fixtures (as opposed to CFL bulbs) may also be used by participating builders to fulfill the EStar product category requirement.

The measures referred to above and used for analysis are typical of most participating homes, but it should be noted that builders may choose other measures in order to meet EStar guidelines.

IMPLEMENTATION PLAN

Marketing Strategy

As a continuation and enhancement of the existing EStar program, a certain momentum in marketing has already been attained. Builders are inclined to spend the extra dollars to improve their homes, as long as consumer awareness is high enough to create demand for energy efficiency. The EStar label, while widely recognized and understood, may not be sufficient, in and of itself, to justify these costs to the builder. Some additional educational and promotional efforts will probably need to be made to strengthen demand for EStar homes among home buyers. This would be even more important when entering the previously unserved areas of Cochise County.

Nationwide, positive results have been seen where participating builders cooperate in an EStar partnership that includes advertising the brand in local home magazines and home sections of newspapers. As the EStar provider, Southwest should participate in the development of such a partnership and in its promotional activities.

The vast majority of all proposed EStar budget dollars go to the critical areas of verifying duct tightness, infiltration levels, insulation quality, and thermal bypass compliance. However, Southwest believes that approximately \$24,000 should be spent to participate in an EStar partnership to raise awareness. This amount declines over the following two years, as participation is expected to reach the maximum supportable number. If participation lags below these levels, it is anticipated that funds may be shifted toward additional communication of program benefits.

Customized feature and benefit brochures will be produced for subdivision sites. Typically printed in-house to hold down costs, these brochures are budgeted at \$2,000 to \$4,000 per year.

Another promising venue for promotion is the Southern Arizona Home Builder Association spring and fall home shows. Promoting and explaining EStar cooperatively with builders participating in the home show's "New Home" center would be a natural outgrowth of efforts to create an EStar partnership.

Approximately \$2,250 to \$5,000 per year is envisioned for home show participation.

Training

Training occurs on several levels. As an EStar provider, Southwest is required by RESNET to have a quality assurance designee/trainer who must participate in continuing education annually. Approximately \$3,000 annually is budgeted for this activity under the RESNET conference.

Some training for the employees of Southwest's certified raters will be provided by Southwest. However, most of the training will be at the expense of the certified rater or taken on by the employee, and therefore is included in the contract costs for testing. Site training of builder employees and subcontractors is a line item expense in Southwest's contract with the certified rater. As such, it may be scheduled whenever and wherever needed or appropriate. This is billed monthly at \$75 per hour. A minimum of 15 one-hour sessions are envisioned. Site training is conducted collaboratively between the certified rater and the quality assurance designee. This type of training is a priority item to ensure program results and will be conducted as needed, even at the expense of other budget items. Up to 44 hours are anticipated in the first year under the \$450,000 budget.

Individual education is a daily process which results from the inspection and testing activity. Site supervisors are notified of the results of tests and inspections done at their sites, and of items which must be corrected, thereby creating an ongoing training process.

Large group education (seminars) for multiple builders, featuring an outside speaker, is another appropriate type of education for EStar. One or two large events are anticipated annually. Invitations would go to builders, construction personnel, customer service staff, subcontractors and their employees, site sales people, and REALTORS®. Speakers for such events will cost \$3,000 or more per day, including travel and accommodations. Typically, Southwest would host such an event in its auditorium for a group of up to 200. Ideally this type of event may be undertaken jointly by an EStar partnership group, resulting in greater attendance at a larger venue.

Staffing Requirements

The program will be implemented by Southwest Service Planning employees, with support from DSM staff. Additional data entry work may be contracted on a part-time basis.

Currently, Southwest contracts with a company for testing, inspections, training, and plan analysis. This contractor is capable of expanding to the Cochise County areas, if necessary. Other contracts for these services may be issued as needed.

Timeline of Activities

As an ongoing program, all stages of implementation are currently underway.

MEASUREMENT AND EVALUATION

EStar will continue to track and report program effectiveness as it has in previous years for semi-annual reports. Typical tracking items include:

- Number of builders participating
- Homes committed
- Homes inspected and tested
- Homes certified
- Energy savings – MMBtu, therms and kWh
- Demand reductions – kW

Individual homes will be tested using blower door and Duct Blaster® equipment for air infiltration and duct leakage. Compliance with the thermal bypass checklist will also be enforced by having the builder sign each checklist, acknowledging that any defects will be repaired.

Southwest's performance as an EStar certification provider is also reviewed and renewed annually by RESNET.

BUDGET

The budget for this program is \$450,000 annually, or approximately 10.3 percent of the total DSM budget of \$4.385 million. Although a three-year program horizon was used for planning purposes, this level of spending will continue until further action is taken by the Commission. Program dollars are collected through a Demand Side Management Adjuster Mechanism (DSMAM), payable by all full-margin customer classes.

Program costs are estimates based on currently available information. Program dollars may be adjusted among categories of expenditures, based on program effectiveness. This flexibility will ensure optimal program performance for the total budget amount. Details of the estimated budget are provided in Appendix B.

COST-EFFECTIVENESS TEST RESULTS

The cost effectiveness test ratio for the Estar Home program is 5.56.

More detailed results of the cost-effectiveness testing and the societal evaluation are provided in Appendix C.

Societal Costs

Energy production and delivery consume large quantities of natural resources, such as fossil fuels, water, and land, and they have significant impacts on the environment. These impacts include air and water pollution, as well as the aesthetic aspects of energy infrastructure. With reduced energy requirements accruing from DSM programs, there are related societal benefits from water savings, fewer emissions, and lessened effects on the environment. Population growth in Arizona places increasing demands on a limited water supply, while lowered emissions has a positive effect on air and water quality, and consequently the health of residents.

Economic Impacts

Energy reliability has become an increasingly important issue. Arizonans are highly aware of the fragility of the Western power grid, due to a recent series of notable blackouts and brownouts. This problem is being examined by the Western Governors' Association on a regional basis.

In Arizona, as well as nationally, the demand for clean-burning natural gas for use in power plants has increased dramatically since 2000, resulting in an unprecedented escalation in the price of natural gas. This, in turn, has contributed to increases in the price of electricity. When consumers pay more for energy, they have less disposable income for other goods and services, thus affecting the state's economy.

Homes are responsible for approximately 30 percent of the nation's energy needs; therefore, they can contribute significantly in efforts to reduce the pollution associated with energy production and consumption. This is a principal reason why the national EStar program has been such an important component of the Environmental Protection Agency's Climate Change Action Plan.

All programs which reduce the need for energy mean reduced use of resources, less environmental impact, and delayed demand for additional energy infrastructure. These related benefits have a stabilizing effect on the local economy.

Human Impacts

Less energy production and use reduce the impact on Arizona's resources—land, water, air quality, and human health—encouraging a better quality of life for all residents. By reversing the upward spiral of ever-increasing energy demand, the related spiral of ever-increasing energy costs can also be reversed. This directly benefits the pocketbooks of all Arizonans.

Further, it should be recognized that EStar homes also increase occupant comfort while decreasing their energy bills.

ENERGY STAR® HOME

APPENDIX A
Equipment and Measures

APPENDIX A - Equipment and Measures - ENERGY STAR Home

All energy figures are based on REM/Rate analysis.

Measures are typical of ENERGY STAR new homes, but not all-inclusive of possible measures for compliance.

	Shell and Mechanical		Lights and Appliances	
	Natural Gas	Electric	Natural Gas	Electric
BASELINE (STANDARD) EQUIPMENT/MEASURES				
Number of Baseline Equipment/Measures	1	1	1	1
Useful Life (years)	25	25	12	12
Natural Gas Consumption (therms)	207	-	90	-
Winter (5 months, Nov-Mar)	207	-	50	-
Summer (7 months, Apr-Oct)	-	-	40	-
Electric Consumption (kWh)		12,160		7,002
Winter (5 months, Nov-Mar)		-		2,930
Summer (7 months, Apr-Oct)		12,160		4,072
Electric Demand (kW)		4.21		0.30
Baseline Equipment/Measure Cost	Std construct	Std construct	WH EF=0.56	Std appl pkg
Initial cost	\$ 2,243	\$ -	\$ 310	\$ 420
Installation cost	-	-	-	-
Annual maintenance cost	-	-	-	-
DSM (HIGH EFFICIENCY) EQUIPMENT/MEASURES				
Number of DSM (High-Efficiency) Natural Gas Appliances/Measures Installed Due to Program	1	1	1	1
Useful Life (years)	25	25	12	12
Natural Gas Consumption (therms)			81	
Winter (5 months, Nov-Mar)	129		45	
Summer (7 months, Apr-Oct)	0		36	
Electric Consumption (kWh)		9,230		6,534
Winter (5 months, Nov-Mar)		0		2,723
Summer (7 months, Apr-Oct)		9,230		3,811
Electric Demand (kW)		3.70		0.07
DSM Equipment/Measure Cost	Includes insulation upgrades, thermal bypass measures, duct sealing, and programmable thermostats		WH EF=0.62	Includes EStar dishwasher and lighting
Initial cost	\$ 2,857	\$ -	\$ 355	\$ 480
Installation	-	-	-	-
Annual maintenance cost	-	-	-	-

ENERGY STAR® HOME

**APPENDIX B
Budget**

APPENDIX B - Estimated Budget - ENERGY STAR® Home

Budget dollars are estimates that may be shifted among categories for flexibility, based on program effectiveness.

For Years 2007, 2008, and 2009

	2007	2008	2009
Program Implementation			
Inspections and testing	\$ 380,800	\$ 403,800	\$ 408,800
Communication			
Newspaper - placement	5,000	2,250	-
Magazines - production	2,000	1,000	-
Magazines - placement	17,000	10,000	8,000
Brochures	4,000	4,000	4,000
Outreach Events			
Trade show fees	1,000	1,000	1,000
Displays	3,500	-	-
Handouts	500	500	500
Training and Education			
Seminars - refreshments	3,000	1,500	1,500
Seminars - speakers	6,000	3,000	3,000
Seminars - promotion	2,000	1,000	1,000
Workshops - refreshments	2,500	1,000	850
Workshops - speakers	3,300	1,150	950
Measurement and Evaluation			
RESNET - rating fees	8,000	8,400	9,000
Software - REM/Rate®	5,000	5,000	5,000
Other Administrative Costs			
Office supplies	400	400	400
Travel expenses - conferences	3,000	3,000	3,000
Other travel expenses	3,000	3,000	3,000
TOTAL	\$ 450,000	\$ 450,000	\$ 450,000

ENERGY STAR® HOME

APPENDIX C
Cost-Effectiveness Test Results

Southwest Gas Corporation
Energy Star® Home
2007-2009

COST-EFFECTIVENESS OVERVIEW	
Annual Budget	\$450,000
Present Value Benefits	\$58,485,618
Present Value Costs	\$10,521,912
Present Value Net Benefits	\$47,963,706
Cost-Effectiveness Ratio	5.56

UNITS		
2007	2008	2009
4,200	4,500	4,500

CUMULATIVE ENERGY SAVINGS (Three-Year Program)		
Kilowatt-hour (kWh)	Kilowatt (kW)	Therms (Th)
1,119,125,040	9,768	27,165,600

ENVIRONMENTAL BENEFITS [1]				
Annual Savings	CO ₂ (lbs)	NOx (lbs)	SOx (lbs)	H ₂ O (gallons)
2007	14,068,779	2,639	66	3,574,728
2008	15,073,692	2,827	71	3,830,066
2009	15,073,692	2,827	71	3,830,066
Lifetime Savings	1,026,237,662	192,490	4,812	260,756,134
Annual Avoided Costs	CO ₂ (\$)	NOx (\$)	SOx (\$)	H ₂ O (\$)
2007	\$ 136,239	\$ 34,520	\$ 64,437	\$ 4,254
2008	\$ 145,970	\$ 36,986	\$ 69,040	\$ 4,558
2009	\$ 145,970	\$ 36,986	\$ 69,040	\$ 4,558
Lifetime Avoided Costs	\$ 9,937,830	\$ 2,518,031	\$ 4,700,325	\$ 310,300

[1] Sources:

- Avoided emission costs data from National Renewable energy Laboratory January 2005 report on Emerging Markets for Renewable Energy Certificates Opportunities and Challenges, as augmented by Bill Schrand/Southwest Administrator/Environmental Programs, and as augmented and commented on by David Berry/WRA.

- Conversion factor for CO₂ from Rocky Mountain Institute website on Energy and Carbon Dioxide Conversion Factors (5/23/05).

- Water values from Central Arizona Water Conservation District/Central Arizona Project, City of Phoenix and City of Tucson websites.

- Environmental benefits (conversion factors per kWh) listed in APS' DSM Portfolio Plan 2005-2007 (7/1/05)

4

MULTI-FAMILY NEW CONSTRUCTION

MULTI-FAMILY NEW CONSTRUCTION

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APPENDICES

- A – Equipment and Measures
- B – Budget
- C – Communication Plan
- D – Cost-Effectiveness Test Results

PROGRAM OVERVIEW

Program Description

Southwest Gas Corporation (Southwest) plans to implement a Demand Side Management (DSM) program targeting multi-family apartment homebuilders beginning in 2007. The program will require apartment builders to meet the current building code requirements adopted by the applicable governing municipality. The program requirements will meet established and highly recognized ENERGY STAR® energy-efficiency guidelines, requiring duct sealing, programmable thermostats, compact fluorescent lighting, and high-efficiency water heaters.

Financial incentives will be provided directly to multi-family apartment builders to drive program participation and the resulting gain in energy efficiency. Additionally, particular focus will be placed on builders who serve seniors and low-income consumers with new apartment housing units.

Program promotional efforts will include a campaign for general awareness and education. This will help provide a background for the building community necessary to promote overall energy efficiency and sustainable efficiency improvement in the Arizona rental marketplace.

This program will increase Arizona's energy savings and assist in the market transformation to ENERGY STAR residential new construction that has already occurred, and continues to evolve, in the single-family market. It will expand energy savings benefits to a new set of consumers who are typically very difficult to reach. Overall, the program will result in a positive societal benefit.

Program Objectives and Rationale

Apartment new construction contributes significantly to the annual load growth for electricity and water throughout the large metropolitan areas of Phoenix and Tucson. Recent economic metrics show:¹

- Continued increases in employment for Phoenix and Tucson
- Continued population growth in the target markets
- Increases in charged rent
- Improved capital investment climate for multi-family developments
- Decrease in supply due to conversions to for-sale condominiums

Apartment construction is typically targeted at all consumer groups, since units range from high-rent properties to properties designed for lower income segments.

¹ Marcus & Millichap Real Estate Investment Brokerage Co., Apartment Research Report, June 2004.

However, the multi-unit nature of the construction ensures a greater emphasis on lower- and middle-income segments that are unable to afford the rapidly rising home prices evident in both markets.

These consumer groups require value and low-cost alternatives for their ongoing costs, such as monthly utilities and rent. On the other hand, builders prefer low "first-cost" construction techniques, minimizing installation price of the units while maximizing their financial returns. This strategy used by builders can be counter to the construction of energy-efficient buildings and the installation of energy-efficient products, since these improvements typically have a cost premium associated with purchase and installation. These normal market forces are the backdrop for the efficiency incentive program presented here.

Currently, natural gas is installed in many multi-family apartment projects, at a minimum, to serve the amenities provided for the tenants. Projects typically request gas service for clubhouse use, community barbecues, and pool/spa heating needs. However, the individual apartment units are typically constructed with standard thermostats, regular incandescent lighting, no internal natural gas piping, and electric water heaters.

For gas installations by Southwest, all new construction projects must be determined to be economically feasible using the acceptable methodology outlined in the Arizona Gas Tariff Rule No. 6. Due to the high-density nature of multi-unit developments, and the fact that the gas main infrastructure is already in place adjacent to apartment developments, costs can be minimized. Apartment projects typically occupy the fringe parcels in master-planned communities and follow where single-family and commercial retail development already exist.

This program, therefore, is targeted to apartment builders to help improve the installation of energy-efficient measures in the individual units that reduce energy costs from the "status quo" building approach. Through prudent financial incentives for sealed ductwork, the installation of programmable thermostats, compact fluorescent lights (CFLs), and high-efficiency natural gas water heaters, coupled with an educational and marketing approach, Southwest will gain acceptance of higher efficiency standards for some of the new construction planned in 2007 and beyond. The two primary objectives of the program, in this light, are as follows:

1. Increase the energy efficiency standard in approximately 2,000 apartment units constructed in Arizona in each of the years 2007/2008/2009, by using a prescriptive approach
2. Create an increased awareness of high-efficiency measures for use by apartment builders in Arizona

Products and Services to Be Provided

Financial incentives will be provided to apartment builders to increase their installation of sealed ductwork and such high-efficiency appliances as water heaters, programmable thermostats, and a minimum of CFLs in two permanent light fixtures. The program will also provide duct testing and verification on 10 to 15 percent of the individual units to confirm that the proper installation of measures and duct sealing are being accomplished. Education and outreach on the benefits of energy efficiency will be provided to apartment leasing staffs and to apartment renters through brochures. A limited print campaign will be used to drive end-users to participating builders and to educate the public.

Opportunities

Because of the continued high population growth and escalation in single-family home prices expected in the major metropolitan areas of Arizona, there will be an ongoing, and potentially increasing need, for new apartment rental units. These units are necessary to provide housing for lower-income population segments. These consumers stand to benefit greatly from the lower utility costs realized from higher-efficiency appliances, thereby increasing their disposable income and positively impacting the local economy. In addition, consumers establish the habit of using high-efficiency appliances, which can affect their purchase decisions in the future, when some of them move into single-family housing.

The program is designed to provide a sufficient level of incentives to the builders to overcome installation cost barriers and assist in the cost differential to upgrade to higher-efficiency water heaters, ENERGY STAR appliances and lighting, and the installation of sealed ducts. It is anticipated that such incentives, over time, can engender a market transformation very similar to what has occurred with the prevalence of new ENERGY STAR single-family homes. Eventually, higher-efficiency appliances can become the norm in new apartments, rather than the exception.

Societal benefits to Arizona from savings in energy, water, and emissions will also result from this program.

Barriers to Program Acceptance, Adoption, and Deliverability

Significant barriers exist in the new construction apartment market. The following is a list of obstacles, based on past experience and discussions with apartment developers:

- Higher cost of energy-efficient appliances
- Higher costs associated with natural gas appliances
 - Added piping and venting costs
 - Higher price for appliances

- Added time for construction and utility installation
- Lack of awareness about higher-efficiency appliances
- Reluctance to change established practices
- Additional costs which do not necessarily equate to increased rental income for the builder

TARGET MARKET

The target market for this program is multi-family apartment builders in Arizona. The initial emphasis will be in the Phoenix area where there is more apartment growth, and then in both Phoenix and Tucson during Years 2 and 3. The ultimate beneficiaries of the program will be the renters of the units that are constructed. They will benefit from lower utility costs throughout the rental life of the unit. A secondary beneficiary will be the owner, who will improve the value of the property through improved efficiency systems.

Additionally, Southwest will work with the Arizona Energy Office to ensure that a portion of the participating Phoenix and Tucson builders in the program are serving the traditionally underserved senior and low-income customers.

The apartment renter has demographic characteristics that can vary tremendously depending on the unit type, cost, and location. This segment, however, can be characterized as encompassing a large number of the lower- and middle-income consumers. Rental units can provide a cost-effective housing option for such families, as well as those on a fixed income.

These consumers have typically not been beneficiaries of high-efficiency DSM programs in the past, since they are difficult to reach and are not inclined, nor usually able in a rental situation, to make capital investments related to energy efficiency.

The target markets for this program are as follow:

- Primary target – multi-family apartment builders operating in the Phoenix and Tucson areas. These developers can be encouraged to improve their market position through offering higher-efficiency units for rent.
 - Builders serving seniors and low-income customers in the same geographic area will also be targeted.
- Secondary target – the tenants of the units in these multi-unit apartment developments. They will have lower utility bills and a higher quality living environment throughout their time occupying the unit.

Program Eligibility Requirements

All builders of apartment dwellings in the greater Phoenix and Tucson areas are potentially eligible for this program.

Number of Potential Customers

The number of potential customers during the first three years of this program is listed in Table 1 below.

Table 1 – Apartment Permit Activity¹

Year	Phoenix	Tucson	Total
2005	3,250	1,517	4,767
2006	6,547	1,510	8,057
2007 – Program Year 1	7,047 ² (est.)	1,550 ² (est.)	8,597
2008 – Program Year 2	6,950 ² (est.)	1,600 ² (est.)	8,550
2009 – Program Year 3	7,100 ² (est.)	1,650 ² (est.)	8,750

¹ Phoenix – Elliot Pollack Report, 2005.

Tucson – Economic Outlook 2006/2007, Eller College of Management, University of Arizona.

² Southwest Service Planning Department, 2006.

Estimated Level of Program Participation

Southwest estimates the following levels of program participation during the first three years of this program:

Year 1	2007 – 2,000 units (Phoenix only)
Year 2	2008 – 2,000 units (Phoenix and Tucson)
Year 3	2009 – 2,000 units (Phoenix and Tucson)

It is estimated that demand will remain constant due to limited program resources.

ENERGY MEASURES

Baseline (Standard) Measures

The program is designed to improve the energy efficiency of the targeted multi-family apartments. The baseline, therefore, is defined as multi-family apartment units that would have been constructed without the program and incentives. Detailed information on the baseline measures is provided in Appendix A.

Of the projected 7,047 estimated apartment permits for 2007 in the Phoenix metropolitan area, it is assumed that 7,047 of these will be constructed with non-sealed ductwork, non-programmable thermostats, and incandescent lighting, while 6,347 will be constructed with electric water heating.

The Phoenix and Tucson markets are predominantly built to all-electric specifications, including all current participants in the Arizona Department of Housing Low-Income Housing Tax Credit program. Any use of gas is limited to approximately 700 grade A (luxury) apartment units. The majority of new apartments in all classes install laundry facilities in the units.

Further information on the baseline appliances found in Phoenix-area apartments is provided in Tables 2 and 3 below.

Table 2 – Estimated Standard Appliances in Phoenix-Area Apartments¹

Appliance/Measure	Energy Factor (EF)	Natural Gas ²	Electric	Total
Non-sealed ductwork	n/a	n/a	n/a	7,047
Non-programmable thermostats	n/a	n/a	n/a	7,047
Water heater	Gas: 0.54 - 0.58 Electric: 0.88	700 (10%)	6,347 (90%)	7,047
Incandescent lighting	n/a	n/a	n/a	7,047

¹ Phoenix Elliott Pollack report, 2005.

² Southwest Central Arizona Division Service Planning data, 2005-2006.

Table 3 – Baseline Appliance Information ^{1,2,3,4}

Appliance/Measure	Energy Use	Demand kW	Useful Life (Years)	Cost
Non-sealed ductwork	9,789 kWh	2.69	25	\$2,875
Non- programmable thermostat	9,789 kWh	2.69	25	\$2,875
Water heater – electric	2,168 kWh	1.10	12	\$300
Water heater – natural gas	74 therms	n/a	12	\$355
Incandescent lighting	5,071 kWh	0.30	12	\$10

¹ California Statewide Residential Appliance Saturation Survey (RASS), California Energy Commission, June 2004.

² Database of Energy Efficiency Resources (DEER), California Energy Commission, October 2005.

³ Energy Information Administration and manufacturer websites (General Electric and Sears).

⁴ Energy use and costs for ductwork and thermostats are embedded in the overall HVAC system figures. See Table 4 for the incremental energy savings and costs that result from improving these two measures.

DSM Measures

Information on the DSM measures is provided in Table 4 below. More detailed information is available in Appendix A.

Table 4 – High-Efficiency Appliance Information^{1,2,3,4}

Appliance	Number Installed (Per Year)	Useful Life	Energy Savings/Unit	Appliance Cost	Incremental Cost
Duct sealing	2,000	18	850 kWh	\$3,025	\$150
Programmable thermostat	2,000	12	205 kWh	\$2,895	\$20
Water heater - electric	-0-	n/a	2,168 kWh	\$398	\$398
Water heater – natural gas	2,000	12	13 therms	\$398	\$43
Compact fluorescent lighting (two minimum)	2,000	12	177 kWh	\$25	\$15

¹ California Statewide Residential Appliance Saturation Survey (RASS), California Energy Commission, June 2004.

² Database of Energy Efficiency Resources (DEER), California Energy Commission, October 2005.

³ Energy Information Administration and manufacturer websites (General Electric and Sears).

⁴ Costs for duct sealing and programmable thermostats are embedded in the overall HVAC system costs.

IMPLEMENTATION PLAN

Marketing and Delivery Strategy

Key marketing and delivery tasks will include the following:

- Program eligibility requirements – Develop final program qualifications for builders, including flexible and prescriptive requirements, and customized payment process for rebate dollars.
- Marketing material development – Develop brochures promoting the program and a flyer for builders' leasing agents to use. Include program

information on Southwest website. Print media will also be used for program outreach.

- Segmentation and targeting – Southwest Phoenix and Tucson Service Planning employees will identify and target key builders to drive the desired volume of participating units.
- Direct builder marketing – Service Planning employees will focus on concentrated direct negotiation with key builders to drive program participation.
- Ongoing rebate management – As units are constructed and occupied, payment of rebates will be made to qualifying builders.
- Measurement and verification – Ongoing measurement and verification will ensure that the program is meeting its goals.

Communication

The audience for this program is the major multi-family apartment builders in Phoenix during Year 1, and in both Phoenix and Tucson during Years 2 and 3. Communication will focus on one-on-one contact with apartment builders. A brochure will be designed to assist with this purpose. More detailed information on the communication plan is provided in Appendix C.

Consumers will be educated through the apartment builders' leasing staff. Renters will be provided with educational materials which create awareness and explain the benefits of energy efficiency.

Southwest will utilize its existing toll-free Energy Services Department hotline for general questions from consumers and builders, and the Southwest website for providing general program and contact information. Southwest will work with the Arizona Department of Commerce Energy Office to promote the program with participants in the Low-Income Housing Tax Credit Program.

Program Incentives

The program is designed to provide a sufficient level of incentives to the builders to overcome installation cost barriers, and assist in the cost differential to upgrade to sealed ductwork, programmable thermostats, higher-efficiency water heaters, and the use of compact fluorescent lighting. It is anticipated that such incentives will lead to a market transformation very similar to what has occurred in the single-family new construction market with ENERGY STAR homes. Higher-efficiency construction and appliances would then become the norm, rather than the exception, in new apartments.

Currently, only 10 percent of the new apartment market (luxury projects) is built with natural gas in the units, while 90 percent of the market is all-electric. Southwest believes this practice disadvantages lower-income residents by giving them disproportionately higher energy costs. Thus, incentives in this program are designed to motivate builders to provide more fairness in energy choice to consumers. Moving, and ultimately transforming, the market cannot be easily accomplished without meaningful incentives.

The incentive levels for the two different segments in the multi-family market are indicated below in Tables 7 and 8. Because the two segments within the multi-family market (10 percent and 90 percent) would incur different costs if they upgrade to the standards in this DSM program, Southwest has set two different incentive levels for the two segments.

Table 7 – Incentives for 10 Percent of Multi-Family Market

Measure Description	Incentive
Sealed ductwork	\$150
Programmable thermostat	\$20
Water heater – natural gas (.63 EF)	\$43
CFL (minimum of two fixtures per unit)	\$15
Total	\$228

Table 8 – Incentives for 90 Percent of Multi-Family Market

Measure Description	Incentive
Sealed ductwork	\$150
Programmable thermostat	\$20
Water heater – natural gas (.63 EF)	\$398
CFL (minimum of two fixtures per unit)	\$15
Total	\$583

Staffing Requirements

Awareness-building and communications will be handled by existing staff in Southwest's Service Planning Department and other internal departments. The budget includes temporary staffing to assist with the administration of the program, including field verification and processing of incentive payments directly to the contracted builder.

Timeline of Activities

The program will be developed and submitted to the Arizona Corporation Commission for review during the 2006 calendar year. Program activity is expected to commence in January 2007. Southwest's goal is for all Year 1 program deliverables to be scheduled and completed prior to actual program implementation, due to the inherent long lead-time characteristics of the new construction market. It is likely that the full Year 1 program effects will continue into Year 2 and beyond.

MEASUREMENT AND EVALUATION

Southwest will track and measure:

- Number of program participants
- Number of units constructed
- Measures installed
- Number and results of duct tests conducted
- Rebates processed
- Energy savings in therms and kilowatt-hours (kWh)
- Demand reduction (kW)
- Number of communication activities
- Website hits
- Consumer and builder inquiries

Southwest may also conduct follow-up phone or mail surveys of participants and non-participants to determine satisfaction, reasons for non-participation, effectiveness of communications, influence of the program on decision-making, and the need for program modifications. An outside contractor may also be utilized in program measurement and evaluation.

BUDGET

The budget for this program is \$1.2 million, which represents approximately 27 percent of the total DSM budget of \$4.385 million. More detail can be found in Appendix B. Although a three-year program horizon was used for planning purposes, this level of spending will continue until the Commission determines otherwise or decides to take further action. Program dollars are collected through a Demand Side Management Adjustor Mechanism (DSMAM), payable by all full-margin customer classes.

Program costs are estimates based on currently available information. Program dollars may be adjusted among categories of expenditures, based on program

effectiveness. This flexibility will ensure optimal allocation of the total budget amount.

COST-EFFECTIVENESS TEST RESULTS

The cost-effectiveness test ratio for the Multi-Family New Construction program is 2.17. More cost-effectiveness information, including the results of the societal evaluation, is provided in Appendix D.

Societal Costs

Energy production has a great impact on resources—particularly water—and the environment. In fact, the Arizona Department of Environmental Quality regulates the environmental effects of energy production. Reduced energy requirements resulting from DSM programs provide quantifiable societal benefits in terms of water savings and less pollution. Less energy needed, therefore, equates to a better quality of life for Arizonans.

Economic Impacts

Especially during hot weather, Arizona's news can be full of stories about escalating energy prices, blackouts, brownouts, and the fragility of the Western power grid. DSM programs that lessen energy demand due to increased energy efficiency can help reduce the strain on energy infrastructure, and minimize vulnerability.

With Arizona's population growing at an estimated three percent annually, reduced energy requirements slow the need for additional infrastructure and the resources required to produce and deliver energy. This helps to stabilize the region's economy and assure sufficient resources to meet future growth.

Arizona generates much of its electricity, especially during peak periods, from natural gas in new power plants or additions to existing power plants constructed since 2000. This phenomenon is mirrored nationally, helping to drive natural gas prices to record heights, with associated increases in the price of electricity. Higher energy costs affect every aspect of Arizona's economy, driving up the prices of all goods and services.

Human Impacts

Builders would have more incentive to construct energy-efficient apartments under this program. Therefore, it is believed that without the incentives provided by this DSM program, apartments will continue to be built to less efficient standards.

As a result, the units may have leaky ductwork (which wastes heating and cooling energy), low-efficiency appliances, and incandescent lighting. The latter actually leads to increased cooling load, which can be significant during peak periods when the existing power grid is especially vulnerable to overload. The net result is that multi-family consumers would otherwise continue to pay higher utility bills.

MULTI-FAMILY NEW CONSTRUCTION

**APPENDIX A
Equipment and Measures**

APPENDIX A - Equipment and Measures - Multi-Family New Construction

2007

	Duct Sealing		Programmable Thermostat		Water Heater		Compact Fluorescent Lights	
	Natural Gas	Electric	Natural Gas	Electric	Natural Gas	Electric	Natural Gas	Electric
BASELINE/STANDARD/EQUIPMENT/MEASURES								
Number of Baseline Equipment/Measures	700	6,347	700	6,347	700	700	700	6,347
Useful Life (years)	-	25	-	25	12	-	-	12
Natural Gas Consumption (therms)	-	-	-	-	74	-	-	-
Winter (5 months, Nov-Mar)	-	-	-	-	41	-	-	-
Summer (7 months, Apr-Oct)	-	-	-	-	33	-	-	-
Electric Consumption (kWh)	-	9,789	-	9,789	-	-	-	5,071
Winter (5 months, Nov-Mar)	-	1,026	-	1,026	-	-	-	2,113
Summer (7 months, Apr-Oct)	-	8,763	-	8,763	-	-	-	2,958
Electric Demand (kW)	-	2.69	-	2.69	0.30	-	-	0.30
Baseline Equipment/Measure Cost	\$	2,875	\$	2,875	\$	355	\$	10
Initial cost	-	-	-	-	-	-	-	-
Installation cost	-	-	-	-	-	-	-	-
Annual maintenance cost	-	-	-	-	-	-	-	-
DSM/HIGH EFFICIENCY/EQUIPMENT/MEASURES								
Number of DSM (High Efficiency) Natural Gas Appliances/Measures Installed Due to Program	2,000 hi-eff/700 standard	5,247	2,000 high-eff/700 standard	5,247	2,000 high-eff/700 standard	2,000 high-eff/700 standard	2,000 high-eff/700 standard	5,247
Useful Life (years)	-	25	-	25	12	-	-	12
Natural Gas Consumption (therms)	-	-	-	-	61	-	-	-
Winter (5 months, Nov-Mar)	-	-	-	-	34	-	-	-
Summer (7 months, Apr-Oct)	-	-	-	-	27	-	-	-
Electric consumption (kWh)	-	8,939	-	9,584	-	-	-	4,894
Winter (5 months, Nov-Mar)	-	986	-	967	-	-	-	2,039
Summer (7 months, Apr-Oct)	-	7,943	-	8,617	-	-	-	2,855
Electric demand (kW)	-	2.42	-	2.69	0.30	-	-	0.30
DSM Equipment/Measure Cost	\$	3,025	\$	2,895	\$	398	\$	25
Initial cost	-	-	-	-	-	-	-	-
Installation cost	-	-	-	-	-	-	-	-
Annual maintenance cost	-	-	-	-	-	-	-	-

APPENDIX A - Equipment and Measures - Multi-Family New Construction
2008

	Duct Sealing		Programmable Thermostat		Water Heater		Compact Fluorescent Lights	
	Natural Gas	Electric	Natural Gas	Electric	Natural Gas	Electric	Natural Gas	Electric
BASELINE (STANDARD) EQUIPMENT/MEASURES								
Number of Baseline Equipment/Measures	855	7,695	855	7,695	855	855	855	7,695
Useful Life (years)	-	25	-	25	12	-	-	12
Natural Gas Consumption (therms)	-	-	-	-	74	-	-	-
Winter (5 months, Nov-Mar)	-	-	-	-	41	-	-	-
Summer (7 months, Apr-Oct)	-	-	-	-	33	-	-	-
Electric Consumption (kWh)	-	9,789	-	9,789	-	-	-	5,071
Winter (5 months, Nov-Mar)	-	1,026	-	1,026	-	-	-	2,113
Summer (7 months, Apr-Oct)	-	8,763	-	8,763	-	-	-	2,958
Electric Demand (kW)	-	2.69	-	2.69	0.30	-	-	0.30
Baseline Equipment/Measure Cost								
Initial cost	\$	2,875	\$	2,875	\$	355	\$	10
Installation cost	-	-	-	-	-	-	-	-
Annual maintenance cost	-	-	-	-	-	-	-	-
DSM (HIGH EFFICIENCY) EQUIPMENT/MEASURES								
Number of DSM (High Efficiency) Natural Gas Appliances/Measures Installed Due to Program	2,000 hi-eff/700 standard	5,247	2,000 hi-eff/700 standard	5,247	2,000 hi-eff/700 standard	2,000 hi-eff/700 standard	2,000 hi-eff/700 standard	5,247
Useful Life (years)	-	25	-	25	12	-	-	12
Natural Gas Consumption (therms)	-	-	-	-	61.00	-	-	-
Winter (5 months, Nov-Mar)	-	-	-	-	33.90	-	-	-
Summer (7 months, Apr-Oct)	-	-	-	-	27.10	-	-	-
Electric consumption (kWh)	-	8,939	-	9,584	-	-	-	4,894
Winter (5 months, Nov-Mar)	-	996	-	967	-	-	-	2,039
Summer (7 months, Apr-Oct)	-	7,943	-	8,617	-	-	-	2,855
Electric demand (kW)	-	2.42	-	2.69	0.30	-	-	0.30
DSM Equipment/Measure Cost								
Initial cost	\$	3,025	\$	2,895	\$	398	\$	25
Installation cost	-	-	-	-	-	300	-	-
Annual maintenance cost	-	-	-	-	-	-	-	-

APPENDIX A - Equipment and Measures - Multi-Family New Construction
2009

	Duct Sealing		Programmable Thermostat		Water Heater		Compact Fluorescent Lights	
	Natural Gas	Electric	Natural Gas	Electric	Natural Gas	Electric	Natural Gas	Electric
BASELINE (STANDARD) EQUIPMENT/MEASURES								
Number of Baseline Equipment/Measures	875	7,875	875	7,875	875	875	875	7,875
Useful Life (years)	-	25	-	25	12	-	-	12
Natural Gas Consumption (therms)								
Winter (5 months, Nov-Mar)	-	-	-	-	74	-	-	-
Summer (7 months, Apr-Oct)	-	-	-	-	41	-	-	-
Electric Consumption (kWh)								
Winter (5 months, Nov-Mar)	-	9,789	-	9,789	-	-	-	5,071
Summer (7 months, Apr-Oct)	-	1,026	-	1,026	-	-	-	2,113
	-	8,763	-	8,763	-	-	-	2,958
Electric Demand (kW)								
	-	2.69	-	2.69	0.30	-	-	0.30
Baseline Equipment/Measure Cost								
Initial cost	\$	2,875	\$	2,875	\$	355	\$	10
Installation cost	-	-	-	-	-	-	-	-
Annual maintenance cost	-	-	-	-	-	-	-	-
DSM (HIGH EFFICIENCY) EQUIPMENT/MEASURES								
Number of DSM (High Efficiency) Natural Gas Appliances/Measures Installed Due to Program	2,000 hi-eff/700 standard	5,247	2,000 high-eff/700 standard	5,247	2,000 high-eff/700 standard	2,000 high-eff/700 standard	2,000 high-eff/700 standard	5,247
Useful Life (years)	-	25	-	25	12	-	-	12
Natural Gas Consumption (therms)								
Winter (5 months, Nov-Mar)	-	-	-	-	61	-	-	-
Summer (7 months, Apr-Oct)	-	-	-	-	34	-	-	-
Electric consumption (kWh)								
Winter (5 months, Nov-Mar)	-	8,939	-	9,584	-	-	-	4,894
Summer (7 months, Apr-Oct)	-	986	-	967	-	-	-	2,039
	-	7,943	-	8,617	-	-	-	2,855
Electric demand (kW)								
	-	2.42	-	2.69	0.30	-	-	0.30
DSM Equipment/Measure Cost								
Initial cost	\$	3,025	\$	2,895	\$	388	\$	25
Installation cost	-	-	-	-	-	-	-	-
Annual maintenance cost	-	-	-	-	-	-	-	-

MULTI-FAMILY NEW CONSTRUCTION

**APPENDIX B
Budget**

APPENDIX B - Estimated Budget - Multi-Family New Construction

For Years 2007, 2008, and 2009

Budget dollars are estimates that may be shifted among categories for flexibility, based on program effectiveness.

	2007	2008	2009
Implementation			
Outside contractors	\$ 45,000	\$ 45,000	\$ 45,000
Communication			
Newspaper - production	1,500	1,146	1,146
Newspaper - placement	31,400	36,354	36,354
Magazines - production	3,000	1,000	1,000
Magazines - placement	11,900	17,500	17,500
Banners	700	1,500	1,500
Brochures	7,500		
Incentives			
Incentive amounts	1,095,000	1,095,000	1,095,000
Measurement and Evaluation			
Outside contractors	1,500	1,500	1,500
Surveys	500	500	500
Other Administrative Costs			
Office supplies	1,000	500	500
Travel expenses	1,000		
TOTAL	\$ 1,200,000	\$ 1,200,000	\$ 1,200,000

MULTI-FAMILY NEW CONSTRUCTION

**APPENDIX C
Communication Plan**

APPENDIX C - Communication Plan - Multi-Family New Construction

Budget dollars are estimates that may be shifted among categories for flexibility, based on program effectiveness.

2007						
Dates	Publication	Type of Media	Description	Frequency	Price	Cost
Jul - Dec	Apartment.com Magazine	Monthly/Free	Full page 4/C	6	\$823 gross/6 mo	\$ 4,938
Jul - Dec	AZ Republic Real Estate Magazine	Monthly	Full page B/W	6	\$1,153 gross	6,918
Oct - Dec	AZ Republic Weekend Real Estate	Broadsheet/Sat. only	1/2 page 4/C	3	\$4,706 gross	14,118
Nov - Dec	AZ Republic Weekend Real Estate	Tabloid-size/Sun. only	1/2 page 4/C	2	\$2,706 gross	5,412
				Total		\$ 31,386

2008						
Dates	Publication	Type of Media	Description	Frequency	Price	Cost
Jan - Dec	Apartment.com Magazine	Monthly/Free	Full page 4/C	12	\$764 gross/ 12 mo.	\$ 9,168
Jan - Dec	AZ Republic Real Estate Magazine	Monthly	1/2 page B/W	12	\$694 gross	8,328
May - Jun	AZ Republic Weekend Real Estate	Broadsheet/Sat. only	1/2 page 4/C	6	\$4,706 gross	28,236
Sep - Oct	AZ Republic Weekend Real Estate	Tabloid-size/Sun. only	1/2 page 4/C	3	\$2,706 gross	8,118
				Total		\$ 53,850

2009						
Dates	Publication	Type of Media	Description	Frequency	Price	Cost
Jan - Dec	Apartment.com Magazine	Monthly/Free	Full page 4/C	12	\$764 gross/ 12 mo.	\$ 9,168
Jan - Dec	AZ Republic Real Estate Magazine	Monthly	1/2 page B/W	12	\$694 gross	8,328
Jan - Feb	AZ Republic Weekend Real Estate	Broadsheet/Sat. only	1/2 page 4/C	6	\$4,706 gross	28,236
Aug	AZ Republic Weekend Real Estate	Tabloid-size/Sun. only	1/2 page 4/C	3	\$2,706 gross	8,118
				Total		\$ 53,850

MULTI-FAMILY NEW CONSTRUCTION

APPENDIX D
Cost-Effectiveness Test Results

**Southwest Gas Corporation
Multi-Family New Construction
2007-2009**

COST-EFFECTIVENESS OVERVIEW	
Annual Budget	\$1,200,000
Present Value Benefits	\$7,571,560
Present Value Costs	\$3,495,700
Present Value Net Benefits	\$4,075,860
Cost-Effectiveness Ratio	2.17

UNITS		
2007	2008	2009
2,000	2,000	2,000

CUMULATIVE ENERGY SAVINGS (Three-Year Program)		
Kilowatt-hour (kWh)	Kilowatt (kW)	Therms (Th)
334,839,966	5,940	(3,859,200)

ENVIRONMENTAL BENEFITS [1]				
Annual Savings	CO ₂ (lbs)	NOx (lbs)	SOx (lbs)	H ₂ O (gallons)
2007	6,278,169	1,178	29	1,595,216
2008	6,278,169	1,178	29	1,595,216
2009	6,278,169	1,178	29	1,595,216
Lifetime Savings	307,134,080	57,609	1,440	78,039,521
Annual Avoided Costs	CO ₂ (\$)	NOx (\$)	SOx (\$)	H ₂ O (\$)
2007	\$ 60,796	\$ 15,404	\$ 28,755	\$ 1,898
2008	\$ 60,796	\$ 15,404	\$ 28,755	\$ 1,898
2009	\$ 60,796	\$ 15,404	\$ 28,755	\$ 1,898
Lifetime Avoided Costs	\$ 2,974,210	\$ 753,601	\$ 1,406,721	\$ 92,867

[1] Sources:

- Avoided emission costs data from National Renewable energy Laboratory January 2005 report on Emerging Markets for Renewable Energy Certificates Opportunities and Challenges, as augmented by Bill Schrand/Southwest Administrator/Environmental Programs, and as augmented and commented on by David Berry/WRA.
- Conversion factor for CO₂ from Rocky Mountain Institute website on Energy and Carbon Dioxide Conversion Factors (5/23/05).
- Water values from Central Arizona Water Conservation District/Central Arizona Project, City of Phoenix and City of Tucson websites.
- Environmental benefits (conversion factors per kWh) listed in APS' DSM Portfolio Plan 2005-2007 (7/1/05)

5

CONSUMER PRODUCTS

CONSUMER PRODUCTS

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APPENDICES

- A – Equipment and Measures
- B – Budget
- C – Cost-Effectiveness Test Results

PROGRAM OVERVIEW

Program Description

Southwest Gas Corporation (Southwest or Company) offers this program to residential consumers in the Company's Arizona service areas who purchase either new or replacement ENERGY STAR® labeled high-efficiency water heaters, clothes washers and dryers (purchased together), and programmable thermostats at retail stores. Where ENERGY STAR ratings exist, the customer may purchase any qualifying model; however, in the absence of the ENERGY STAR rating, only equipment meeting the program efficiency guidelines will be eligible for a rebate.

The goal is to increase the awareness and purchases of more efficient equipment. During program implementation, qualifying appliance standards will be reviewed annually and adjusted, as necessary, to reflect changing national efficiency standards.

A variety of Southwest communications, such as bill inserts, newsletters, and website announcements will inform consumers about the rebates that are available for higher efficiency measures. Point-of-purchase informational materials and educational events will also be available at retail stores. After purchase, the consumer will submit a rebate form to Southwest with proof of purchase, and a rebate check will be sent directly to them. Follow-up phone calls will be made to a sampling of these customers to conduct a short survey. This survey will assess customer satisfaction, as well as the efficacy of the communication channels and the rebate in the purchase decision.

Program Objectives and Rationale

Consumers are faced with a barrage of choices when it comes to the purchase of appliances such as water heaters, clothes washers, dryers, and thermostats. Often, energy performance of these items is very low on the list of considerations at the time of purchase; consumers may not even be aware that higher efficiency choices are available, or that the incremental cost can quickly be repaid in the form of lower energy bills. Southwest believes that actively informing and educating consumers is the first step toward encouraging them to make wiser energy efficiency decisions in their purchases. Secondly, the availability of a financial incentive in the form of a rebate could be the trigger to actually initiate a higher efficiency purchase. Since appliances last many years, the annual incremental effects of lower energy use can have a profound effect on Arizona's total energy needs, with a corresponding impact on environmental quality and the resources associated with energy production.

Products and Services to Be Provided

Rebates will be offered to consumers for the purchase of high-efficiency water heaters, clothes washers and dryers (purchased together), and programmable thermostats. In addition, Southwest will provide information about the program and high-efficiency appliances through bill inserts, direct mail, point-of-sale materials, retailer events, and retailer training.

Opportunities

Over 87 percent of Southwest's approximately 875,000 Arizona residential customers are located in the greater Phoenix and Tucson areas. Based on the U.S. Census Bureau *American Housing Survey for the Phoenix Metropolitan Area: 2002* and Southwest's records, the total population in Southwest service areas is estimated to be 2,178,480. Of this total, 100 percent are estimated to have heating (implying the presence of a thermostat) and water heating, 80 percent are estimated to have clothes washers and 77 percent to have dryers. (See Appendix A.)

A 2005 year-end report from the Association of Home Appliance Manufacturers (AHAM) for Maricopa and Pima counties shows the following domestic shipments of appliances, which are indicative of the number being purchased annually.

Table 1: Domestic Appliance Shipments by County in 2005

Appliance	Maricopa	Pima	Total	Available Market	% of Purchases
Clothes washers	141,778	33,517	175,295	1,742,784	10%
Clothes dryers	128,956	28,923	157,879	1,677,430	9%
Water heaters*	n/a	n/a	n/a	2,178,480	10% (est.)
Thermostats*	n/a	n/a	n/a	2,178,480	10% (est.)

* AHAM does not provide data on water heaters or thermostats; however, it can be assumed from the other percentages above that a 10% annual purchase rate would be reasonable.

Given a purchase rate of approximately 10 percent annually, the potential for installing higher efficiency appliances in Arizona is huge, with significant resulting impacts on total energy use.

Barriers to Program Acceptance, Adoption, and/or Deliverability

Educating consumers is always a challenge, as is motivating them to purchase different items than they may have originally intended to purchase. Appliance purchases are often made in a crisis situation, when the existing equipment is non-functioning and cannot readily be repaired. Consumers are apt to buy whatever the retailer has available at that moment, in the desired price range, with little heed to the energy performance. This situation of haste narrows the window even further for potentially influencing the consumer. High-efficiency equipment does not necessarily "advertise" itself by looking noticeably different than its less-efficient counterparts; except for cosmetic differences, one water heater or clothes washer looks very much like another. Often, the purchase decision is highly influenced by the retail salesperson, who may have his/her own agenda in steering the customer to a particular brand or model.

Another barrier is the greater initial cost of higher efficiency products. Consumers who are primarily price-motivated need plenty of education to justify the larger price tag in their own minds. Southwest's program information will help them realize that lower operating cost of higher efficiency equipment more than pays for itself, often in a relatively short period of time.

With rebates, there is some degree of hassle involved in redemption for the consumer; therefore, the rebate amount must be sufficiently attractive to not only influence the purchase decision, but also to instigate the appropriate consumer follow-through.

Retailers must be willing to display appropriate point-of-purchase materials and work with a Southwest representative who will coordinate Southwest's informational outreach with retailer sales and promotions. In addition, the sheer geographic size of the market – particularly in the Phoenix area – requires the full-time services of a contract employee to reach most potential retailers. Another concern is that participating retailers may be limited or not available in some areas.

TARGET MARKET

Customer Type

This program will be available to all Southwest residential customers located in the Company's Arizona service areas.

Program Eligibility

The intended installation of the new purchase or replacement product must be located in a Southwest Arizona service territory. Customers will be eligible for more than one rebate if they purchase more than one qualifying measure.

Where ENERGY STAR ratings exist, the customer may purchase any qualifying model; however, in the absence of the ENERGY STAR rating, only equipment meeting the program efficiency guidelines will be eligible for a rebate.

Number of Potential Participants

The number of potential participants over the first three program years is estimated below. The figures for Years 2 and 3 assume a three percent annual growth rate in Southwest's service area population.

Year 1	2,178,480 people
Year 2	2,243,834 people
Year 3	2,311,149 people

Estimated Level of Participation

The estimated level of program participation over the first three years of the program is:

Year 1	5,950 measures
Year 2	5,950 measures
Year 3	5,950 measures

ENERGY MEASURES

Table 2 – Baseline (Standard) and DSM Measures

Appliance	Baseline	DSM	ENERGY STAR	Percent ENERGY STAR Sold in Arizona
Water heater	0.58 EF (gas) 0.88 EF (electric)	0.63 EF (gas) 0.93 EF (electric)	Not labeled	n/a
Clothes washer	1.04 MEF*	1.52 MEF**	MEF=1.72***	36.5%
Clothes dryer	2.67 EF (gas) 3.01 EF (electric) No moisture sensor	Same, but with moisture sensor	Not labeled	n/a
Thermostat	Non-programmable	Programmable	Accuracy of +/- 2 degrees; Four program periods per day	10%

Note: The Environmental Protection Agency (EPA) does not rate all categories of appliances for the ENERGY STAR label.

*MEF (Modified Energy Factor measures the energy used during the washing process, including machine energy, water heating energy, and dryer energy).

** This MEF exceeds the current ENERGY STAR standard of 1.42. An MEF of 1.52 was used in cost-effectiveness calculations.

*** The MEF for ENERGY STAR rating will increase to 1.72 on January 1, 2007, and also include a new requirement (water factor of 8.0).

During implementation, Southwest's program will reflect any changes to national equipment efficiency standards or ENERGY STAR ratings.

Additional details on the energy measures are provided in Appendix A.

IMPLEMENTATION PLAN

Marketing and Delivery Strategy

Consumers will be informed about the Consumer Products program via Southwest bill inserts, customer newsletters, and the Company website. Rebate forms will be available on the website or by mail, in response to customer requests through the toll-free Southwest Energy Services hotline, 1-800-654-2765. Customers can leave a phone message after-hours, and also request forms via e-mail. A contract employee will be hired to deliver point-of-purchase informational materials to retailers, coordinate activities with them, and act as a liaison between retailers and Southwest.

Communication Plan

Informational bill inserts will be delivered in Southwest bills to all Arizona residential customers, educating them about high-efficiency equipment and also indicating how to obtain rebate forms.

Each Southwest Arizona residential customer will also be sent a direct mail postcard at the beginning of the program to announce it, and to encourage them to watch their bills for informational inserts. Postcards will be repeated annually each program year.

Frequency of Communication

Bill inserts will be sent four times per year. Direct mail will be sent once per year.

Timing of Communication

Bill inserts will be sent in coordination with retail partners' sales and promotions, as determined with partners. For appliances, bill inserts would be evenly spaced during the year. For thermostats, distribution would be in early fall.

Postcards will be sent as described above.

Geography of Communication

All Southwest residential customers in Arizona service areas will receive postcards and inserts.

Cost of Communication

Bill inserts are projected to cost \$14,500 per distribution, for a total of \$58,000 per year for four. Postcard production and mailing are estimated at \$0.25 each, totaling \$225,000 for 900,000 units.

Training

A contractor will be hired to work with retailers as needed and to ensure that informational point-of-purchase materials are displayed. Where feasible, ongoing educational sessions will be held with retail salespeople as needed.

Seminars/Workshops

The contract employee will work with retailers to conduct workshops on site at retail locations, to educate customers on the benefits of high-efficiency appliances, installation techniques, and related issues. The contractor will also educate customers on how to program setback thermostats. Informational handouts, signage, and other literature will be provided during these sessions. Approximately 20 to 30 customers are expected to attend each session.

Incentives

Incentives will be paid to customers who install a DSM measure (See Appendix A). The customer will complete the application for a rebate, attach the paid retail invoice or sales receipt, and submit the forms for payment to Southwest or its designate. Incentives will be processed by Southwest or its designate. Customers will be eligible for multiple rebates for multiple qualifying purchases.

Table 3: Rebate Amount per Program Measure

Measure	Rebate Amount
Water heater	\$ 75
Clothes washer and dryer (sets only)	\$ 200
Programmable thermostat	\$ 15

Staffing Requirements

One contract employee is expected to be required for this program. In addition, Southwest Energy Services employees will serve as the consumer point of contact for additional information and requests for rebate forms via the consumer toll-free hotline, 1-800-654-2765. They will also respond to e-mail requests.

Timelines

Bill insert mailings will be timed to coordinate with retail partners' sales or promotions, which are envisioned to be held in May, June, July, and September of each year.

MEASUREMENT AND EVALUATION

The number of participating retailers, retail events, and attendance will be tracked by the contractor. Incentives paid to participants, the number of appliances sold, demand and usage reduction, calls to Energy Services, and website hits will be tracked by Southwest.

Follow-up phone surveys will be conducted by Southwest Energy Services. Customer satisfaction will be tracked, as well as the influence of the rebate on the purchase decision. Other marketing data may also be obtained. In addition, customer records will be updated as appropriate.

BUDGET

The budget for this program is \$800,000, which represents about 18 percent of the total DSM budget of \$4.385 million. Although a three-year program horizon was used for planning purposes, this level of spending will continue until further action is taken by the Commission.

Program dollars are collected through a Demand Side Management Adjuster Mechanism (DSMAM), payable by all full-margin customer classes.

Program costs are estimates based on currently available information. Program dollars may be adjusted among categories of expenditures, based on program effectiveness. This flexibility will ensure optimal program performance for the total budget amount.

Additional budget information is provided in Appendix B.

COST-EFFECTIVENESS TEST RESULTS

The cost-effectiveness test ratio for the Consumer Products program is 5.04.

Detailed results of the cost-effectiveness testing and the societal evaluation are provided in Appendix C.

Societal Costs

Energy production consumes a large amount of water (about 0.45 gallon per kWh per *The Last Straw*, Hewlett Foundation, April 2003) and produces emissions that affect air quality. These emissions are carbon dioxide, associated with global warming, sulfur oxides (SOx) associated with acid rain, and nitrous oxides (NOx) associated with smog. In addition, mercury, other heavy metals, and particulates are emitted into the air and water supply. These can all have an adverse effect on the health of residents, and in fact, the Arizona Department of

Environmental Quality regulates their quantity and hence their impact on Arizona's environment. Reduced energy requirements resulting from DSM programs provide quantifiable societal benefits in terms of water savings and less pollution. Less energy needed equates to a better quality of life for Arizonans. The sheer number of water heaters, clothes washers, dryers, and thermostats found in Arizona homes translates into an opportunity for significant energy savings.

Economic Impacts

The energy crunch of 2000-2001 and several subsequent notable blackouts and brownouts increased Arizonans' awareness of the fragility of the Western power grid. Energy reliability has become an increasingly important issue. This problem is being addressed by the Western Governors' Association, as it is a regional problem, not isolated just to Arizona.

Meanwhile, the demand for clean-burning natural gas for use in power plants has increased dramatically since 2000. Fourteen new power plants or additions to existing power plants have been constructed in Arizona since 2000, all of them using natural gas. A similar phenomenon has also occurred across the United States. The laws of supply and demand resulted in a large increase in the price of natural gas in 2005 with associated increases in the price of electricity. It seems logical to conclude that reducing demand for electricity can result in an incrementally lower demand for the natural gas that is increasingly used to generate it. The two forms of energy are inextricably tied together when the total energy picture is considered.

Therefore, all programs which reduce the need for energy have an impact on the economics of energy production and delivery, as well as on the energy supply infrastructure. With Arizona's population growing at an estimated three percent annually, reduced energy requirements slow the need for additional infrastructure and the resources required to produce and deliver energy. This helps to stabilize the region's economy. In addition, when consumers pay less for energy, they have more disposable income, which benefits the economy as they are able to purchase other goods and services.

Human Impacts

Less energy production and use reduce the impact on Arizona's resources—land, water, air quality, and human health—encouraging a better quality of life for all residents. By depressing the upward spiral of ever-increasing energy demand, the related spiral of potential future increases in energy costs can also be reversed. This directly benefits the pocketbooks of all Arizonans. Consumers with lower utility bills have more disposable income at their command, and therefore spend a lower percentage of their income on energy.

CONSUMER PRODUCTS

APPENDIX A
Equipment and Measures

APPENDIX A - Equipment and Measures - Consumer Products
2007

	Water Heating		Clothes Washer		Clothes Dryer		Thermostat	
	Natural Gas	Electric	Natural Gas	Electric	Natural Gas	Electric	Natural Gas	Electric
BASELINE (STANDARD) EQUIPMENT/MEASURES								
Number of Baseline Equipment/Measures	874,196	1,304,284	-	1,742,784	121,323	1,556,107	874,196	1,304,284
Useful Life (years)	13	15	-	14	18	18	15	15
Natural Gas Consumption (therms)	185	-	-	-	31	-	195	-
Winter (5 months, Nov-Mar)	77	-	-	-	13	-	195	-
Summer (7 months, Apr-Oct)	108	-	-	-	18	-	-	-
Electric Consumption (kWh)	-	2,552	-	537	79	1,079	500 (fan)	9,531
Winter (5 months, Nov-Mar)	-	1,063	-	224	33	450	500	1,800
Summer (7 months, Apr-Oct)	-	1,489	-	313	46	629	-	7,371
Electric Demand (kW)	-	4.50	-	1.15	0.72	5.60	0.50	3.60
Water Usage (gal/year)	-	-	-	14,560	-	-	-	-
Baseline Equipment/Measure Cost	\$ 310	\$ 230	\$ -	\$ 309	\$ 363	\$ 319	\$ 16	\$ 16
Initial cost	-	-	-	-	-	-	-	-
Installation cost	-	-	-	-	-	-	-	-
Annual maintenance cost	-	-	-	-	-	-	-	-
DSM (HIGH EFFICIENCY) EQUIPMENT/MEASURES								
Number of DSM (High Efficiency) Natural Gas Appliances/Measures Installed Due to Program	1,500	-	-	1,500	1,500	-	1,180	1,770
Useful Life (years)	13	-	-	14	18	-	15	15
Natural Gas Consumption (therms)	157	-	-	-	31	-	176	-
Winter (5 months, Nov-Mar)	65	-	-	-	13	-	176	-
Summer (7 months, Apr-Oct)	92	-	-	-	18	-	-	-
Electric Consumption (kWh)	-	-	-	302	79	-	450	8,254
Winter (5 months, Nov-Mar)	-	-	-	126	33	-	450	1,620
Summer (7 months, Apr-Oct)	-	-	-	176	46	-	-	6,634
Electric Demand (kW)	-	-	-	1.15	0.72	-	0.50	3.60
Water Usage (gal/year)	-	-	-	7,280	-	-	-	-
DSM Equipment/Measure Cost	\$ 420	\$ 300	\$ -	\$ 449	\$ 605	\$ -	\$ 45	\$ 45
Initial cost	-	-	-	-	-	-	-	-
Installation cost	-	-	-	-	-	-	-	-
Annual maintenance cost	-	-	-	-	-	-	-	-

Consumer Products

APPENDIX A - Equipment and Measures - Consumer Products
2008

BASELINE (STANDARD) EQUIPMENT/MEASURES	Water Heater		Clothes Washer		Clothes Dryer		Thermostat	
	Natural Gas	Electric	Natural Gas	Electric	Natural Gas	Electric	Natural Gas	Electric
Number of Baseline Equipment/Measures	900,422	1,343,413	-	1,795,068	124,963	1,602,790	900,422	1,343,413
Useful Life (years)	13	15	-	14	18	18	15	15
Natural Gas Consumption (therms)	185	-	-	-	31	-	195	-
Winter (5 months, Nov-Mar)	77	-	-	-	13	-	195	-
Summer (7 months, Apr-Oct)	108	-	-	-	18	-	-	-
Electric Consumption (kWh)	-	2,552	-	537	79	1,079	500	9,531
Winter (5 months, Nov-Mar)	-	1,063	-	224	33	450	500	1,800
Summer (7 months, Apr-Oct)	-	489	-	313	46	629	-	7,371
Electric Demand (kW)	-	4.50	-	1.15	0.72	5.60	0.50	3.60
Water Usage (gal/year)	-	-	-	14,560	-	-	-	-
Baseline Equipment/Measure Cost	\$ 310	\$ 230	\$ -	\$ 309	\$ 363	\$ 319	\$ 16	\$ 16
Initial cost	-	-	-	-	-	-	-	-
Installation cost	-	-	-	-	-	-	-	-
Annual maintenance cost	-	-	-	-	-	-	-	-
DSM (HIGH EFFICIENCY) EQUIPMENT/MEASURES								
Number of DSM (High Efficiency) Natural Gas Appliances/Measures Installed Due to Program	1,500	-	-	1,500	1,500	-	1,180	1,770
Useful Life (years)	13	-	-	14	18	-	15	15
Natural Gas Consumption (therms)	157	-	-	-	31	-	176	-
Winter (5 months, Nov-Mar)	65	-	-	-	13	-	176	-
Summer (7 months, Apr-Oct)	92	-	-	-	18	-	-	-
Electric Consumption (kWh)	-	-	-	302	79	-	450	8,254
Winter (5 months, Nov-Mar)	-	-	-	126	33	-	450	1,620
Summer (7 months, Apr-Oct)	-	-	-	176	46	-	-	6,634
Electric Demand (kW)	-	-	-	1.15	0.72	-	0.50	3.60
Water Usage (gal/year)	-	-	-	7,280	-	-	-	-
DSM Equipment/Measure Cost	\$ 420	\$ 300	\$ -	\$ 449	\$ 605	\$ -	\$ 45	\$ 45
Initial cost	-	-	-	-	-	-	-	-
Installation cost	-	-	-	-	-	-	-	-
Annual maintenance cost	-	-	-	-	-	-	-	-

Consumer Products

2009
APPENDIX A - Equipment and Measures - Consumer Products

	Water Heater		Clothes Washer		Clothes Dryer		Thermostat	
	Natural Gas	Electric	Natural Gas	Electric	Natural Gas	Electric	Natural Gas	Electric
BASELINE (STANDARD) EQUIPMENT/MEASURES								
Number of Baseline Equipment/Measures	927,435	1,383,715		1,848,920	128,712	1,650,873	927,435	1,383,715
Useful Life (years)	13	15		14	18	18	15	15
Natural Gas Consumption (therms)								
Winter (5 months, Nov-Mar)	185	-			31		195	
Summer (7 months, Apr-Oct)	77				13		195	
Electric Consumption (kWh)				537	79	1,079	500	9,531
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Summer (7 months, Apr-Oct)		1,063		313	46	629		7,371
Electric Demand (kW)		4.50		1.15	0.72	5.60	0.50	3.60
Water Usage (gall/year)				14,560				
Baseline Equipment/Measure Cost								
Initial cost	\$ 310	\$ 230		\$ 309	\$ 363	\$ 319	\$ 16	\$ 16
Installation cost	-	-		-	-	-	-	-
Annual maintenance cost	-	-		-	-	-	-	-
DSM (HIGH EFFICIENCY) EQUIPMENT/MEASURES								
Number of DSM (High Efficiency) Natural Gas Appliances/Measures Installed Due to Program	1,500	-		1,500	1,500	-	1,180	1,770
Useful Life (years)	13	14		14	18	15	15	15
Natural Gas Consumption (therms)								
Winter (5 months, Nov-Mar)	157	-			31		176	
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Electric Consumption (kWh)				302	79	450	450	8,254
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Summer (7 months, Apr-Oct)		176		176	46			6,634
Electric Demand (kW)		1.15		1.15	0.72	0.50	0.50	3.60
Water Usage (gall/year)				7,280				
DSM Equipment/Measure Cost								
Initial cost	\$ 420	\$ 300		\$ 449	\$ 605	\$ -	\$ 45	\$ 45
Installation cost	-	-		-	-	-	-	-
Annual maintenance cost	-	-		-	-	-	-	-

Consumer Products

CONSUMER PRODUCTS

APPENDIX B
Budget

APPENDIX B - Estimated Budget - Consumer Products

Budget dollars are estimates that may be shifted among categories for flexibility, based on program effectiveness.

	2007	2008	2009
Implementation			
Outside contractor	\$ 50,000	\$ 50,000	\$ 50,000
Communication			
Bill inserts - production	58,000	58,000	58,000
Direct mail - production	225,000	225,000	225,000
Signage	5,000	5,000	5,000
Banners	2,000	2,000	2,000
Brochures	1,000	1,000	1,000
Incentives			
Incentive amounts	456,750	\$456,750	\$456,750
Other Costs			
Materials/Supplies	2,250	2,250	2,250
TOTAL	\$ 800,000	\$ 800,000	\$ 800,000

INCENTIVES			
Appliance	Number of Measures	Incentive Amount	Annual Total
Water heater	\$ 1,500	\$ 75	\$ 112,500
Clothes washer and dryer	1,500	200	300,000
Programmable thermostat	2,950	15	44,250
TOTAL			\$ 456,750

CONSUMER PRODUCTS

APPENDIX C
Cost-Effectiveness Test Results

**Southwest Gas Corporation
Consumer Products
2007-2009**

COST-EFFECTIVENESS OVERVIEW	
Annual Budget	\$800,000
Present Value Benefits	\$18,085,619
Present Value Costs	\$3,591,677
Present Value Net Benefits	\$14,493,942
Cost-Effectiveness Ratio	5.04

UNITS		
2007	2008	2009
5,950	5,950	5,950

CUMULATIVE ENERGY SAVINGS (Three-Year Program)		
Kilowatt-hour (kWh)	Kilowatt (kW)	Therms (Th)
265,199,006	21,960	569,250

ENVIRONMENTAL BENEFITS [1]				
Annual Savings	CO ₂ (lbs)	NOx (lbs)	SOx (lbs)	H ₂ O (gallons)
2007	5,524,924	1,036	26	12,323,825
2008	5,524,924	1,036	26	12,323,825
2009	5,524,924	1,036	26	12,323,825
Lifetime Savings	243,187,489	45,614	1,140	520,431,368
Annual Avoided Costs	CO ₂ (\$)	NOx (\$)	SOx (\$)	H ₂ O (\$)
2007	\$ 53,502	\$ 13,556	\$ 25,305	\$ 14,665
2008	\$ 53,502	\$ 13,556	\$ 25,305	\$ 14,665
2009	\$ 53,502	\$ 13,556	\$ 25,305	\$ 14,665
Lifetime Avoided Costs	\$ 2,354,967	\$ 596,698	\$ 1,113,836	\$ 619,313

[1] Sources:

- Avoided emission costs data from National Renewable energy Laboratory January 2005 report on Emerging Markets for Renewable Energy Certificates Opportunities and Challenges, as augmented by Bill Schrand/Southwest Administrator/Environmental Programs, and as augmented and commented on by David Berry/WRA.
- Conversion factor for CO₂ from Rocky Mountain Institute website on Energy and Carbon Dioxide Conversion Factors (5/23/05).
- Water values from Central Arizona Water Conservation District/Central Arizona Project, City of Phoenix and City of Tucson websites.
- Environmental benefits (conversion factors per kWh) listed in APS' DSM Portfolio Plan 2005-2007 (7/1/05)

6

COMMERCIAL EQUIPMENT

COMMERCIAL EQUIPMENT

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- C – Communication and Education Plan
- D – Cost-Effectiveness Test Results

PROGRAM OVERVIEW

Program Description

Southwest Gas Corporation (Southwest or Company) plans to implement a DSM program for both new and existing commercial customers, designed to encourage the purchase of higher efficiency water heaters, griddles, steamers, and fryers. These customers could represent any establishment where such appliances are utilized, including restaurants, schools, hospitals, and churches. In addition, for the first year of the program, the Company will partner with the Arizona Department of Water Resources (ADWR) to provide free, high-efficiency pre-rinse water spray valves. These latter become mandatory in Arizona in 2008, thereby eliminating the need for this program measure after 2007.

The commercial appliances to be included in the program use a very large amount of energy; therefore, the potential for energy savings is great. However, first-cost is an obstacle that will be overcome with appropriate financial incentives, coupled with education on the benefits of greater efficiency.

Program awareness will be accomplished through a variety of communication methods focused on commercial customers. These methods include magazine and radio ads, informational postcards, the Southwest website, trade shows, seminars, and workshops. Southwest Service Planning representatives will serve as program coaches and advisers, working closely with commercial customers to assist them with their purchase and installation decisions.

Program Objectives and Rationale

The primary program objective is to increase the number of pre-rinse spray valves, high-efficiency water heaters, griddles, steamers, and fryers used in commercial establishments.

Because commercial appliances use so much energy, the rationale for the program is the great amount of potential energy savings. Even though it is likely that there will be a relatively small number of program participants, the energy savings are potentially greater than for comparable residential programs.

Table 1 – Potential for High-Efficiency Commercial Equipment

Appliance	Market Potential	Expected DSM Participants (Year 1)	Potential Annual Energy Savings
Spray valve	18,000	5,000	1,464,000 therms 7.877million kWh 250 million gallons of water
Water heater	18,000	111	74,938 therms 2.483 million kWh
Griddle	18,000	65	127,556 therms 857,506 kWh
Steamer	1,800	20	10,288 therms 61,148 kWh
Fryer	30,000	101	32,076 therms 21,940 kWh

It is important to take a long-term view of this program, in that it could help to transform a market that has otherwise been notoriously energy-inefficient. Over time, it is expected that the cost differential between standard and high-efficiency commercial equipment could decrease, as awareness and demand for high-efficiency equipment in the marketplace increase. The potential energy savings to be realized can more than justify the financial incentives required to turn this market around, reaping significant reductions in Arizona's overall energy needs.

With reduced energy requirements, there are concomitant societal benefits in terms of water savings and less pollution associated with energy production and consumption. Water savings are crucial in Arizona where population growth demands a reliable water supply, while pollution has an effect on environmental quality and consequently the health of residents. Therefore, less energy equates to a better quality of life for Arizonans.

Products and Services to Be Provided

New and existing commercial customers will be offered consultation, advisement, and assistance in the purchase of high-efficiency commercial water heaters, griddles, steamers, and fryers. Financial incentives will be provided to overcome the often large, first-cost differential.

Opportunities

Compared to residential customers, commercial customers represent a wide diversity of types, and therefore, opportunities. This proposed program is designed to capture a segment of possible types of customers, yet one that potentially can produce significant energy savings. Since establishments where food service is provided comprise the primary type of commercial customer for

Southwest, it was determined that this segment was a good place to start with a DSM program, although non-food service customers are also eligible for water heater replacement.

The high growth in the Phoenix and Tucson markets means there is plenty of opportunity to capture higher efficiency in new commercial businesses. Many older establishments, in an effort to keep up with growth and competition, are expected to undertake major renovations, representing yet another opportunity to upgrade to higher efficiency equipment.

Lastly, higher energy prices are forcing many customers to rethink their energy priorities, giving higher efficiency equipment an attractiveness it may not have had before. Southwest intends to utilize this higher level of interest to drive customers to the purchase of more efficient equipment.

Barriers to Program Acceptance, Adoption, or Deliverability

The primary barriers to the purchase of higher-efficiency equipment are cost, awareness, timing, and location of the decision-maker.

High-efficiency commercial appliances are significantly more expensive than their less-efficient counterparts. To truly transform this highly-inefficient market segment, it is crucial that the financial incentives be large enough to actually cause the appropriate purchase to be made.

Many small businesses are often seriously undercapitalized, meaning the owners base their equipment purchase decisions primarily on price, often opting for used equipment when available, which is typically of lower efficiency. If the business is new, the owners may not understand just how high their energy bills will be when using inefficient appliances, perhaps even exacerbating their precarious financial position. These business owners require information and education before equipment purchases are made, which presents a challenge in timing.

Larger businesses, especially chains and franchises, often make purchase decisions from some central location at corporate headquarters, where local market conditions and energy prices are usually not considered. Changing these practices requires diligent and intensive effort at a national level, which may be beyond the scope of this program, except in a few isolated instances where more consideration may be given to local factors. The timeframe from initial inception of a new project to actual construction may be 18 months or more, meaning that reaching decision-makers early-on is crucial.

On the other hand, experienced business owners who are well aware of the impacts of energy costs on their budget, may be highly amenable to learning about more efficient equipment and opting for higher efficiency, as they replace their energy "hogs" or plan business expansions or new endeavors. However, they need to be shown the cost/benefit and payback analysis for high-efficiency

appliances to justify the purchase. Again, reaching them in advance of the purchase decision is essential.

TARGET MARKET

This program will be available to both new and existing commercial customers located in Southwest's Arizona service areas.

Program Eligibility

All new and existing commercial customers in Southwest's Arizona service areas who install one or more of the following high-efficiency appliances—water heaters, griddles, steamers, and fryers—are eligible for this program. Customers will be eligible for multiple rebates if they install multiple measures.

Depending on the results of the program, incentive caps per customer may be considered after Year 1. Southwest will evaluate this possibility after first-year program information has been collected and analyzed.

The number of potential customers for the first three years of this program is indicated in Table 2 below. All numbers reflect an estimated annual growth rate of three percent.

The estimated level of program participation over the first three years is presented in Table 3 below.

Table 2 – Number of Potential Customers

Year	Spray Valves	Water Heaters	Griddles	Fryers	Steamers
1	18,000	18,000	18,000	30,000	1,800
2	n/a	18,540	18,540	30,900	1,854
3	n/a	19,096	19,096	31,827	1,910

Table 3 – Estimated Level of Program Participation

Year	Spray Valves	Water Heaters	Griddles	Fryers	Steamers
1	5,000	111	65	101	20
2	n/a	140	79	121	39
3	n/a	140	79	121	39

ENERGY MEASURES

Energy efficiency information for the baseline and DSM measures in the Commercial Equipment program is presented in Table 4. Additional energy information is provided in Appendix A.

Table 4 – Baseline (Standard) and DSM Measures

Appliance	Baseline	DSM
Pre-rinse spray valve	3 gal/minute	1.6 gal/minute
Water heater	0.80 EF	0.985 EF
Griddle	36%	61%
Fryer	42%	55%
Steamer	42%	69%

IMPLEMENTATION PLAN

Marketing and Delivery Strategy

Southwest Service Planning representatives will work with commercial customers to advise, coach, and influence them to install high-efficiency program measures. Southwest or its designate will verify installation and assist customers in applying for the appropriate rebate(s). Rebates will be processed by Southwest or its designate.

During 2007, Southwest will cooperate with the ADWR to install high-efficiency pre-rinse spray valves. Southwest will contribute toward the purchase of 5,000 valves, and ADWR will oversee their delivery and installation.

Communication Plan and Training

Year 1 will be composed mainly of communication with commercial customers via trade publications, such as *Restaurateur of Arizona* magazine, the Southwest website, informational postcard distribution, and radio. There will also be participation in appropriate trade shows and culinary events.

Year 2 will consist of continued communication and participation in informational events, such as trade shows, the Arizona Restaurant and Hospitality Show, culinary competitions, and culinary awareness events. Southwest will also

sponsor educational seminars, speakers, and demonstrations at the Southwest Tempe Food Service Center. Potential topics include:

- Fundamentals of Energy Efficiency in Foodservice
- What's New in High-Efficiency Foodservice Equipment
- Use It, Clean It, Tune It
- Hot Topics for Health Care Foodservice
- Ventilation Basics – Understanding Capture and Containment

Year 3 will continue the communication and informational events outlined above. Additional information on the communication plan for the Commercial Equipment program is provided in Appendix C.

Incentives

Due to the high cost of high-efficiency equipment, incentives equating to the full value of the incremental cost are vital to the success of this program and to the desired market transformation. Incentives will be paid to customers who install any eligible DSM measure, and multiple incentives will be paid for multiple measures. However, in order to stay within the program budget, individual measure incentives will be limited to a maximum value shown in Table 5 below. Depending on market conditions and program success, a total per-customer cap may be considered after Year 1.

The customer will complete the application for a rebate, attach the paid retail invoice(s) or sales receipt(s), and submit the forms for payment to Southwest or its designate. The rebate applications will be available online at the Southwest website (www.swgas.com), as well as through the Southwest Energy Services consumer hotline (1-800-654-2765). The application may be requested by phone, e-mail, or an after-hours voicemail message. Southwest Service Planning representatives can also deliver the applications at the time of installation verification. Incentives will be processed by Southwest or its designate.

There will be no rebates for pre-rinse spray valves. Rather, Southwest will work with the Arizona Department of Water Resources by contributing to their free valve distribution program. The Company will provide \$25 each toward a total of 5,000 valves.

Additional incentive information is provided in Appendix B.

Table 5 – Rebate Amounts Per Measure

Measure	Incremental Cost	Rebate Amount
Pre-rinse spray valve	n/a	n/a
Water heater	\$ 1,700	Up to \$1,700
Griddle	\$ 2,102	Up to \$2,102
Fryer	\$ 2,583	Up to \$2,583
Steamer	\$ 532	Up to \$ 532

Staffing Requirements

The program will be implemented by Southwest Service Planning representatives and Southwest Energy Services call center personnel. There may be a need for a part-time contract employee to assist with measure verification and the processing of rebates.

Timeline of Activities

Communication and outreach activities will commence at the time of program approval. Given the long lead time for decision-making and implementation, a significant number of installations, and consequently rebates paid, are not expected during Year 1. By Years 2 and 3, there should be greater activity as the program becomes known and accepted, and decisions made in Year 1 are actually implemented.

MEASUREMENT AND EVALUATION

Southwest will track and evaluate the following:

- Number of businesses participating
- Measures installed
- Rebates processed
- Energy savings – therms and kilowatt-hours (kWh)
- Demand reductions - kW
- Number of inquiries
- Number of website hits
- Attendance at educational events

Southwest will also conduct follow-up phone or mail surveys of participants and non-participants to determine satisfaction, reasons for non-participation, effectiveness of communications, influence of the program on purchase decision, and the need for program modifications.

BUDGET

The budget for this program is \$1 million annually, or approximately 23 percent of the total DSM budget of \$4.385 million. Although a three-year program horizon was used for planning purposes, this level of spending will continue until further action is taken by the Commission. Program dollars are collected through a Demand Side Management Adjuster Mechanism (DSMAM), payable by all full-margin customer classes.

Program costs are estimates based on currently available information. Program dollars may be adjusted among categories of expenditures, based on program effectiveness. This flexibility will ensure optimal program performance for the total budget amount.

Additional detail on the estimated budget for this program is provided in Appendix B.

COST-EFFECTIVENESS TEST RESULTS

The cost-effectiveness test ratio for the Commercial Equipment program is 7.35. More cost-effectiveness information, including the results of the societal evaluation, is provided in Appendix D.

Societal Costs

Energy production consumes a large amount of water (about 0.45 gallon per kWh according to *The Last Straw*, The Hewlett Foundation, April 2003) and produces emissions that affect environmental quality and have an adverse effect on the health of Arizona residents. Therefore, reductions in energy requirements can lessen the impact on resources and the environment.

Economic Impacts

Arizona's population is growing at an estimated three percent annually, resulting in an approximately four percent yearly increase in the need for power. DSM programs can help slow this yearly demand increase, thus slowing the need for additional infrastructure and the resources required to produce and deliver energy. This helps to stabilize the region's economy. A strong economy is advantageous in continuing to attract businesses to Arizona.

Further, lower energy costs contribute to the economic viability of business enterprises, resulting in fewer business failures and defaults on business loans. This contributes to the health of Arizona's business climate.

Human Impacts

Less energy production and use reduce the impact on Arizona's resources and environment, helping to maintain the quality of life which draws so many new residents and businesses to the state. Lower energy costs will allow more businesses to be successful and more business owners to enjoy profitable enterprises.

COMMERCIAL EQUIPMENT

APPENDIX A
Equipment and Measures

APPENDIX A - Equipment and Measures - Commercial Equipment

	Pre-Rinse Spray Valves		Tank Water Heaters		Griddles		Steamers		Fryers	
	Natural Gas	Electric	Natural Gas	Electric	Natural Gas	Electric	Natural Gas	Electric	Natural Gas	Electric
BASELINE (STANDARD) MEASURES										
Average Number of Customers	10,800	7,200	10,800	7,200	10,800	7,200	10,800	7,200	18,000	12,000
Existing customer base	210	63	312	70	160	n/a	35	16	400	160
New construction	7	7	10	10	10	10	10	10	10	10
Useful Life (years)	783	-	4,478	-	3,490	-	999	-	1,270	-
Natural Gas Consumption (therms)	326	1,866	1,454	416	529	741	583	-	529	-
Winter (5 months, Nov-Mar)	457	2,612	2,036	-	-	-	-	-	741	-
Summer (7 months, Apr-Oct)	-	16,879	-	112,854	-	-	-	15,287	-	13,875
Electric Consumption (kWh)	-	3.86	-	24.00	-	-	-	3.50	-	2.70
Electric Demand (kW)	-	-	-	-	-	-	-	-	-	-
Baseline Costs	-	-	-	-	-	-	-	-	-	-
Initial cost	-	-	\$ 2,500	\$ 2,400	\$ 1,759	\$ 12,371	\$ 850	\$ 12,321	\$ 1,520	\$ 1,403
Annual maintenance costs	-	-	-	-	\$ 850	\$ 850	\$ 850	\$ 850	\$ 850	\$ 850
DSM (HIGH EFFICIENCY) MEASURES										
Number of Natural Gas Appliances Installed Due to Program	4,000	1,000	89	22	52	4	16	4	81	20
Useful Life (years)	7	10	10	10	10	10	10	10	10	10
Natural Gas Consumption (therms)	417	3,636	1,037	356	874	364	510	874	364	510
Winter (5 months, Nov-Mar)	174	1,515	432	148	208	510	208	510	364	510
Summer (7 months, Apr-Oct)	243	2,121	605	208	605	510	208	510	364	510
Water Savings (gallons)	50,000	-	-	-	-	-	-	-	-	-
Electric Consumption (kWh)	9,002	107,085	-	107,085	-	-	-	-	-	12,778
Electric Demand (kW)	2.06	24.00	-	24.00	-	-	-	-	-	2.50
DSM Costs	\$ 25	\$ 4,200	\$ 4,200	\$ 4,200	\$ 3,861	\$ 850	\$ 12,903	\$ 850	\$ 4,103	\$ 850
Initial cost	-	-	-	-	-	-	-	-	-	-
Annual maintenance costs	-	-	-	-	-	-	-	-	-	-

COMMERCIAL EQUIPMENT

**APPENDIX B
Budget**

APPENDIX B - Estimated Budget - Commercial Equipment

For Years 2007, 2008, and 2009

Budget dollars are estimates that may be shifted among categories for flexibility, based on program effectiveness.

Description		2007	2008	2009
Communication				
Magazines - ad production	Restaurateur of Arizona	\$ 10,000	\$ 10,000	\$ 10,000
Magazines - ad placement	Restaurateur of Arizona	19,000	19,000	19,000
Internet - production	Website	5,000	-	-
Postcards	Postcard printing	5,500	5,500	5,500
Radio	Various local radio stations	50,000	50,000	50,000
Postage		1,920	1,920	1,920
Outreach Events				
Trade show fees				
Arizona Restaurant and Hospitality Association (ARHA)	Sysco, Shamrock, US Foods, Schools Food Service	\$ 6,000	\$ 6,000	\$ 6,000
Knowledge booth		10,000	10,000	10,000
Trade show co-op		5,000	5,000	5,000
Culinary competition	School culinary competition on high-efficiency equipment	10,000	10,000	10,000
Culinary awareness events	In association with ARHA	4,000	4,000	4,000
Displays	Booth	10,000	-	-
Training and Education				
Employee to educate chair/franchise owners		\$ 60,000	\$ 60,000	\$ 60,000
Travel expenses		15,000	15,000	15,000
Seminars - program development	Quarterly	8,000	8,000	8,000
High-efficiency equipment and maintenance		4,000	4,000	4,000
Speaker		4,000	4,000	4,000
Food supplies and refreshments	2,000 each per seminar	1,000	1,000	1,000
Promotion		1,200	1,200	1,200
Postcards and mailing	Semi-annually	10,000	10,000	10,000
Energy awareness items		2,000	2,000	2,000
High-efficiency equipment demonstration		2,000	2,000	2,000
Speaker		1,000	1,000	1,000
Refreshments		600	600	600
Promotion	2,000 each per seminar	8,000	8,000	8,000
Postcards and mailing		4,000	4,000	4,000
Energy awareness items	Food	6,000	6,000	6,000
Program development	Chefs			
Workshops - supplies				
Workshops - speakers				
Other Administrative Costs				
Contract employee - to process rebates	One part-time person	\$ 15,000	\$ 15,000	\$ 15,000
Incentives				
Incentive amounts (maximum per item)				
Tank water heaters	\$	\$ 186,700	\$ 238,700	\$ 238,700
Griddles		136,630	166,557	166,557
Steamers		10,640	20,640	20,640
Fryers		260,883	310,883	310,883
Pre-rinse spray valves (purchase at \$25/each)		124,925	-	-
TOTAL	Commercial Equipment	\$ 999,998	\$ 1,000,000	\$ 1,000,000

COMMERCIAL EQUIPMENT

APPENDIX C
Communication and Education Plan

APPENDIX C – COMMUNICATION AND EDUCATION PLAN

COMMUNICATION AND OUTREACH

- ***Restaurateur of Arizona* magazine**

This magazine is distributed monthly to 8,000 restaurants in Arizona, and is the communication vehicle of the Arizona Restaurant and Hospitality Association. Southwest will place a rotating ad on the inside front cover.

Frequency: Monthly.

- **Radio**

Southwest will place ads on various local radio stations.

Frequency: Annually, based on what budget will purchase.

- **Point-of-purchase postcard**

Southwest will produce and distribute four-color postcards announcing the program and qualifying appliances, and featuring benefits of efficiency. Distribution will be made at:

- Trade shows
- Culinary schools
- Tempe Food Service Center
- Restaurant supply houses where high-efficiency equipment is sold

Frequency: Printed annually and distributed as needed.

- **Booth display**

Southwest will create a display booth for use at trade shows and events, with appropriate signage, photographs, etc.

Frequency: Multiple events annually.

- **Equipment booth at restaurant trade show**

Southwest will participate in the annual Arizona Restaurant and Hospitality Show.

Frequency: Annually.

- **Trade show co-op**

Southwest will participate in co-op advertising and promotion for the Arizona Restaurant and Hospitality Show.

Frequency: Annually.

- **Information and knowledge booth at restaurant trade shows**

Southwest will participate in shows conducted by broadline distributors and associations: Sysco; Shamrock; US Foods; and Schools Foodservice.

Frequency: Annually at each show.

EDUCATION AND TRAINING

- **Workshops at Arizona culinary schools**

Southwest will sponsor events at Scottsdale Culinary, the Art Institute of Phoenix, Arizona Culinary Institute, and Scottsdale Community College.

Frequency: Twice annually at each of the schools.

- **High-efficiency equipment and demonstration seminars at Tempe Food Service Center**

Southwest will feature new technologies and have chefs do cooking presentations. Attendees will include culinary professionals, students, buyers, specifiers of equipment, and restaurant owners. Direct mail will be used for invitations, and handouts will be used to increase energy awareness and provide supplemental information.

Frequency: Quarterly.

- **High-efficiency equipment and maintenance seminars at Southwest Gas Tempe Food Service Center**

Southwest will sponsor professionals in the foodservice industry who specialize in these types of workshops and seminars. Attendees will include restaurateurs, national and regional chain operators/owners, and student culinarians. Direct mail will be used for invitations, and handouts will be used to increase energy awareness and provide additional information on the topics presented. Possible seminar topics may include:

Use It, Clean It, Tune It - How to maximize energy efficiency in your existing commercial cooking appliances
Fundamentals of Energy Efficiency in Foodservice
Specifying Dishwashers and Water Heaters for Energy Efficiency
Specifying Cooking Equipment for Energy Efficiency
Ventilation Basics, Understanding Capture and Containment
Hot Topics for College and University Foodservice
Hot Topics for Health Care Foodservice
What's New in Energy Conservation and Why You Need to Know

Frequency: Twice annually.

- **Culinary competition**

Southwest will sponsor the Southwest Gas Cup at an annual high school culinary competition. The purpose is to enhance the learning experience of future culinarians about the importance and need for high-efficiency products.

Frequency: Annually.

- **Culinary awareness events**

Southwest will assist the Arizona Restaurant and Hospitality Association in events to enhance the learning experience of future culinarians about the importance and benefits of high-efficiency equipment.

Frequency: Twice annually.

Other

- **Southwest website (www.swgas.com)**

Pages will be added to the existing Southwest website that present programs, high-efficiency equipment, rebate information, and links to other appropriate websites. Rebate applications will also be available for downloading. Requests for information can also be made via e-mail.

Frequency: Ongoing; updated as required.

- **Southwest Energy Services call center hotline (1-800-654-2765)**

Information and scripts will be provided to the call center for responding to inquiries regarding high-efficiency commercial equipment, program requirements, and rebates. Rebate applications can be requested to be

sent electronically or by mail. Call center services include after-hours messaging, as well as response to e-mail inquiries.

Frequency: Ongoing; updated as required.

COMMERCIAL EQUIPMENT

APPENDIX D
Cost-Effectiveness Test Results

**Southwest Gas Corporation
Commercial Equipment
2007-2009**

COST-EFFECTIVENESS OVERVIEW	
Annual Budget	\$1,000,000
Present Value Benefits	\$21,881,616
Present Value Costs	\$2,975,334
Present Value Net Benefits	\$18,906,282
Cost-Effectiveness Ratio	7.35

UNITS		
2007	2008	2009
5,297	379	379

CUMULATIVE ENERGY SAVINGS (Three-Year Program)		
Kilowatt-hour (kWh)	Kilowatt (kW)	Therms (Th)
121,160,230	4,015	15,735,690

ENVIRONMENTAL BENEFITS [1]				
Annual Savings	CO₂ (lbs)	NOx (lbs)	SOx (lbs)	H₂O (gallons)
2007	11,118,007	2,085	52	252,824,968
2008	4,275,899	802	20	1,086,461
2009	4,275,899	802	20	1,086,461
Lifetime Savings	173,403,202	32,525	813	1,794,059,919
Annual Avoided Costs	CO₂ (\$)	NOx (\$)	SOx (\$)	H₂O (\$)
2007	\$ 107,664	\$ 27,280	\$ 50,922	\$ 300,862
2008	\$ 41,407	\$ 10,492	\$ 19,584	\$ 1,293
2009	\$ 41,407	\$ 10,492	\$ 19,584	\$ 1,293
Lifetime Avoided Costs	\$ 1,679,193	\$ 425,471	\$ 794,213	\$ 2,134,931

[1] Sources:

- Avoided emission costs data from National Renewable energy Laboratory January 2005 report on Emerging Markets for Renewable Energy Certificates Opportunities and Challenges, as augmented by Bill Schrand/Southwest Administrator/Environmental Programs, and as augmented and commented on by David Berry/WRA.
- Conversion factor for CO₂ from Rocky Mountain Institute website on Energy and Carbon Dioxide Conversion Factors (5/23/05).
- Water values from Central Arizona Water Conservation District/Central Arizona Project, City of Phoenix and City of Tucson websites.
- Environmental benefits (conversion factors per kWh) listed in APS' DSM Portfolio Plan 2005-2007 (7/1/05)

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DISTRIBUTED GENERATION

DISTRIBUTED GENERATION

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- A – Equipment and Measures
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PROGRAM OVERVIEW

Program Description

Distributed generation (DG) is defined as localized, on-site power generation, typically deployed through the use of modular technologies. Combined heat and power (CHP) describes any system that simultaneously or sequentially generates electric or mechanical energy and utilizes the thermal energy that is normally wasted. Most CHP systems are configured to generate electricity or mechanical power, recapture the waste heat, and use that heat for space heating, water heating, industrial steam loads, air conditioning, humidity control, water cooling, product drying, or any other thermal need. Alternately, CHP may use excess heat from industrial processes and convert it into electricity.

The proposed DG program will encourage, in particular, the installation of high-efficiency CHP technologies. This program is intended for a variety of customers, depending upon the potential application. Most program participants will be general service customers utilizing Southwest Gas Corporation (Southwest) general service or transportation tariffs; however, it is possible other Southwest customers could participate.

The market potential for DG and CHP is substantial and could contribute significantly to conserving energy in Arizona, as well as accruing significant societal and customer benefits. CHP is an affordable, clean, and reliable piece of the puzzle for meeting Arizona's energy needs and should be considered a key component to economic and homeland security strategies throughout the western United States.

CHP technologies will be required to achieve a total fuel efficiency of 60 percent to 70 percent in order to qualify for funding. The 60 percent to 70 percent fuel efficiency figures are roughly comparable to fuel efficiency requirements for cogeneration facilities under the Public Utilities Regulatory Policies Act of 1978. This efficiency compares very favorably with:

- Older simple-cycle natural gas peaking power plant efficiency of 24.4 percent, excluding transmission and distribution (T&D) losses
- Newer simple-cycle natural gas peaking plants efficiency of 32.5 percent, excluding T&D
- Newer combined-cycle natural gas power plants with an efficiency of 48.7 percent, excluding T&D

Peak-shaving technologies are also acceptable applications for this program. Peak shaving may be defined as the reduction of the amount of electricity demand drawn from a power utility during utility-designated peak time periods.

Peak-shaving technologies that demonstrate substantial consumer benefits during peak electric demand periods will be funded, provided that some thermal energy is displaced during system operation. However, these applications will not be subject to a total fuel efficiency requirement.

Peak shaving can also save on T&D losses. Arizona Public Service Company estimates that T&D losses are 13.9 percent during peak days, as compared to an average system loss of approximately 7.5 percent.

The use of new natural gas technologies, such as fuel cells and microturbines, will also be eligible to participate in this program. These new technologies will not be subject to a total efficiency requirement, but will be required to displace some thermal energy during system operation.

Program Objectives and Rationale

This DSM program will achieve fuel savings for consumers by promoting high-efficiency electric generation, providing financial benefits during peak electrical demand periods, and demonstrating the use of new natural gas technologies which are being brought to market.

In addition, DG—and particularly CHP—may save millions of dollars in new capital investment, reduce power costs, decrease homeland security vulnerabilities, improve reliability and power quality, avoid transmission losses, reduce water use, cut fossil fuel use, decrease greenhouse gas emissions, and reduce other pollutants.

Fuel savings can be quantified by comparing CHP fuel efficiencies with existing or projected gas or electric uses. Each project will be justified using an average efficiency of 33 percent for electric power plant facilities, as denoted in the Western Governors' Association White Paper on CHP, when comparing CHP and power plants. The associated T&D losses of 7.5 percent will also be taken into account.

The program can assist with price elasticity in natural gas markets by encouraging more efficient use of natural gas. A study by the American Council for an Energy Efficient Economy (ACEEE) indicates that a reduction of about one percent in total gas demand could result in wholesale natural gas price reductions of 10 to 20 percent. While Southwest cannot quantify the reduction in prices specifically for Arizona consumers as a result of this finding, all reductions in gas demand should assist in reducing natural gas prices.

Peak-shaving technologies with heat recovery will show benefits to consumers, since these technologies can be more efficient than natural gas simple-cycle turbines with T&D losses during peak electric periods. Southwest proposes to use the 24.4 percent efficiency of a simple-cycle peaking power plant, along with

the associated 13.9 percent T&D losses, when comparing fuel savings from specific peak-shaving projects.

Newer natural gas technologies will be demonstrated to promote these applications for future consumer use.

Emission reductions and water savings in all cases will be estimated based upon fuel savings and natural gas emission factors.

Products and Services to Be Provided

Incentives will be provided to users or developers of DG and CHP projects to reduce payback investment periods.

Southwest's Key Account Management engineers will work with manufacturer representatives to prepare preliminary engineering studies which assess the feasibility of DG projects. In conjunction with the manufacturer representatives, Southwest personnel will also oversee project implementation.

Opportunities

DG can vary in size from several kilowatts (kW) to several megawatts (MW) of produced electric power. Southwest's Key Account Management engineers believe that numerous potential applications for DG exist in Arizona.

CHP is feasible with incentives in commercial/industrial facilities and multi-family buildings. Wherever there is significant thermal load and the need for electrical and/or mechanical power, CHP should be considered.

The use of DG peak-shaving technologies could be attractive in many applications, if electric utility rates were more closely tied to the actual cost of producing electricity during peak electrical demand periods.

A number of newer DG technologies, such as fuel cells or microturbines, can be used in either commercial or industrial applications, or perhaps in joint-ownership communities with the need for localized power generation.

An assessment of CHP potential in Arizona and Nevada was completed in August 2005. The study indicates a low level of promotional activity currently in Arizona. The study also shows that CHP market penetration will produce economic benefits, energy savings, and a potential reduction in environmental emissions for the region. This proposed DSM program can be the first step in energizing CHP technology in Arizona.

Barriers to Program Acceptance, Adoption, and/or Deliverability

The main barriers to implementation of this program are:

- An absence of statewide DG/CHP interconnection requirements and rules
- Utility tariffs that do not reflect more realistic "real-time" pricing and power grid backup charges for DG
- Two- to three-year timeframe for developing DG/CHP projects
- Current high natural gas prices

TARGET MARKET

Customer Type

Initially, the program will focus on small to large industrial or commercial customers and CHP applications, since the technologies are already available to implement this program. Municipalities, schools, restaurants, hospitals, and hotels are all candidates for CHP.

Commercial and industrial customers are candidates for peak-shaving applications. However, completion of the Arizona Corporation Commission workshop on DG and implementation of more realistic time-of use rates that reflect the true cost of producing electricity during peak periods would enhance this part of the program.

Program Eligibility

This program will be limited to Southwest customers in Arizona.

Potential Installations

Potential installations during the first three years of the program are as follows:

Year 1	Over 2,000 MW of potential
Year 2	Over 2,000 MW of potential
Year 3	Over 2,000 MW of potential

Estimated Level of Program Participation

The estimated level of program participation is indicated below:

Year 1	One or two installations – 700 kW
Year 2	One to three installations – 700 kW
Year 3	Two to four installations – 700 kW

ENERGY MEASURES

Baseline (Standard) Measures

Commercial and industrial customers have not considered DG in Arizona over the last several years. One reason for this is that the proposed deregulation of electricity led to uncertainty in electrical prices. Further, the absence of progressive DG tariffs and rules have made it difficult for DG developers. Thus, the current standard practice is to tie into the electrical grid without considering DG.

In Arizona over the last few years, CHP systems have been installed at the City of Tucson (1.8 MW), the University of Arizona (12 MW), and Arizona State University (8.5 MW). However, no systems have been installed over the last several years by the private sector.

Peak-shaving equipment has been installed in hospitals (Banner-Samaritan) in Arizona, since they have more favorable time-of-use rates and can also use the equipment for emergency power. The units range in size from 800 kW to approximately 2 MW.

Early designs of microturbines have been tested by the City of Phoenix and others.

Natural gas and electric consumption and demand vary from facility to facility. DG capacity and thermal loads will also vary, in order to optimize the capital investment. DG equipment can have a service life of up to 20 years.

DSM Measures

The DSM measures proposed will show savings in one or more of the following areas: energy usage; energy demand; peak demand; air pollutants; and water use. These savings will be estimated by comparing the DSM baseline with the measures.

The number of CHP installations will vary by year. All CHP installations will need to demonstrate a 60 percent to 70 percent fuel efficiency or higher. This efficiency must be shown during standard operations, as defined by the customer. Standard operations will vary depending upon the type of facility where CHP is being utilized.

Peak-shaving installations will be required to show some thermal displacement, but the true test of a peaking unit will be the cost of energy displaced. Fuel cells, microturbines, and new technologies will also have thermal requirements.

DG industrial equipment has a cost of \$940 per kW, not including the associated cost of thermal equipment, which can add an additional \$400 to \$500 per kW. DG peak-shaving equipment has a cost of \$998 per kW. The United States Energy Information Administration also provides additional estimates for commercial applications.

Commercial fuel cells (listed at \$6,044 per kW), microturbines (listed at \$1,732 per kW), and new technologies are generally more expensive than conventional DG equipment, but have lower air emissions.

Additional information on both the baseline and DSM measures is provided in Appendix A.

IMPLEMENTATION PLAN

Marketing and Delivery Strategy

The proposed DG program will be conveyed to customers through:

- The Technology Information Center program, which will use e-mails to distribute energy information to targeted customers
- Direct customer contact with existing Southwest Key Account Management engineers
- Direct mailings to key energy representatives at government facilities
- Seminars or workshops

Southwest's intent is to use existing resources and the Technology Information Center (another DSM program recommended in this plan) as the principal means to staff and communicate this program.

The incentives offered will be:

- \$500 per kW for CHP systems with a fuel efficiency of 70 percent, up to a maximum of 50 percent of the installed cost of any project
- \$450 per kW for CHP systems with a fuel efficiency of 65 percent, up to a maximum of 50 percent of the installed cost of any project

- \$400 per kW for CHP systems with a fuel efficiency of 60 percent, up to a maximum of 50 percent of the installed cost of any project
- \$400 per kW for peak-shaving systems
- \$400 per kW for new technologies including fuel cells and microturbines that demonstrate thermal replacement

Since CHP projects can take up to three years to develop, Southwest intends to include information as soon as feasible through the Technology Information Center, to announce the program for 2007.

Southwest's Key Account Management engineers will work with the customers through all phases of implementation and will oversee the delivery of appropriate rebates. Rebates will be processed by Southwest or its designate.

MEASUREMENT AND EVALUATION

The following information will be tracked and evaluated:

- Number and type of installations (DG and CHP)
- Technologies used
- Energy savings (therms, kWh)
- Thermal displacement
- Demand reductions (kW)

Southwest Key Account Management engineers will verify energy savings and demand reductions.

BUDGET

The annual program budget is \$400,000 which represents about nine percent of the total DSM budget of \$4.385 million. A three-year program horizon was used for planning purposes, and this level of spending will continue until further action is taken by the Commission. Program dollars are collected through a Demand Side Management Adjuster Mechanism (DSMAM), payable by all full-margin customer classes.

Program costs are estimates based on currently available information. Program dollars may be adjusted among categories of expenditures, based on program effectiveness. This flexibility will ensure optimal performance for the total budget amount.

It is anticipated that the annual program costs will be allocated to the following categories:

Design consultant services	\$ 22,000
Seminar/workshop costs	\$ 10,000
Brochures/printing/design costs	\$ 8,000
Contractors/verification	\$ 8,000
Materials/supplies	\$ 2,000
Incentives	\$ 350,000
<u>Total</u>	<u>\$ 400,000</u>

Additional budget details are provided in Appendix B.

COST-EFFECTIVENESS TEST RESULTS

The cost-effectiveness test ratio for the DG program is 6.84. Detailed results of the cost-effectiveness testing and the societal evaluation are provided in Appendix C.

Societal Costs

Societal costs take into consideration the full impacts of resource use and pollution associated with the production and consumption of energy. When energy requirements are reduced, less water is consumed and less pollution is produced.

Major population areas in Arizona are very arid. With an escalating population rate of approximately three percent per year, preserving the state's water supply is crucial. Energy production consumes a large amount of water (approximately 0.45 gallons per kWh, according to *The Last Straw*, The Hewlett Foundation, April 2003) and produces emissions that affect air quality. These emissions are carbon dioxide, associated with global warming, sulfur oxides (SOx) associated with acid rain, and nitrous oxides (NOx) associated with smog.

In addition, mercury, other heavy metals, and particulates are emitted into the air and water supply. These can all have an adverse effect on the health of residents, and in fact, the Arizona Department of Environmental Quality regulates their quantity and hence their impact on Arizona's environment.

Because of their greater efficiency, DG and CHP actually reduce the amount of energy required to produce and transmit electricity, ultimately saving water and decreasing pollution. Reducing pollution has a positive effect on air quality and consequently the health of residents. Therefore, a better quality of life for Arizonans is a direct byproduct of more efficient energy production.

Economic Impacts

The energy crunch of 2000-2001, and several subsequent notable blackouts and brownouts, increased Arizonans' awareness of the fragility of the Western power grid. Energy reliability has become an increasingly important issue. This problem is being addressed by the Western Governors' Association, as it is a regional problem, not isolated just to Arizona. Because DG and CHP installations are localized, they help to avoid problems of grid vulnerability from excessive power demands, lengthy transmission distances, and potential terrorist threats.

Meanwhile, the demand for clean-burning natural gas for use in power plants has increased dramatically since 2000. Fourteen new power plants or additions to existing power plants have been constructed in Arizona since 2000, all of them using natural gas. A similar phenomenon has also occurred across the United States, resulting in a great increase in the price of natural gas in 2005, with associated increases in the price of electricity.

DG and CHP can help stop or retard that spiral of escalation. They can also delay or minimize the need for additional power plant infrastructure and the resources required to produce and deliver energy. This helps to stabilize the region's economy.

Human Impacts

With the need for construction of fewer large-scale power plants, there is less impact on Arizona's resources—land, water, air quality, and human health—encouraging a better quality of life for all residents. DG and CHP further reduce the need for out-of-state power purchases or reliance on power supplies produced and transmitted over long-distances. This has a positive impact on the citizens of other states as well. Ultimately, stabilized energy costs benefit the pocketbooks of all Arizonans.

DISTRIBUTED GENERATION

APPENDIX A
Equipment and Measures

APPENDIX A - Equipment and Measures - Distributed Generation

For Years 2007, 2008, and 2009

Distributed Generation - 700 kW CHP

This example reflects a boiler displacement.

	Equipment/Measure	
	Natural Gas	Electric
BASELINE (STANDARD) EQUIPMENT/MEASURES		
Number of Baseline Equipment/Measures	Boiler	Utility grid
Useful Life (years)	20 years	20 years
Natural Gas Consumption (therms)		
Winter (5 months, Nov-Mar)	150,000	242,802*
Summer (7 months, Apr-Oct)	210,000	339,922*
Electric Consumption (kWh)		
Winter (5 months, Nov-Mar)	-	3,650,000
Summer (7 months, Apr-Oct)	-	5,110,000
Electric Demand (kW)		2,000
Baseline Equipment/Measure Cost		
Initial cost	-	-
Installation cost	-	-
Annual maintenance cost	-	-
DSM (HIGH EFFICIENCY) EQUIPMENT/MEASURES		
Number of DSM (High Efficiency) Natural Gas Appliances/Measures Installed Due to Program	1	-
Useful Life (years)	20	-
Natural Gas Consumption (therms)		
Winter (5 months, Nov-Mar)	692	-
Summer (7 months, Apr-Oct)	969	-
Electric Consumption (kWh)		
Winter (5 months, Nov-Mar)	2,171,750	1,478,250
Summer (7 months, Apr-Oct)	3,040,450	2,069,550
Electric Demand (kW)		1,300
DSM Equipment/Measure Cost		
Initial cost	\$ 525,000	
Installation cost	\$ 175,000	
Annual maintenance cost @ \$0.01/kWh	\$ 52,122	

*Assumes displacement of a 33% efficient 700 kW power plant usage.

DISTRIBUTED GENERATION

**APPENDIX B
Budget**

APPENDIX B - Estimated Budget - Distributed Generation

For Years 2007, 2008, and 2009

Budget dollars are estimates that may be shifted among categories for flexibility, based on program effectiveness.

	2007	2008	2009
Implementation			
Outside contractors - energy studies	\$ 22,000	\$ 22,000	\$ 22,000
Communication			
Brochures/Printing/Design	8,000	8,000	8,000
Training and Education			
Seminars - promotion	10,000	10,000	10,000
Incentives			
Incentives	350,000	350,000	350,000
Measurement and Evaluation			
Outside contractors	8,000	8,000	8,000
Other Administrative Costs			
Office supplies/materials	2,000	2,000	2,000
TOTAL	\$ 400,000	\$ 400,000	\$ 400,000

DISTRIBUTED GENERATION

APPENDIX C
Cost-Effectiveness Test Results

**Southwest Gas Corporation
Distributed Generation
2007-2009**

COST-EFFECTIVENESS OVERVIEW	
Annual Budget	\$400,000
Present Value Benefits	\$30,857,254
Present Value Costs	\$4,512,111
Present Value Net Benefits	\$26,345,143
Cost-Effectiveness Ratio	6.84

UNITS		
2007	2008	2009
700 kW	700 kW	700 kW

CUMULATIVE ENERGY SAVINGS (Three-Year Program)		
Kilowatt-hour (kWh)	Kilowatt (kW)	Therms (Th)
336,186,900	2,100	22,063,200

ENVIRONMENTAL BENEFITS [1]				
Annual Savings	CO ₂ (lbs)	NOx (lbs)	SOx (lbs)	H ₂ O (gallons)
2007	5,138,056	964	24	1,305,526
2008	5,138,056	964	24	1,305,526
2009	5,138,056	964	24	1,305,526
Lifetime Savings	308,283,387	57,824	1,446	78,331,548
Annual Avoided Costs	CO ₂ (\$)	NOx (\$)	SOx (\$)	H ₂ O (\$)
2007	\$49,756	\$12,607	\$23,533	\$1,554
2008	\$49,756	\$12,607	\$23,533	\$1,554
2009	\$49,756	\$12,607	\$23,533	\$1,554
Lifetime Avoided Costs	\$2,985,340	\$756,421	\$1,411,985	\$93,215

[1] Sources:

- Avoided emission costs data from National Renewable energy Laboratory January 2005 report on Emerging Markets for Renewable Energy Certificates Opportunities and Challenges, as augmented by Bill Schrand/Southwest Administrator/Environmental Programs, and as augmented and commented on by David Berry/WRA.

- Conversion factor for CO₂ from Rocky Mountain Institute website on Energy and Carbon Dioxide Conversion Factors (5/23/05).

- Water values from Central Arizona Water Conservation District/Central Arizona Project, City of Phoenix and City of Tucson websites.

- Environmental benefits (conversion factors per kWh) listed in APS' DSM Portfolio Plan 2005-2007 (7/1/05)

8

TECHNOLOGY INFORMATION CENTER

TECHNOLOGY INFORMATION CENTER

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APPENDICES

- A - Sample Newsletter
- B - Budget

PROGRAM OVERVIEW

Program Description

Southwest Gas Corporation (Southwest or Company) has designed the Technology Information Center program primarily for industrial and transportation-eligible general service customers.

The program consists of sending monthly e-mail newsletters containing technical information, to enable industrial customers to reduce energy usage, lower utility bills, ask questions about energy-efficient technologies, and increase their awareness of environmental issues.

The newsletter will also provide general natural gas information of interest to large customers. In particular, it will focus on specific energy savings or technology information that will help customers optimize natural gas resources. The information may be generic in nature or may apply specifically to customers in Southwest's service territory. Sample newsletter stories will deal with such subjects as:

- Energy-saving measures and rebate programs
- Energy-saving technologies and equipment
- Air quality and water conservation issues
- Purchasing of natural gas by customers and gas suppliers
- Natural gas transportation issues
- Curtailment
- Gas prices
- Pipeline issues
- Rate design
- Seminars and training

The newsletter will also contain a link to an "Ask an Expert" hotline and an electronic research library.

Customer interest in various topics will be tracked by Southwest for use in tailoring future DSM programs. Customer privacy will be maintained.

Program Objectives and Rationale

The program has various benefits for large consumers, including:

- Energy-saving DSM ideas
- Proactive environmental education
- Natural gas issues information
- Another means of communicating with Southwest

Products and Services to Be Provided

Southwest intends to contract with a natural gas newsletter provider who will send a national newsletter to customers every month. Southwest will provide specific articles to the newsletter contractor dealing with local natural gas issues, including energy efficiency.

A feedback mechanism will be provided so that customers will be able to offer comments or ask questions on the stories or information provided in the newsletters.

Opportunities

The newsletters afford Southwest the opportunity to keep issues such as energy efficiency and demand side management in front of large customers every month.

The newsletters can also introduce new technologies and provide information that is useful in corporate planning and budgets for large customers.

Barriers to Program Acceptance, Adoption, and/or Deliverability

The main barriers to implementation of this program are:

- Determining who should receive the newsletter. Corporate officers, facilities engineers, and production personnel are all candidates for this type of information
- Ensuring that the newsletter contains different and useful types of information for different audiences to increase readership
- Maintaining the accuracy of e-mail addresses, resulting from customer contact changes

TARGET MARKET

Customer Type

All industrial and transportation-eligible general service customers will be eligible for this program. Transportation-eligible customers are those whose average monthly requirements on an annual basis are greater than 15,000 therms per month.

Customers who use Southwest tariffs for Optional Gas Service, Gas Air Conditioning, Compressed Natural Gas, Electric Generation, or Natural Gas Engine Service will also receive the newsletter. Architects or engineers who express an interest in receiving the newsletter may also receive the newsletter. All of these classes of customers can have a large impact on energy conservation and DSM.

Program Eligibility Requirements

This program will generally be limited to industrial and large transportation-eligible general service customers. Customers must be located in Southwest's Arizona service areas.

Numbers of Potential Customers

The number of potential customers during the first three years of the program is estimated as follows:

Year 1 – 200 newsletter recipients
Year 2 – 300 newsletter recipients
Year 3 – 300 newsletter recipients

Estimated Level of Program Participation

The estimated level of program participation during the first three years of the program reflects the number of potential customers, as follows:

Year 1 – 200 to 300 customers
Year 2 – 200 to 300 customers
Year 3 – 200 to 300 customers

ENERGY MEASURES

Baseline (Existing) Measures

Southwest does not have data regarding the types of equipment or the equipment efficiencies which could be impacted by the newsletter articles. This data varies by customer and is diverse in nature. Much of this information is proprietary. As a result, a baseline energy analysis is not possible.

DSM Measures

Because the program is educational in nature, Southwest cannot provide accurate or meaningful energy savings estimates. However, Southwest believes that savings will occur as industrial and commercial customers increase their awareness of high-efficiency equipment and begin utilizing that equipment in their operations.

IMPLEMENTATION PLAN

Marketing and Delivery Strategy

The availability of the Technology Information Center will be communicated to Southwest's large industrial and commercial customers by Company Key Account Management engineers. Architects or engineers who express an interest in the newsletter may also receive the newsletter upon request; these two program targets could potentially communicate newsletter information to their clients.

MEASUREMENT AND EVALUATION

This program will be measured by the number of e-mail newsletters sent to customers, the number of customers who access the website, the topics selected for viewing, and the number of calls to the hotline. Southwest will also evaluate the program based on the types of questions asked.

BUDGET

The budget for this program is \$35,000 annually, or approximately 0.8 percent of the total DSM budget of \$4.385 million. A three-year program horizon was used for planning purposes, and this level of spending will continue until further action is taken by the Commission. Program dollars are collected through a Demand Side Management Adjuster Mechanism (DSMAM), payable by all full-margin customer classes.

COST-EFFECTIVENESS TEST RESULTS

Because this program is primarily educational in nature, Southwest does not have the data necessary to demonstrate cost-effectiveness test results. However, the Company believes that as energy issues continue to be of great importance to society, the information sent to these large customers will be read and taken into consideration. Ultimately, as companies replace equipment or undergo general remodeling, many of the DSM and energy efficiency measures advocated are likely to be implemented.

Societal Costs

As with the estimated energy savings, Southwest is unable to provide an estimate of related societal benefits. However, there may well be advantages, such as decreased air pollution or water savings, as a result of the higher-efficiency technologies adopted by industrial and commercial customers through this program. It is a well-known fact that the energy requirements for industrial equipment can be extremely large on a per-unit basis; therefore, any reduction in these requirements by the installation of higher-efficiency equipment will have a significant, positive impact on energy production, consumption, and the environment.

TECHNOLOGY INFORMATION CENTER

APPENDIX A
Sample Newsletter



SOUTHWEST GAS CORPORATION

Gas Line

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Natural Gas and Workplace Safety Guidelines

By following a few simple guidelines, you can ensure that you and your employees are safe while working around natural gas equipment and appliances.

Getting the Most From Your HVAC System

An introduction to some fundamental steps to take in maintaining HVAC systems for optimum energy and economic savings.

Industrial Refrigeration: Natural Gas Success Stories

Read how these facilities are using gas engine cooling for their refrigeration needs.

May 15, 2006

FEATURED ARTICLE:

Best Practices in Energy Management

Higher energy costs and increasing competition have business owners and executives everywhere looking for ways to reduce energy consumption. Successfully planning and implementing an energy management program will not only help save energy costs in the short term, but can have numerous long-term benefits, such as increased production, reduced waste, improved environmental performance and a healthier workplace. A well-planned energy management program is no stand alone operation, but one that will encompass all aspects of the organization. While every organization is different, the most successful energy management programs have a few things in common. These include a dedicated energy management team, a specific set of goals and an action plan for achieving them, and a system for evaluating performance and recognizing achievements.

[more >>](#)

Heat Treating: Energy Efficiency Can Improve Your Bottom Line

Increasing global competition, combined with a shrinking domestic market, has caused many heat-treating facilities to look for ways to improve the efficiency of their operations and increase their bottom line. With energy costs at an all-time high, practices that lower energy consumption in heat-treating processes will not only have a significant impact on energy bills, but should also help to increase the competitive position of heat-treating plants. Some of the more common ways to improve the energy efficiency of heat-treating furnaces include combustion control, waste-heat recovery, and improved furnace design.

[more >>](#)

Stay Cool with Natural Gas

Natural gas is commonly thought of as an important fuel for space heating, cooking or certain industrial processes. Increasingly, however, natural gas technologies are seen as reliable and effective space cooling options in a wide variety of commercial and industrial applications. Gas-fired cooling systems come in a variety of types: engine driven and steam turbine chillers, absorption systems, and desiccant technology. Each has its own strengths and weaknesses and particular niche applications. Desiccant systems can not only cool a building, but provide cost-effective dehumidification as well. Common applications for gas-fired cooling systems include government buildings, hospitals, warehouses, and food processing facilities.

[more >>](#)

Energy Recovery in Commercial and Institutional Buildings

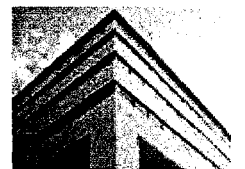
Energy recovery is the beneficial use of heat or cooling energy that would otherwise be lost from a specific space. Technologies that recover heat and/or cooling energy reduce the cost and consumption of energy in commercial and institutional buildings. The recaptured energy is potentially useful for heating and/or cooling/dehumidifying outdoor air brought into a building for ventilation, space heating, and water heating.

[more >>](#)

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James Stephens

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TECHNOLOGY INFORMATION CENTER

**APPENDIX B
Estimated Budget**

**APPENDIX B - Estimated Budget - Technology Information Center
For Years 2007, 2008, and 2009**

	2007	2008	2009
Implementation			
Contracted newsletter provider	\$ 35,000	\$ 35,000	\$ 35,000
TOTAL	\$ 35,000	\$ 35,000	\$ 35,000