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QUESTAR Gas

DSM Market Characterization Report

Submitted By:

Nexant

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Contents

Executive Summary

To support Questar Gas Company's (Questar) efforts to offer customers a new suite of energy efficiency programs, Nexant has conducted an analysis to update the estimated market potential of gas energy efficiency programs within Questar's Utah service territory.

Based on the results of the market segmentation analysis presented in Section B of this study, space heating and water heating end-uses account for nearly 88% of a residential customer's natural gas consumption. Commercial customers under a GS-1 rate schedule are predominately small commercial businesses using less than 500 DTH/year.

Nexant evaluated over sixty energy savings measures targeting residential and small commercial end use technologies including: high efficiency space and water heating equipment, weatherization products, control systems, boiler tune-ups, and commercial cooking equipment. The above technologies were packaged into program offerings based on a review of market trends and similar national programs, results of interviews recently conducted with local vendors, and Nexant's experience in implementing similar Demand Side Management (DSM) programs around the country.

Potential program offerings were then prioritized into a roll-out strategy for follow-on design efforts. The programs were prioritized using the following criteria:

1. The program must contain market-ready and quantifiable measures
2. The program must be cost effective in terms of the Total Resource Cost Test (TRC)
3. Implementation of at least one program during the 2006-2007 heating season
4. The program must accommodate participants from a broad customer base
5. Launch programs with lesser complexity first

As a result of this work, Nexant has identified several potentially cost effective program opportunities including:

- Residential Prescriptive Program
- Commercial Prescriptive Program
- New Construction Energy Star Homes Program
- Commercial Audit Program

The efficiency programs recommended above are primarily resource oriented. Working side by side with resource acquisition programs, market transformation initiatives can also be valuable in increasing awareness and bolstering support for all energy efficiency efforts. Although the scope of this study focuses on quantifiable resource acquisition programs, the value and structure of natural gas market transformation efforts should be investigated. As such, additional efforts with the DSM Advisory group and the public service commission should be taken to address the regulatory requirements and timing of market transformation initiatives. Examples include:

- Broad-based energy efficiency advertising.
- Dedicated energy efficiency tools and resources.
- Focused energy efficiency education and outreach programs to market actors such as customers, vendors, and interested parties.
- Fast response programs and measures to handle transient conditions (price spikes, constrained supply, etc.).

Based upon the prioritization criteria, Nexant prepared a phased approach that launches two programs per year. Table 1 illustrates the program launch strategy whereby the prescriptive programs begin in year 1 with easy-to-implement measures. In year 2, the ENERGYSTAR Homes program and Commercial Audit Program commence. In Year 3, additional measures are added to expand the prescriptive programs' offering.

Table 1. Suggested Program Roll-out Strategy

Program		Year 1	Year 2	Year 3
Residential Prescriptive	Stage (1): ▪ Space & Water Heating Equipment ▪ Natural Gas Appliances	√	√	√
	Stage (2) ▪ Weatherization Measures			√
Commercial Prescriptive	Stage (1): ▪ Space & Water Heating Equipment ▪ HVAC & Process Controls	√	√	√
	Stage (2): ▪ Weatherization Measures ▪ Commercial Cooking Measures			√
New Construction EnergyStar Homes Program			√	√
Commercial Audit Program			√	√

After a three year DSM pilot program, the suite of programs is anticipated to achieve a cumulative savings of 626,000 DTH in savings. In Year 3 alone, customers saved approximately 313,000 DTH/year. As a reference point, the incremental annual savings of the suggested program rollout is equivalent to providing natural gas to 2,700 customers each year[1] or approximately 0.4% of annual sales. Table 2 and Table 3 present estimated savings achievable from the program roll-out strategy and the associated range of economic parameters for the recommended programs; respectively.

[1] Based upon a typical existing GS-1 customer's consumption of 115 DTH per year.

Table 2. Preliminary gross annual natural gas savings estimates for the recommended programs (Cumulative DTH)

Program	Sector	Year 1	Year 2	Year 3
Residential Prescriptive	Res.	24,887	64,705	126,344
Commercial Prescriptive	Comm.	13,966	36,312	74,963
New Construction EnergyStar Homes Program	Res.	0	210,587	421,175
Commercial Audit Program	Comm.	0	1,617	4,205
Total (DTH)		**38,853**	**313,221**	**626,687**

Table 3. Estimated economic parameters for the recommended programs

Program	Design/Admin/ Marketing Budget (2006$)*	Incentive Budget (2006$)	Program Life Savings (DTH)**	Benefit Cost Ratio (TRC)
Residential Prescriptive	$898,156	$1,368,555	1,903,853	1.98
Commercial Prescriptive	$224,199	$1,156,341	1,301,682	1.91
New Construction EnergyStar Homes Program	$270,000	$4,280,232	9,055,259	1.85
Commercial Audit Program	$165,000	$73,956	89,930	1.40
Total	**$1,557,355**	**$6,879,084**	**12,350,724**	**-**

* Budget numbers assume cost sharing with the Residential Prescriptive Program

** Assumes savings achieved for a maximum of 23 years

Section A Introduction

A.1 OVERVIEW

Nexant was retained by Questar Gas Company (Questar) to develop a strategy for future implementation of cost-effective natural gas demand side management (DSM) programs. As a starting point, Nexant recommended that Questar follow a three-phase implementation process as follows:

- Phase I - Market Characterization & Delivery Evaluation
- Phase II - Program Design & Implementation
- Phase III - Evaluation, measurement and verification (EM&V)

This primary objective of this report (Phase I) is to provide Questar a market characterization report that assesses the market and develops an implementation strategy for future DSM initiatives. Nexant's approach to the work consisted of the following key steps:

- *Step 1 – Review Market Segmentation Information.* Review utility customer segments within Questar's GS-1 retail customer base. Results of this review shape the potential number and make-up of program participants.

- *Step 2 – Evaluate Best Practices in Natural Gas DSM.* Review utility program offerings included in similar service territories for best practices approaches and measures.

- *Step 3 – Measure Analysis.* Develop a natural gas end-use measure list using publicly available data from sources and gas efficiency programs in other states. Data collected for this step includes:

    1. Estimating the energy (therms) and economic savings per customer installation
    2. Calculating incremental costs for each gas measure
    3. Determining the measure-life for each gas measure on the list

4. Assessing measure incentive levels based upon savings, incremental costs, and incentives provided by similar utility-sponsored programs

- *Step 4 –Recommend Program Delivery Mechanisms.* Nexant evaluated and recommended robust program delivery mechanisms based upon natural gas best practices and market analysis efforts conducted in the earlier steps. The goal of this step is to provide Questar with solid delivery mechanisms for market-ready measures that can be hand selected for implementation in Phase II.

- *Step 5 – Vendor Evaluation.* Contact contractors, dealers, or distributors for targeted end-use measures for feedback on the following:

  1. Evaluate market practices within each technology including current sales of high-efficiency equipment, incremental customer costs, etc.
  2. Characterize vendor training and service abilities to help assess the possible success of implementing incentive programs in the Utah service territory.
  3. Obtain vendor feedback, suggestions, likelihood of acceptance, and possible savings impacts associated with the rollout of the DSM programs.

- *Step 6 – Screen Program Cost-Effectiveness.* Nexant conducted a preliminary cost-effectiveness screening for each recommended program. Programs having favorable economics may be selected for follow-on work in the design phase (Phase II).

- *Step 7 – Prioritize Program Offerings.* Based upon several prioritization criterion, Nexant provided a recommended program roll-out strategy.

A.2 GUIDE TO REPORT

The balance of this report includes additional details on this effort, organized as follows:

- Section B characterizes Questar's GS-1 customer base by end-use and customer type.
- Section C provides survey of best practice approaches for natural gas DSM programs.

- Section D summarizes the analysis methodology for the various measures.
- Section E provides recommendations for the four program delivery mechanisms.
- Appendices at the end of the report contain all of the supporting information pertaining to analysis.

A.3 NEXANT BACKGROUND

Nexant is a leading provider of energy technology solutions and consulting services to electric and gas utilities, energy producers, and oil and gas companies—both in the U.S. and abroad—as well as to international development organizations, national and regional government agencies, and energy end users. Nexant is an organization comprised of approximately 200 employees in offices world-wide and has developed a portfolio of over 700 major projects in nearly 30 countries. Members of the Energy Management business unit, the Nexant division offering services to Questar Gas Company, have provided a comprehensive range of energy management services to utilities, demand-side management (DSM) program sponsors, and energy end users since 1986, first through Schiller Associates and now through Nexant. Some of our current clients include:

- Bonneville Power Authority
- The California Energy Commission
- CenterPoint Energy
- Georgia Power Company
- MidAmerican Energy
- National Grid USA
- New York Power Authority
- NYSERDA
- Pacific Gas and Electric
- PacifiCorp
- San Diego Gas and Electric
- Southern California Edison
- TXU Electric
- US Department of Energy
- Wisconsin Focus on Energy
- Xcel Energy

Within the United States, Nexant, Inc. has its headquarters in San Francisco (CA), and offices in Houston (TX), Boulder (CO), Chandler (AZ), Madison (WI), Salt Lake City (UT), White Plains

(NY), West Covina (CA) and Washington DC. Nexant's main international offices are located in London (United Kingdom), Bangkok (Thailand) and Tokyo (Japan).

To increase the accuracy of DSM savings estimates and to support potential future DSM program planning activities, natural gas usage data was segmented by market sector and end use technology for customers purchasing retail gas on a GS-1 rate schedule.

A summary of the number of customers and natural gas consumption of Questar's GS-1 customer base is shown in Figure 1 below. Although the commercial customer base comprises only 7% of the customer count, commercial customers consume nearly 30% of the natural gas sold under the GS-1 rate schedule. As such, the recommended DSM programs focus on both residential and commercial customers.

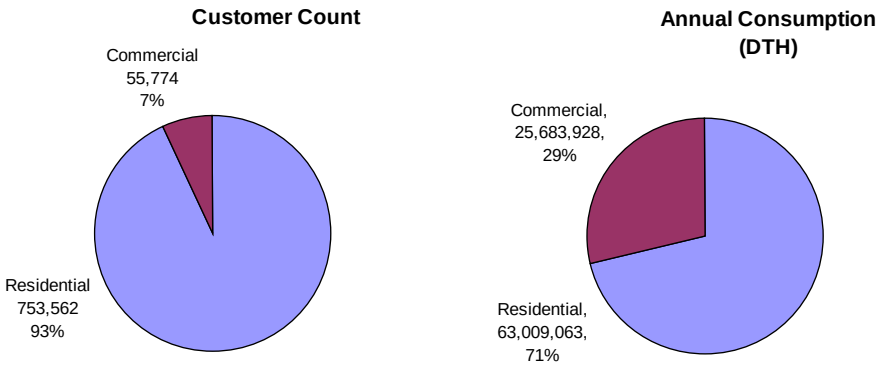

Figure 1. GS-1 Customers by Annual Load in Decatherms

B.1 RESIDENTIAL MARKET

As shown in Figure 2, the residential market is primarily composed of single dwelling homes. Multi-dwelling and master meter customers consist of apartment and condominium complexes.

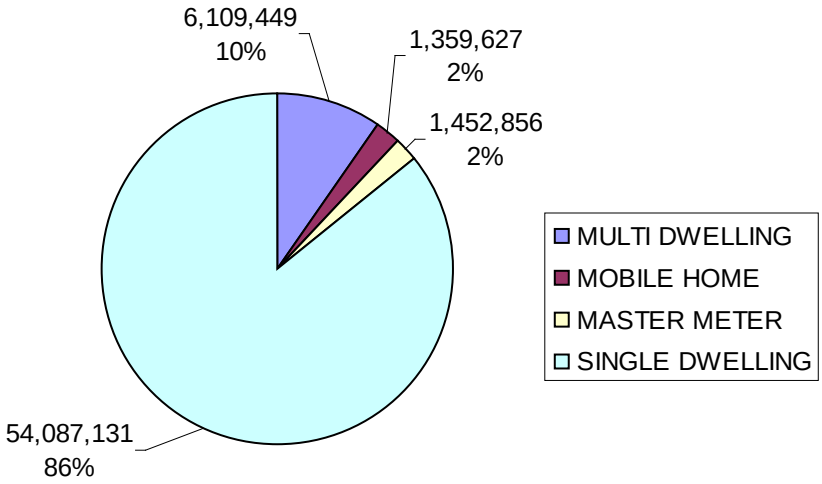

Figure 2. Annual Consumption by Residential GS-1 Customers

Space heating and water heating end-uses consume the vast majority of natural gas within the residential market as shown in Table 4. Consequently, measures recommended for implementation focus on these end uses.

Table 4. Contribution to Annual Consumption by Major End Use for Residential Sector[2]

Residential Sector	
Space Heating	59%
Water Heating	29%
Secondary Appliances	8%
Dryer	2%
Cooking	2%
Total	100%

B.2 COMMERCIAL MARKET

To properly characterize the eligible commercial participant mix, it was necessary to evaluate the business segmentation of commercial customers. Nexant utilized data provided by Questar[3]

[2] The Maximum Achievable Cost Effective Potential for Gas DSM in Utah for the Questar Gas Company Service Area. GDS Associates, Inc. June 2004.

which provided an estimate of the type of the commercial businesses served by the GS-1 rate as shown in Table 5. Although the data was based upon 2004 usage, it was deemed acceptable and valid for this analysis.

Table 5. Segmentation of Commercial GS-1 Accounts[4]

Building Type	% of Commercial Sales
Retail Trade (incl.Auto Repair/Amusement)	28.0%
Schools	15.3%
Services-Primarily Health	13.7%
Restaurant	8.4%
Public Administration	7.4%
Finance, Insurance, Real Estate (F.I.R.E)	6.8%
Churches	5.8%
Hotels	4.8%
Transportation, Warehouses, etc.	3.3%
Agriculture	3.2%
Construction	2.2%
Electric Generation	1.2%
Total	100%

Figure 3 illustrates that the majority GS-1 customers are designated as "small commercial" and consume 500 decatherms per year or less. As a result, eligible measures and the program delivery should focus primarily on light commercial end use equipment.

[3] Data was presented in: The Maximum Achievable Cost Effective Potential for Gas DSM in Utah for the Questar Gas Company Service Area. GDS Associates, Inc. June 2004.

[4] The Maximum Achievable Cost Effective Potential for Gas DSM in Utah for the Questar Gas Company Service Area. GDS Associates, Inc. June 2004.

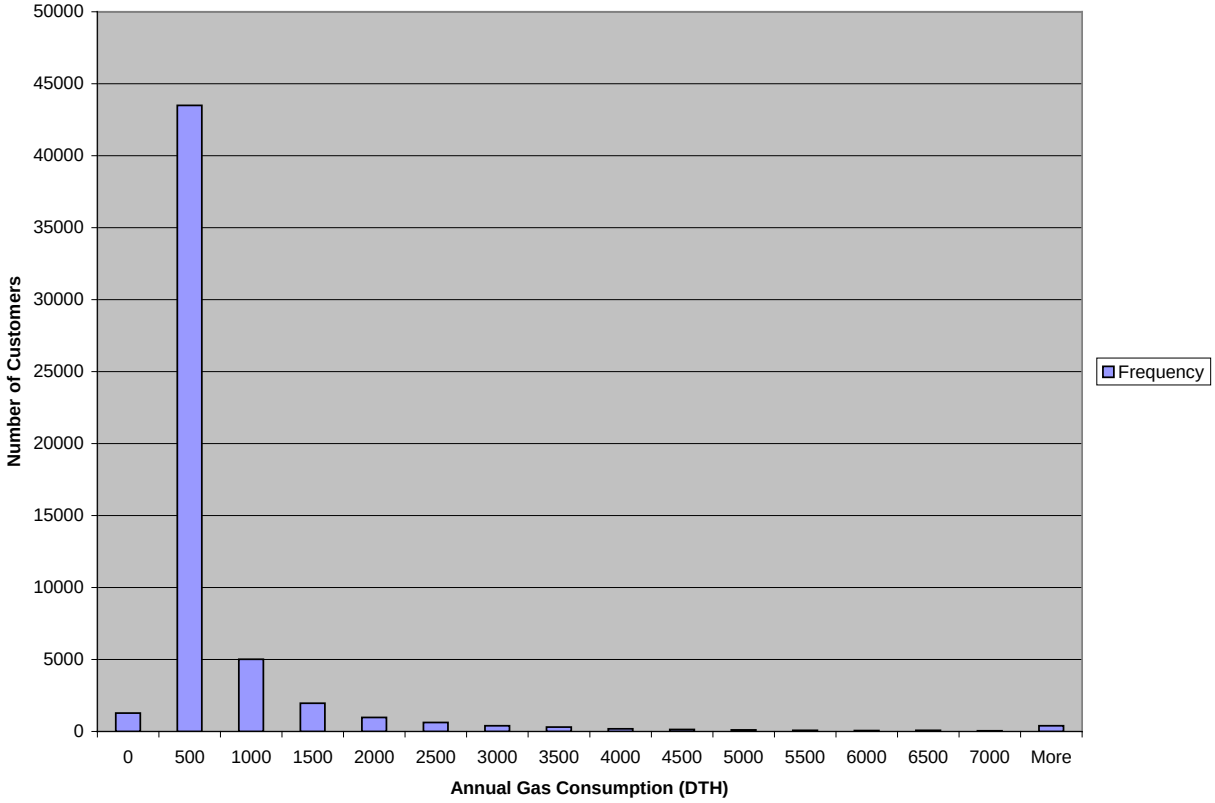

Figure 3. Commercial GS-1 Customers in Utah by Annual Gas Consumption Level in Decatherms[5]

[5] Source: Questar Gas Company customer data.

To position Questar for a successful launch into the DSM market, Nexant completed a literature review to characterize successful traits of DSM programs implemented by other utilities.

C.1 INTRODUCTION

The approach to natural gas conservation is multi-faceted and requires action on behalf of numerous organizations. A 2005 report conducted by the Alliance to Save Energy[6] concluded that energy conservation is a result of seven key policies including:

- Utility Demand Side Management (DSM)
- Research, Development, Demonstration, and Deployment (RDD&D)
- Appliance Standards
- Tax Incentives
- Building Codes
- Building and Product Labels
- Federal Energy Management Programs

DSM programs administered through utilities or third parties were considered the most viable and productive due to the utilities' visibility and access to the customer base.

There are numerous studies available evaluating the potential of gas and electric conservation programs across the western United States. A 2005 meta-study conducted by Western Resource Advocates[7] reviewed seven potential studies conducted in California, Oregon, Washington, and Utah. The report concluded that the residential market sector could achieve natural gas savings in the range of 5% and 26% versus a "business-as-usual" scenario.

In a separate study conducted by the Southwest Energy Efficiency Project[8] (SWEEP), the authors reviewed ten comprehensive natural gas DSM programs implemented across the nation. The study examined offerings which targeted at least two customer classes (residential, commercial, industrial, and/or low-income). Based upon their results, all of the utilities contained programs targeting residential and commercial customers for retrofit and new construction measures. To

[6] Building on Success: Policies to Reduce Energy Waste in Buildings. Alliance to Save Energy. July 2005.
[7] Gas Efficiency, Using Natural Gas More Efficiently: Saving Money and Protecting Our Western Way of Life. Western Resource Advocates, , May 2005
[8] *Natural Gas Demand-Side Management Programs: A National Survey*. Boulder, CO: Southwest Energy Efficiency Project. S. Tegen and H. Geller, Jan. 2006.

normalize the performance and program spending between utilities, the study weighted the savings against annual revenues and commodity sales. In short, natural gas utilities are realizing savings of 0.1% to 1.0% of their annual gas sales through their DSM programs. Table 6 illustrates the program spending and savings of the ten natural gas DSM programs.

Table 6. Information on Comprehensive DSM Programs Implemented by Ten Gas Utilities in 2004

Utility	Program spending (million $)	% of retail revenues	Gas savings (MCF/yr) (1)	% of gas sales saved	MCF/yr saved per million dollars	Benefit-Cost Ratio (2)
Aquila	2.1	1.4	146,000	0.5	69,000	--
Centerpoint	5.6	0.5	720,000	0.5	129,000	2.6
Keyspan	12.0	1.0	490,000	0.4	41,000	3.00
Northwest Natural Gas	4.7	0.7	85,000	0.1	18,000	--
NSTAR	3.9	0.8	71,500	0.2	18,000	2.29
PG&E	21.7	0.7	2,040,000	0.7	94,000	2.1
PSE	3.8	0.4	311,000	0.5	82,000	1.93
SoCal Gas	21.0	0.6	1,100,000	0.3	53,000	2.67
Vermont Gas	1.1	1.6	57,000	1.0	57,000	5.6
Xcel Energy (MN)	4.0	0.7	663,000	0.9	166,000	1.56
Average	7.9	0.8	564,000	0.5	72,700	2.7
Median	4.3	0.7	400,500	0.5	63,000	2.4

C.2 BEST PRACTICES APPROACHES

For successful participation, realized savings and long-term energy efficiency/customer benefits through Questar's DSM initiatives, seven recommendations are listed below. These suggestions are based on the results of the interviews and surveys recently conducted with key market players, Nexant's experience in implementing similar DSM programs around the country, and "exemplary" program benchmarking studies [9],[10],[11]:

1. Develop a comprehensive energy efficiency approach
2. Simplify and integrate program offerings

[9] Natural Gas Efficiency NY Potential & Exemplary Programs, Philip Mosenthal, AESP Brownbag Seminar, April 27, 2006.
[10] DSM Best Practices. IndEco Strategic Consulting. July 21, 2005.
[11] Responding to the Natural Gas Crisis: America's Best natural Gas Energy Efficiency Programs. ACEEE, M. Kushler, D. York, P. Witte. December 2003

3. Brand DSM and focus on customer service
4. Develop strategic partnerships with market actors
5. Provide customized service, when applicable
6. Provide qualified, independent expertise
7. Integrate program evaluation early

A description of each best practices facet is provided below.

C.2.1 Develop a comprehensive energy efficiency approach

To stimulate a conservation-focused marketplace, numerous resources are needed to reach various customer groups. Examples of key elements include:

- Develop energy efficiency education and awareness campaigns with customers and market actors.
- Create long-term energy efficiency programs that provide persistent savings.
- When needed, implement fast-response programs and measures to handle transient conditions (price spikes, constrained supply, etc.).
- Support continual improvement of codes and standards.

C.2.2 Simplify and Integrate Program Offerings

An important component for program participation is to create a streamlined program delivery mechanism. Program processes should accomplish the following goals:

- Provide post-purchase claims for prescriptive incentives directly to customers for qualifying equipment.
- Minimize the paperwork requirements and complex program rules.
- Ensure that transitions between internal program offerings are seamless.
- Strive to minimize divisions between programs so they are invisible to customers.

- Where applicable, leverage other utility program offerings (i.e. Utah Power) and maintain similar delivery mechanisms to limit market confusion.

C.2.3 Brand DSM and focus on customer service

Create an image for the DSM program which can be readily identified by customers and connotes efficiency and conservation. Additionally, provide customer service resources for potential participants to ask questions, learn more about the programs, and access participation procedures.

C.2.4 Develop strategic partnerships with market actors

Partnerships with market actors such as equipment manufacturers, vendors, engineering firms, regulators, and industry leaders provide significant benefits to program outreach and market transformation. Key benefits of these alliances include:

- Working with market actors leverages utility capabilities to increase market awareness and technology adoption.
- Utilizing existing trade ally networks creates an instant marketing channel for eligible technologies. Currently, Utah Power maintains networks in the residential and commercial HVAC and home construction sectors that could be leveraged for gas program offerings.

C.2.5 Provide customized service, when applicable

The ability to modify program structures to fluctuating market conditions is paramount to successful initiatives. Audit programs, in particular, should have flexibility to adapt to changing customer needs and requirements.

C.2.6 Provide qualified, independent expertise

Independent expertise provided to customers adds credibility to the measures and maintains program integrity. Additionally, when high quality expertise is provided in a timely manner, customer satisfaction is enhanced.

C.2.7 Integrate program evaluation early

Within each program offering, frequent monitoring and feedback on program performance provides for mid-year adjustments if necessary.

C.3 MARKET TRANSFORMATION/RESOURCE ACQUISITION PROGRAMS

There are two broad categories of energy conservation approaches: market transformation and resource acquisition. Each category has valid program documentation, associated value, and proven implementation models. Market transformation is an effort that imparts long lasting changes in customers' and market actors' behaviors that increase the adoption of energy efficient practices and technologies. Market transformation can take on many forms such as educational campaigns, vendor training, and development of tools and resources to promote energy efficiency. Resource acquisition programs focus on persistent and quantifiable energy conservation strategies through energy efficient equipment products and operational changes. Examples of typical resource acquisition programs include equipment incentive programs, design assistance programs, and demand response programs.

Historically most of the efficiency programs offered in Utah have been resource oriented. Working side by side with resource acquisition programs, market transformation initiatives can be valuable in increasing awareness and bolstering support for energy efficiency efforts. Although the scope of this study focuses on quantifiable resource acquisition programs, the value and structure of natural gas market transformation efforts should be investigated.

C.3.1 Residential Program Delivery Mechanisms

Nexant completed a review of residential natural gas DSM programs in similar service territories to characterize successful program traits implemented by other organizations. In general, residential programs target space heating and water heating end uses[12]. Table 7 illustrates generalized program designs.

[12] American Council for an Energy-Efficient Economy. http://www.aceee.org/.

Table 7. Residential Natural Gas Efficiency Program Traits[13]

Market Sector	Measures Targeted	Program Services
Existing Homes	high efficiency space heating high efficiency water heating high efficiency appliances Weatherization (windows & insulation)	Marketing Support Prescriptive Financial Incentives Technical/Training Assistance Fee-based Audit Services
New Construction Homes	high efficiency space heating high efficiency water heating high efficiency appliances (dishwashers, clothes washers, dryers, etc.) weatherization (windows & insulation)	Marketing Support EnergyStar Performance Ratings Technical Assistance Performance Testing Prescriptive Financial Incentives

Typical measures that reduce gas consumption include high efficiency furnaces, water heaters, dishwashers, dryers, and washers; low flow showerheads; high performance windows; and improvements in duct, wall, and roof insulation.

Best practice programs targeting measures within existing homes provide financial incentives in the form of rebates after the purchase of eligible equipment. Most programs also provide technical and marketing assistance to vendors and customers. A few utilities also offer customized auditing services on a fee-based approach.

Currently in the western United States, there are eleven high performance new-construction homes efforts in operation.[14] These programs provide an array of services ranging from technical assistance, marketing support, performance testing, and financial incentives.

In Utah, Utah Power's Energy Star Homes Program focuses on electric conservation measures within single and multi-family homes that exceed ENERGYSTAR performance requirements. The program provides prescribed financial incentives and marketing support to builders and requires performance testing to ensure compliance with program requirements.

C.3.2 Commercial Program Delivery Mechanisms

Commercial programs share similar traits with the residential prescriptive programs for the small commercial sector. Programs targeting small businesses generally focus on space heating, water heating, and weatherization measures. However, large commercial/industrial facilities are generally more complex and have customized systems including control

[13] American Council for an Energy-Efficient Economy. http://www.aceee.org/.
[14] Review of Energy-Efficient New Homes Programs in the Southwest. H. Geller, L. Kinney, J. Schlegel, January 2006.

systems, process loads, thermal distribution systems, etc. As such, these customers require programs with a mixture of prescriptive and customize approaches. Customized programs generally provide audit services and incentive rates in terms of a $/therm saved for projects submitted to the program.

Table 8 details common traits of commercial programs. Detailed program and measure level information for measures implemented by other utilities is included in Appendix C.

Table 8. Commercial Natural Gas Efficiency Program Traits[11]

Market Sector	Measures Targeted	Program Services
Small Commercial	high efficiency space heating high efficiency water heating high efficiency appliances (dishwashers, clothes washers, dryers, etc) weatherization (windows & insulation) control system improvements space heating tune-ups high efficiency cooking equipment	Marketing Support Prescriptive Financial Incentives Technical/Training Assistance
Large Commercial/Industrial	Customized heating measures Customized process measures	Custom Financial Incentives Audit Services

The purpose of this study is to develop a strategy to help prepare Questar for future implementation of natural gas energy efficiency programs. To achieve the goal of deploying ratepayer funds most effectively, Nexant conducted an analysis of market-ready measures and combined them into a suite of DSM programs. Each program was then screened for cost-effectiveness for viability. Nexant then prioritized the program offerings into detailed recommendations. Details specific to each of the analysis steps is provided below.

D.1 MEASURE ANALYSIS

The first step in the analysis was to develop a comprehensive natural gas measure list utilizing publicly available information. Primary data sources included the GDS Report[15], Nexant's Natural Gas Measure Savings List for NYSERDA[16], Pacific Gas &Electric's Single Family Rebate Program Filing[17], the California Energy Commission/California Public Utilities Commission's Database for Energy Efficient Resources (DEER)[18], and other utility natural gas program filings. In total, sixty-one measures were analyzed in this stage of the study. Table 9 and Table 10 summarize the measures that were evaluated as part of this analysis for the residential and commercial markets; respectively.

Table 9. Residential Measures Evaluated

Residential Measures	
Duct Insulation	Duct Sealing
Install High Performance windows	Install a High Efficiency Gas Clothes Dryer
Install Exterior Storm Windows	Install an ENERGY STAR Dish Washer
Install Water Heater Blanket	Install a Programmable Thermostat
Install High Efficiency Gas Water Heater	Insulate and Weatherize (Wall)
Install Tank-less Gas Water Heater	Insulate and Weatherize (Roof)
Install Active Solar Water Heating System	Insulate and Weatherize (Floor)

[15] The Maximum Achievable Cost Effective Potential for Gas DSM in Utah for the Questar Gas Company Service Area. GDS Associates, Inc. June 2004.
[16] Gas Efficiency Measure Analysis to Support NYSERDA's Con Edison Commercial Gas Efficiency Program. Nexant, Inc., September 1, 2005.
[17] PG&E -CUPC 2004-2005 \Single Family Rebate Program. 2005.
[18] Database for Energy Efficient Resources (DEER). California Energy Commission (CEC) and California Public Utilities Commission (CPUC). Present

Residential Measures	
Install Active Solar Pool Water Heating System	Install High Efficiency Condensing Furnace
Install Low Flow Showerhead	Install an ENERGY STAR Clothes Washer

Table 10. Commercial Measures Evaluated

Commercial Measures	
Install High Performance windows	Install High Efficiency Condensing Boiler
Install High Efficiency Gas Water Heater	Replace Burner, Boiler or Furnace
Install Drain water Heat Recovery System	Boiler Tune-Up
Install Active Solar Water Heating System	Furnace Tune-Up
Install Active Solar Pool Water Heating System	Install Vent Dampers
Install DHW Circulation Control System, Boiler/Water Heater	Install Energy Management System
Install a Horizontal ENERGY STAR Clothes Washer	Install Demand Control Ventilation System
Install a High Efficiency Gas Clothes Dryer	Install Blow down Heat Recovery System
Install a Programmable Thermostat	Install Stack Economizers
Insulate and Weatherize (Roof)	Install HVAC Heat Recovery System
Insulate and Weatherize (Floor)	Install a Gas-Fired Fryer
Install Duct Insulation	Install a Gas-Fired Broiler
Install High Efficiency Gas Unit Heater, Non-Condensing	Install a Gas-Fired Broiler
Install High Efficiency Gas Unit Heater, Condensing	Install a High Efficiency Combi-Oven
Install High Efficiency Condensing Furnace	Install a High Efficiency Conveyor Over
Install Infrared Heating System	Install a High Efficiency Steamer
Install Boiler Reset Control	Install a High Efficiency Dual Deck Pizza Oven
Install Oxygen Trim Controls, Boiler	Install a Kitchen Hood
Replace Steam Trap	Install Low-Flow Pre-Rinse Spray Valve in Dish Washer
Repair/Maintain Steam Trap	Install a High Efficiency Rotisserie Oven
Install High Efficiency Non-Condensing Boiler	Install a High Efficiency Griddle
	Install a High Efficiency Gas Range Top

After screening each measure for its prospective benefits and costs, Nexant evaluated each measure in terms of its ability to participate in the program. Three measures were excluded from future analysis and integration into the programs as shown below. Additional details pertaining to each measure are provided in Appendix E, F, G, and H.

Table 11. Natural Gas Efficiency Measure Exclusions

Dropped Measures	Reason(s)
Install Active Solar Water Heating System	Currently, costs for these systems are prohibitively high. The economics associated with purchasing and installing these systems are not favorable and therefore removed from the analysis.
Install Active Solar Pool Water Heating System	
Residential Programmable Thermostats	EnergyStar has proposed to delist programmable thermostats in the residential sector due to a lack of verified savings. Nexant

Dropped Measures	Reason(s)
	recommends aligning with EnergyStar, should the proposal be approved.

D.2 MEASURE-LEVEL SAVINGS ESTIMATES AND INCREMENTAL COSTS

Savings estimates and measure lives were pulled from previously cited resources, evaluated, and adjusted on the basis of the heating degree days in Questar's service territory, where applicable. To account for the economic benefits on a seasonal basis, savings were divided between summer and winter periods, as defined by the current GS-1 Rate Schedule (effective June 1, 2006). Summer is defined as April 1st through October 31st. Winter is defined as November 1st through March 31st.

Nexant evaluated the incremental costs for each measure. The incremental cost of a specific measure is defined as the cost to upgrade to the high efficiency technology or improve a system above standard practice. For example, if a standard efficiency water heater costs $350 and a high efficiency unit costs $450, the incremental cost would be $100. Additional details pertaining to the measure savings and incremental costs are provided in Appendix E and F.

D.3 INCENTIVE LEVELS

Incentives play an important role in the success of a DSM program. The incentive must be large enough to motivate Questar's customers to upgrade to more energy efficient products; however, it needs to be balanced with economic and cost-effectiveness requirements to ratepayers and the utility. For the purposes of this analysis, incentive levels were developed based upon four components:

- Aligning the incentive amount with those offered by utilities in similar service territories
- Reviewing the customer's simple payback associated with purchasing the high efficiency equipment over standard equipment
- Evaluating the incentive amount as a percentage of the incremental cost

- Evaluating the incentive amount as a function of the energy saved

In general, the incentives range between 25% and 50% of the incremental cost between the standard efficiency and high efficiency equipment. A summary of the incentive levels are provided in Appendix F.

D.4 PARTICIPATION RATES

Nexant estimated the measure-level participation rates based upon documentation from similar service territories with adjustments based upon professional engineering judgment and our experience in the Utah market with electric energy efficiency programs. Table 39 and Table 40 in Appendix G provide additional detail and rationale for each value.

As with all market transformation efforts, awareness and response to a particular measure builds over the life of a program. It takes time for the vendor network and customer base to become familiar with the eligible technologies and incentive process, to increase the local supply of high efficiency equipment stock, and to recognize the benefit of conservation practices. The participation rates provided in Table 39 and Table 40 (Appendix G) are based upon the measures being available in the market for several years. As such, Nexant estimated that a measure introduced to the market would experience participation numbers that are 50% that of a mature measure. The second year participation numbers for the same measure would increase to 80%; culminating in a mature measure by the third year.

D.5 VENDOR EVALUATION

Once the various measures and programs were identified with the economic model, Nexant then interviewed a variety of vendors of energy efficient equipment for input and recommendations about the uptake of a natural gas DSM program in Utah. The vendors that were contacted are summarized in Table 12 below. Additional details from the survey are provided in Appendix B.

Table 12. Vendor Survey Participants

Technology	Vendors
Space Heating (Residential & Small Commercial)	Contractors: 3 Design Build Contractor: 1 Manufacturer: 2
Water Heating (Residential & Small Commercial)	National Home Improvement Chain: 2
Weatherization Products (windows, insulation, etc)	National Home Improvement Chain: 2
Commercial Cooking Equipment	Independent Representative 1 Industry Association 1

D.5.1 Equipment manufacturers and representatives

Nationally, eight major manufacturers account for nearly all residential and commercial space heating equipment production. Carrier, Lennox, York, and Trane equipment appear to dominate the Utah market.

For water heating equipment, there are approximately a half-dozen major manufacturers nationally, with Sears, AO Smith, and Whirlpool products leading the Utah market.

Weatherization products such as high efficiency windows and insulation are primarily dominated by local contractors who provide customers with information, recommendations, price quotes, and installation services. The remainder of the weatherization business comes through the national home improvement centers such as Home Depot and Lowes who also use local contractors to perform the installations.

Commercial cooking equipment distribution varies widely primarily through independent and factory representatives, food service consultants, industry associations, local cooking equipment contractors, and restaurant suppliers.

D.5.2 Market Practices

Space Heating Market. Nexant's survey results indicate that the majority of the equipment is being replaced because it has failed. The next most common reason for replacement is "planned replacement" where the equipment is nearly worn out and is subject to fail in the future, but not immediately. The last major reason for new equipment purchase is to supply new construction.

In all cases, customers are receptive to higher efficiency replacement equipment; however there is little incentive for a customer to replace equipment that is well within its measure lifetime. In all cases, the customer generally contacts a space heating equipment contractor to purchase and install the equipment. Some customers will contact a local retailer to select equipment and then go through one of the retailer's authorized installation contractors to get the equipment installed.

Weatherization Market. Survey respondents indicated that customers generally begin thinking about adding additional insulation to their homes and businesses when their gas bills rise higher than they expect or when they experience comfort problems (such as a cold room). At this point, the customer usually contacts a contractor to further evaluate their home/business and make recommendations for improvements. To some extent, especially in the residential market, some customers will contact a local retailer of insulation products and try to fix the problem themselves.

Regarding energy efficient windows, customers tend to consider window replacements when the appearance of their windows no longer suits them or they notice comfort problems (a drafty window etc.). At this point, the customer usually contacts a window contractor for next steps. When appearance improvements are desired, customers tend to be less cost sensitive and are willing to pay more to get the appearance they want. However, when it comes to comfort problem solutions, cost is more of a factor in the choice of the replacement window. Once the replacement window is selected, most customers will opt to have a window contractor install the windows rather than install the windows themselves. However, there are some customers who will visit a local window retailer first to decide on a window replacement and then contact the retailer's contractor to have the windows installed.

Water Heating Market. Survey respondents indicated that most customers look for replacement water heaters only once they have noticed a problem with the existing water heater such as a water leak or cold showers. Next, customers usually contact a local plumber to get the problem fixed as quickly as possible. Customers are usually more concerned with fixing the water heater than the cost or features of available models. Some customers will contact a local retailer of

water heaters first and then either use the retailer's contractor to install the water heater or install the water heater themselves.

Commercial Cooking Market. Nexant's survey shows that there is interest in energy efficient equipment because the cooking market is low margin and therefore customers are interested in opportunities to reduce their expenses to improve their bottom line. However, since the profit margins are slim, most customers with existing equipment tend to extend the life of existing equipment as long as possible or until they need additional cooking capacity. Customers that are constructing new stores may be hesitant to switch to a new type of equipment that they are not familiar, but will do so with the appropriate education and incentives. As such, the largest opportunity for efficiency improvements in the commercial cooking market will be with new equipment.

New equipment is generally purchased on the advice or recommendation of independent and factory representatives, food service consultants, industry associations, and restaurant suppliers. Nexant recommends pursuing these vendors through a dedicated trade ally network.

D.5.3 Vendor Assessment of DSM Programs

Space Heating Market. Our survey indicates the following:

- The majority of vendors agreed that a program to promote energy efficient equipment would be very beneficial in the Utah market because customers are cost conscious and need extra incentives to upgrade their equipment.
- A uniform software tool used by all vendors would be helpful for vendors and customers.
- Contractors tend to dominate equipment selection.
- Rising energy costs are increasing the awareness of the customer base.
- The barriers to sales of energy efficient equipment are shown in Table 13. The most significant barrier is initial cost. Utility incentives will be necessary to overcome this barrier.

- Customers generally look for simple paybacks of 5 years or less to make the investment in energy efficient equipment attractive. This equates to 17.5% of the incremental cost.
- Vendors overwhelmingly support incentives as the leading resources in promoting energy efficient equipment. (Table 14).

Table 13. Market Barriers to Space Heating Equipment

Rank	Barrier
1	First Cost
2	Low Incentives
3	Lack of Owner Familiarity with High-Efficiency Equipment
4	Long Paybacks

Table 14. Resources Needed for Market Transformation

Rank	Resource
1	Utility Incentives
2	Utility-provided savings calculation tool
3	Educational materials targeting end-use customers
4	Prescriptive incentive levels for appropriate equipment types/sizes/efficiencies

Weatherization Market.

Nexant's survey indicated that increased insulation levels will be primarily limited to new construction as it is often very difficult to insulate buildings after they have already been constructed. However, there are a number of contractors who specialize in insulating existing homes. This market is small and primarily driven by contractors.

Opportunities for high efficiency windows in the Utah market are available in both new construction and existing buildings. Consequently, trade ally networks exist in both new building construction as well as retrofitting existing buildings.

Water Heating Market.

The survey results show that this market will have new construction and retrofit components.

The primary trade ally network will be new construction contractors and plumbers.

ENERGYSTAR labeling is widely recognized and used for promoting energy efficiency equipment.

Commercial Cooking Market.

Survey respondents indicated that most of the potential will be with the new equipment market.

As such, our primary trade ally network will consist of independent and factory representatives, food service consultants, industry associations, and restaurant suppliers.

Section E Program Recommendations

To support Questar's efforts to offer customers a suite of energy efficiency programs, Nexant hand-selected various measures for integration into market-ready programs. Program selection was based on a review of market trends, best practices, and similar national programs; results of interviews recently conducted with local vendors; and Nexant's experience in implementing similar Demand Side Management (DSM) programs around the country. The program initiatives were then weighted in a priority list based upon the following prioritization criteria:

1. The program must contain market-ready and quantifiable measures
2. The program must be cost effective in terms of the Total Resource Cost Test (TRC)
3. Implementation of at least one program during the 2006-2007 heating season.
4. The program must accommodate participants from a broad customer base
5. Launch programs with lesser complexity first. Questar should begin early planning for programs with increased complexity or coordination requirements.

As a result of this work, Nexant has identified several potentially cost effective program opportunities targeting the residential and commercial markets that are described in more detail in Sections E.1through E.3, including:

1. Residential Prescriptive
2. Commercial Prescriptive
3. New Construction ENERGYSTAR Homes
4. Custom Audit Program

The efficiency programs recommended above are primarily resource oriented. Working side by side with resource acquisition programs, market transformation initiatives can also be valuable in increasing awareness and bolstering support for all energy efficiency efforts. Although the scope of this study focuses on quantifiable resource acquisition programs, the value and structure of

natural gas market transformation efforts should be investigated. As such, additional efforts with the DSM Advisory group and the public service commission should be taken to address the regulatory requirements and timing of market transformation initiatives. Examples include:

- Broad-based energy efficiency advertising.
- Dedicated energy efficiency tools and resources.
- Focused energy efficiency education and outreach programs to market actors.
- Fast response programs and measures to handle transient conditions (price spikes, constrained supply, etc.).

E.1 RESIDENTIAL AND COMMERCIAL PRESCRIPTIVE PROGRAM STRUCTURE

The prescriptive programs are composed of market-ready measures marketed primarily through a network of contractors, distributors, and manufacturer representatives. This program uses an incentive with a pre-determined incentive amount (hence "prescriptive") to the customer to motivate equipment replacements and upgrades to more energy efficient equipment.

The prescriptive programs for the residential and commercial markets share similar marketing and delivery structures. Approaches for establishing the Trade Ally network and the program delivery mechanism for eligible participants are outlined below.

E.1.1 Trade Ally Network

To help increase public awareness and solicit program participation, steps should be taken to develop a Trade Ally network consisting of relevant equipment dealers, distributors, auditors, and other key market players actively involved in the sale and installation qualifying equipment. Currently, Utah Power maintains a trade ally network that could be leveraged for residential HVAC measures. Figure 4 illustrates the proposed mechanism to establish the Trade Ally network.

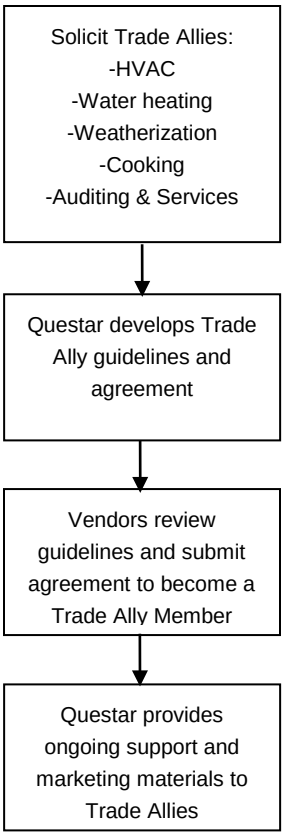

Figure 4. Implementation process for Trade Ally network

The trade ally network will serve as a prime marketing channel for the prescriptive program. Additional marketing efforts included in the budgetary numbers include the development of a program website, case-studies, educational pieces, and detailed program process brochures.

E.1.2 Program Delivery

At the heart of the prescriptive program is the post-purchase incentive application. Through this mechanism, customers receive an incentive for purchasing new, energy efficient equipment in lieu of standard equipment. While the Trade Ally might assist the customer in filling out the incentive application, it is the customer's responsibility to submit the incentive application to receive payment of the incentive from Questar. Nexant's experience indicates that post-purchase

incentive mechanisms provide solid participation as customers have a vested interest in seeing the process through until their payment is received.

The suggested implementation process for the prescriptive programs will be identical to the participation process currently utilized in Utah Power's residential and commercial HVAC programs in Utah. An overview of this process is shown in Figure 5.

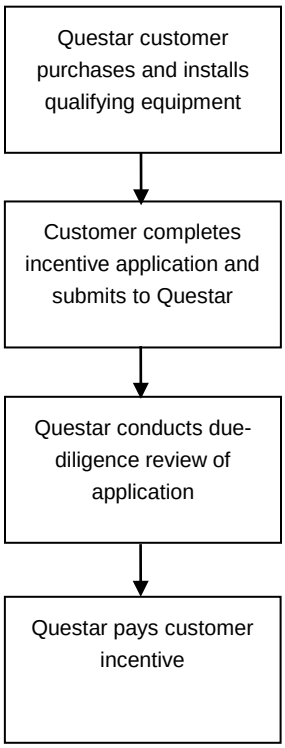

Figure 5. Incentive process for prescriptive measures

To support residential customers who request auditing services, Nexant recommends developing a trade ally network of vendors that provide residential auditing services. Customers who choose to pay for an audit may then participate through the prescriptive program, with assistance from

the audit vendor network. Additional marketing materials such as educational and case-study pieces can be developed to support this outreach effort.

Best practices approaches for commercial programs suggest providing both prescriptive and audit-based programs. Several studies conclude that flexible "custom" commercial offerings provide a broader reach and yield better savings. As such, Nexant recommends a separate Commercial Audit Program as detailed in Section E.3.

E.1.3 Program Budgets

Planning numbers for budgetary purposes is provided in Table 15 and Table 16.

Table 15. Budgetary Planning Numbers for the Residential Prescriptive Program[19]

Program	Year 1	Year 2	Year 3	Total
Design Costs	$10,000	$5,000	$10,000	$25,000
Marketing Costs	$30,000	$30,000	$30,000	$90,000
Administrative Costs	$143,081	$210,930	$354,145	$708,156
Evaluation Costs	-	-	$75,000	$75,000
Incentives	$264,142	$422,628	$681,785	$1,368,555
Total	**$447,224**	**$668,558**	**$1,150,930**	**$2,266,711**
Gross Annual Savings (Cumulative DTH)	**24,887**	**64,705**	**126,344**	**-**

Table 16. Budgetary Planning Numbers for the Commercial Prescriptive Program

Program	Year 1	Year 2	Year 3	Total
Design Costs	$10,000	$5,000	$10,000	$25,000
Marketing Costs	$15,000	$15,000	$15,000	$45,000
Administrative Costs	$19,969	$25,239	$33,990	$79,198
Evaluation Costs	-	-	$75,000	$75,000
Incentives	$237,634	$380,215	$538,491	$1,156,341
Total	**$282,603**	**$425,454**	**$672,481**	**$1,380,539**
Gross Annual Savings (Cumulative DTH)	**13,966**	**36,312**	**74,963**	**-**

[19] The cumulative savings achieved by Year 3 for the Residential Prescriptive Program is equivalent to providing natural gas to approximately 1,100 GS-1 facilities for one year, assuming an average GS-1 customer's usage of 115 DTH/year. The Commercial Prescriptive Program's savings is equivalent to providing natural gas to 650 facilities for one year, also assuming 115 DTH/year.

E.2 NEW CONSTRUCTION ENERGYSTAR HOMES PROGRAM

The ENERGYSTAR Homes initiative is a voluntary program administered by the U.S. Environmental Protection Agency[20]. ENERGYSTAR certified homes must meet the qualifications of the program by exceeding the 2006 International Energy Conservation Code (IECC) by at least 15%. The program addresses the comprehensive energy use of a home through improved glazing, insulation, heating and cooling, envelope construction, lighting and appliances.

Leveraging this national initiative, a New Construction ENERGYSTAR Homes can significantly impact the natural gas usage in new single- and multi-family home stock in Utah. Additionally, now in its second year, the Utah Power ENERGYSTAR Homes Program is building on success as it continues to recruit additional homes.

E.2.1 Delivery Mechanism

In Utah, Utah Power's ENERGYSTAR New Homes Program focuses on electric conservation measures within single and multi-family homes that exceed ENERGYSTAR performance requirements. The program provides prescribed financial incentives and marketing support to builders and requires performance testing to ensure compliance with program requirements. Questar's entrance into this market will further improve new home performance as high efficiency natural gas measures can be emphasized.

Nexant recommends working in conjunction with Utah Power and their program administrator to integrate with the existing program infrastructure. Opportunities for cost sharing may exist through joint electric and natural gas marketing, administration costs, and incentive offers.

E.2.2 Incentive Structure

Nexant recommends aligning with Utah Power's program as much as possible. Currently, Utah Power offers cash incentives to contractors who build qualifying homes. Measures currently offered include:

[20] http://www.energystar.gov/

Table 17. Utah Power EnergyStar Homes Incentives (Single-Family)

Requirement	Builder Incentive
Meet basic ENERGYSTAR specifications (includes windows, envelope, A/C testing)	$350 -$550 per home
If above requirement is met, additional incentives are available (below)	
Install an evaporative cooling system (in lieu of direct expansion mechanical cooling)	$300 per home
Include an ENERGYSTAR dishwasher	$10 per unit
Upgrade to 15 ENERGYSTAR lighting fixtures	$100 per home
Install of ENERGYSTAR ceiling fan(s) with "Gossamer" blade design	$10 per unit

Table 18. Utah Power EnergyStar Homes Incentives (Multi-Family)

Requirement	Builder Incentive
Meet basic ENERGYSTAR specifications (includes windows, duct sealing, A/C testing, EnergyStar Dishwasher, Clothes Washer, Refrigerator)	$250
If above requirement is met, additional incentives are available (below)	
Upgrade to 5 ENERGYSTAR interior lighting fixtures	$50 per unit
Upgrade to 2 ENERGYSTAR outdoor lighting fixtures	$50 per unit
Install of ENERGYSTAR ceiling fan(s) with "Gossamer" blade design	$10 per unit

Nexant recommends expanding the technology and incentive offering with additional technologies such as:

- High efficiency water heaters
- High efficiency furnaces
- High efficiency clothes dryers (if applicable)

E.2.3 Program Budgets

Planning numbers for budgetary purposes is provided in Table 19.

Table 19. Budgetary Planning Numbers for the New Construction EnergyStar Homes Program[21]

Program	Year 1	Year 2	Year 3	Total
Design Costs	-	$10,000	$5,000	$15,000
Marketing Costs	-	$30,000	$30,000	$60,000
Administrative Costs	-	$60,000	$60,000	$120,000
Evaluation Costs	-	0	$75,000	$75,000
Incentives	-	$2,140,116	$2,140,116	$4,280,232
Total	**-**	**$2,240,116**	**$2,310,116**	**$4,550,232**
Gross Annual Savings (Cumulative DTH)	**-**	**210,587**	**421,175**	**-**

E.3 COMMERCIAL AUDIT PROGRAM

Many large commercial/industrial facilities are generally more complex and have customized systems including control systems, process loads, thermal distribution systems, etc. As such, these customers require programs with a mixture of prescriptive and customize approaches. The commercial audit program addresses non-prescriptive measures or businesses needing technical audit services. It is anticipated that the majority of the participants in this program will be specialized light industrial or small commercial facilities with monthly gas consumption of exceeding 500 decatherms.

E.3.1 Delivery Mechanism

Custom audit programs require flexibility and independent, expert technical assistance. Nexant proposes a program that provides technical support and a standard financial offer ($/therm saved) based on actual savings achieved. Based upon best practices, Nexant recommends providing engineering services to participating customers from either in-house or subcontracted energy engineering staff. Costs of engineering services may be shared with the customer or paid by the utility in full. This delivery mechanism allows Questar to maintain a quality control function for incoming projects as well as aligning with the existing custom delivery structure existing on the electric DSM side.

[21] The cumulative savings achieved by Year 3 for the Energy Star Homes Program is equivalent to providing natural gas to approximately 3,660 GS-1 facilities for one year, assuming an average GS-1 customer's usage of 115 DTH/year.

E.3.2 Incentive Structure

Nexant proposes a standard offer program structure where the utility funds audit services (partially or in-whole) and incentive rates in terms of a $/therm saved for projects submitted to the program. For the purposes of this analysis, Nexant assumed an incentive of $17.60 per annual decatherm saved. The incentive is estimated to be a one-time payment provided upon completion of all verification activities for the project.

E.3.3 Program Budgets

Planning numbers for budgetary purposes is provided in Table 20.

Table 20. Budgetary Planning Numbers for the Commercial Audit Program[22]

Program	Year 1	Year 2	Year 3	Total
Design Costs	-	$20,000	$5,000	$25,000
Marketing Costs	-	$15,000	$15,000	$30,000
Administrative Costs	-	$40,000	$40,000	$80,000
Evaluation Costs	-	0	$30,000	$30,000
Incentives	-	$28,445	$45,512	$73,956
Total	**-**	**$103,445**	**$135,512**	**$238,956**
Gross Annual Savings (Cumulative DTH)	**-**	**1,617**	**4,205**	**-**

E.4 PROGRAM RAMP-UP

Based upon the prioritization criteria, Nexant prepared a phased approach that launches two programs per year. Table 21 illustrates the program launch strategy whereby the prescriptive programs begin in year 1 with easy-to-implement measures. In year 2, the ENERGYSTAR Homes program and Commercial Audit Program commence. In Year 3, additional measures are added to expand the prescriptive programs' offering.

[22] The cumulative savings achieved by Year 3 for the Commercial Audit Program is equivalent to providing natural gas to approximately 36 GS-1 facilties for one year, assuming an average GS-1 customer's usage of 115 DTH/year.

Table 21. Suggested Program Roll-out Strategy

Program		Year 1	Year 2	Year 3
Residential Prescriptive	Stage (1): ▪ Space & Water Heating Equipment ▪ Natural Gas Appliances	√	√	√
	Stage (2) ▪ Weatherization Measures			√
Commercial Prescriptive	Stage (1): ▪ Space & Water Heating Equipment ▪ HVAC & Process Controls	√	√	√
	Stage (2): ▪ Weatherization Measures ▪ Commercial Cooking Measures			√
New Construction EnergyStar Homes Program			√	√
Commercial Audit Program			√	√

A summary of the measures included in each stage of the residential and commercial prescriptive programs are listed in Table 22 and Table 23.

Table 22. Suggested Residential Measure Roll-out Strategy

Stage	Sector	Measure
Stage 1	Residential	Water Heater Blanket
Stage 1	Residential	High Efficiency Gas Water Heater
Stage 1	Residential	Tank less Gas Water Heater
Stage 1	Residential	Low Flow Showerhead
Stage 1	Residential	ENERGY STAR Clothes Washer
Stage 1	Residential	High Efficiency Gas Clothes Dryer
Stage 1	Residential	ENERGY STAR Dish Washer
Stage 1	Residential	High Efficiency Condensing Furnace 90 AFUE
Stage 1	Residential	High Efficiency Condensing Furnace 92 AFUE
Stage 1	Residential	High Efficiency Condensing Furnace 94 AFUE
Stage 2	Residential	Duct Insulation
Stage 2	Residential	Duct Sealing
Stage 2	Residential	High Performance Windows
Stage 2	Residential	Exterior Storm Windows
Stage 2	Residential	Wall Insulation
Stage 2	Residential	Roof Insulation
Stage 2	Residential	Floor Insulation

Table 23. Suggested Commercial Measure Roll-out Strategy

Stage	Sector	Measure
Stage 1	Commercial	High Efficiency Gas Water Heater
Stage 1	Commercial	DHW Circulation Control System
Stage 1	Commercial	ENERGY STAR Horizontal Clothes Washer
Stage 1	Commercial	High Efficiency Gas Clothes Dryer
Stage 1	Commercial	Unit Gas Heater, Non-Condensing
Stage 1	Commercial	Unit Gas Heater, Condensing
Stage 1	Commercial	High Efficiency Condensing Furnace
Stage 1	Commercial	Infrared Heating System
Stage 1	Commercial	Boiler Reset Control
Stage 1	Commercial	Boiler Oxygen Trim Controls
Stage 1	Commercial	High Efficiency Non-Condensing Boiler
Stage 1	Commercial	High Efficiency Condensing Boiler
Stage 1	Commercial	Burner Replacement, Boiler or Furnace
Stage 1	Commercial	Energy Management System
Stage 1	Commercial	Demand Control Ventilation System
Stage 1	Commercial	Blow down Heat Recovery System
Stage 1	Commercial	Stack Economizers
Stage 1	Commercial	HVAC Heat Recovery System
Stage 1	Commercial	Dish Washer Low-Flow Pre Rinse Spray Valve
Stage 1	Commercial	Programmable Thermostat
Stage 2	Commercial	High Performance Windows
Stage 2	Commercial	Drain water Heat Recovery System
Stage 2	Commercial	Roof Insulation
Stage 2	Commercial	Floor Insulation
Stage 2	Commercial	Duct Insulation
Stage 2	Commercial	Steam Trap Replacement
Stage 2	Commercial	Steam Trap Maintenance
Stage 2	Commercial	Boiler Tune Up
Stage 2	Commercial	Furnace Tune Up
Stage 2	Commercial	Furnace Vent Dampers
Stage 2	Commercial	Boiler Vent Dampers
Stage 2	Commercial	Gas-Fired Fryer
Stage 2	Commercial	Gas-Fired Broiler
Stage 2	Commercial	High Efficiency Combi-Oven
Stage 2	Commercial	High Efficiency Conveyor Oven
Stage 2	Commercial	High Efficiency Steamer
Stage 2	Commercial	High Efficiency Dual Deck Pizza Oven
Stage 2	Commercial	Kitchen Hood
Stage 2	Commercial	High Efficiency Rotisserie Oven
Stage 2	Commercial	High Efficiency Griddle
Stage 2	Commercial	High Efficiency Gas Range Top

Table 24. Program Summary

Year	Program	Design Costs *(1)*	Marketing Costs *(2)*	Administrative Costs *(3)*	Total Utility Cost *(1+2+3)*	Incentives	Gross Program Savings (Summer) [DTH] (Cumulative)	Gross Program Savings (Winter) [DTH] (Cumulative)	Gross Incremental Customer Costs ($)
1	Residential Prescriptive (Stage 1)	$20,000	$45,000	$163,051	$228,051	$501,777	9,883	28,969	$1,578,929
	Commercial Prescriptive (Stage 1)*								
2	Residential Prescriptive (Stage 1)	$40,000	$90,000	$336,169	$466,169	$2,971,404	149,180	164,041	$15,423,873
	Commercial Prescriptive (Stage 1)*								
	Commercial Custom								
	Energy Star Homes								
3	Residential Prescriptive (Stages 1 &2)	$30,000	$90,000	$743,135	$863,135	$3,405,904	294,470	332,217	$17,397,190
	Commercial Prescriptive (Stages 1 &2)*								
	Commercial Custom								
	Energy Star Homes								
	Grand Total	**$90,000**	**$225,000**	**$1,242,355**	**$1,557,355**	**$6,879,084**	**294,470**	**332,217**	**$34,399,992**

**Costs for the Commercial prescriptive program assume cost sharing with the Residential Prescriptive Program.*

Section F References

Reference No.	Name of Study/Database/Software	Date of Study	Sponsoring Organization	Firm completing study
1	The Maximum Achievable Cost Effective Potential for Gas DSM in Utah for the Questar Gas Company Service Area	2004	Utah Natural Gas DSM Advisory Group	GDS Associates, Inc.
2	ENERGY STAR Programmable Thermostat Savings Calculator	-	EPA, DOE	EPA, DOE
3	ENERGY STAR Residential Appliance Back-up Calculations	-	EPA, DOE	EPA, DOE
4	ENERGY STAR Clothes and Dish Washer Savings Calculator	-	EPA, DOE	EPA, DOE
5	ENERGY STAR Furnace Savings Calculator	-	EPA, DOE	EPA, DOE
6	RESFEN simulation software	2005	Regents of the Univ. of California, Lawrence Berkeley National Lab, EERE, DOE	LBL National Lab
7	Database for Energy Efficient Resources (DEER)	-	California Energy Commission (CEC) and California Public Utilities Commission (CPUC)	CEC, CPUC
8	Gas Deemed Savings Database	2004	Nexant	Nexant
9	PG&E - 2004-2005 \Single Family Rebate Program	2003	PG&E	PG&E
10	2007/2008/2009 Triennial Plan, Minnesota Natural Gas and Electric Conservation Program Improvement Program	2006	Xcel Energy	Xcel Energy
11	Colorado DSM Market Potential Assessment 2006	2006	Xcel Energy	KEMA, Inc. and Quantum Consulting
12	OEMC Colorado New Residential Construction EEMs	2006	OEMC	Nexant
13	Energy Trust of Oregon (ETO)	-	Consortium	Consortium
14	Department of Energy, Energy Efficiency Products: Showerheads http://www.eere.energy.gov/femp/procurement/eep_showerhead.cfm			

Appendix A Cost Effectiveness Inputs

Four methodologies were used to analyze each program's cost-effectiveness:

- Total Resource Cost Test (TRC): The TRC test provides an estimate of the net value of a DSM program in comparison to alternative supply-side options, from the perspective of both the program participants as well as the utility.
- Program Administrator Cost Test (PAC): The PAC Test evaluates the costs of a DSM program as a resource option from the utility perspective.
- Ratepayer Impact Measure (RIM): The RIM test quantifies the impacts in utility revenues and operating costs that the DSM program causes on customer bills or rates.
- Utah Ratepayer Impact Measure (URIM): The URIM is a variant of the RIM test described above. This test has the same benefits and costs as the RIM test except that the URIM test allows for lost revenues to be counted for only one year.
- Participant Test: The Participant Test aims to measure the quantifiable costs and benefits seen by the end-use customer directly participating in the DSM program

These tests were administered as per the *California Standard Practice Manual – Economic Analysis of Demand Side Management Programs and Projects*, published by the California Public Utilities Commission and California Energy Commission in October 2001.

The cost-effectiveness analyses were conducted over the estimated equipment lifetime. Although the programs are estimated to operate for a three year pilot, the benefits and costs are extrapolated over a twenty year timeframe. This is due to the associated persistence in savings or costs of the equipment's lifecycle. Benefits evaluated include avoided non-gas and commodity costs. All program costs, including those associated with design, implementation, incentives, administration, marketing, measurement and verification, and evaluation activities, were included in the economic analysis. Table 25 summarizes the key economic parameters used in conducting the cost-effectiveness analyses as provided by Questar.

Table 25. General Economic Parameters

Parameter	Value
Nominal Discount Rate (%)	7.0%
Inflation Rate (%)	2.8%

Year	Avoided Costs[23]		Customer Rates[24]			
			Commercial		Residential	
	Summer MC:Et ($/DTH)	Winter MC:Et ($/DTH)	Summer	Winter	Summer	Winter
2006	$6.54	$8.05	$7.65	$8.41	$8.68	$9.56
2007	$6.54	$8.35	$8.28	$8.52	$9.32	$9.67
2008	$7.03	$8.58	$8.10	$8.35	$9.16	$9.51
2009	$7.16	$8.90	$7.86	$8.10	$8.92	$9.27
2010	$7.59	$9.11	$7.68	$7.87	$8.75	$9.05
2011	$7.25	$8.72	$7.58	$7.85	$8.66	$9.04
2012	$7.86	$9.03	$7.75	$8.04	$8.84	$9.24
2013	$8.10	$9.34	$7.91	$8.18	$9.02	$9.39
2014	$8.34	$9.67	$8.06	$8.34	$9.17	$9.57
2015	$8.59	$10.01	$8.24	$8.54	$9.37	$9.78
2016	$8.85	$10.36	$8.52	$8.82	$9.66	$10.07
2017	$9.12	$10.72	$8.74	$9.02	$9.88	$10.28
2018	$9.39	$11.10	$8.96	$9.27	$10.12	$10.54
2019	$9.67	$11.49	$9.23	$9.54	$10.40	$10.82
2020	$9.96	$11.89	$9.59	$9.93	$10.76	$11.24
2021	$10.26	$12.31	$9.93	$10.24	$11.12	$11.56
2022	$10.57	$12.74	$10.16	$10.46	$11.36	$11.79
2023	$10.88	$13.18	$10.39	$10.70	$11.60	$12.04
2024	$11.21	$13.64	$10.61	$10.93	$11.84	$12.28
2025	$11.55	$14.12	$10.83	$11.14	$12.07	$12.51
2026	$11.89	$14.62	$11.05	$11.36	$12.30	$12.74
2027	$12.25	$15.13	$11.26	$11.59	$12.53	$12.98
2028	$12.62	$15.66	$11.49	$11.81	$12.77	$13.22
2029	$13.00	$16.20	$11.71	$12.04	$13.00	$13.46

As an example of the calculation methodology applied to calculate the Program cost effectiveness, details regarding the calculation of the TRC are included below. For reference, this example portrays the cost effectiveness of the Residential Prescriptive Program.

[23] Avoided costs are based upon Questar's estimated commodity costs listed in the GS-1 tariff.

[24] The commercial customer rates were based upon the second block in the GS-1 tariff and the residential customer rates were based upon the first block in the GS-1 tariff.

TRC TEST FORMULAE

The applicable equations used to calculate the Residential Prescriptive program's cost-effectiveness from the TRC perspective, are listed below.

$$BCR_{TRC} = \frac{B_{TRC}}{C_{TRC}} \qquad \text{Eq. (1)}$$

where:

BCR_{TRC} = Benefit-cost ratio of total costs of the resource
B_{TRC} = Benefits of the program
C_{TRC} = Cost of the Program

The B_{TRC} and C_{TRC} terms are further defined as follows:

$$B_{TRC} = \sum_{t=1}^{N} \frac{UAC_t + TC_t}{(1+d)^{t-1}} + \sum_{t=1}^{N} \frac{UAC_{at} + PAC_{at}}{(1+d)^{t-1}} \qquad \text{Eq. (2)}$$

$$C_{TRC} = \sum_{t=1}^{N} \frac{PRC_t + PCN_t + UIC_t}{(1+d)^{t-1}} \qquad \text{Eq. (3)}$$

where:

UAC_t = Utility avoided supply costs in year t
TC_t = Tax credits in year t
UAC_{at} = Utility avoided supply costs for the alternate fuel in year t
PAC_{at} = Participant avoided costs in year t for alternate fuel devices
PRC_t = Program Administrator program costs in year t
PCN_t = Net participant costs in year t (incremental cost for energy efficient measure)
UIC_t = Utility increased supply costs in year t
N = lifecycle of program impacts (years)
d = discount rate

The utility supply cost terms (UAC_t, UAC_{at}, and UIC_t) are further defined by costing period to reflect time-variant costs of supply:

$$UAC_t = \sum_{t=1}^{I} \left[\Delta EN_{it} * MC:E_{it} * K_{it}\right] + \sum_{t=1}^{I} \left[\Delta DN_{it} * MC:D_{it} * K_{it}\right] \qquad \text{Eq. (4)}$$

UAC_{at} = (Use UAC_t formula, but with marginal costs and costing periods appropriate for the alternate fuel utility.)

$$UIC_t = \sum_{t=1}^{I}\left[\Delta EN_{it} * MC:E_{it} * (K_{it} - 1)\right] + \sum_{t=1}^{I}\left[\Delta DN_{it} * MC:D_{it} * (K_{it} - 1)\right] \quad \text{Eq. (5)}$$

where:

ΔEN_{it} = Reduction in net energy use in costing period i in year t
ΔDN_{it} = Reduction in net demand in costing period i in year t
$MC:E_{it}$ = Marginal cost of energy in costing period i in year t
$MC:D_{it}$ = Marginal cost of demand in costing period i in year t
K_{it} = 1 when ΔEN_{it} or ΔDN_{it} is positive (a reduction) in costing period i in year t, and zero otherwise

PRIMARY ASSUMPTIONS

To be conservative, simplifying assumptions used in conducting the cost-benefit analysis included:

- Avoided costs for electric savings (UAC_{at}) were not applied.
- No demand component was used for natural gas consumption.
- No benefit for water savings was applied.
- Tax credits (TC_t) were not incorporated.
- Seasonal marginal costs (Winter and Summer), instead of monthly or hourly values, were used to estimate utility avoided supply costs.
- Where required, a net-to-gross ratio of 0.8 was applied. The net-to-gross ratio corrects the savings attributed to the program net of any changes that would have happened in absence of the program. Net results account for the impacts associated with free-ridership, spillover, and market transformation effects. The 0.8 value was selected based upon evaluations conducted by the California Energy Commission and presented in their Database for Energy Efficiency Resources.
- The net participant costs reflect the incremental increase in cost to the customer to install a high efficiency option over standard practice or code-compliant equipment.

In addition to the items listed above, the absence of any increased utility supply costs (UIC_t) for the programs allows Equations 2, 3, and 4 to be simplified as follows:

$$B_{TRC} = \sum_{t=1}^{N}\frac{UAC_t}{(1+d)^{t-1}} \quad \text{Eq. (6)}$$

$$C_{TRC} = \sum_{t=1}^{N}\frac{PRC_t + PCN_t}{(1+d)^{t-1}} \quad \text{Eq. (7)}$$

$$UAC_t = \left(\Delta EN_t * MC:E_t * K_t\right) \quad \text{Eq. (8)}$$

PROGRAM ADMINISTRATOR PROGRAM COSTS

For planning purposes, it was assumed that the program start date is 2007 and sunset at the end of 2009. For programs staring in 2007, they will operate for three years. Estimates of all costs associated with the design, implementation, and administration of the Residential Prescriptive Program were included in the quantification of the Program Administrator program costs (PRC_t).

NET PARTICIPANT COSTS

Estimates of the net participant costs (PCN_t) for the Residential Prescriptive Program were calculated using Equation 9:

$$PCN_t = \left(\Delta EQPT_{res,t} * IU_{res,t} * NTG_{res,t}\right) \quad \text{Eq. (9)}$$

where:

$\Delta EQPT_{res,t}$ = Incremental equipment cost associated with eligible residential equipment in year t

$IU_{res,t}$ = Number of residential installed units in year *t*

$NTG_{res,t}$ = Residential net-to-gross savings ratio in year *t*

Estimated inputs for each value are detailed in Table 36 in Appendix E.

DETAILED COST-BENEFIT ANALYSIS

Detailed results of the cost-benefit analyses are shown in Tables 26 through 33 for each cost test and each program. All inputs and calculations for these tests were administered per the California Standard Practice Manual – Economic Analysis of Demand Side Management Programs and Projects, published by the California Public Utilities Commission and California Energy Commission in October 2001.

Table 26. Residential Prescriptive Program Inputs

				Utility Avoided Costs (gas)	Bill Reductions (gas)	Incentives Paid to Customers	Gross Participant Costs	Net Participant Costs	Program Administrator Costs	Net Revenue Loss (gas)
Year	t	d	$\frac{1}{(1+d)^{t-1}}$	UACt	BRt	INCt	PCt	PCNt	PRCt	RLt
2007	1	7.00%	1.000	$ 152,845	$ 237,505	$ 264,142	$ 800,391	$ 640,312	$ 183,081	$ 190,004
2008	2	7.00%	0.935	$ 414,365	$ 606,837	$ 422,628	$ 1,280,625	$ 1,024,500	$ 245,930	$ 485,469
2009	3	7.00%	0.873	$ 840,205	$ 1,156,655	$ 681,785	$ 2,658,500	$ 2,126,800	$ 469,145	$ 925,324
2010	4	7.00%	0.816	$ 868,985	$ 1,131,104	$ -	$ -	$ -	$ -	$ 904,883
2011	5	7.00%	0.763	$ 831,403	$ 1,126,262	$ -	$ -	$ -	$ -	$ 901,010
2012	6	7.00%	0.713	$ 872,898	$ 1,150,606	$ -	$ -	$ -	$ -	$ 920,484
2013	7	7.00%	0.666	$ 902,110	$ 1,170,781	$ -	$ -	$ -	$ -	$ 936,625
2014	8	7.00%	0.623	$ 932,305	$ 1,192,526	$ -	$ -	$ -	$ -	$ 954,021
2015	9	7.00%	0.582	$ 963,515	$ 1,218,450	$ -	$ -	$ -	$ -	$ 974,760
2016	10	7.00%	0.544	$ 995,774	$ 1,254,968	$ -	$ -	$ -	$ -	$ 1,003,974
2017	11	7.00%	0.508	$ 940,217	$ 1,168,105	$ -	$ -	$ -	$ -	$ 934,484
2018	12	7.00%	0.475	$ 824,979	$ 1,010,059	$ -	$ -	$ -	$ -	$ 808,047
2019	13	7.00%	0.444	$ 662,471	$ 795,780	$ -	$ -	$ -	$ -	$ 636,624
2020	14	7.00%	0.415	$ 681,270	$ 820,681	$ -	$ -	$ -	$ -	$ 656,545
2021	15	7.00%	0.388	$ 689,096	$ 824,966	$ -	$ -	$ -	$ -	$ 659,973
2022	16	7.00%	0.362	$ 667,864	$ 785,192	$ -	$ -	$ -	$ -	$ 628,153
2023	17	7.00%	0.339	$ 630,711	$ 727,076	$ -	$ -	$ -	$ -	$ 581,661
2024	18	7.00%	0.317	$ 601,458	$ 678,859	$ -	$ -	$ -	$ -	$ 543,087
2025	19	7.00%	0.296	$ 622,458	$ 691,179	$ -	$ -	$ -	$ -	$ 552,943
2026	20	7.00%	0.277	$ 644,192	$ 704,063	$ -	$ -	$ -	$ -	$ 563,251
2027	21	7.00%	0.258	$ 538,454	$ 579,451	$ -	$ -	$ -	$ -	$ 463,561
2028	22	7.00%	0.242	$ 368,961	$ 390,375	$ -	$ -	$ -	$ -	$ 312,300
2029	23	7.00%	0.226	$ 62,524	$ 64,923	$ -	$ -	$ -	$ -	$ 51,938

Table 27. Residential Prescriptive Program Cost Test Results

	Participant Cost Test (PC)		Rate Impact Measure Test (RIM)		Utah Rate Impact Measure Test (URIM)		Total Resource Cost Test (TRC)		Program Administrator Cost Test (PAC)	
Year	B_{PC}	C_{PC}	B_{RIM}	C_{RIM}	B_{URIM}	C_{URIM}	B_{TRC}	C_{TRC}	B_{PAC}	C_{PAC}
2007	$ 501,648	$ 800,391	$ 152,845	$ 637,228	$ 152,845	$ 637,228	$ 152,845	$ 823,394	$ 152,845	$ 447,224
2008	$ 962,116	$ 1,196,846	$ 387,257	$ 1,078,530	$ 387,257	$ 900,956	$ 387,257	$ 1,187,318	$ 387,257	$ 624,821
2009	$ 1,605,765	$ 2,322,037	$ 733,868	$ 1,813,480	$ 733,868	$ 1,389,453	$ 733,868	$ 2,267,398	$ 733,868	$ 1,005,267
2010	$ 923,318	$ -	$ 709,351	$ 738,654	$ 709,351	$ -	$ 709,351	$ -	$ 709,351	$ -
2011	$ 859,220	$ -	$ 634,273	$ 687,376	$ 634,273	$ -	$ 634,273	$ -	$ 634,273	$ -
2012	$ 820,366	$ -	$ 622,364	$ 656,293	$ 622,364	$ -	$ 622,364	$ -	$ 622,364	$ -
2013	$ 780,141	$ -	$ 601,114	$ 624,113	$ 601,114	$ -	$ 601,114	$ -	$ 601,114	$ -
2014	$ 742,645	$ -	$ 580,592	$ 594,116	$ 580,592	$ -	$ 580,592	$ -	$ 580,592	$ -
2015	$ 709,149	$ -	$ 560,774	$ 567,319	$ 560,774	$ -	$ 560,774	$ -	$ 560,774	$ -
2016	$ 682,619	$ -	$ 541,635	$ 546,095	$ 541,635	$ -	$ 541,635	$ -	$ 541,635	$ -
2017	$ 593,805	$ -	$ 477,959	$ 475,044	$ 477,959	$ -	$ 477,959	$ -	$ 477,959	$ -
2018	$ 479,872	$ -	$ 391,941	$ 383,897	$ 391,941	$ -	$ 391,941	$ -	$ 391,941	$ -
2019	$ 353,336	$ -	$ 294,145	$ 282,669	$ 294,145	$ -	$ 294,145	$ -	$ 294,145	$ -
2020	$ 340,554	$ -	$ 282,703	$ 272,443	$ 282,703	$ -	$ 282,703	$ -	$ 282,703	$ -
2021	$ 319,936	$ -	$ 267,243	$ 255,949	$ 267,243	$ -	$ 267,243	$ -	$ 267,243	$ -
2022	$ 284,590	$ -	$ 242,065	$ 227,672	$ 242,065	$ -	$ 242,065	$ -	$ 242,065	$ -
2023	$ 246,286	$ -	$ 213,644	$ 197,029	$ 213,644	$ -	$ 213,644	$ -	$ 213,644	$ -
2024	$ 214,909	$ -	$ 190,406	$ 171,928	$ 190,406	$ -	$ 190,406	$ -	$ 190,406	$ -
2025	$ 204,495	$ -	$ 184,163	$ 163,596	$ 184,163	$ -	$ 184,163	$ -	$ 184,163	$ -
2026	$ 194,679	$ -	$ 178,124	$ 155,743	$ 178,124	$ -	$ 178,124	$ -	$ 178,124	$ -
2027	$ 149,741	$ -	$ 139,147	$ 119,793	$ 139,147	$ -	$ 139,147	$ -	$ 139,147	$ -
2028	$ 94,281	$ -	$ 89,109	$ 75,425	$ 89,109	$ -	$ 89,109	$ -	$ 89,109	$ -
2029	$ 14,654	$ -	$ 14,112	$ 11,723	$ 14,112	$ -	$ 14,112	$ -	$ 14,112	$ -
	$ 12,078,123	**$ 4,319,273**	**$ 8,488,835**	**$ 10,736,114**	**$ 8,488,835**	**$ 2,927,637**	**$ 8,488,835**	**$ 4,278,110**	**$ 8,488,835**	**$ 2,077,311**
	NPVPC	**$ 7,758,850**	**NPVRIM**	**$ (2,247,279)**	**NPVURIM**	**$ 5,561,198**	**NPVTRC**	**$ 4,210,725**	**NPVPAC**	**$ 6,411,524**
	BCRPC	**2.80**	**BCRRIM**	**0.79**	**BCRURIM**	**2.90**	**BCRTRC**	**1.98**	**BCRPAC**	**4.09**

Table 28. Commercial Prescriptive Program Inputs

				Utility Avoided Costs (gas)	Bill Reductions (gas)	Incentives Paid to Customers	Gross Participant Costs	Net Participant Costs	Program Administrator Costs	Net Revenue Loss (gas)
Year	**t**	**d**	$\frac{1}{(1+d)^{t-1}}$	**UACt**	**BRt**	**INCt**	**PCt**	**PCNt**	**PRCt**	**RLt**
2007	1	7.00%	1.000	$ 92,389	$ 118,834	$ 237,634	$ 778,539	$ 622,831	$ 44,969	$ 95,067
2008	2	7.00%	0.935	$ 247,220	$ 302,670	$ 380,215	$ 1,245,662	$ 996,529	$ 45,239	$ 242,136
2009	3	7.00%	0.873	$ 527,279	$ 606,264	$ 538,491	$ 1,806,971	$ 1,445,577	$ 133,990	$ 485,011
2010	4	7.00%	0.816	$ 540,775	$ 589,113	$ -	$ -	$ -	$ -	$ 471,290
2011	5	7.00%	0.763	$ 478,498	$ 542,918	$ -	$ -	$ -	$ -	$ 434,335
2012	6	7.00%	0.713	$ 495,828	$ 555,017	$ -	$ -	$ -	$ -	$ 444,014
2013	7	7.00%	0.666	$ 511,820	$ 563,314	$ -	$ -	$ -	$ -	$ 450,651
2014	8	7.00%	0.623	$ 525,537	$ 570,282	$ -	$ -	$ -	$ -	$ 456,226
2015	9	7.00%	0.582	$ 542,153	$ 581,936	$ -	$ -	$ -	$ -	$ 465,549
2016	10	7.00%	0.544	$ 558,876	$ 598,520	$ -	$ -	$ -	$ -	$ 478,816
2017	11	7.00%	0.508	$ 576,084	$ 609,570	$ -	$ -	$ -	$ -	$ 487,656
2018	12	7.00%	0.475	$ 592,453	$ 622,177	$ -	$ -	$ -	$ -	$ 497,742
2019	13	7.00%	0.444	$ 583,665	$ 607,488	$ -	$ -	$ -	$ -	$ 485,990
2020	14	7.00%	0.415	$ 599,428	$ 628,003	$ -	$ -	$ -	$ -	$ 502,402
2021	15	7.00%	0.388	$ 604,171	$ 630,724	$ -	$ -	$ -	$ -	$ 504,579
2022	16	7.00%	0.362	$ 618,407	$ 636,969	$ -	$ -	$ -	$ -	$ 509,575
2023	17	7.00%	0.339	$ 628,666	$ 639,644	$ -	$ -	$ -	$ -	$ 511,716
2024	18	7.00%	0.317	$ 633,891	$ 636,100	$ -	$ -	$ -	$ -	$ 508,880
2025	19	7.00%	0.296	$ 652,127	$ 644,391	$ -	$ -	$ -	$ -	$ 515,512
2026	20	7.00%	0.277	$ 669,687	$ 651,938	$ -	$ -	$ -	$ -	$ 521,550
2027	21	7.00%	0.258	$ 544,839	$ 522,818	$ -	$ -	$ -	$ -	$ 418,254
2028	22	7.00%	0.242	$ 320,005	$ 302,431	$ -	$ -	$ -	$ -	$ 241,945
2029	23	7.00%	0.226	$ 6,941	$ 6,446	$ -	$ -	$ -	$ -	$ 5,157

Table 29. Commercial Prescriptive Program Cost Test Results

	Participant Cost Test (PC)		Rate Impact Measure Test (RIM)		Utah Rate Impact Measure Test (URIM)		Total Resource Cost Test (TRC)		Program Administrator Cost Test (PAC)	
Year	B_{PC}	C_{PC}	B_{RIM}	C_{RIM}	B_{URIM}	C_{URIM}	B_{TRC}	C_{TRC}	B_{PAC}	C_{PAC}
2007	$ 356,468	$ 778,539	$ 92,389	$ 377,671	$ 92,389	$ 377,671	$ 92,389	$ 667,800	$ 92,389	$ 282,604
2008	$ 638,210	$ 1,164,170	$ 231,046	$ 623,916	$ 231,046	$ 535,068	$ 231,046	$ 973,615	$ 231,046	$ 397,621
2009	$ 999,873	$ 1,578,279	$ 460,546	$ 1,010,999	$ 460,546	$ 799,508	$ 460,546	$ 1,379,655	$ 460,546	$ 587,372
2010	$ 480,892	$ -	$ 441,434	$ 384,713	$ 441,434	$ -	$ 441,434	$ -	$ 441,434	$ -
2011	$ 414,190	$ -	$ 365,044	$ 331,352	$ 365,044	$ -	$ 365,044	$ -	$ 365,044	$ -
2012	$ 395,719	$ -	$ 353,519	$ 316,576	$ 353,519	$ -	$ 353,519	$ -	$ 353,519	$ -
2013	$ 375,360	$ -	$ 341,047	$ 300,288	$ 341,047	$ -	$ 341,047	$ -	$ 341,047	$ -
2014	$ 355,143	$ -	$ 327,278	$ 284,114	$ 327,278	$ -	$ 327,278	$ -	$ 327,278	$ -
2015	$ 338,692	$ -	$ 315,538	$ 270,954	$ 315,538	$ -	$ 315,538	$ -	$ 315,538	$ -
2016	$ 325,555	$ -	$ 303,991	$ 260,444	$ 303,991	$ -	$ 303,991	$ -	$ 303,991	$ -
2017	$ 309,875	$ -	$ 292,852	$ 247,900	$ 292,852	$ -	$ 292,852	$ -	$ 292,852	$ -
2018	$ 295,592	$ -	$ 281,470	$ 236,474	$ 281,470	$ -	$ 281,470	$ -	$ 281,470	$ -
2019	$ 269,732	$ -	$ 259,154	$ 215,786	$ 259,154	$ -	$ 259,154	$ -	$ 259,154	$ -
2020	$ 260,599	$ -	$ 248,741	$ 208,479	$ 248,741	$ -	$ 248,741	$ -	$ 248,741	$ -
2021	$ 244,606	$ -	$ 234,308	$ 195,684	$ 234,308	$ -	$ 234,308	$ -	$ 234,308	$ -
2022	$ 230,867	$ -	$ 224,139	$ 184,693	$ 224,139	$ -	$ 224,139	$ -	$ 224,139	$ -
2023	$ 216,670	$ -	$ 212,951	$ 173,336	$ 212,951	$ -	$ 212,951	$ -	$ 212,951	$ -
2024	$ 201,373	$ -	$ 200,674	$ 161,098	$ 200,674	$ -	$ 200,674	$ -	$ 200,674	$ -
2025	$ 190,652	$ -	$ 192,941	$ 152,522	$ 192,941	$ -	$ 192,941	$ -	$ 192,941	$ -
2026	$ 180,266	$ -	$ 185,174	$ 144,213	$ 185,174	$ -	$ 185,174	$ -	$ 185,174	$ -
2027	$ 135,106	$ -	$ 140,797	$ 108,085	$ 140,797	$ -	$ 140,797	$ -	$ 140,797	$ -
2028	$ 73,041	$ -	$ 77,285	$ 58,433	$ 77,285	$ -	$ 77,285	$ -	$ 77,285	$ -
2029	$ 1,455	$ -	$ 1,567	$ 1,164	$ 1,567	$ -	$ 1,567	$ -	$ 1,567	$ -
	$ 7,289,935	**$ 3,520,987**	**$ 5,783,885**	**$ 6,248,892**	**$ 5,783,885**	**$ 1,712,247**	**$ 5,783,885**	**$ 3,021,071**	**$ 5,783,885**	**$ 1,267,596**
	NPVPC	**$ 3,768,948**	**NPVRIM**	**$ (465,007)**	**NPVURIM**	**$ 4,071,638**	**NPVTRC**	**$ 2,762,814**	**NPVPAC**	**$ 4,516,289**
	BCRPC	**2.07**	**BCRRIM**	**0.93**	**BCRURIM**	**3.38**	**BCRTRC**	**1.91**	**BCRPAC**	**4.56**

Table 30. New Construction EnergyStar Homes Program Inputs

				Utility Avoided Costs (gas)	Bill Reductions (gas)	Incentives Paid to Customers	Gross Participant Costs	Net Participant Costs	Program Administrator Costs	Net Revenue Loss (gas)
Year	**t**	**d**	$\frac{1}{(1+d)^{t-1}}$	**UACt**	**BRt**	**INCt**	**PCt**	**PCNt**	**PRCt**	**RLt**
2007	1	7.00%	1.000	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	2	7.00%	0.935	$ 1,293,520	$ 1,959,234	$ 2,140,116	$ 12,840,696	$ 10,272,557	$ 100,000	$ 1,567,388
2009	3	7.00%	0.873	$ 2,656,838	$ 3,818,818	$ 2,140,116	$ 12,840,696	$ 10,272,557	$ 170,000	$ 3,055,054
2010	4	7.00%	0.816	$ 2,770,706	$ 3,739,563	$ -	$ -	$ -	$ -	$ 2,991,651
2011	5	7.00%	0.763	$ 2,648,862	$ 3,714,801	$ -	$ -	$ -	$ -	$ 2,971,841
2012	6	7.00%	0.713	$ 2,813,106	$ 3,793,540	$ -	$ -	$ -	$ -	$ 3,034,832
2013	7	7.00%	0.666	$ 2,903,837	$ 3,863,570	$ -	$ -	$ -	$ -	$ 3,090,856
2014	8	7.00%	0.623	$ 2,997,512	$ 3,933,658	$ -	$ -	$ -	$ -	$ 3,146,926
2015	9	7.00%	0.582	$ 3,094,226	$ 4,018,718	$ -	$ -	$ -	$ -	$ 3,214,975
2016	10	7.00%	0.544	$ 3,194,080	$ 4,140,125	$ -	$ -	$ -	$ -	$ 3,312,100
2017	11	7.00%	0.508	$ 3,297,175	$ 4,232,762	$ -	$ -	$ -	$ -	$ 3,386,210
2018	12	7.00%	0.475	$ 3,403,618	$ 4,336,470	$ -	$ -	$ -	$ -	$ 3,469,176
2019	13	7.00%	0.444	$ 3,513,518	$ 4,454,026	$ -	$ -	$ -	$ -	$ 3,563,221
2020	14	7.00%	0.415	$ 3,626,987	$ 4,616,505	$ -	$ -	$ -	$ -	$ 3,693,204
2021	15	7.00%	0.388	$ 3,744,142	$ 4,760,827	$ -	$ -	$ -	$ -	$ 3,808,661
2022	16	7.00%	0.362	$ 3,865,105	$ 4,859,976	$ -	$ -	$ -	$ -	$ 3,887,981
2023	17	7.00%	0.339	$ 3,989,998	$ 4,962,834	$ -	$ -	$ -	$ -	$ 3,970,267
2024	18	7.00%	0.317	$ 4,118,951	$ 5,064,086	$ -	$ -	$ -	$ -	$ 4,051,269
2025	19	7.00%	0.296	$ 4,252,097	$ 5,159,425	$ -	$ -	$ -	$ -	$ 4,127,540
2026	20	7.00%	0.277	$ 4,389,572	$ 5,256,680	$ -	$ -	$ -	$ -	$ 4,205,344
2027	21	7.00%	0.258	$ 4,531,518	$ 5,355,872	$ -	$ -	$ -	$ -	$ 4,284,697
2028	22	7.00%	0.242	$ 4,678,082	$ 5,455,901	$ -	$ -	$ -	$ -	$ 4,364,721
2029	23	7.00%	0.226	$ 4,829,414	$ 5,555,388	$ -	$ -	$ -	$ -	$ 4,444,311

Table 31. New Construction EnergyStar Homes Program Cost Test Results

	Participant Cost Test (PC)		Rate Impact Measure Test (RIM)		Utah Rate Impact Measure Test (URIM)		Total Resource Cost Test (TRC)		Program Administrator Cost Test (PAC)	
Year	B_{PC}	C_{PC}	B_{RIM}	C_{RIM}	B_{URIM}	C_{URIM}	B_{TRC}	C_{TRC}	B_{PAC}	C_{PAC}
2007	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ 3,831,169	$ 12,000,651	$ 1,208,897	$ 3,558,415	$ 1,208,897	$ 3,558,415	$ 1,208,897	$ 9,693,979	$ 1,208,897	$ 2,093,566
2009	$ 5,204,764	$ 11,215,562	$ 2,320,585	$ 4,686,147	$ 2,320,585	$ 3,317,131	$ 2,320,585	$ 9,120,934	$ 2,320,585	$ 2,017,745
2010	$ 3,052,598	$ -	$ 2,261,722	$ 2,442,078	$ 2,261,722	$ -	$ 2,261,722	$ -	$ 2,261,722	$ -
2011	$ 2,834,004	$ -	$ 2,020,804	$ 2,267,203	$ 2,020,804	$ -	$ 2,020,804	$ -	$ 2,020,804	$ -
2012	$ 2,704,742	$ -	$ 2,005,705	$ 2,163,793	$ 2,005,705	$ -	$ 2,005,705	$ -	$ 2,005,705	$ -
2013	$ 2,574,460	$ -	$ 1,934,949	$ 2,059,568	$ 1,934,949	$ -	$ 1,934,949	$ -	$ 1,934,949	$ -
2014	$ 2,449,684	$ -	$ 1,866,700	$ 1,959,747	$ 1,866,700	$ -	$ 1,866,700	$ -	$ 1,866,700	$ -
2015	$ 2,338,931	$ -	$ 1,800,868	$ 1,871,145	$ 1,800,868	$ -	$ 1,800,868	$ -	$ 1,800,868	$ -
2016	$ 2,251,954	$ -	$ 1,737,368	$ 1,801,563	$ 1,737,368	$ -	$ 1,737,368	$ -	$ 1,737,368	$ -
2017	$ 2,151,722	$ -	$ 1,676,117	$ 1,721,377	$ 1,676,117	$ -	$ 1,676,117	$ -	$ 1,676,117	$ -
2018	$ 2,060,226	$ -	$ 1,617,034	$ 1,648,181	$ 1,617,034	$ -	$ 1,617,034	$ -	$ 1,617,034	$ -
2019	$ 1,977,641	$ -	$ 1,560,044	$ 1,582,113	$ 1,560,044	$ -	$ 1,560,044	$ -	$ 1,560,044	$ -
2020	$ 1,915,686	$ -	$ 1,505,071	$ 1,532,549	$ 1,505,071	$ -	$ 1,505,071	$ -	$ 1,505,071	$ -
2021	$ 1,846,331	$ -	$ 1,452,043	$ 1,477,065	$ 1,452,043	$ -	$ 1,452,043	$ -	$ 1,452,043	$ -
2022	$ 1,761,479	$ -	$ 1,400,892	$ 1,409,183	$ 1,400,892	$ -	$ 1,400,892	$ -	$ 1,400,892	$ -
2023	$ 1,681,083	$ -	$ 1,351,550	$ 1,344,867	$ 1,351,550	$ -	$ 1,351,550	$ -	$ 1,351,550	$ -
2024	$ 1,603,160	$ -	$ 1,303,954	$ 1,282,528	$ 1,303,954	$ -	$ 1,303,954	$ -	$ 1,303,954	$ -
2025	$ 1,526,488	$ -	$ 1,258,042	$ 1,221,190	$ 1,258,042	$ -	$ 1,258,042	$ -	$ 1,258,042	$ -
2026	$ 1,453,516	$ -	$ 1,213,753	$ 1,162,813	$ 1,213,753	$ -	$ 1,213,753	$ -	$ 1,213,753	$ -
2027	$ 1,384,059	$ -	$ 1,171,030	$ 1,107,247	$ 1,171,030	$ -	$ 1,171,030	$ -	$ 1,171,030	$ -
2028	$ 1,317,672	$ -	$ 1,129,818	$ 1,054,137	$ 1,129,818	$ -	$ 1,129,818	$ -	$ 1,129,818	$ -
2029	$ 1,253,924	$ -	$ 1,090,062	$ 1,003,139	$ 1,090,062	$ -	$ 1,090,062	$ -	$ 1,090,062	$ -
	$ 49,175,289	**$ 23,216,213**	**$ 34,887,010**	**$ 40,356,048**	**$ 34,887,010**	**$ 6,875,545**	**$ 34,887,010**	**$ 18,814,913**	**$ 34,887,010**	**$ 4,111,311**
	NPVPC	**$ 25,959,077**	**NPVRIM**	**$ (5,469,038)**	**NPVURIM**	**$ 28,011,465**	**NPVTRC**	**$ 16,072,097**	**NPVPAC**	**$ 30,775,698**
	BCRPC	**2.12**	**BCRRIM**	**0.86**	**BCRURIM**	**5.07**	**BCRTRC**	**1.85**	**BCRPAC**	**8.49**

Table 32. Commercial Audit Program Inputs

				Utility Avoided Costs (gas)	Bill Reductions (gas)	Incentives Paid to Customers	Gross Participant Costs	Net Participant Costs	Program Administrator Costs	Net Revenue Loss (gas)
Year	**t**	**d**	$\frac{1}{(1+d)^{t-1}}$	**UACt**	**BRt**	**INCt**	**PCt**	**PCNt**	**PRCt**	**RLt**
2007	1	7.00%	1.000	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	2	7.00%	0.935	$ 10,309	$ 13,343	$ 28,445	$ 56,889	$ 45,512	$ 75,000	$ 10,674
2009	3	7.00%	0.873	$ 27,619	$ 33,664	$ 45,512	$ 91,023	$ 72,819	$ 90,000	$ 26,931
2010	4	7.00%	0.816	$ 28,620	$ 32,784	$ -	$ -	$ -	$ -	$ 26,227
2011	5	7.00%	0.763	$ 27,377	$ 32,555	$ -	$ -	$ -	$ -	$ 26,044
2012	6	7.00%	0.713	$ 28,821	$ 33,311	$ -	$ -	$ -	$ -	$ 26,649
2013	7	7.00%	0.666	$ 29,777	$ 33,941	$ -	$ -	$ -	$ -	$ 27,152
2014	8	7.00%	0.623	$ 30,765	$ 34,611	$ -	$ -	$ -	$ -	$ 27,689
2015	9	7.00%	0.582	$ 31,786	$ 35,425	$ -	$ -	$ -	$ -	$ 28,340
2016	10	7.00%	0.544	$ 32,842	$ 36,592	$ -	$ -	$ -	$ -	$ 29,273
2017	11	7.00%	0.508	$ 33,932	$ 37,456	$ -	$ -	$ -	$ -	$ 29,965
2018	12	7.00%	0.475	$ 35,059	$ 38,463	$ -	$ -	$ -	$ -	$ 30,770
2019	13	7.00%	0.444	$ 36,223	$ 39,589	$ -	$ -	$ -	$ -	$ 31,671
2020	14	7.00%	0.415	$ 37,427	$ 41,196	$ -	$ -	$ -	$ -	$ 32,957
2021	15	7.00%	0.388	$ 38,670	$ 42,558	$ -	$ -	$ -	$ -	$ 34,046
2022	16	7.00%	0.362	$ 39,955	$ 43,491	$ -	$ -	$ -	$ -	$ 34,793
2023	17	7.00%	0.339	$ 41,283	$ 44,477	$ -	$ -	$ -	$ -	$ 35,581
2024	18	7.00%	0.317	$ 42,655	$ 45,437	$ -	$ -	$ -	$ -	$ 36,350
2025	19	7.00%	0.296	$ 44,074	$ 46,331	$ -	$ -	$ -	$ -	$ 37,065
2026	20	7.00%	0.277	$ 45,539	$ 47,250	$ -	$ -	$ -	$ -	$ 37,800
2027	21	7.00%	0.258	$ 47,054	$ 48,196	$ -	$ -	$ -	$ -	$ 38,557
2028	22	7.00%	0.242	$ 48,619	$ 49,133	$ -	$ -	$ -	$ -	$ 39,306
2029	23	7.00%	0.226	$ 50,236	$ 50,080	$ -	$ -	$ -	$ -	$ 40,064

Table 33. Commercial Audit Program Cost Test Results

	Participant Cost Test (PC)		Rate Impact Measure Test (RIM)		Utah Rate Impact Measure Test (URIM)		Total Resource Cost Test (TRC)		Program Administrator Cost Test (PAC)	
Year	B_{PC}	C_{PC}	B_{RIM}	C_{RIM}	B_{URIM}	C_{URIM}	B_{TRC}	C_{TRC}	B_{PAC}	C_{PAC}
2007	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ 39,054	$ 53,168	$ 9,634	$ 106,653	$ 9,634	$ 106,653	$ 9,634	$ 112,628	$ 9,634	$ 96,677
2009	$ 69,155	$ 79,503	$ 24,123	$ 141,884	$ 24,123	$ 132,560	$ 24,123	$ 142,212	$ 24,123	$ 118,361
2010	$ 26,761	$ -	$ 23,362	$ 21,409	$ 23,362	$ -	$ 23,362	$ -	$ 23,362	$ -
2011	$ 24,836	$ -	$ 20,886	$ 19,869	$ 20,886	$ -	$ 20,886	$ -	$ 20,886	$ -
2012	$ 23,750	$ -	$ 20,549	$ 19,000	$ 20,549	$ -	$ 20,549	$ -	$ 20,549	$ -
2013	$ 22,616	$ -	$ 19,842	$ 18,093	$ 19,842	$ -	$ 19,842	$ -	$ 19,842	$ -
2014	$ 21,554	$ -	$ 19,159	$ 17,243	$ 19,159	$ -	$ 19,159	$ -	$ 19,159	$ -
2015	$ 20,617	$ -	$ 18,500	$ 16,494	$ 18,500	$ -	$ 18,500	$ -	$ 18,500	$ -
2016	$ 19,903	$ -	$ 17,864	$ 15,923	$ 17,864	$ -	$ 17,864	$ -	$ 17,864	$ -
2017	$ 19,041	$ -	$ 17,249	$ 15,233	$ 17,249	$ -	$ 17,249	$ -	$ 17,249	$ -
2018	$ 18,273	$ -	$ 16,656	$ 14,619	$ 16,656	$ -	$ 16,656	$ -	$ 16,656	$ -
2019	$ 17,578	$ -	$ 16,084	$ 14,063	$ 16,084	$ -	$ 16,084	$ -	$ 16,084	$ -
2020	$ 17,095	$ -	$ 15,531	$ 13,676	$ 15,531	$ -	$ 15,531	$ -	$ 15,531	$ -
2021	$ 16,505	$ -	$ 14,997	$ 13,204	$ 14,997	$ -	$ 14,997	$ -	$ 14,997	$ -
2022	$ 15,763	$ -	$ 14,482	$ 12,611	$ 14,482	$ -	$ 14,482	$ -	$ 14,482	$ -
2023	$ 15,066	$ -	$ 13,984	$ 12,053	$ 13,984	$ -	$ 13,984	$ -	$ 13,984	$ -
2024	$ 14,384	$ -	$ 13,504	$ 11,507	$ 13,504	$ -	$ 13,504	$ -	$ 13,504	$ -
2025	$ 13,708	$ -	$ 13,040	$ 10,966	$ 13,040	$ -	$ 13,040	$ -	$ 13,040	$ -
2026	$ 13,065	$ -	$ 12,592	$ 10,452	$ 12,592	$ -	$ 12,592	$ -	$ 12,592	$ -
2027	$ 12,455	$ -	$ 12,160	$ 9,964	$ 12,160	$ -	$ 12,160	$ -	$ 12,160	$ -
2028	$ 11,866	$ -	$ 11,742	$ 9,493	$ 11,742	$ -	$ 11,742	$ -	$ 11,742	$ -
2029	$ 11,304	$ -	$ 11,339	$ 9,043	$ 11,339	$ -	$ 11,339	$ -	$ 11,339	$ -
	$ 464,351	**$ 132,671**	**$ 357,277**	**$ 533,451**	**$ 357,277**	**$ 239,214**	**$ 357,277**	**$ 254,840**	**$ 357,277**	**$ 215,038**
	NPVPC	**$ 331,680**	**NPVRIM**	**$ (176,173)**	**NPVURIM**	**$ 118,063**	**NPVTRC**	**$ 102,438**	**NPVPAC**	**$ 142,239**
	BCRPC	**3.50**	**BCRRIM**	**0.67**	**BCRURIM**	**1.49**	**BCRTRC**	**1.40**	**BCRPAC**	**1.66**

Appendix B Vendor Survey Data

Nexant has completed a survey of Utah space heating equipment vendors in both the commercial and residential markets to better understand local trends as seen through their eyes. Included in this section are the results of these surveys organized in the order in which the questions were asked. Results are shown in the highlighted boxes.

1. Company types: *A total of seven (7) vendors were surveyed.*

☐ **Manufacturer Rep.**	☐ **Distributor**	■ **Repair/Service**	■ **Other**
(choose one below)	(choose one below)	*Contractor 1 and Contractor 2*	*Contractor 3, Contractor 4, and Design Build Contractor 1*
○ Independent	● Independent, *Manufacturer 1*		
● Mfr. Employed, *Manufacturer 2*	○ Mfr. owned		

2. Approximately what percent of your business is derived strictly from heating sales?

The vendors reported that, on average, their customers were split by market as follows:
Residential = 67%
Commercial = 31%

3.

What is your service territory within Utah?

The six vendors surveyed represented customers in all areas of Utah. Listed here is the breakdown of where the vendors felt the majority of their customer base was located.

- *Northern Utah: Contractor 4*
- *Utah (statewide): Manufacturer 2, Design Build Contractor 1, and Manufacturer 1*
- *Salt Lake City: Contractor 3 and Contractor 2*

4. Please list any analysis or software tools you use as part of the sales process to estimate operating costs (energy, O&M) or potential savings associated with heating equipment.

There was a wide variety of answers to this question, which implies that there doesn't seem to be a set analysis or software tool that was being used. Several vendors replied that they had "in-house" software that they had created to fill this function.

5. Do you identify opportunities and calculate energy savings heating system retrofits?

All vendors responded YES to this question except Contractor 4, which said that they did not identify opportunities or calculate savings.

6. Please characterize the driving factors for residential and commercial heating equipment sales.

Reason for Equipment Sale	Percentage
Equipment Failure	47%
Planned Replacement	29%
New Construction	22%
Other	2%
Total	100%

These values have been averaged based on the total percentages that each vendor gave in the survey.

7.

Please identify the key decision maker in heating equipment purchases.

Key Decision Maker	Percentage
Building Owner	7.5%
A&E Firm	15%
Contractor	77.5%
Other	
Total	100%

Four of the vendor declined answering this question, as they felt it didn't apply to them. Design Build Contractor 1 and Manufacturer 1 did respond and their answers are averaged in this table.

8. In your opinion, what are the key decision making criteria when purchasing new heating equipment?

There was a wide variety of responses to this question, which can be seen in the individual surveys, so we have chosen to represent the most common answers here. The top four responses were that the equipment warranty, quality, price, and energy efficiency were the most important factors for customers when deciding on equipment.

9. Please characterize the typical sales patterns for heating equipment that you have noticed among your customers.

This question also received a wide variety of response. In general, though, most vendors responded to this question that the typical customer purchased new equipment from them for one of three reasons: equipment failure, planned replacements, and new construction or first time systems. Along with these responses the vendors mentioned trends for each of these three types of customers. Customers that were replacing failed equipment, economics were more likely to play are a larger role and they would typically buy a less expensive, less efficient system. Customers that had planned on replacing or installing equipment were more likely to research and consider more expensive, higher efficiency systems.

10. Please summarize the effects of rising energy costs upon your customers buying trends.

Overall, the vendors all had similar responses to this question. Rising gas prices had encouraged people to investigate more efficient equipment and in many cases buy the more efficient equipment even if the initial cost was greater.

11.

Please name the top three market barriers to increased sales of high-efficiency heating equipment.

The response listed below characterizes the most common responses to this question.

Rank	Barrier
1	First Cost
2	Low Incentives
4	Lack of Owner Familiarity with High-Efficiency Equipment
3	Long Paybacks

12. Please name the top three resources you'd like to have from the utility to help increase sales of high-efficiency heating equipment.

5 (average)	Minimum simple payback for customer (yrs)
	and/or
17.5% (average)	Minimum percentage of incremental customer cost (%)

$200 - $400 incentive necessary (average from vendors)

13.

If you feel utility incentives are a key component to increasing sales of high-efficiency heating equipment, please indicate the minimum level necessary to impart a noticeable change (i.e. 10 – 15% increase) in the market place.

The response listed below characterizes the most common responses to this question.

Rank	Resource
1	Utility Incentives
2	Utility-provided savings calculation tool
3	Educational materials targeting end-use customers
4	Prescriptive incentive levels for appropriate equipment types/sizes/efficiencies

14. In your opinion, what could be done to increase the percentage of high-efficiency heating equipment sold into the Questar market?

Incentives and Education for both vendors and customers were the most common requests. Some vendors suggested coupling the heating program with the electric and/or cooling (Utah Power's Cool Cash Program) programs already running in their service areas.

Below in Table 34 is a list of example incentive measures being undertaken by other utilities.

Table 34. Utility Measure List

End-Use	Category	Description	Residential	Commercial	Industrial	Retro-Commissioning	New Construction	Existing Rebate Programs
Space Heating	High efficiency boilers	Boilers with efficiencies greater than applicable standards. Group by Hot Water, Low Pressure Steam, High Pressure Steam	■	■	■	■	■	Alliant Energy (IA), Xcel (MN), CenterPoint, Minnegasco, GasNetworks (MA, NH), KeySpan (MA, NH), PG&E, VT, Puget Sound Energy, Energy Trust (OR), SoCal Gas, PG&E
	High efficiency furnaces	Furnaces with efficiencies greater than standard. Includes condensing furnaces with electronic ignition	■	■	■	■	■	Alliant Energy (IA), Xcel (MN), CenterPoint, Minnegasco, GasNetworks (MA, NH), KeySpan (MA, NH), PG&E, VT, Energy Trust (OR), PSE, Austin Utilities
	High efficiency unit heaters	Unit heaters with efficiencies greater than applicable standards. Includes power vent with intermittent ignition device	■	■	■	■	■	VT, CenterPoint, Minnegasco, Energy Trust (OR)
	Infrared Heaters			■	■	■	■	GasNetworks (MA, NH), CenterPoint
	Burner Replacements	Replacement units include power burners that mechanically mix oxygen and gas for max efficiency		■	■	■		CenterPoint, Minnegasco, Puget Sound
	Boiler Tune-Ups	Includes reducing excess air, cleaning boiler tubes, recalibrating boiler controls	■	■	■	■		Xcel (MN), CenterPoint, Minnegasco, Puget Sound Energy
	High Efficiency Gas Heat	Replaces furnaces and/or AC systems		■	■	■	■	None specified

End-Use	Category	Description	Residential	Commercial	Industrial	Retro-Commissioning	New Construction	Existing Rebate Programs
	Pumps							
	Intermittent Ignition Device	Eliminates constantly-burning pilots for furnaces		■	■		■	Austin Energy (TX)
	Vent Damper	Shuts off flue pipe to prevent heat loss when burner is not running		■	■	■	■	CenterPoint, Minnegasco, Energy Trust (OR), Austin Utilities
Heating Distribution	Steam to Hydronic Conversion	Hot water boilers generally operate at lower temperatures resulting in fewer losses.		■	■	■		CenterPoint, Austin Utilities
	Steam Trap Maintenance			■	■	■		Xcel (MN)
	Pipe Insulation			■	■	■	■	PG&E, SoCal Gas
	Tank Insulation			■	■	■	■	PG&E, SoCal Gas
	Single Pipe Steam Balancing	Eliminates overheating of certain areas in order to minimize complaints from occupants in cooler areas		■	■	■		Austin Utilities
	Duct sealing / repair			■	■	■		Energy Trust (OR)
	Duct insulation			■	■	■		Energy Trust (OR)
Space Heat Controls	Programmable Thermostats		■	■	■	■	■	Puget Sound Energy, Alliant Energy, SoCal Gas, NEGASCO, PG&E
	Boiler Reset Controls	Automatically controls boiler water temperature based on OAT		■	■	■	■	Xcel (MN), CenterPoint, Minnegasco, Austin Utilities
	Boiler Cut-Off Controls			■		■	■	CenterPoint, Austin Utilities
	Burner Controls			■				Xcel (MN)
	0xygen Trim Controls	Automatically remove excess air from boilers to improve efficiency		■	■	■	■	Xcel (MN)
	Energy Management System	Includes Time-of-Use controls, zoning and loop controls, supply air temperature reset, building warm-up ventilation control		■	■	■	■	None specified

End-Use	Category	Description	Residential	Commercial	Industrial	Retro-Commissioning	New Construction	Existing Rebate Programs
	Demand Control Ventilation			■	■	■	■	None specified
	Air De-stratification Controls	Control add-on for unit heaters; allows fan to run without burner for mixing		■	■	■	■	None specified
Heat Recovery	Blow down Heat Recovery	Recover heat from blow-down stream		■	■	■	■	None specified
	Stack Economizers	Install feed water economizers to recover stack gas wasted heat		■	■	■	■	SoCal Gas
	HVAC Heat Recovery	Recover thermal energy from exhaust air		■	■	■	■	SoCal Gas
	Kitchen Heat Recovery	Recover thermal energy from cooking equipment (range, hood, oven)		■	■	■	■	SoCal Gas
	Washer Drain Heat Recovery			■	■	■	■	SoCal Gas
	Refrigeration Heat Recovery			■	■	■	■	SoCal Gas
	Clothes Dryer Heat Recovery			■	■	■	■	SoCal Gas
	Wastewater heat recovery				■	■	■	SoCal Gas
Hot Water Equipment	High efficiency Domestic Water Heaters	DHW heaters with efficiencies greater than applicable standards.	■	■		■	■	Alliant Energy (IA), VT, GasNetworks (MA, NH), KeySpan (MA, NH), SoCal Gas, PSE, Austin Utilities, PG&E
	Instantaneous Water Heaters	Heat water and use as needed without storing in a tank	■	■		■	■	PG&E, Energy Trust, SoCal Gas, GasNetworks (MA, NH), Montana-Dakota Utilities
	Gas Booster	See Cooking Equipment		■		■	■	
	Direct Contact Water Heaters			■	■	■	■	SoCal Gas
	Solar Water Heater			■		■	■	Austin Energy
	High Efficiency Tank		■					Energy Trust (OR)
Hot Water Dist &	Low Flow Showerheads		■	■		■	■	NEGASCO

End-Use	Category	Description	Residential	Commercial	Industrial	Retro-Commissioning	New Construction	Existing Rebate Programs
Controls								
	DHW Circulation Controls	Includes time clocks on pumps and set points		■		■		None specified
								None specified
Envelope	Windows	Argon gas fill and Low-E	■	■		■	■	Alliant Energy (IA), Energy Trust (OR), GasNetworks (MA, NH)
	Exterior Storm Windows		■	■				
	Insulation - Roof/Ceiling		■	■		■	■	Austin Energy, Austin Utilities, Energy Trust (OR)
	Insulation - Wall		■	■		■	■	Energy Trust (OR), GasNetworks, Austin Utilities
	Insulation - Floor		■	■		■	■	Energy Trust (OR)
	Air Curtain	Prevents influx of outside air through an opening into heated area		■	■	■	■	None specified
	Super insulated Doors			■		■	■	None specified
Laundry Equipment	Horizontal Axis Washer	High efficiency washers with extractor cycle		■			■	SoCal Gas, PG&E
	High Efficiency Dryer	Includes auto termination and exhaust recycle		■	■		■	None specified
Kitchen Equipment	Gas Fryer			■				GasNetworks (MA, NH), CenterPoint, Minnegasco, Energy Trust (OR), SoCal Gas, NEGASCO
	Dishwasher Gas Booster Water Heater			■				CenterPoint, Minnegasco
	Broiler	Under-fired, Infrared upright		■				CenterPoint, Minnegasco, SoCal Gas
	Char broiler	Over-fired, Infrared upright		■				CenterPoint, Minnegasco, SoCal Gas
	Combi-ovens (convection, steam and combination)			■				CenterPoint, Minnegasco, SoCal Gas

End-Use	Category	Description	Residential	Commercial	Industrial	Retro-Commissioning	New Construction	Existing Rebate Programs
	Convection Ovens	Includes cross-flow convection ovens	■	■				CenterPoint, Minnegasco, Energy Trust (OR), SoCal Gas (CA), Austin Utilities
	Conveyor Ovens			■				CenterPoint, Minnegasco, SoCal Gas
	Dishwasher		■	■				CenterPoint, Minnegasco
	Infrared Fryer			■				CenterPoint, Minnegasco, Austin Utilities
	Pasta Cooker			■				CenterPoint, Minnegasco
	Steamers			■				CenterPoint, Minnegasco, SoCal Gas
	Cross-Flow Convection Ovens			■				None Specified
	Dual Deck Pizza Ovens			■				VT
	Kitchen Hoods			■				PG&E
	Low-Flow Pre-Rinse Spray Valves			■				PG&E, SoCal Gas
Other	Desiccant Dehumidification			■				None Specified
	Gas-fired Humidifiers			■				None Specified
	Absorption Chillers			■	■			Xcel Energy
	Swimming Pool Covers			■		■	■	None Specified
	High Efficiency Pool Heater			■		■	■	SoCal Gas, PG&E
	Solar Pool Heater			■		■	■	None specified
	Furnace Tune-Up	Includes heat exchanger cleaning, burner adjustment	■	■		■		None specified

Appendix D Market Segmentation Validation

Nexant reviewed market segmentation data from the GDS Report[25] against current customer data provided by Questar. The data correlated well with the GDS Report and was deemed acceptable for planning purposes specific to this DSM effort. Table 35 provides validation of customer data.

Table 35. Validation of GDS Study

GDS Study	Questar Market Data	Comments
Table 3.1 on pg. 13 gives a total residential load of 63.9 mil dk in 2005.	Gives about 63 mil annual dk in residential.	Good agreement.
Residential customer forecast in Table 3-3 on pg. 14 gives 724,902 customers in 2005.	Gives 754,162 residential customers now.	Good agreement. GDS 4% low.
Residential customer consumption in Table 3-3 on pg. 14 uses 63.9 mil dk in 2005.	Currently given as 63,009,063 annually.	Good agreement.
Commercial consumption in Table 3-1 on pg. 13 is 30.5 mil dk in 2005.	Combined GS1 and F1 commercial is stated as 31 mil dk/yr.	Good agreement.

[25] The Maximum Achievable Cost Effective Potential for Gas DSM in Utah for the Questar Gas Company Service Area. GDS Associates, Inc. June 2004.

Table 36. Measure Level Costs and Savings Estimates

Phase	Sector	Measure	Include Measure	Measure Life (Years)	Net-to-Gross[26]	Gross Participant Savings [DTH] (Annual)	Gross Participant Savings [DTH] (Summer)	Gross Participant Savings [DTH] (Winter)	Gross Customer Cost*	Incentive	Gross Customer Cost/Lifetime Dth Saved
Stage 1	Residential	ENERGY STAR Homes Program	Yes	35	0.8	49.20	28.70	20.50	$3,000.00	$500.00	$1.74
Stage 1	Residential	Water Heater Blanket	Yes	15	0.8	2.20	1.28	0.92	$14.00*	$5.00	$0.42
Stage 1	Residential	High Efficiency Gas Water Heater	Yes	15	0.8	2.70	1.58	1.13	$100.00	$50.00	$2.47
Stage 1	Residential	Tank less Gas Water Heater	Yes	20	0.8	2.81	1.64	1.17	$390.64	$200.00	$6.95
Stage 1	Residential	Low Flow Showerhead	Yes	10	0.8	4.40	2.57	1.83	$6.20*	$3.00	$0.14
Stage 1	Residential	ENERGY STAR Clothes Washer	Yes	14	0.8	1.20	0.70	0.50	$225.00	$50.00	$13.39
Stage 1	Residential	High Efficiency Gas Clothes Dryer	Yes	12	0.8	1.02	0.59	0.42	$50.00	$25.00	$4.08
Stage 1	Residential	ENERGY STAR Dish Washer	Yes	13	0.8	0.30	0.18	0.13	$133.65	$30.00	$34.27
Stage 1	Residential	High Efficiency Condensing Furnace 90 AFUE	Yes	20	0.8	10.90	-	10.90	$320.00	$137.50	$1.47
Stage 1	Residential	High Efficiency Condensing Furnace 92 AFUE	Yes	20	0.8	11.40	-	11.40	$400.00	$137.50	$1.75
Stage 1	Residential	High Efficiency Condensing Furnace 94 AFUE	Yes	20	0.8	11.90	-	11.90	$480.00	$150.00	$2.02
Stage 1	Residential	Programmable Thermostat	No	15	0.8	2.69	-	2.69	$58.50*	$0.00	$1.45

26 Where required, a net-to-gross ratio of 0.8 was applied. The net-to-gross ratio corrects the savings attributed to the program net of any changes that would have happened in absence of the program. Net results account for the impacts associated with free-ridership, spillover, and market transformation effects. The 0.8 value was selected based upon evaluations conducted by the California Energy Commission and presented in their Database for Energy Efficiency Resources.

*Where noted by an asterisk (*), the gross cost reflects the total cost of the technology. For example, installing a programmable thermostat would be elective over a functioning non-programmable type. Therefore the cost reflects the full cost of to purchase the high efficiency technology. All other costs in the table reflect the incremental cost to install a high efficiency technology over a standard option per energy code or general practice.

Phase	Sector	Measure	Include Measure	Measure Life (Years)	Net-to-Gross[26]	Gross Participant Savings [DTH] (Annual)	Gross Participant Savings [DTH] (Summer)	Gross Participant Savings [DTH] (Winter)	Gross Customer Cost*	Incentive	Gross Customer Cost/Lifetime Dth Saved
Stage 2	Residential	Duct Insulation	Yes	20	0.8	8.46	-	8.46	$246.00*	$60.00	$1.45
Stage 2	Residential	Duct Sealing	Yes	18	0.8	10.61	-	10.61	$324.00*	$162.00	$1.70
Stage 2	Residential	High Performance Windows	Yes	35	0.8	6.23	-	6.23	$201.00	$100.50	$0.92
Stage 2	Residential	Exterior Storm Windows	Yes	20	0.8	5.73	-	5.73	$2,001.00*	$50.25	$17.46
Stage 2	Residential	Wall Insulation	Yes	25	0.8	17.75	-	17.75	$687.50*	$150.00	$1.55
Stage 2	Residential	Roof Insulation	Yes	20	0.8	11.40	-	11.40	$980.00*	$225.00	$4.30
Stage 2	Residential	Floor Insulation	Yes	20	0.8	16.55	-	16.55	$980.00*	$225.00	$2.96
Stage 2	*Residential*	*Active Solar Water Heating System*	*No*	*15*	*0.8*	*7.50*	*4.38*	*3.13*	*$3,850.00**	*$1,925.00*	*$34.22*
Stage 2	*Residential*	*Active Solar Pool Water Heating System*	*No*	*10*	*0.8*	*0.61*	*0.36*	*0.26*	*$725.60*	*$181.40*	*$118.95*
Stage 1	Commercial	High Efficiency Gas Water Heater	yes	15	0.8	15.81	9.22	6.59	$1,260.00	$630.00	$5.31
Stage 1	Commercial	DHW Circulation Control System	yes	10	0.8	11.66	6.80	4.86	$900.00*	$450.00	$7.72
Stage 1	Commercial	ENERGY STAR Horizontal Clothes Washer	yes	7	0.8	5.00	2.92	2.08	$1,103.00	$551.50	$31.51
Stage 1	Commercial	High Efficiency Gas Clothes Dryer	yes	12	0.8	1.02	0.59	0.42	$50.00	$25.00	$4.08
Stage 1	Commercial	Programmable Thermostat	yes	15	0.8	31.11	-	31.11	$100.00*	$50.00	$0.21
Stage 1	Commercial	Unit Gas Heater, Non-Condensing	yes	18	0.8	2.01	1.17	0.84	$291.90	$145.95	$8.07
Stage 1	Commercial	Unit Gas Heater, Condensing	yes	18	0.8	6.15	3.59	2.56	$360.00	$180.00	$3.25
Stage 1	Commercial	High Efficiency Condensing Furnace	yes	20	0.8	30.60	-	30.60	$487.50	$225.00	$0.80
Stage 1	Commercial	Infrared Heating System	yes	17	0.8	32.64	-	32.64	$1,391.00	$695.50	$2.51
Stage 1	Commercial	Boiler Reset Control	yes	20	0.8	28.49	-	28.49	$612.00*	$153.00	$1.07
Stage 1	Commercial	Boiler Oxygen Trim Controls	yes	20	0.8	96.96	-	96.96	$10,000.00*	$2,500.00	$5.16
Stage 1	Commercial	High Efficiency Non-Condensing Boiler	yes	20	0.8	7.80	-	7.80	$381.00	$190.50	$2.44
Stage 1	Commercial	High Efficiency Condensing Boiler	yes	20	0.8	18.17	-	18.17	$487.50	$243.75	$1.34
Stage 1	Commercial	Burner Replacement, Boiler or Furnace	yes	12	0.8	12.41	-	12.41	$207.00	$103.50	$1.39

Phase	Sector	Measure	Include Measure	Measure Life (Years)	Net-to-Gross[26]	Gross Participant Savings [DTH] (Annual)	Gross Participant Savings [DTH] (Summer)	Gross Participant Savings [DTH] (Winter)	Gross Customer Cost*	Incentive	Gross Customer Cost/Lifetime Dth Saved
Stage 1	Commercial	Energy Management System	yes	20	0.8	24.11	14.06	10.05	$1,479.00	$369.75	$3.07
Stage 1	Commercial	Demand Control Ventilation System	yes	10	0.8	54.81	31.98	22.84	$500.00*	$250.00	$0.91
Stage 1	Commercial	Blowdown Heat Recovery System	yes	20	0.8	242.41	141.41	101.00	$10,000.00*	$5,000.00	$2.06
Stage 1	Commercial	Stack Economizers	yes	20	0.8	9.31	5.43	3.88	$112.50*	$56.25	$0.60
Stage 1	Commercial	HVAC Heat Recovery System	yes	20	0.8	24.11	14.06	10.05	$1,785.00*	$892.50	$3.70
Stage 1	Commercial	Dish Washer Low-Flow Pre Rinse Spray Valve	yes	5	0.8	39.71	23.17	16.55	$30.00*	$7.50	$0.15
Stage 2	Commercial	High Performance Windows	yes	35	0.8	19.20	-	19.20	$2,400.00	$600.00	$3.57
Stage 2	Commercial	Drainwater Heat Recovery System	yes	20	0.8	18.99	11.08	7.91	$750.00*	$375.00	$1.97
Stage 2	Commercial	Roof Insulation	yes	20	0.8	29.07	-	29.07	$2,499.00*	$225.00	$4.30
Stage 2	Commercial	Floor Insulation	yes	20	0.8	42.19	-	42.19	$2,499.00*	$225.00	$2.96
Stage 2	Commercial	Duct Insulation	yes	20	0.8	4.59	-	4.59	$81.50*	$40.75	$0.89
Stage 2	Commercial	Steam Trap Replacement	yes	5	0.8	22.95	-	22.95	$306.00	$76.50	$2.67
Stage 2	Commercial	Steam Trap Maintenance	yes	5	0.8	18.62	-	18.62	$99.75*	$24.94	$1.07
Stage 2	Commercial	Boiler Tune Up	yes	2	0.8	96.96	-	96.96	$600.00*	$150.00	$3.09
Stage 2	Commercial	Furnace Tune Up	yes	2	0.8	3.98	-	3.98	$150.00*	$37.50	$18.84
Stage 2	Commercial	Furnace Vent Dampers	yes	12	0.8	12.41	-	12.41	$187.50*	$46.88	$1.26
Stage 2	Commercial	Boiler Vent Dampers	yes	12	0.8	12.41	-	12.41	$187.50*	$46.88	$1.26
Stage 2	Commercial	Gas-Fired Fryer	yes	10	0.8	44.20	25.79	18.42	$1,300.00	$500.00	$2.94
Stage 2	Commercial	Gas-Fired Broiler	yes	10	0.8	124.10	72.39	51.71	$1,500.00	$375.00	$1.21
Stage 2	Commercial	High Efficiency Combi-Oven	yes	10	0.8	16.43	9.58	6.85	$1,300.00	$750.00	$7.91
Stage 2	Commercial	High Efficiency Conveyor Oven	yes	10	0.8	156.60	91.35	65.25	$2,100.00	$525.00	$1.34
Stage 2	Commercial	High Efficiency Steamer	yes	10	0.8	66.19	38.61	27.58	$2,000.00	$750.00	$3.02
Stage 2	Commercial	High Efficiency Dual Deck Pizza Oven	yes	10	0.8	34.39	20.06	14.33	$2,000.00	$750.00	$5.82
Stage 2	Commercial	Kitchen Hood-Demand Controlled Ventilation	yes	10	0.8	405.16	236.34	168.82	$15,000.00	$3,750.00	$3.70
Stage 2	Commercial	High Efficiency Rotisserie Oven	yes	10	0.8	39.00	22.75	16.25	$3,500.00	$875.00	$8.97

Phase	Sector	Measure	Include Measure	Measure Life (Years)	Net-to-Gross[26]	Gross Participant Savings [DTH] (Annual)	Gross Participant Savings [DTH] (Summer)	Gross Participant Savings [DTH] (Winter)	Gross Customer Cost*	Incentive	Gross Customer Cost/Lifetime Dth Saved
Stage 2	Commercial	High Efficiency Griddle	yes	10	0.8	34.63	20.20	14.43	$1,000.00	$125.00	$2.89
Stage 2	Commercial	High Efficiency Gas Range Top	yes	10	0.8	20.33	11.86	8.47	$800.00	$200.00	$3.94
Stage 2	Commercial	Custom Projects	yes	35	0.8	58.00	23.00	35.00	$2,040.00	$1,020.00	$1.00
Stage 2	*Commercial*	*Active Solar Water Heating System*	*No*	*15*	*0.8*	*18.76*	*10.94*	*7.82*	*$9,625.00**	*$4,812.50*	*$34.20*
Stage 2	*Commercial*	*Active Solar Pool Water Heating System*	*No*	*10*	*0.8*	*1.54*	*0.90*	*0.64*	*$1,814.00*	*$907.00*	*$117.79*

The incentive levels presented herein are estimates that will be further detailed in the design phases of the programs.

Table 37. Residential Prescriptive Measure Incentive Structure

Sector	Measure	Include Measure	Incentive/ measure	Incentive per Unit Saved ($/DTH)	Incentive as a Percentage of Customer Cost
Residential	Duct Insulation	Yes	$60.00	$7.09	24%
Residential	Duct Sealing	Yes	$162.00	$15.27	50%
Residential	High Performance Windows	Yes	$100.50	$16.13	50%
Residential	Exterior Storm Windows	Yes	$50.25	$8.77	3%
Residential	Water Heater Blanket	Yes	$5.00	$2.27	36%
Residential	High Efficiency Gas Water Heater	Yes	$50.00	$18.52	50%
Residential	Tankless Gas Water Heater	Yes	$200.00	$71.10	51%
Residential	Low Flow Showerhead	Yes	$3.00	$0.68	48%
Residential	ENERGY STAR Clothes Washer	Yes	$50.00	$41.67	22%
Residential	High Efficiency Gas Clothes Dryer	Yes	$25.00	$24.57	50%
Residential	ENERGY STAR Dish Washer	Yes	$30.00	$100.00	22%
Residential	Wall Insulation	Yes	$150.00	$8.45	22%
Residential	Roof Insulation	Yes	$225.00	$19.74	23%
Residential	Floor Insulation	Yes	$225.00	$13.60	23%
Residential	High Efficiency Condensing Furnace 90 AFUE	Yes	$137.50	$12.61	43%
Residential	High Efficiency Condensing Furnace 92 AFUE	Yes	$137.50	$12.06	34%
Residential	High Efficiency Condensing Furnace 94 AFUE	Yes	$150.00	$12.61	31%
Residential	Active Solar Water Heating System	No	$1,925.00	$256.51	50%

Sector	Measure	Include Measure	Incentive/ measure	Incentive per Unit Saved ($/DTH)	Incentive as a Percentage of Customer Cost
Residential	Active Solar Pool Water Heating System	No	$181.40	$295.15	25%
Residential	Programmable Thermostat	No	$0.00	$0.00	0%

Table 38. Commercial Prescriptive Measure Incentive Structure

Sector	Measure	Include Measure	Incentive/ measure	Incentive per Unit Saved ($/DTH)	Incentive as a Percentage of Customer Cost
Commercial	High Performance Windows	yes	$600.00	$31.25	25%
Commercial	High Efficiency Gas Water Heater	yes	$630.00	$39.85	50%
Commercial	Drainwater Heat Recovery System	yes	$375.00	$19.74	50%
Commercial	DHW Circulation Control System	yes	$450.00	$38.58	50%
Commercial	ENERGY STAR Horizontal Clothes Washer	yes	$551.50	$110.31	50%
Commercial	High Efficiency Gas Clothes Dryer	yes	$25.00	$24.57	50%
Commercial	Programmable Thermostat	yes	$50.00	$1.61	50%
Commercial	Roof Insulation	yes	$225.00	$7.74	9%
Commercial	Floor Insulation	yes	$225.00	$5.33	9%
Commercial	Duct Insulation	yes	$40.75	$8.88	50%
Commercial	Unit Gas Heater, Non-Condensing	yes	$145.95	$72.61	50%
Commercial	Unit Gas Heater, Condensing	yes	$180.00	$29.27	50%
Commercial	High Efficiency Condensing Furnace	yes	$225.00	$7.35	46%
Commercial	Infrared Heating System	yes	$695.50	$21.31	50%
Commercial	Boiler Reset Control	yes	$153.00	$5.37	25%
Commercial	Boiler Oxygen Trim Controls	yes	$2,500.00	$25.78	25%
Commercial	Steam Trap Replacement	yes	$76.50	$3.33	25%

Sector	Measure	Include Measure	Incentive/ measure	Incentive per Unit Saved ($/DTH)	Incentive as a Percentage of Customer Cost
Commercial	Steam Trap Maintenance	yes	$24.94	$1.34	25%
Commercial	High Efficiency Non-Condensing Boiler	yes	$190.50	$24.42	50%
Commercial	High Efficiency Condensing Boiler	yes	$243.75	$13.41	50%
Commercial	Burner Replacement, Boiler or Furnace	yes	$103.50	$8.34	50%
Commercial	Boiler Tune Up	yes	$150.00	$1.55	25%
Commercial	Furnace Tune Up	yes	$37.50	$9.42	25%
Commercial	Furnace Vent Dampers	yes	$46.88	$3.78	25%
Commercial	Boiler Vent Dampers	yes	$46.88	$3.78	25%
Commercial	Energy Management System	yes	$369.75	$15.34	25%
Commercial	Demand Control Ventilation System	yes	$250.00	$4.56	50%
Commercial	Blowdown Heat Recovery System	yes	$5,000.00	$20.63	50%
Commercial	Stack Economizers	yes	$56.25	$6.04	50%
Commercial	HVAC Heat Recovery System	yes	$892.50	$37.02	50%
Commercial	Gas-Fired Fryer	yes	$500.00	$11.31	38%
Commercial	Gas-Fired Broiler	yes	$375.00	$3.02	25%
Commercial	High Efficiency Combi-Oven	yes	$750.00	$45.65	58%
Commercial	High Efficiency Conveyor Oven	yes	$525.00	$3.35	25%
Commercial	High Efficiency Steamer	yes	$750.00	$11.33	38%
Commercial	High Efficiency Dual Deck Pizza Oven	yes	$750.00	$21.81	38%
Commercial	Kitchen Hood-Demand Controlled Ventilation	yes	$3,750.00	$9.26	25%
Commercial	Dish Washer Low-Flow Pre Rinse Spray Valve	yes	$7.50	$0.19	25%
Commercial	High Efficiency Rotisserie Oven	yes	$875.00	$22.43	25%
Commercial	High Efficiency Griddle	yes	$125.00	$3.61	13%
Commercial	High Efficiency Gas Range Top	yes	$200.00	$9.84	25%
Commercial	Custom Projects	yes	$1,020.00	$17.59	50%
Commercial	Active Solar Water Heating System	No	$4,812.50	$256.51	50%
Commercial	Active Solar Pool Water Heating System	No	$907.00	$590.31	50%

Participation rates for each measure were collected from numerous resources and updated as necessary. The annual participation rate is the percentage of the total sector customer base that would participate in the program. The number of participants was calculated as the product of the estimated annual participation rate and the current customer count within the residential and commercial GS-1 rate schedule. Adjustments to specific participation rates are noted.

Table 39. Residential Measure Participation Rate Information (for Questar customer base of 753,562 in 2006)

Measure Name	Annual Participation Rate	Annual Participants	Source (no., pgs) (See References Section)	Comments
Install High Performance windows	0.120%	904	**1** (14, App. A- 2)	Questar projections adjusted downward according to note 1.
Install Exterior Storm Windows	0.08%	603	None	Per professional engineering judgment, storm window participation rate is two-thirds the rate for HP windows
Duct Insulation	0.03%	226	**11**	
Duct Sealing	0.03%	226	**11**	
Install Water Heater Blanket	0.07%	527	**1** (14, App. A- 2)	Nexant adjusted the reference participation rate downward using a similar technique as described in note 1.
Install High Efficiency Gas Water Heater	0.20%	1,507	**1** (14, App. A- 2)	Nexant adjusted the reference participation rate downward using a similar technique as described in note 1.
Install Tank less Gas Water Heater	0.04%	301	**10** (iii,312)	Equal to half of the regular water heater participants based on high costs.
Install Active Solar Water Heating System	0.010%	75	**13**	Based on Arizona data
Install Active Solar Pool Water Heating System	0.010%	75	**13**	http://www.energytrust.org/Pages/about/library/reports/050809_SWH_Review.pdf
Install Low Flow Showerhead	0.69%	5,162	**10** (iii, 312)	Reduced by 50% per accessibility and costs.

Measure Name	Annual Participation Rate	Annual Participants	Source (no., pgs) (See References Section)	Comments
Install an ENERGY STAR Clothes Washer	0.240%	1,809	**1** (14, App. A- 2)	Nexant adjusted the reference participation rate downward using a similar technique as described in note 1.
Install a High Efficiency Gas Clothes Dryer	0.03%	226	**10** (iii,312)	
Install an ENERGY STAR Dish Washer	0.240%	1,809	**1** (14, App. A- 2)	Per professional engineering judgment, dishwasher participation rate is equal to clothes washer rate. Nexant adjusted the reference participation rate downward using a similar technique as described in note 1.
Install a Programmable Thermostat	0.22%	1,658	**1** (14, App. A- 2)	Nexant adjusted the reference participation rate downward using a similar technique as described in note 1.
Insulate and Weatherize (Wall)	0.03%	226	**10** (iii, 314)	Reduced by 50% per cost and ease of implementation.
Insulate and Weatherize (Wall Low Income)	0.03%	226	**10** (iii, 314)	Reduced by 50% per cost and ease of implementation.
Insulate and Weatherize (Roof)	0.03%	226	**10** (iii, 314)	Reduced by 50% per cost and ease of implementation.
Insulate and Weatherize (Floor)	0.03%	226	**10** (iii, 314)	Reduced by 50% per cost and ease of implementation.
Install High Efficiency Condensing Furnace	0.08%	527	**1** (14, App. A- 2)	Nexant adjusted the reference participation rate downward using a similar technique as described in note 1.
Implement all ENERGY STAR Homes Program Measures	0.71%	5,350	**1** (14, App. A- 2)	Nexant adjusted the reference participation rate downward using a similar technique as described in note 1.

Notes

1. Nexant adjusted the participation rates presented in Reference 1 as follows:
   First, the total potential participant levels were calculated:

$$\text{Total Potential Participants} = \frac{\text{Participants}}{\text{Penetration Rate}} = \frac{13{,}883}{0.8} = 17{,}354$$

   Nexant estimated from past experience that this measure will have 50% of the potential participants complete the measure. Therefore, Nexant expects that the total participants for this measure are as follows:

$$\text{Participants}_{\text{nexant}} = (\text{Total Potential Participants})(0.50) = (17{,}354)(0.50) = 8{,}677$$

   Using this, the adjusted total penetration rate is as follows:

$$\text{Penetration Rate}_{\text{tot}} = \frac{\text{Participants}_{\text{nexant}}}{\text{Source Study Customer Base}} = \frac{8{,}677}{745{,}114} = \quad 0.0116$$

   Now, Nexant expects that 10% of the market will turn over annually (see Reference 1, pg . 49). So, the annual penetration rate is as follows:

$$\text{Penetration Rate}_{\text{annual}} = (0.0116)(0.10) = 0.00116 = 0.12\%$$

   Converting this to annual participants,

$$\text{Participants}_{\text{annual}} = (\text{Penetration Rate}_{\text{annual}})(\text{Questar Customer Base}) = (0.012)(753{,}562) = 904$$

Table 40. Commercial Measure Participation Rate Information (based on a 2006 customer base of 55,774)

Measure Name	Annual Participation Rate	Annual Participants	Source (pgs)	Comments
Install High Performance windows	0.100%	56	**1** (25,App.B-2)	Questar projections adjusted downward according to note 1.
Install High Efficiency Gas Water Heater	0.060%	33	**1** (25,App.B-2)	Questar projections adjusted downward per engineering judgment.
Install Drain water Heat Recovery System	0.040%	22	**13**	Based on professional judgment, ease of application, and cost, participation rate set equal to solar water heating participation rate
Install Active Solar Water Heating System	0.040%	22	**13**	Based on professional judgment
Install Active Solar Pool Water Heating System	0.040%	22	**13**	Quadruple the value for residential systems due to larger available budget and ease of application
Install DHW Circulation Control System, Boiler/Water Heater	0.040%	22	**13**	Based on professional judgment, ease of application, and cost, participation rate set equal to solar water heating participation rate
Install a Horizontal ENERGY STAR Clothes Washer	0.100%	56	**10**	
Install a High Efficiency Gas Clothes Dryer	0.100%	56	None	Per professional engineering judgment, gas dryer participation rate is equal to the clothes washer rate
Install a Programmable Thermostat	0.050%	28	**1** (25,App.B-2)	Questar projections adjusted downward according to note 1.
Insulate and Weatherize (Roof)	0.020%	11	**1** (25,App.B-2)	Questar projections adjusted downward according to note 1. Reduced by 75% per accessibility and costs.

Measure Name	Annual Participation Rate	Annual Participants	Source (pgs)	Comments
Insulate and Weatherize (Floor)	0.020%	11	**1** (25,App.B-2)	Questar projections adjusted downward according to note 1. Per professional engineering judgment, floor insulation participation rate is equal to roof rate
Install Duct Insulation	0.070%	39	**1** (25,App.B-2)	Questar projections adjusted downward according to note 1. Reduced rate by 19% for applicability factor.
Install High Efficiency Gas Unit Heater, Non-Condensing	0.020%	11	Nexant	Per engineering judgment, unit heaters have same participation rate as infrared heaters
Install High Efficiency Gas Unit Heater, Condensing	0.020%	11	Nexant	Per engineering judgment, unit heaters have same participation rate as infrared heaters
Install High Efficiency Condensing Furnace	0.500%	279	**1** (25,App.B-2)	Questar projections adjusted downward according to note 1. Doubled participation rate per market accessibility
Install Infrared Heating System	0.021%	12	**1** (25,App.B-2)	Questar projections adjusted downward according to note 1.
Install Boiler Reset Control	0.200%	112	**1** (25,App.B-2)	Questar projections adjusted downward according to note 1. Doubled participation rate per market accessibility
Install Oxygen Trim Controls, Boiler	0.200%	112	**10** (ii, 305)	All sizes included
Replace Steam Trap	0.300%	17	**1** (25,App.B-2)	Questar projections adjusted downward according to note 1. Doubled participation rate per market accessibility
Repair/Maintain Steam Trap	0.000%	0	Nexant	Nexant does not anticipate much, if any participation in this measure. Participation revised downward based upon professional judgment.
Install High Efficiency Non-Condensing Boiler	0.100%	56	**10** (ii, 305)	
Install High Efficiency Condensing Boiler	0.100%	56	**10** (ii, 305)	

Measure Name	Annual Participation Rate	Annual Participants	Source (pgs)	Comments
Replace Burner, Boiler or Furnace	0.080%	45	**10**(ii, 305)	
Boiler Tune-Up	0.200%	112	**10** (ii, 305)	Reduced by 33% per engineering judgment
Furnace Tune-Up	0.200%	112	**10** (ii, 305)	Reduced by 33% per engineering judgment
Install Vent Dampers	0.150%	84	**10** (ii, 306)	All sizes included
Install Energy Management System	0.010%	6	**10** (ii, 308)	Energy management measures based on total customer base and total participation split over 3 years, reduced by 10% per engineering judgment.
Install Demand Control Ventilation System	0.010%	6	**10** (ii, 308)	Energy management measures based on total customer base and total participation split over 3 years, reduced by 10% per engineering judgment.
Install Blow down Heat Recovery System	0.010%	1	**10** (ii, 308)	Revised participation rate downward based upon professional judgment of customer market.
Install Stack Economizers	0.010%	1	**10** (ii, 308)	Revised participation rate downward based upon professional judgment of customer market.
Install HVAC Heat Recovery System	0.010%	6	**10** (ii, 308)	Energy management measures based on total customer base and total participation split over 3 years, reduced by 10% per engineering judgment.
Install a Gas-Fired Fryer	0.010%	6		This participation rate corresponds to 6 participants per year out of 55,000, which is reasonable considering upfront costs and actual number of businesses with the ability to upgrade their equipment

Measure Name	Annual Participation Rate	Annual Participants	Source (pgs)	Comments
Install a Gas-Fired Broiler	0.010%	6		This participation rate corresponds to 6 participants per year out of 55,000, which is reasonable considering upfront costs and actual number of businesses with the ability to upgrade their equipment
Install a Gas-Fired Broiler	0.010%	6		This participation rate corresponds to 6 participants per year out of 55,000, which is reasonable considering upfront costs and actual number of businesses with the ability to upgrade their equipment
Install a High Efficiency Combi-Oven	0.010%	6		This participation rate corresponds to 6 participants per year out of 55,000, which is reasonable considering upfront costs and actual number of businesses with the ability to upgrade their equipment
Install a High Efficiency Conveyor Over	0.010%	6		This participation rate corresponds to 6 participants per year out of 55,000, which is reasonable considering upfront costs and actual number of businesses with the ability to upgrade their equipment
Install a High Efficiency Steamer	0.010%	6		This participation rate corresponds to 6 participants per year out of 55,000, which is reasonable considering upfront costs and actual number of businesses with the ability to upgrade their equipment
Install a High Efficiency Dual Deck Pizza Oven	0.010%	6		This participation rate corresponds to 6 participants per year out of 55,000, which is reasonable considering upfront costs and actual number of businesses with the ability to upgrade their equipment

Measure Name	Annual Participation Rate	Annual Participants	Source (pgs)	Comments
Install a Kitchen Hood	0.010%	6		This participation rate corresponds to 6 participants per year out of 55,000, which is reasonable considering upfront costs and actual number of businesses with the ability to upgrade their equipment
Install Low-Flow Pre-Rinse Spray Valve in Dish Washer	0.010%	6		This participation rate corresponds to 6 participants per year out of 55,000, which is reasonable considering upfront costs and actual number of businesses with the ability to upgrade their equipment
Install a High Efficiency Rotisserie Oven	0.010%	6		This participation rate corresponds to 6 participants per year out of 55,000, which is reasonable considering upfront costs and actual number of businesses with the ability to upgrade their equipment
Install a High Efficiency Griddle	0.010%	6		This participation rate corresponds to 6 participants per year out of 55,000, which is reasonable considering upfront costs and actual number of businesses with the ability to upgrade their equipment
Install a High Efficiency Gas Range Top	0.010%	6		This participation rate corresponds to 6 participants per year out of 55,000, which is reasonable considering upfront costs and actual number of businesses with the ability to upgrade their equipment
Commercial Audit Program	0.100%	56	**1** (25,App.B-2)	Questar projections adjusted downward according to engineering judgment. Reduced by 50% per costs. Assumed that custom program would be similar in performance to the Recommissioning Program.

Notes

1. Nexant adjusted the participation rates presented in Reference 1 as follows:
   First, the total potential participant levels were calculated as follows:

$$\text{Total Potential Participants} = \frac{\text{Participants}}{\text{Penetration Rate}} = \frac{1134}{0.8} = 1{,}418$$

   Nexant estimated from past experience that this measure will have 50% of the potential participants complete the measure. Therefore, Nexant expects that the total participants for this measure are as follows:

$$\text{Participants}_{\text{nexant}} = (\text{Total Potential Participants})(0.50) = (1{,}418)(0.50) = 709$$

   Using this, the adjusted total penetration rate is as follows:

$$\text{Penetration Rate}_{\text{tot}} = \frac{\text{Participants}_{\text{nexant}}}{\text{Source Study Customer Base}} = \frac{709}{53{,}591} = 0.0132$$

   Now, Nexant expects that 10% of the market will turn over annually (see Reference 1, pg . 49). So, the annual penetration rate is as follows:

$$\text{Penetration Rate}_{\text{annual}} = (0.0132)(0.10) = 0.00132 = 0.10\%$$

   Converting this to annual participants,

$$\text{Participants}_{\text{annual}} = (\text{Penetration Rate}_{\text{annual}})(\text{Questar Customer Base}) = (0.0010)(55{,}774.) = 56$$

   Other measures with multiples of the participation rate have been calculated in a similar fashion.

A description of each measure is provided below.

Table 41. Program Measure List

Measure Name	Description
ENERGY STAR Homes Program	Upgrade building envelope, high performance windows, controlled air infiltration, upgraded heating and cooling systems, tight duct systems, upgraded water-heating systems
Install a High Efficiency Gas Clothes Dryer	Features pilot-less ignition, automatic shut-off, and moisture control sensors.
Install a Drain Water Heat Recovery System	Recover heat from dishwashers, clothes washers, kitchen sink and shower to preheat water
Install an Active Solar Water Heating System	Install solar water heating system with associated pumps and controls to pre-heat/fully heat DHW
Install DHW Circulation Controls	Reduce standby losses by installing time clocks on pumps and reducing set points during off peak periods (3% reduction in fuel for water heating).
Install Boiler Reset Controls	Automatically controls boiler water temperature based on OAT and turns off when OAT reaches specified temp (70 F usually). May include a timer.
Install Oxygen Trim Controls	Automatically remove excess air from boiler to improve efficiency (20% reduction in excess air)
Maintain Steam Trap	Test and maintain steam traps
Replace Burner (Boiler/Furnace)	Replace burner on boiler with a power burner (mechanically mixes oxygen and gas for maximum efficiency).
Boiler Tune-Up	Tune-up old boiler by reducing excess air, cleaning boiler tubes, recalibrating controls, etc.

Measure Name	Description
Install Vent Dampers (Boiler and Furnace)	Install power vent technology on boiler/furnace to shut off flue pipe to prevent heat loss when boiler/furnace is not in use.
Install an Energy Management System	Includes time of use controls, zoning and loop controls, supply air temperature reset, building warm up ventilation control
Install Demand Control Ventilation	Monitors CO2 levels in space to determine required ventilation rates
Install a Blow Down Heat Recovery System	Recover heat from blow down steam to preheat boiler makeup water.
Install Stack Economizers	Recover gas stack heat to preheat boiler makeup water.
Install an HVAC Heat Recovery System	Recover thermal energy from exhaust air to preheat supply air
Install a Low-Flow Pre-Rinse Spray Valve	Install low-flow pre-rinse spray valves in dish washing equipment to reduce hot water used in kitchen rinsing applications, thereby reducing hot water heater energy consumption.
Duct Insulation	Insulate furnace ducts running through non-conditioned spaces.
Duct Sealing	Seal furnace duct leakage between conditioned air delivery points
High Performance Windows	Upgrade windows to energy efficient type.
Exterior Storm Windows	Add an additional storm window to the existing windows.
Water Heater Blanket	Add an additional insulating blanket around the existing water heater.
High Efficiency Gas Water Heater	Install a High Efficiency Gas Water Heater
Tank less Gas Water Heater	Install a gas fired water heater without a tank. These heat the incoming water instantaneously on demand. Sometimes called a “demand” water heater.
Low Flow Showerhead	Install a showerhead using a maximum of 1.5 gallons of water per hour.

Measure Name	Description
ENERGY STAR Clothes Washer	Install a ENERGY STAR certified clothes washer
ENERGY STAR Dish Washer	Install a ENERGY STAR certified dish washer
Wall Insulation	Install additional wall insulation.
Roof Insulation	Install additional roof insulation.
Floor Insulation	Install additional floor insulation.
High Efficiency Condensing Furnace 90 AFUE	Install a High Efficiency Condensing Furnace with a 90 AFUE rating
High Efficiency Condensing Furnace 92 AFUE	Install a High Efficiency Condensing Furnace with a 92 AFUE rating.
High Efficiency Condensing Furnace 94 AFUE	Install a High Efficiency Condensing Furnace with a 94 AFUE rating.
ENERGY STAR Horizontal Clothes Washer	Install and ENERGY STAR Horizontal Clothes Washer
Unit Gas Heater, Non-Condensing	Install a Unit Gas Heater, Non-Condensing.
Unit Gas Heater, Condensing	Install a Unit Gas Heater, Condensing.
Infrared Heating System	Install an Infrared Heating System.
Steam Trap Replacement	Replace steam traps.
High Efficiency Non-Condensing Boiler	Install a High Efficiency Non-Condensing Boiler
High Efficiency Condensing Boiler	Install a High Efficiency Condensing Boiler.

Measure Name	Description
Burner Replacement, Boiler or Furnace	Replace burners on the boiler or furnace system with high efficiency burners.
Boiler Tune Up	Tune up the boiler system to operate at maximum efficiency,
Furnace Tune Up	Tune up the furnace system to operate at maximum efficiency,
Furnace Vent Dampers	Install vent dampers on the furnace flue to close the vent pipe except when the furnace burner is operating.
Boiler Vent Dampers	Install vent dampers on the furnace flue to close the vent pipe except when the boiler burner is operating.
Blow down Heat Recovery System	Install a heat exchanger to transfer heat from the boiler blow down water to the incoming boiler feed water.
HVAC Heat Recovery System	Install a heat exchanger on the building air exhaust duct to transfer heat from the exhaust air to the fresh air intake.
Gas-Fired Fryer	Install a high efficiency Gas-Fired Fryer.
Gas-Fired Broiler	Install a high efficiency Gas-Fired Broiler.
High Efficiency Combi-Oven	Install a high efficiency Combi-Oven.
High Efficiency Conveyor Oven	Install a high efficiency Conveyor Oven.
High Efficiency Steamer	Install a High Efficiency Steamer.
High Efficiency Dual Deck Pizza Oven	Install a High Efficiency Dual Deck Pizza Oven.
Kitchen Hood	Install demand controlled ventilation controls to modulate the speed of the exhaust and make-up air fans in response to cooking activity.
High Efficiency Rotisserie Oven	Install a High Efficiency Rotisserie Oven.
High Efficiency Griddle	Install a High Efficiency Griddle.
High Efficiency Gas Range Top	Install a High Efficiency Gas Range Top.

Appendix I Data Resources

The tables shown below provide data sources for the key cost, measure life, and savings references by measure. The number in each cell refers to the "Reference No." in Section F.

Table 42. Residential Measure Data Sources

Residential Measure Name	Cost Reference	Measure Life Reference	Savings Reference
ENERGY STAR Homes Program	1	1	1
Duct Insulation	11	11	11
Duct Sealing	11	11	11
High Performance Windows	1	1	1,6
Exterior Storm Windows	8	8	8
Water Heater Blanket	1,7	7	1
High Efficiency Gas Water Heater	1	1	1
Tankless Gas Water Heater	7	7	7
Drainwater Heat Recovery System	8	8	8
Active Solar Water Heating System	8	8	8
Active Solar Pool Water Heating System	8	8	8
Low Flow Showerhead	8	8	14
DHW Circulation Control System	8	8	8
ENERGY STAR Clothes Washer	1	4	4
High Efficiency Gas Clothes Dryer	8	8	8
ENERGY STAR Dish Washer	11	4	4
Programmable Thermostat	1	2	2
Wall Insulation	7	7	1
Wall Insulation- Low Income	1	7	1
Roof Insulation	1	1	1
Floor Insulation	8	8	8
High Efficiency Condensing Furnace 90 AFUE	1	5	5
High Efficiency Condensing Furnace 92 AFUE	1	5	5
High Efficiency Condensing Furnace 94 AFUE	1	5	5

Table 43. Commercial Measure Data Sources

Non- Residential Measure Name	Cost Reference	Measure Life Reference	Savings Reference
High Performance Windows	1	1	1,6
High Efficiency Gas Water Heater	1	1	1
Drainwater Heat Recovery System	8	8	8

Non- Residential Measure Name	Cost Reference	Measure Life Reference	Savings Reference
Active Solar Water Heating System	**8**	**8**	**8**
Active Solar Pool Water Heating System	**8**	**8**	**8**
DHW Circulation Control System	**8**	**8**	**8**
ENERGY STAR Horizontal Clothes Washer	**8**	**8**	**8**
High Efficiency Gas Clothes Dryer	**8**	**8**	**8**
Programmable Thermostat	**1**	**2**	**2**
Roof Insulation	**1**	**1**	**1**
Floor Insulation	**8**	**8**	**8**
Duct Insulation	**1**	**1**	**1**
Unit Gas Heater, Non-Condensing	**8**	**8**	**8**
Unit Gas Heater, Condensing	**8**	**8**	**8**
High Efficiency Condensing Furnace	**1**	**1**	**1**
Infrared Heating System	**1**	**1**	**1**
Boiler Reset Control	**1,8**	**1,8**	**1,8**
Boiler Oxygen Trim Controls	**8**	**8**	**8**
Steam Trap Replacement	**1**	**1**	**1**
Steam Trap Maintenance	**8**	**8**	**8**
High Efficiency Non-Condensing Boiler	**8**	**8**	**8**
High Efficiency Condensing Boiler	**8**	**8**	**8**
Burner Replacement, Boiler or Furnace	**8**	**8**	**8**
Boiler Tune Up	**8**	**8**	**8**
Furnace Tune Up	**8**	**8**	**8**
Furnace Vent Dampers	**8**	**8**	**8**
Boiler Vent Dampers	**8**	**8**	**8**
Energy Management System	**8**	**8**	**8**
Demand Control Ventilation System	**8**	**8**	**8**
Blowdown Heat Recovery System	**8**	**8**	**8**
Stack Economizers	**8**	**8**	**8**
HVAC Heat Recovery System	**8**	**8**	**8**
Gas-Fired Fryer	**8**	**8**	**8**
Gas-Fired Broiler	**8**	**8**	**8**
High Efficiency Combi-Oven	**8**	**8**	**8**
High Efficiency Conveyor Oven	**8**	**8**	**8**
High Efficiency Steamer	**8**	**8**	**8**
High Efficiency Dual Deck Pizza Oven	**8**	**8**	**8**
Kitchen Hood-Demand Controlled Ventilation	**8**	**8**	**8**
Dish Washer Low-Flow Pre Rinse Spray Valve	**8**	**8**	**8**
High Efficiency Rotisserie Oven	**8**	**8**	**8**
High Efficiency Griddle	**8**	**8**	**8**
High Efficiency Gas Range Top	**8**	**8**	**8**
Custom Projects	**1**	**1**	**1,8**

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