UGI GAS STATEMENT NO. 11 – THEODORE M. LOVE

BEFORE THE
PENNSYLVANIA PUBLIC UTILITY COMMISSION

Docket No. R-2015-2518438

UGI Utilities, Inc. – Gas Division

Statement No. 11

Direct Testimony of

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(Green Energy Economics Group, Inc.)

Topics Addressed: **Energy Efficiency & Conservation Plan and Total Resource Cost Implementation**

Dated: January 19, 2016

I. INTRODUCTION

Q. Please state your name, occupation, and business address.

A. My name is Theodore M. Love, and I am the Senior Analyst and Data Scientist at Green Energy Economics Group, Inc. ("GEEG"), an energy consulting firm founded in 2005. My office address is 147 South Oxford Street, Brooklyn, New York.

Q. On whose behalf are you testifying in this proceeding?

A. My testimony is submitted on behalf of UGI Utilities, Inc. – Gas Division ("UGI Gas").

Q. Please briefly describe your qualifications.

A. I have been involved in the review and preparation of both gas and electric energy efficiency plans, as well as potential studies and cost-effectiveness analysis, in nearly a dozen states, two Canadian Provinces, and China, since I began working with GEEG in 2007. Most relevant to this proceeding, I have been advising Philadelphia Gas Works ("PGW") on their energy efficiency activities since August 2008. My full resume is attached as UGI Gas Exhibit TML-1.

Q. Have you presented testimony in rate proceedings before a regulatory agency?

A. Yes. In 2015, I presented testimony on behalf of PGW in support of the continuation of their demand-side management ("DSM") gas programs for a second five-year phase under Docket No. P-2014-2459362.

Q. What is the purpose of your testimony?

A. I will be describe the development of the UGI Gas Energy Efficiency and Conservation Plan ("EE&C Plan" or "the Plan"), provide an overview of the programs proposed under the Plan, and provide details on the Plan's benefits and costs.

Q. Are you sponsoring any exhibits in this proceeding?

A. Yes, I am sponsoring the following exhibits:

- UGI Gas Exhibit TML-1 – Resume of Theodore M. Love; and
- UGI Gas Exhibit TML-2 – UGI Gas's Five Year Energy Efficiency & Conservation Plan.

Q. Please summarize your testimony.

A. In Section II, I explain why it is appropriate and important for UGI Gas to implement natural gas energy efficiency and conservation programs. I also give an overview of the proposed programs and how they were developed. In Section III, I discuss the benefits, costs and staging of the proposed portfolio of programs. Section IV provides a summary of each of the proposed programs. Finally, I provide my conclusions and recommendations in Section V.

UGI Gas proposes to invest $24.8 million in real 2015 dollars in energy efficiency programs over the next five years and, if implemented, expects to reduce natural gas consumption by 7,385 Billion British thermal units ("BBtus") over the lifetime of the installed measures. The energy efficiency programs provide UGI Gas customers with present value of total resource benefits of $53.9 million at cost of $30.6 million, including participant investments, for a net benefit to customers of $23.2 million with a

Total Resource Cost ("TRC") benefit-cost ratio ("BCR") of 1.76. The proposed Combined Heat and Power ("CHP") Program is projected to cost $2.8 million in real 2015 dollars over the five-year period. This investment would lead to a 25,591 BBtu reduction in net primary energy usage over the lifetime of the installed CHP units, and avoid the emission of approximately 101,000 tons of carbon dioxide per year by the end of the five-year period. The CHP program provides $44.6 million in net total resource benefits with a BCR of 1.60. Combined, the energy efficiency programs and CHP Program provide $67.9 million in net total resource benefits with an overall TRC BCR of 1.65.

II. OVERVIEW AND BACKGROUND

Q. Why is it appropriate for UGI Gas to implement energy efficiency and conservation programs?

A. Improving efficiency and addressing climate change in all end uses of our energy resources is an increasingly important part of this nation's energy, economic, and environmental policy goals. Over the past decade numerous nationwide initiatives have focused on improving efficiency, including large portions of funding from the American Recovery and Reinvestment Act of 2009 ("ARRA") to the Clean Power Plan ("CPP") ruling recently issued by the United States Environmental Protection Agency ("US EPA"). In Pennsylvania, the General Assembly has embraced this view by the passage of Act 129, of 2008[1] ("Act 129") that mandates, among other things, the implementation of electric distribution company ("EDC") programs, funded by ratepayers, to promote

[1] Act 129 of 2008, P.L. 1592, 66 Pa.C.S §§ 2806.1 and 2806.2.

electric energy conservation and efficiency improvements. Phase II of Act 129 was approved in 2012, and Phase III of Act 129 was approved in June of 2015, central to which is the continuation of mandatory electric efficiency programs. This reaffirmation of support for Act 129 confirms the value that utility-facilitated electric efficiency provides to the residents of Pennsylvania. A similar undertaking by natural gas distribution companies ("NGDCs") is expected to have similar beneficial impacts.

Furthermore, PGW has been successfully operating a voluntary portfolio of natural gas energy efficiency programs for the past five years. These programs have resulted in over 260 BBtus in incremental annual gas savings and a present value of TRC net benefits of $5.7 million from inception through August 31, 2014. PECO also offers customers rebates for energy efficiency furnaces through their Smart Gas Efficiency Upgrade program, and Peoples Natural Gas has committed to the preparation of an EE&C Plan by the end of 2016.[2]

Altogether, over 30 years of program experience across North America, as well as many years of activity in Pennsylvania, proves that large-scale energy efficiency and conservation investment portfolios can be effectively and cost-effectively administered by the distribution utilities responsible for delivering energy service.

Q. Will the Plan, if implemented, benefit UGI Gas's customers?

A. Yes, it will. Section 1.3 of the EE&C Plan (UGI Gas Exhibit TML-2) describes the goals of the portfolio as the following:

[2] Settlement in Docket Nos. A-2013-2353647, A-2013-2353649, A-2013-2353651 before the Pennsylvania Public Utility Commission.

- Help customers save energy cost-effectively through a holistic approach to energy efficiency and conservation.
- Avoid lost opportunities and provide deep levels of savings.
- Provide a wide range of services for UGI Gas's diverse customer base.
- Contribute to the economic welfare of its customers and Pennsylvania.

UGI Gas is proposing to spend $24.8 million in real 2015 dollars towards energy efficiency programs, an investment that will return a present value of total resource net benefits of $23.2 million and save customers 7,385 BBtus of gas over the lifetime of measures installed. For the CHP program, an investment of $2.8 million in real 2015 dollars is projected to return present value total resource benefits of $44.6 million. Furthermore, the program should avoid approximately 101,000 tons of carbon dioxide emissions per year by the end of the five-year period, which I expect to be countable towards Pennsylvania's CPP goals.

Q. How was the Plan developed?

A. As described in Section 1.4 of UGI Gas Exhibit TML-2, the Plan was developed in three stages. The first stage involved the characterization of measure costs, savings, and cost-effectiveness of eligible measures. An achievable scenario was developed for each of the cost-effective measures for the second stage. Finally, the programs were designed and staged to meet budget goals and follow best practices in program and portfolio design.

Q. What kinds of efficiency opportunities does UGI Gas's EE&C Plan target?

A. UGI Gas plans to implement a comprehensive portfolio of six natural gas efficiency programs and a CHP program to capture energy efficiency and conservation opportunities available through four distinct types of market transactions. The first source of savings is to upgrade the efficiency of new gas-using appliances and equipment when those appliances and equipment require replacement. This market opportunity is called "natural replacement." The second opportunity to improve efficiency is before a building or renovation is designed and constructed, otherwise known as the new construction and gut renovation market. The third source of gas savings is to increase energy efficiency of existing buildings by retrofitting them with supplemental measures (like attic insulation) and with early replacement of inefficient equipment with high-efficiency models (like boilers and furnaces). The retrofit market also includes some larger opportunities to reduce overall net energy usage through fuel-switching measures, such as CHP plants. The final source of gas savings is to change customer behavior to use less energy without necessarily installing new equipment, a relatively new, but quickly growing sector of the efficiency market. UGI Gas's EE&C portfolio is explicitly designed and planned to achieve cost-effective savings through all four types of market transactions among residential and nonresidential customers by introducing programs to address each in the four-stage sequence.

Q. What are the programs proposed for inclusion in the Plan?

A. The following six natural gas energy efficiency programs are proposed for the five-year portfolio:

- Residential Prescriptive (RP)

- Nonresidential Prescriptive (NP)
- New Construction (NC)
- Residential Retrofit (RR)
- Nonresidential Retrofit (NR)
- Behavior and Education (BE)

The Plan also includes a CHP program that is proposed as a separate fuel-switching program, and a crosscutting budget for portfolio-wide administrative costs. These programs will be discussed in more detail later in my testimony.

Q. Has UGI Gas provided detailed plans for the proposed programs?

A. Yes, Section 2 of UGI Gas Exhibit TML-2 provides a detailed plan for each of the programs, including annual budgets, savings, and participation projections along with more information on program design, eligible rate classes, target markets, incentive approach, marketing, evaluation, measurement, and verification ("EM&V"), as well as implementation.

Q. Is UGI Gas's EE&C Plan modeled on successful efforts elsewhere?

A. Yes. UGI Gas's proposed portfolio incorporates many of the strategies proven effective around the country, by program administrators like National Grid in Massachusetts ("NGrid"), as well as by natural gas program administrators in Pennsylvania, such as PGW.

Q. What best practices in program and portfolio design are incorporated in the Plan?

A. Providing incentives to defray the efficiency cost premium for the purchase of new high-efficiency new equipment has been the cornerstone of gas energy efficiency efforts across the country for decades. Best practices included making sure that UGI Gas has the flexibility to address changing market conditions as new technologies enter the marketplace and as codes and standards are adopted that eliminate the least-efficient equipment. UGI Gas's minimum efficiency requirements will be updated to meet increasingly strict federal standards and to align with minimum requirements established in other leading efforts from utilities such as NGrid and PGW. These programs will also aggressively target market participants throughout the supply chain.

The most successful new construction programs take an integrated approach to building efficiency. These programs coordinate the multiple functions and stages associated with building construction with the array of efficiency opportunities across building energy sources and end uses. Financial incentives typically defray most or all of the incremental cost of high-efficiency design, equipment, and construction over and above standard market practice.

In the residential retrofit market, UGI Gas's program will target high-use customers while also allowing self-selected participation. Low cost audits will require blower-door tests in order to facilitate advanced air-sealing and insulation practices, as well as heating system retrofits. Nonresidential retrofits will be sold to customers as financial investments and technical assistance will be provided to ensure that all options are explored and that a given project goes as deep as cost-effectively possible.

UGI Gas will also launch a behavior program targeted at high usage residential heating customers, based on successful programs from Massachusetts. These types of

behavior programs have proven effective at convincing large groups of customers to save small amounts of energy, which adds up to a large pool of savings that traditional programs have not captured. Similar programs have been adopted by Act 129 electric utilities and make up a significant portion of these utilities' annual savings.

Finally, UGI Gas will be providing opportunities for medium to large commercial and industrial customers to participate in a CHP program. Any potential CHP project will need to pass the TRC test, and resulting electric generation reductions should be directly applicable to statewide emission reduction goals tied to the CPP.

Q. How are low-income customers addressed by the Plan?

A. Low-income customers are allowed to participate in any of the programs open to residential customers. Although no program in the proposed EE&C portfolio specifically targets this market segment, UGI Gas already has a Low Income Usage Reduction Program ("LIURP") as discussed in the direct testimony of Robert R. Stoyko (UGI Gas Statement No. 7).

III. BENEFITS, COSTS, AND STAGING OF PROPOSED PLAN PORTFOLIO

Q. How did you assess the benefits and costs of UGI Gas's proposed portfolio?

A. Costs and benefits were compared from two perspectives: a total resource perspective and the gas system administrator perspective. The primary test for the UGI Gas EE&C Plan is the TRC test, which is most comparable to the test proposed by PGW for its Phase II plan and similar to the test used by the Commission for Act 129. This test compares the avoided cost of resources, including natural gas, electricity, and water, against the

incremental cost of pursuing efficiency measures and any administration costs incurred under the programs.

The Gas Administrator Cost test only counts those costs and benefits within the sphere of costs paid by gas ratepayers. In this case, it means all the costs paid by UGI Gas for providing incentives and administering the proposed EE&C portfolio, ignoring any additional costs paid by participants. The benefits in the Gas Administrator Cost test are only the avoided costs of natural gas.

Q. What avoided cost values were used in the development of the UGI Gas EE&C Plan?

A. UGI Gas Exhibit TML-2 provides an overview of the avoided cost methodology in Section 1.8.2 and a table of projected values in Section 3.1.

Q. How does the assessment of the CHP Program differ from that of the energy efficiency programs?

A. The CHP Program will need to meet the same TRC cost-effectiveness criteria as the energy-efficiency programs, but will also need to demonstrate that the fuel-switching projects result in overall net primary energy reduction. These reductions will be tracked separately because the fuel-switching program will result in an increase in gas usage that should not be conflated with the savings from the energy efficiency programs.

Q. What are the lifetime costs and benefits you estimate from implementing UGI Gas's EE&C Plan?

A. The table below (Table 18 from UGI Gas Exhibit TML-2) shows the cost-effectiveness summary for UGI Gas's proposed portfolio of natural gas energy efficiency programs. The energy efficiency programs provide UGI Gas customers with present value of total resource benefits of $53.9 million at cost of $30.6 million, including the participant investments, for a net benefit to customers of $23.2 million with a BCR of 1.76. The CHP program provides $44.6 million in net total resource benefits with a BCR of 1.60. The entire EE&C Plan provides $67.9 million in net total resource benefits with a TRC BCR of 1.65.

Program	Total Resource PV Benefits	Total Resource PV Costs	Total Resource PV Net Benefits	Total Resource BCR
EE&C Total	**$172,528,340**	**$104,668,959**	**$67,859,381**	**1.65**
Residential Prescriptive (RP)	$31,130,604	$14,907,355	$16,223,249	2.09
Nonresidential Prescriptive (NP)	$8,708,345	$3,813,860	$4,894,485	2.28
Residential Retrofit (RR)	$4,816,226	$3,509,802	$1,306,423	1.37
Nonresidential Retrofit (NR)	$3,347,061	$1,739,899	$1,607,162	1.92
New Construction (NC)	$3,671,531	$1,919,760	$1,751,772	1.91
Behavior and Education (BE)	$2,178,476	$1,624,141	$554,335	1.34
Portfolio-wide Costs	$-	$3,108,352	$(3,108,352)	-
EE Programs	**$53,852,243**	**$30,623,169**	**$23,229,074**	**1.76**
CHP Program	$118,676,097	$74,045,790	$44,630,307	1.60

Q. Will these net benefits stimulate economic activity?

A. Yes. The present worth of TRC net benefits represents a long-term injection of wealth into the economy. For residential customers, the reduction in the total costs of gas service translates to after-tax disposable income, which can be saved or spent. Likewise, lower gas bills for business customers means some combination of increased profit margins and more competitive product and service pricing. Businesses will re-invest the resulting extra profits, or distribute them to owners, or some combination of the two. Either way, the TRC savings will stimulate additional business activity.

Moreover, the amount of additional economic activity stimulated by the efficiency investment will end up being several times the net benefits due to re-spending within the local, state, and regional economies. While there is doubtless some "leakage" as some spending takes place outside Pennsylvania, the majority of the economic benefits stay at the state and local levels.

This economic activity generated by the net economic benefits of efficiency investment is in addition to the economic activity generated directly by expenditures on the part of both UGI Gas and program participants to install the efficiency measures.

Q. How much natural gas will UGI Gas's customers save due to the energy efficiency programs?

A. The natural gas efficiency programs will save UGI Gas customers 7,385 BBtus over the lifetime of all measures installed. The table below (Table 4 from UGI Gas Exhibit TML-2) shows the first year and lifetime gas savings associated with each sector over the five years of the proposed portfolio of natural gas efficiency programs.

Sector	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY '17 - '21
First Year Gas Savings	**14,769**	**54,316**	**151,025**	**208,869**	**218,428**	**647,407**
Residential (R/RT)	11,969	40,845	123,315	170,574	175,764	**522,468**
Nonresidential (N/NT)	2,800	13,471	27,709	38,295	42,664	**124,938**
Lifetime Gas Savings	**268,207**	**1,003,368**	**1,651,083**	**2,141,624**	**2,320,709**	**7,384,990**
Residential (R/RT)	222,047	781,454	1,199,174	1,524,193	1,646,485	**5,373,353**
Nonresidential (N/NT)	46,161	221,914	451,909	617,430	674,223	**2,011,636**

Q. What additional benefits do you project for UGI Gas customers from the energy efficiency portion of the EE&C Plan?

A. I estimate the proposed programs will save UGI Gas customers 92,460 MWh of electricity, 249 million gallons of water, and avoid the emission of 510,000 tons of CO_2 --

the equivalent of removing over 19,400 cars from the road for five years. Section 1.5 of UGI Gas Exhibit TML-2 contains a more detailed breakdown of additional savings due to the proposed portfolio.

Q. What benefits do you project for UGI Gas customers from the CHP program?

A. I estimate the CHP program will reduce net primary energy consumed by 25,591 BBtus over the lifetime of the installed plants.

Q. Will the CHP program help Pennsylvania meet its Clean Power Plan goals?

A. Yes. Any efficiency or conservation measures that reduce the output of CO_2 from fossil-fuel fired electric generating units ("EGUs"), that are installed after 2012, and that are operational during the years covered by the CPP could be incorporated into a state implementation plan ("SIP") to assist Pennsylvania achieve its CPP goals. I project that UGI Gas's CHP program will reduce net generation emissions by 101,000 tons of CO_2 per year by the end of the five-year plan, which is equivalent to taking 3,800 cars off the road for five years. These savings should persist through 2030, which should make them countable towards CPP goals. While Pennsylvania has yet to release its draft SIP, anticipated in spring of 2016, based on Pennsylvania's goal of prioritizing indigenous resources in its SIP and the clear benefits of CHP in reducing EGU CO_2 emissions, it is reasonable to assume that a Pennsylvania SIP will incorporate savings from CHP.

Q. How much additional employment do you estimate that the Plan will generate?

A. The Plan will generate between 222 and 369 additional new jobs over the lifetime of the efficiency measures installed. The majority of these jobs will stay close to where savings occurred due to most of the job creation being a product of the economic "multiplier" effect through the cycle of re-spending energy savings, and the shift away from spending in the less-labor intensive energy sector towards more job-intensive sectors such as food service and production, as discussed in Section 1.5.5 of UGI Gas Exhibit TML-2.

Q. How much will it cost to achieve these results?

A. For the natural gas energy efficiency programs, UGI Gas projects an investment of $24.8 million in real, 2015, dollar terms, or approximately $5.0 million per year.[3] For the CHP program, UGI Gas projects an investment of $2.8 million in real, 2015, dollar terms, or approximately $555,000 per year. For the combined portfolio, this would be an investment of $27.6 million over five years ($5.5 million per year) in real, 2015, dollars, or a nominal investment of $30.6 million ($6.1 million per year).

Q. How will these programs be staged to achieve the results you have identified?

A. Once final approval has been granted for the EE&C Plan, the Residential Prescriptive and Nonresidential Prescriptive programs will be the first programs fully developed and launched in fiscal year 2017. The New Construction, Residential Retrofit, and Nonresidential Retrofit programs will be developed throughout fiscal year 2017 and then launched in fiscal year 2018. The final program to launch will be the Behavior and Education program in coordination with planned updates to UGI Gas's customer

[3] The real dollar figure adjusts future spending to account for inflation. An inflation rate of 2% was used for this analysis.

information system. All the programs will ramp up over the three to four years until the portfolio reaches its full level of annual investment in the final year of the five-year portfolio. The CHP program would be open to customers in fiscal year 2017. The table below shows the projected annual nominal dollar investment by program.

Program	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY 17 - FY 21
EE&C Total	**$2,769,500**	**$4,556,650**	**$6,621,825**	**$7,945,412**	**$8,746,821**	**$30,640,208**
Residential Prescriptive (RP)	716,000	1,731,000	2,307,000	2,755,000	2,815,000	10,324,000
Nonresidential Prescriptive (NP)	250,000	331,000	587,000	663,000	713,000	2,544,000
Residential Retrofit (RR)	200,000	520,000	800,000	1,000,000	1,200,000	3,720,000
Nonresidential Retrofit (NR)	100,000	216,000	306,000	432,000	654,000	1,708,000
New Construction (NC)	135,000	273,000	479,000	638,000	782,000	2,307,000
Behavior and Education (BE)	-	320,000	510,000	735,000	735,000	2,300,000
Portfolio wide Costs	950,000	730,000	780,000	800,000	850,000	4,110,000
EE Total	**2,351,000**	**4,121,000**	**5,769,000**	**7,023,000**	**7,749,000**	**27,013,000**
CHP Program	418,500	435,650	852,825	922,412	997,821	3,627,208

The table below shows projected budgets, in real 2015 dollars, for the entire portfolio, including CHP, for fiscal year 2017, both by program category and broken out between residential (R/RT) and non-residential classes.

Program Category	R/RT	Non-Residential	Total
Customer Incentives	$ 471,396	$ 310,856	$ 782,252
Administration	$ 1,108,417	$ 339,349	$ 1,447,765
Marketing	$ 172,955	$ 209,851	$ 382,806
Inspections	$ 16,422	$ 9,262	$ 25,683
Evaluation	$ -	$ 20,000	$ 20,000
Total Expenses	$ 1,769,189	$ 889,317	$ 2,658,506

Please see Section 1.9.1 of UGI Gas Exhibit TML-2 for additional details regarding the proposed program staging, as well as Section 2 for individual program descriptions.

Q. Is UGI Gas proposing a set annual budget for these programs?

A. No. The proposal is for a real dollar investment in energy efficiency over five years of approximately $5.0 million dollars per year. The previously described staging and budget levels represent anticipated funding levels, but the utility should be allowed to move budget dollars between years and programs depending on market conditions and adoption rates, as long as program and portfolio cost-effectiveness and the overall five-year investment amount is met.

Q. Why is this flexibility important?

A. The ability to allocate funding effectively is crucial for a portfolio administrator, and especially so for a portfolio that is just starting up. The uncertainty inherent in launching and ramping up a new program or portfolio means that there can be faster or slower adoptions of efficiency measures. The ability to move budgets makes sure that unspent funds from one lower demand area can be used to address the higher demands in other areas, and helps provide continuity for customers, contractors, and suppliers. This flexibility must also extend to program design and implementation, such as increasing or decreasing incentives based on market conditions. As discussed in Section 1.9.5 of the EE&C Plan (UGI Gas Exhibit TML-2), UGI Gas would have flexibility within the existing proposed five-year budgets and programs, but would file a revised implementation plan if a program was added or removed, additional funds over and beyond the five year goal were required, or material changes were expected for portfolio-level cost-effectiveness projections.

Q. How will UGI Gas report results?

A. As described in Section 1.9.4 of UGI Gas Exhibit TML-2, UGI Gas will provide an annual report every January, three months after the close of the program year, that will provide verified savings and participation, costs committed to this activity, and the resulting cost-effectiveness. Results for the previous year and progress towards the five-year goal will be included. The annual report will also include highlights of program activity and any significant improvements made to program delivery and design.

Q. Please describe UGI Gas's evaluation, measurement, and verification plans for the portfolio?

A. UGI Gas Exhibit TML-2 provides an overview of the EM&V planned for the EE&C Plan (UGI Gas Exhibit TML-2, Section 1.10) as well as plans for each individual program. Measures will require proof of purchase and must be tied to a valid UGI Gas account. Third-party inspections will be performed on all complex projects and a subset of prescriptive rebates, to make sure the correct equipment is installed and solicit customer feedback. Savings are calculated using a technical reference manual ("TRM") that is based on PGW's FY 2016 TRM and calibrated to UGI Gas's territory. UGI Gas will develop a tracking system to store and analyze program activity, spending, and inspection data. Finally, each program will undergo regular impact and process evaluations approximately every two years.

IV. SUMMARY OF PROPOSED PROGRAMS

A. RESIDENTIAL PRESCRIPTIVE PROGRAM

Q. Please describe the Residential Prescriptive Program.

A. The Residential Prescriptive ("RP") Program offers cash incentives for high-efficiency, natural gas powered, residential-sized space and water heating equipment, which is the largest lost opportunity market in UGI Gas's territory. The program is expected to cost $10.3 million in nominal dollars over five years and save 4,094 BBtus of natural gas over the lifetime of measures installed. The program is projected to provide present value TRC net benefits of $16.2 million with a BCR of 2.09.

The RP program specifically targets high efficiency furnaces, boilers, combi-boilers, tankless water heaters and Wi-Fi-enabled thermostats. The rebates for this equipment were designed to be in line with other gas energy efficiency administrators in the region, such as PGW, and cover approximately two-thirds of the measures' incremental costs. A list of the proposed measures and corresponding incentives can be found in the RP Program Description Section on Financial Incentives in UGI Gas Exhibit TML-2.

Q. How were the efficiency levels for the program chosen?

A. In line with the general principles for the portfolio, the RP program targets the highest efficiency levels for the more traditional types of equipment, such as furnaces and boilers. It also seeks to promote market adoption of newer technology, such as tankless water heaters, and in doing so offers more efficiency level options.

Q. Please describe the roll of Wi-Fi thermostats in the program.

A. Wi-Fi thermostats provide the promise of customers more fully engaging with setting the comfort levels in their homes. Many models have additional capabilities that help

customers fine tune temperature settings, or that adjust more intelligently to fit customer behavior. This next generation of thermostat technology is poised to potentially address the behavioral aspects of energy usage more effectively than traditional methods. The RP program will offer $100 incentives for these types of thermostats. In order to get an accurate picture of how this equipment affects space-heating usage, the program will include a rigorous evaluation schedule to proactively track results for this measure and inform long-term decision-making regarding the measure's place in the program. One possibility, if the measure proves to be effective at saving energy, is to move the rebate from a cash rebate to an upstream, point of sale incentive.

Q. Are there any key risk factors for the RP program?

A. A key aspect of future program uncertainty involves the potential shift in baseline efficiency levels for natural gas furnaces. Federal Standards are potentially moving towards requiring condensing units with annual fuel utilization efficiencies ("AFUEs") of 90 percent or more for the Northern region of the United States, which includes Pennsylvania. While the current efficient condition for natural gas furnace incentives of an ENERGY STAR ® rating would still exceed an anticipated baseline shift, savings and incentive levels would be adjusted downwards, and savings and/or spending goals may need to be adjusted accordingly.

B. NONRESIDENTIAL PRESCRIPTIVE PROGRAM

Q. Please describe the Nonresidential Prescriptive Program.

A. The Nonresidential Prescriptive ("NP") Program offers incentives for a variety of natural gas powered equipment used by UGI Gas's small business and commercial customers.

The program is expected to cost $2.5 million in nominal dollars over five years and save 1,358 BBtus of natural gas over the lifetime of measures installed. The program is projected to provide present value TRC net benefits of $4.9 million with a BCR of 2.28.

The program targets commercial sized boilers, unit heaters, steam traps, water heaters, and a few types of commercial kitchen equipment. Incentives for these measures have been designed to be in line with other jurisdictions and cover approximately two-thirds of the incremental cost of the measure. A custom incentive track is also offered for measures that are not currently covered by the prescriptive list, such as custom control and heat recovery systems. A list of the proposed measures and corresponding incentives can be found in the RP Program Description Section on Financial Incentives in UGI Gas Exhibit TML-2. Delivery of the program is nearly the same as the RP program and may have the same rebate processor to improve operation efficiency.

Q. How does implementation of the NP program differ from the RP program?

A. While the main processes used to implement the NP and RP programs are very similar, and will probably share much of the same infrastructure, the main difference comes in how the customers are funneled towards the respective measures. The RP will be driven more by the general portfolio awareness push due to the larger target audience and streamlined messaging of a smaller measure list. The NP, on the other hand, requires a more targeted outreach based approach, pulling participants into the program by working closely with contractors, suppliers, and community organizations. Most small businesses have trusted go-to contractors that service their equipment. When equipment is in need of repair or replacement, it should be easy for the contractor to understand the

opportunity and easy for the business owner to participate. Reaching the contractor will be crucial, since the contractor will need to file paperwork and present the rebate to the business owner, who will therefore be placing trust in the contractor to take full advantage of the program. UGI Gas will also explore options to pay rebates directly to contractors to reduce the amount of the customer's invoice.

C. NEW CONSTRUCTION PROGRAM

Q. Please describe the New Construction Program.

A. The New Construction ("NC") program aims to address natural gas efficiency in new construction and gut rehabilitation projects. The program targets both the residential and nonresidential sectors by providing incentives for going beyond code. The program is performance based and will provide participants with a greater incentive for combining measures and going deeper than they would by upgrading just the space or water heating system through the RP or NP programs.

The program is expected to cost $2.3 million in nominal dollars over five years and save 519 BBtus of natural gas over the lifetime of measures installed. The program is projected to provide present value TRC net benefits of $1.8 million with a BCR of 1.91.

Q. How does the NC program address residential projects?

A. The program will provide a streamlined prescriptive rebate for customers who save at least 20% in gas usage compared to a baseline house just meeting code. The incentive will be designed to cover approximately 80% of the incremental costs.

Q. How does the NC program address nonresidential projects?

A. Since the NC projects tend to be more complicated, the program will focus first on providing technical assistance to potential projects in order to help include efficiency in the initial design process. Nonresidential projects will then be eligible for an incentive that gets larger as the savings increase. The program will have three tiers: at least 15% but less than 20%, at least 20% but less than 30%, and 30% or greater.

D. RESIDENTIAL RETROFIT PROGRAM

Q. Please describe the Residential Retrofit Program.

A. The Residential Retrofit ("RR") program is designed to overcome market barriers for existing residential customers to do comprehensive natural gas efficiency projects that save money and increase comfort. The program specifically addresses the space and water heating system, as well as improvements to the thermal envelope. The program is expected to cost $3.7 million in nominal dollars over five years and save 744 BBtus of natural gas over the lifetime of measures installed. The program is projected to provide present value TRC net benefits of $1.3 million with a BCR of 1.37.

Interested customers will receive an energy audit from a qualified contractor that includes a blower door test. The contractor will provide the customer with a list of recommended actions based on the audit. The customer will then receive an incentive of $60 per first year MMBtus savings based on the measures installed by a qualified contractor. The incentive is designed to offset most of the incremental cost of the higher efficiency equipment and to provide a significant contribution to the cost of qualifying thermal envelope improvements.

Q. How will customer participation in the program be encouraged?

A. The general awareness campaign for the entire portfolio will be the foundation for driving participation in the program. This will drive traffic to an online site that can help customers assess the energy savings potential in their homes and contact a qualified contractor for an in-home audit. Qualified contractors will also be able to generate leads through co-branding and direct marketing campaigns that help the contractor get more work and close larger projects.

Q. What does it mean to be a "qualified contractor"?

A. The cornerstone of the RR program will be the approved contractor network. In order to become part of the network, a contractor will be required to have certification from the Building Performance Institute ("BPI") and be trained in program protocols to ensure quality business practices. Approved contractors must also employ site technicians and site supervisors with BPI professional certifications appropriate to their duties. Once a contractor passes initial approval, the first three projects performed by that contractor will require confirmation of quality installation by an approved third party inspector before the contractor moves from probationary status to full certification. Subsequent contractor work will be sampled up to 10% of projects submitted. Protocols will also be put in place to remove a contractor from the program for poor performance.

UGI Gas already has a contractor portal for sharing leads for customers who are interested in switching to natural gas. UGI Gas will look for ways to use this platform to launch and manage a more comprehensive network of contractors focused on serving the RR program.

Q. Why would a contractor want to participate in the RR program?

A. Customers will only receive an incentive if they use an approved contractor. This gives qualified contractors an additional edge not just in selling a project, but also expanding the scope to include more measures. The quality assurance and inspections provided by UGI Gas give customers an added level of service, help ease customer uncertainty in an unfamiliar process, and help contractors close more jobs. Furthermore, UGI Gas will examine ways to get contractors to encourage deeper savings by potentially offering contractors a performance bonus for meeting heightened goals.

E. NONRESIDENTIAL RETROFIT PROGRAM

Q. Please describe the Nonresidential Retrofit Program?

A. The Nonresidential Retrofit ("NR") Program will provide incentives for overcoming market barriers for natural gas efficiency retrofits in existing commercial and multi-family buildings; it also will be open to agricultural and small industrial applications. Any measure that saves natural gas is eligible, with space heating, water heating, and process heating expected to be the largest opportunities. The program specifically addresses the space and water heating system, as well as improvements to the thermal envelope. The program is expected to cost $1.7 million in nominal dollars over five years and save 410 BBtus of natural gas over the lifetime of measures installed. The program is projected to provide present value TRC net benefits of $1.6 million with a BCR of 1.92.

Q. Why are multifamily projects included in this program?

A. Multi-family buildings technically are any housing other than single-family detached structures, including duplexes and townhouses, as well as apartments. They must have at least one surface defining a given housing unit that is shared by another unit within the building and space or water heating equipment that can service more than one unit. These considerations make multi-family structures difficult to administer within the RR program, which is geared for stand-alone residential units.

F. BEHAVIOR AND EDUCATION PROGRAM

Q. Please describe the Behavior and Education Program.

A. The Behavior and Education ("BE") program is designed to motivate a large group of residential customers to save small amounts of energy by changing behavior through education, outreach, and energy monitoring. The premise is that the delivery of timely, salient, and personalized information allows for informed decision-making. The program combines behavioral science with data analytics to provide clearly defined and actionable information that motivates customers to lower their energy use. The program is expected to cost $2.3 million in nominal dollars over five years and save 260 BBtus of natural gas over the lifetime of measures installed. The program is projected to provide present value TRC net benefits of $554,000 with a BCR of 1.34.

Q. How will savings be verified for this program?

A. A solid evaluation is crucial for the success of this program. UGI Gas will engage an evaluator to begin collecting data on the program as soon as it starts to be able to get as much real time feedback as possible regarding the size and persistence of savings and make sure that any early issues are caught quickly and addressed.

G. COMBINED HEAT AND POWER PROGRAM

Q. Please describe the CHP Program.

A. The CHP program provides incentives for CHP plants that have net-primary-energy savings and are cost-effective under the TRC test. The program also seeks to promote projects that would contribute CO_2 emission reductions that may be counted toward Pennsylvania's CPP goals. The program would offer an incentive of $750 per kW, with a cap of $250,000 per project. Over the five years of the portfolio, the CHP program is projected to cost $3.6 million, in nominal terms, and provide 25,591 BBtus in net-primary-energy savings as well as reduce net CO_2 emissions by 101,000 tons per year by the end of the five-year plan. The program is expected to have a present value of TRC net benefits of $44.6 million with a BCR of 1.60.

Q. What types of CHP projects will the program incentivize?

A. The program will target large commercial and industrial customers with high thermal and electric loads, such as hospitals, college campuses and multi-shift industrial customers. Due to the current state of avoided costs, UGI Gas anticipates that it will be difficult to find cost-effective projects that are much under 1,000 kW. However, UGI Gas will continue to monitor both the energy market and customer opportunities to address as wide a range of CHP technology types and sizes as possible.

H. PORTFOLIO-WIDE COSTS

Q. What do the portfolio-wide costs cover?

A. The portfolio-wide costs cover development, design, tracking, reporting, and administrative overhead that cuts across all the programs in the portfolio. The majority of development costs for the portfolio occur in the first year as programs are designed and reporting infrastructure is put in place. Costs then fall sharply in the second year before climbing as the portfolio grows. Over the five-year period, they represent 15% of the portfolio's expenditures.

V. CONCLUSIONS AND RECOMMENDATIONS

Q. What conclusions do you reach?

A. I conclude that UGI Gas's proposed portfolio of energy efficiency programs and CHP program will be cost-effective and economically beneficial to UGI Gas's ratepayers and the economy of the UGI Gas territory and Pennsylvania.

Q. On the basis of these conclusions, what are your recommendations to the Commission?

A. I strongly recommend that the Commission order implementation of UGI Gas's five-year EE&C Plan. Any delay in implementation represents delay of the benefits that will occur.

Q. Does this conclude your direct testimony?

A. Yes, it does.

UGI GAS EXHIBIT TML-1

THEODORE
LOVE

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Professional Experience

Green Energy Economics Group, Inc. – Cuttingsville, VT 2007 to Present
Senior Analyst and Data Scientist
Providing research and technical assistance relating to the design, analysis, and implementation of energy utility demand-side management (DSM) programs for electric and natural gas service providers around the world; including ten states, two Canadian provinces, and China. Currently focusing on building scalable tools to analyze everything from individual projects to programs to portfolios.

Alter & Rosen, LLP –New York, NY 2007 to 2010
Consultant
Managed the development of an online database management system for musical copyrights and brought on board paying beta users. Managed data entry, reporting, termination and reversion issues for transactions involving musical copyright catalogues valued at over $100 million.

AllianceBernstein LP – White Plains, NY 2006 to 2007
Client Reporting Analyst
Oversaw the monthly and quarterly report process for clients domiciled outside the United States. Increased by 150% the amount of accounts that met a fifth business day deadline. Transferred firm's quarterly reporting process to new system.

Compex Integrated Systems, Inc. LP – Framingham, MA 2005 to 2006
Database Systems Consultant
Designed and implemented custom modules for metal fabrication and finishing business management software. Recruited and trained a team of developers to aid in Compex Integrated System's growth.

Education

Clark University – Worcester, MA
B.A., Magna cum Laude, *Mathematics and Computer Science*, 2006.

Kansai Gaidai University: Hirakata City, Osaka Japan.
Spring Semester 2005

General Assembly: New York City, NY
Data Science Intensive Course, 2015

Recent Project Experience

Research on Leading Energy Efficiency Portfolios
Green Energy Economics Group *(November 2007 – Present)*

- Maintain research and proprietary analysis on actual and projected results from over a dozen electric and natural gas demand side management (DSM) portfolios throughout North America;
- Published paper for the 2012 ACEEE Summer Study on Energy Efficiency in Buildings.

Development of Energy Efficiency and Conservation Plan
UGI Utilities, Inc. – Gas Division ("UGI Gas") *(June 2015 – Present)*
Reading, Pennsylvania
Assist UGI Gas with the development of five year Energy Efficiency and Conservation (EE&C) Plan including:

- Developing an achievable efficiency scenario
- Designing six energy efficiency programs and one combined heat and power (CHP) program
- Preparing testimony before the Pennsylvania PUC

Strategic Planning and Implementation of Five-year DSM Portfolio
Philadelphia Gas Works ("PGW") *(August 2008 – Present)*
Philadelphia, Pennsylvania

- Member of lead consulting team that aided in the design and approval of PGW's five-year, $54 million portfolio of DSM programs;
- Providing ongoing technical assistance in the development of PGW's $35 million Phase II five year plan.
- Providing ongoing technical support in program design and implementation, including the roll-out of six programs that, combined since inception, have saved 120,000 MMBtus at a cost of approximately $17 million;
- Developed specifications for and currently collaborating with internal PGW staff on database system to track weatherization projects, rebate applications, and other information pertaining to PGW's DSM portfolio;
- Developed multiple Excel-based tools used by contractors to perform field audits, provide QA/QC, and track ongoing progress for contractors, programs, and the portfolio as a whole;
- Provided research and analysis support for multiple rounds of expert testimony before the Pennsylvania Public Utility Commission (Docket R-2009—2149884);
- Aided in the issuance of RFPs and selection of candidates for over $40 million in contracts;
- Major contributor to PGW's ongoing formal reporting and evaluation process, including the issuance of five implementation plans, three annual reports, and two impact evaluations.

Technical Assistance for Energy Efficiency Program Planning
Green Mountain Power *(August 2012 – Present)*
Vermont

- Developed multivariable regression model and framework to estimate the cost per kW to address a reliability gap in the St. Albans region with targeted energy efficiency.
- Reviewed and analyzed program proposals for the $20 million Community Energy & Efficiency Development Fund (CEED Fund), including the development of scoring and rebalancing mechanisms;
- Analyzed dataset of 5,000 custom business projects to establish models used for future planning exercises.
- Prepared report on uncounted benefits of renewable generation sources for Vermont.

Analysis of Energy Efficiency in British Columbia
BC Sustainable Energy Association & Sierra Club BC *(May 2011 – Present)*
British Columbia, Canada

- Provided comments and energy efficiency opportunities report for proceedings on FortisBC Gas and Electric's long-term DSM plans in December of 2013.
- Assisted on research for direct testimony on reasonableness of gas DSM Plan by Fortis Energy Utilities before the British Columbia Utilities Commission, BCUC Project No. 3698627;
- Technical support on assessment of FortisBC Electric's long-term DSM plan and corresponding expert testimony;
- Assistance with direct testimony and technical support on assessment of BC Hydro's long-term DSM plan, before the BCUC.

Technical Assistance for Energy Efficiency Programs
Focus on Energy *(June 2011 – Present)*
Wisconsin

- Developed and customized cost-effectiveness calculators for Wisconsin's Focus on Energy portfolio of energy efficiency programs;
- Trained staff and other consultants on usage of tools and general economic analysis of energy efficiency programs;
- Provided QA/QC on cost-effectiveness analysis of 14 programs spending over $160 million in two years.

Chicagoland Energy Efficiency Portfolio
People's Gas *(September 2008 – January 2013)*
Chicago, Illinois

- Providing ongoing regulatory support;
- Provided cost-benefit analysis of various program scenarios and aided in the analysis of contractor bids;
- Customized excel-based portfolio and project cost-effectiveness tools to client's specifications.

Energy Efficiency Potential in Oklahoma
Sierra Club *(April 2011 – November 2011, December 2013 – January 2014)*
Oklahoma

- Provided updated report for energy efficiency in Oklahoma and additional comments on PUC rulemaking for electric and gas utility programs.
- Preparation of report on energy efficiency potential for Oklahoma;
- Assistance with research and drafting comments on the US regional haze Federal Implementation Plan for the State of Oklahoma;
- Research and formulation of energy efficiency potential projections provided as part of expert testimony for Oklahoma Gas & Electric's rate case before the Corporation Commission of Oklahoma, Cause No. PUD 201100087.

Testimony Support for Expanding Gas Energy Efficiency in Pennsylvania
Citizens for Pennsylvania's Future, *Pennsylvania* *(July 2013 – September 2013)*

- Provided support on preparation of testimony regarding Peoples Gas of Pennsylvania's DSM plans, including preparation of benchmarking report and alternative scenario projections.

Energy Efficiency Potential in Texas
Sierra Club, *Texas* *(May 2012 – August 2012)*

- Research and development of alternative energy efficiency potential scenarios for the ten investor owned utilities (IOUs) in Texas;
- Development of comments for the Public Utility Commission of Texas;
- Development of presentation before the Energy Efficiency Incentive Program Committee.

Austin Energy's Energy Efficiency Potential
Austin City Council Consumer Advocate *(April 2012)*
Austin, Texas

- Research and development of alternative energy efficiency potential scenarios for Austin Energy.

Nevada Power's Energy Efficiency Potential
Sierra Club *(November 2011 – June 2012)*
Nevada

- Research on Nevada Power's Integrated Resource Plan (IRP) and development of alternative energy efficiency potential projections.

Comments on EmPower Maryland Programs
Sierra Club *(September 2011 – October 2011)*
Maryland

- Research for and development of comments on EmPower Maryland's energy efficiency programs, including the development of alternative energy efficiency potential projections.

Ontario Power Authority Field Audit Support Tool
Green Communities Canada *(January 2011 – May 2011)*
Ontario, Canada

- Collected and implemented specifications for updating the tool used by Ontario Power Authority's low-income program field agents to collect data and determine project net present values;
- Added custom features including customer input forms, saving and closing routines, and database file importing.

Energy Efficiency Potential in Arkansas
Sierra Club/Audubon Society *(September 2009 – March 2010)*
Arkansas

- Research and drafting assistance for expert testimony on energy efficiency' as an alternative to the White Bluff Steam Electric Station before the Public Service Commission of Arkansas, Docket No. 09-024-U.

Training for NGOs Working on Energy Efficiency Projects in China
ISC and NRDC *(August 2008 – September 2010)*
United States and China

- Developed training materials and provided remote and in-person training sessions on the economic and financial analysis of industrial retrofit projects for structuring and negotiating financial incentive offers to customers;
    - Worked with the Institute for Sustainable Communities (ISC) to aid its efforts to promote energy efficiency in the Guangdong and Jiangsu Provinces (February 2009 – September 2010);
    - Worked with the National Resource Defense Council (NRDC) to aid in its efforts in China, especially in conjunction with a $100 million revolving loan fund from the Asia Development Bank (August 2008- January 2009).

Incentive Calculations for the Project Cost-effectiveness Analysis Tool (CAT)
Efficiency Vermont *(November 2008 – June 2010)*
Burlington, Vermont

- Aided in the design of a new approach to calculating incentives for custom energy efficiency projects based on financing and reaching a desired rate of return;
- Modified CAT's cash-flow projection engine, an Excel VBA system, to accommodate the new approach to incentives.

Vermont's 20-year Forecast of Electricity Savings from Sustained Investment
Efficiency Vermont *(December 2008 – October 2009)*
Burlington, Vermont

- Provided components of final report relating to long-term trends for the environment (climate change, land-use, and water-use), population growth, and governmental regulation;
- Provided additional technical support on electric demand-side savings potential.

Connecticut's Long Term Acquisition Plan
Connecticut Office of the Consumer Council *(August – October 2008)*
Connecticut

- Provided research and support for expert testimony regarding long-range energy-efficiency procurement plan of the Energy Conservation Management Board, on behalf of the Connecticut Office of Consumer Counsel.

Energy Efficiency Plans of BC Hydro and Terasen Gas
BC Sustainable Energy Association and The Sierra Club *(October 2008 – March 2009)*
British Columbia, Canada

- Provided research and support for expert testimony and technical support on assessment of BC Hydro's long-term DSM plan, before the BCUC, on behalf of the BC Sustainable Energy Association and Sierra Club Canada (November 2008 – March 2009);
- Provided research and support for expert testimony on assessment of Terasen Gas conservation plans before the BCUC, on behalf of the BC Sustainable Energy Association and Sierra Club Canada (October 2008).

Publications

Plunkett, John, Theodore Love, Francis Wyatt. "An Empirical Model for Predicting Electric Energy Efficiency Acquisition Costs in North America: Analysis and Application". In *Proceedings of the ACEEE 2012 Summer Study on Energy Efficiency in Buildings*, #906, Washington, D.C.: American Council for an Energy Efficient Economy.

Gold, Elliott, Marie-Claire Munnelly, Theodore Love, John Plunkett, Francis Wyatt. "Comprehensive and Cost-Effective: A Natural Gas Utility's Approach to Deep Natural Gas Retrofits for Low Income Customers." In *Proceedings of the ACEEE 2012 Summer Study on Energy Efficiency in Buildings*, #442, Washington, D.C.: American Council for an Energy Efficient Economy.

UGI GAS EXHIBIT TML-2

UGI Utilities, Inc. – UGI Gas

Five Year Energy Efficiency and Conservation Plan

January 19, 2016

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1 Introduction and Background

1.1 Plan Overview

This plan provides a detailed description of the design and implementation of the energy efficiency and conservation portfolio (EE&C Portfolio or Portfolio) that UGI Utilities, Inc. – Gas Division (UGI Gas) is proposing to offer in its energy efficiency and conservation plan (EE&C Plan or Plan). The Plan will have a five-year duration, beginning in UGI Gas's fiscal year (FY) 2017 through FY 2021,[1] and will include both energy efficiency (EE) programs and a combined heat and power (CHP) program. Though UGI Gas is not mandated to enact an EE&C Plan under Act 129, UGI Gas's voluntary EE&C Plan was developed using the guiding principles of the Commission's 2015 Act 129 Phase III Implementation Order.[2] As discussed in more detail below, the Plan portfolio has been evaluated using a Total Resource Cost (TRC) test which is most comparable to the test proposed by PGW for its Phase II plan and similar to the test used by the Commission for Act 129. To estimate the resource savings from standard energy efficiency measures, UGI Gas developed a Technical Reference Manual (TRM) that builds upon the TRM used for PGW's FY 2016 TRM and calibrates it to UGI Gas's territory.

Over the five years of the EE&C Plan, UGI Gas plans to spend $24.8 million in real 2015 dollars on six energy efficiency (EE) programs. The energy efficiency programs are projected to save 647 BBtus of natural gas during the first five years of the Plan, and 7,385 BBtus of natural gas over the lifetime of the measures installed. From a total resource perspective, the present value of benefits is $53.9 million, with $30.6 million in present value of costs, leading to a present value of net benefits of $23.2 million and a TRC benefit-cost ratio of 1.76. Furthermore, the energy efficiency programs are expected to save 92,460 MWh of electricity, 248 million gallons of water, create between 222 and 369 jobs, and

[1] UGI Gas's fiscal year runs October 1st to September 30th.
[2] Implementation Order, Docket No. M-2014-2424864 (entered June 19, 2015)

avoid the emission of CO_2 equivalent to over 19,400 cars being removed from the road for 5 years.

UGI Gas is also proposing the investment of $2.8 million in real 2015 dollars over five years for a CHP program. This program would provide net energy savings to customers over the five years of the Plan of 1,706 BBtus, and 25,591 BBtus over the lifetime of the CHP projects installed. The CHP program will provide present value of net benefits of $44.6 million from a total resource perspective, with a TRC benefit-cost ratio of 1.60.

Altogether, the EE&C Portfolio is very cost-effective, providing $67.9 million in net resource benefits with a TRC benefit-cost ratio of 1.65, greatly increasing the economic wellbeing of UGI Gas's customers.

1.2 Natural Gas and Energy Efficiency

Natural gas is an abundant resource and an important component of the Pennsylvania economy. In 2014, Pennsylvania had the most shale gas proven reserves in the country, driven by the development of the Marcellus Shale,[3] and over 80 percent of the natural gas UGI Gas delivers to its customers comes from the Marcellus Shale. As a result of this reliable, local supply, UGI Gas customers have seen bills decrease substantially since 2008.

Natural gas also has many important advantages as an end-use fuel source. When compared to the use of electricity generated from natural gas or most other fuels, the direct end-use of natural gas is more efficient and environmentally preferable. Natural gas has a source-to-site efficiency of 92 percent, meaning the vast majority of the energy from natural gas is associated with on-site consumption. Electricity on the other hand, only has a source-to-site efficiency of 32 percent, meaning that less than one third of electric energy is used at the site.[4]

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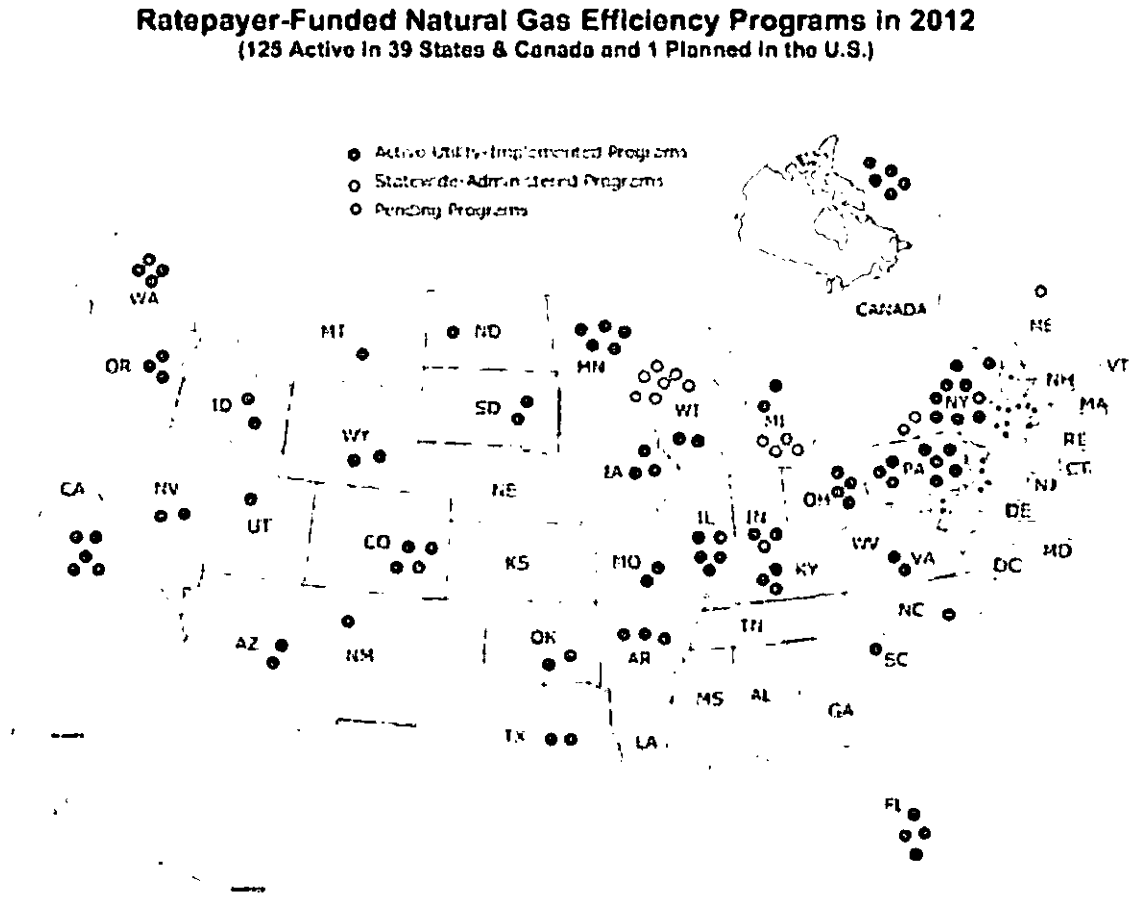
[3] http://marcelluscoalition.org/2015/11/pa-drives-increase-in-u-s-natural-gas-abundance/

[4] Meyer, Richard. Dispatching Direct Use: *Achieving Greenhouse Gas Reductions with Natural Gas in Homes and Businesses*. American Gas Association: Washington, DC. November 11, 2015, p. 5.

As natural gas has continued to grow in importance as a fuel source, natural gas energy-efficiency programs have also shown steady growth activity. The American Council for an Energy Efficient Economy (ACEEE) State Energy Scorecard shows that spending on natural gas energy-efficiency programs has grown both nationally and in the states surrounding Pennsylvania. Nationally, the spending on natural gas energy-efficiency programs has increased by more than five times to $1.4 billion in 2014 from 2006 levels.[5] For states close to Pennsylvania, the rise has been even greater, with New York more than tripling budgets to $175 million between 2009 and 2013 and Maryland going from a few hundred thousand dollars a year in 2009 to $15 million per year in 2013. Within Pennsylvania, a number of gas utilities have undertaken voluntary energy efficiency programs, including Columbia Gas and Philadelphia Gas Works (PGW), which is currently seeking approval for its second five-year gas efficiency portfolio. The trend towards gas efficiency has also spread throughout the United States, as shown in Figure 1.

[5] ACEEE (American Council for an Energy-Efficient Economy), *The 2015 State Energy Efficiency Scorecard*, Annie Gilleo, et al, October 2015, p. 23.

Figure 1. Spread of Natural Gas Energy Efficiency Programs[6]



As the energy market is becoming increasingly customer driven, utilities around the country are recognizing the opportunity to drive economic growth and an efficient economy by sponsoring energy efficiency and conservation programs. For natural gas utilities, the opportunity to invest in helping customers save money, increase comfort, and reduce the impact they have on the environment is now a crucial component of joining the next generation of energy utilities and benefiting the communities that they serve.

[6] American Gas Association. "Natural Gas Efficiency Programs Brief: Investments and Savings – 2012 Program Year". March 2014, p. 4.

1.3 Goals

UGI Gas has the following core goals:

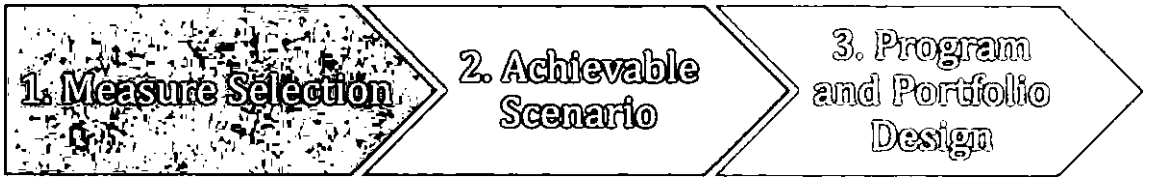
- Help customers save energy cost-effectively through a holistic approach to energy efficiency and conservation;
- Avoid lost opportunities and provide deep levels of savings ;
- Provide a wide range of services for UGI Gas's diverse customer base; and
- Contribute to the economic welfare of its customers and Pennsylvania.

In order to reach these goals, UGI Gas will utilize energy efficiency programs and a CHP program. For its energy efficiency programs, UGI Gas plans to invest approximately $24.8 million in 2015 dollars ($27.0 million nominal) over five years with the goal of returning $23.2 million dollars in present value of total resource net benefits to customers. As a secondary goal for efficiency programs, UGI Gas expects to save customers 7,385 BBtus of natural gas and 510,000 tons of CO_2 emissions over the lifetime of installed measures during the five-year portfolio.

For the CHP program, UGI Gas also plans to invest approximately $2.8 million in 2015 dollars ($3.6 million nominal) over five years with the goal of returning $44.7 million dollars in present value of total resource net benefits to customers.

1.4 Plan Development

Figure 2. Plan Development Process



The UGI Gas EE&C Plan was developed in three stages, as shown Figure 2. The first stage involved the characterization of a wide range of natural gas efficiency measures and project energy savings and costs. Avoided costs for

natural gas and electricity were calculated and combined with the measure and project characterizations for cost-effectiveness screening using the TRC test. The cost-effective measures and projects were then correlated with demographic, building stock, and equipment market characteristics for UGI Gas's territory to calculate achievable savings and participation levels.

Four types of market actions were then identified for inclusion in the portfolio. The first intervention is at the time of "natural replacement", which means helping customers replace broken equipment with equipment that has a higher efficiency than the market baseline. The second intervention is in the new construction and gut rehabilitation market, to make sure that new buildings go above code requirements to save energy. The third intervention is in the retrofit market of existing buildings to make existing buildings more energy efficient. The final intervention is in the behavioral side of energy consumption, through outreach and education. The natural replacement and retrofit markets were divided between residential and nonresidential programs in order to provide more effective program messaging, resulting in six separate energy efficiency programs. A stand-alone CHP program was established based on the program's unique market and reporting requirements. The seven resulting programs are set forth in the following table.

Table 1. Planned Programs

Abbreviation	Program Name	Market Intervention
RP	Residential Prescriptive	Natural Replacement
NP	Nonresidential Prescriptive	Natural Replacement
NC	New Construction	New Construction
RR	Residential Retrofit	Retrofit
NR	Nonresidential Retrofit	Retrofit
BE	Behavior and Education	Behavior
CHP	Combined Heat and Power	Retrofit

Incentive levels were established for each program. Next, non-incentive budgets were developed to address fixed and variable costs associated with

each program and the portfolio as a whole. A target annual investment level was determined, and the programs were weighted to maximize net benefits and avoid lost opportunities. The programs were then staged to reach the target year given operational constraints, and program and portfolio level metrics were checked to make sure they lined up with similar programs and portfolios. Finally, details regarding the implementation of the EE&C Portfolio were developed based on best practices in program design from portfolio administrators in Pennsylvania, such as PGW, and the broader United States, such as National Grid.

1.5 Efficiency Program Benefits

1.5.1 Natural Gas Savings

The following tables provide projected natural gas savings by program and sector for the energy efficiency programs in the EE&C Portfolio.

Table 2. Projected First Year Gas Savings by Program (MMBtus)

Program	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY '17 - '21
Portfolio Total	**14,769**	**54,316**	**151,025**	**208,869**	**218,428**	**647,407**
Residential Prescriptive (RP)	11,969	37,009	49,384	60,395	60,395	**219,152**
Nonresidential Prescriptive (NP)	2,800	10,017	19,819	24,548	24,548	**81,733**
Residential Retrofit (RR)	-	2,772	6,856	8,676	12,678	**30,982**
Nonresidential Retrofit (NR)	-	1,780	4,543	9,086	13,815	**29,223**
New Construction (NC)	-	2,737	5,475	8,742	9,570	**26,524**
Behavior and Education (BE)	-	-	64,948	97,422	97,422	**259,792**

Table 3. Projected Lifetime Gas Savings by Program (MMBtus)

Program	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY '17 - '21
Portfolio Total	**268,207**	**1,003,368**	**1,651,083**	**2,141,624**	**2,320,709**	**7,384,990**
Residential Prescriptive (RP)	222,047	691,542	922,911	1,128,987	1,128,987	**4,094,474**
Nonresidential Prescriptive (NP)	46,161	166,851	329,005	408,224	408,224	**1,358,465**
Residential Retrofit (RR)	-	66,524	164,539	208,232	304,279	**743,574**
Nonresidential Retrofit (NR)	-	25,660	64,097	128,193	192,184	**410,134**
New Construction (NC)	-	52,791	105,582	170,564	189,612	**518,550**
Behavior and Education (BE)	-	-	64,948	97,422	97,422	**259,792**

Table 4. Projected Gas Savings by Sector (MMBtus)

Sector	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY '17 - '21
First Year Gas Savings	**14,769**	**54,316**	**151,025**	**208,869**	**218,428**	**647,407**
Residential (R/RT)	11,969	40,845	123,315	170,574	175,764	**522,468**
Nonresidential (N/NT)	2,800	13,471	27,709	38,295	42,664	**124,938**
Lifetime Gas Savings	**268,207**	**1,003,368**	**1,651,083**	**2,141,624**	**2,320,709**	**7,384,990**
Residential (R/RT)	222,047	781,454	1,199,174	1,524,193	1,646,485	**5,373,353**
Nonresidential (N/NT)	46,161	221,914	451,909	617,430	674,223	**2,011,636**

1.5.2 Electric Savings

The following table shows electric savings for measures installed under the energy efficiency programs in the EE&C Portfolio. The electric savings are secondary savings from measures that primarily save natural gas, such as efficient natural gas furnaces with brushless fan motors and air-conditioning savings from higher insulation.

Table 5. Projected Electric Savings by Sector

Sector	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY '17 - '21
First Year Energy (MWh)	**248.3**	**775.9**	**1,048.6**	**1,311.7**	**1,337.9**	**4,722.6**
Residential (R/RT)	248.3	775.9	1,048.5	1,311.5	1,337.7	**4,722.0**
Nonresidential (N/NT)	-	0.1	0.1	0.2	0.2	**0.6**
Lifetime Energy (MWh)	**4,819**	**15,131**	**20,502**	**25,706**	**26,302**	**92,460**
Residential (R/RT)	4,819	15,130	20,500	25,703	26,298	**92,449**
Nonresidential (N/NT)	-	1	2	4	4	**11**
Summer Peak (kW)	**55**	**172**	**234**	**292**	**300**	**1,052**
Residential (R/RT)	55	172	234	292	300	**1,052**
Nonresidential (N/NT)	-	-	-	-	-	**-**

1.5.3 Water Savings

This section contains projections for water savings due to the energy efficiency programs in the EE&C Portfolio.

Table 6. Projected Water Savings by Sector (Million Gallons)

Sector	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY '17 - '21
First Year Water Savings	**0.6**	**2.8**	**5.8**	**8.0**	**9.0**	**26.2**
Residential (R/RT)	-	0.3	0.7	1.1	1.4	**3.4**
Nonresidential (N/NT)	0.6	2.5	5.1	6.9	7.5	**22.7**
Lifetime Water Savings	**3.4**	**24.6**	**51.8**	**76.4**	**92.2**	**248.5**
Residential (R/RT)	-	6.4	14.4	23.1	30.9	**74.8**
Nonresidential (N/NT)	3.4	18.1	37.4	53.4	61.3	**173.7**

1.5.4 Emission Reductions

This section contains projections for CO_2 emission reductions due to the energy efficiency programs in the EE&C Portfolio. The total savings of 510,000 tons of CO_2 is equivalent to removing 19,463 cars off the road for 5 years. The following table breaks out the emission reductions due to gas savings and electric savings.

Table 7. Projected CO_2 Emission Reductions by Energy Source (Short Tons)

Sector	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY '17 - '21
First Year Reductions	**1,072**	**3,828**	**9,714**	**13,319**	**13,900**	**41,833**
From Gas Savings	864	3,177	8,835	12,219	12,778	**37,873**
From Electric Savings	208	651	879	1,100	1,122	**3,960**
Lifetime Reductions	**19,731**	**71,384**	**113,779**	**146,840**	**157,816**	**509,549**
From Gas Savings	15,690	58,697	96,588	125,285	135,761	**432,022**
From Electric Savings	4,041	12,687	17,191	21,555	22,054	**77,528**

1.5.5 Job Creation

Investing in cost-effective energy-efficiency creates jobs in two ways, one direct and the other indirect, as discussed in a 2012 white paper from the ACEEE.[7] Direct job creation results from hiring related to implementing the programs. Indirect job creation results from the substitution capital spent on natural gas with local capital spent in the local economy. Several times more jobs are created by the indirect or income effect from cost-effective energy-efficiency investment. Further, the net economic benefits from efficiency investment reduce household and business gas bills and raise household disposable incomes and business profitability. Customers will tend to spend most of this additional money and save the rest. This additional spending creates a "multiplier" effect through the cycle of re-spending of the initial cost savings, which stimulates aggregate demand for goods and services. Satisfying increased demand for goods and services requires more labor. While some of the jobs created leak into the broader U.S. and global economy, a good portion

[7] "Energy Efficiency Job Creation: Real World Experiences" Bell, Casey J. American Council for an Energy-Efficiency Economy. October 2012.

(possibly higher than 80%) of jobs created due to energy efficiency stay within the Commonwealth. The approach of looking at net job creation through both direct means and with economic multiplier effects is endorsed in the 2012 white paper from ACEEE.

The number of jobs created from investments in energy efficiency directly relates to the total resource value of the energy that these measures save. *Studies of employment impacts of DSM use energy savings as a surrogate for* total resource value. A recent meta-study of U.S. data found that estimates for the number of jobs created had a wide range, but that most studies estimate that between 30 and 60 net jobs are created by saving one TBtu.[8] In New York, New Jersey, and Pennsylvania, the ACEEE projected that 164,320 jobs, or 59 for every TBtu saved, could be attributed to EE in 1997 through 2010.[9]

As shown in the following table, UGI Gas estimates that its gas energy efficiency programs portfolio will generate between 222 and 369 net additional jobs over the lifetime of the efficiency measures installed over the next five-years. This range is based on assuming that each TBtu of gas savings creates between 30 and 50 full-time equivalent jobs in Pennsylvania.

[8] Laitner, Skip, and Vanessa McKinney. June 2008. *Positive Returns: State Energy Efficiency Analyses Can Inform U.S. Energy Policy Assessments*. Washington, D.C.: American Council for an Energy Efficiency Economy.

[9] Nadel, Steven, Skip Laitner, Marshall Goldberg, Neal Elliott, John DeCicco, Howard Geller, and Robert Mowris. 1997. *Energy Efficiency and Economic Development in New York, New Jersey, and Pennsylvania. Washington, D.C.*: American Council for an Energy Efficiency Economy.

Table 8. Estimated Job Creation due to Energy Efficiency Programs

	30 Jobs/TBtu	40 Jobs/TBtu	50 Jobs/TBtu
Residential Sector			
FY 2017	7	9	11
FY 2018	23	31	39
FY 2019	36	48	60
FY 2020	46	61	76
FY 2021	49	66	82
TOTAL	**161**	**215**	**269**
Nonresidential Sector			
FY 2017	1	2	2
FY 2018	7	9	11
FY 2019	14	18	23
FY 2020	19	25	31
FY 2021	20	27	34
TOTAL	**60**	**80**	**101**
Total Portfolio			
FY 2017	8	11	13
FY 2018	30	40	50
FY 2019	50	66	83
FY 2020	64	86	107
FY 2021	70	93	116
TOTAL	**222**	**295**	**369**

1.6 Efficiency Program Costs

The following table provides an overview of the spending by year and by sector on energy efficiency (EE) programs. The EE programs will cost approximately $5.0 million per year over the five years in 2015 dollars ($5.4 million in nominal dollars). The most spent in a single year is the final year, FY 2021, with a $6.9 million budget in 2015 dollars, which is approximately two percent (2%) of UGI Gas's 2015 revenues. This level is similar to the cap that Act 129 imposes on electric efficiency programs in Pennsylvania.[10]

[10] *See* 66 Pa. C.S. § 2806.1(g) (limiting the total cost of an EDC's EE&C Plan to 2% of the EDC's total annual revenue as of December 31, 2006).

Table 9. Projected Efficiency Portfolio by Budgets by Sector

Sector	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY '17 - '21
Nominal	**$2,351,000**	**$4,121,000**	**$5,769,000**	**$7,023,000**	**$7,749,000**	**$27,013,000**
Residential (R/RT)	$1,831,507	$3,358,356	$4,517,817	$5,527,424	$5,969,491	**$21,204,594**
Nonresidential (N/NT)	$519,493	$762,644	$1,251,183	$1,495,576	$1,779,509	**$5,808,406**
2015$	**$2,271,006**	**$3,902,727**	**$5,356,313**	**$6,392,752**	**$6,915,295**	**$24,838,093**
Residential (R/RT)	$1,769,189	$3,180,477	$4,194,633	$5,031,390	$5,327,241	**$19,502,930**
Nonresidential (N/NT)	$501,817	$722,250	$1,161,680	$1,361,362	$1,588,054	**$5,335,163**

The following two tables present the projected efficiency budgets by program in nominal and real 2015 dollars.

Table 10. Projected Efficiency Portfolio Budgets by Program (Nominal)

Program	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY '17 - '21
EE Total	**$2,351,000**	**$4,121,000**	**$5,769,000**	**$7,023,000**	**$7,749,000**	**$27,013,000**
Residential Prescriptive (RP)	716,000	1,731,000	2,307,000	2,755,000	2,815,000	10,324,000
Nonresidential Prescriptive (NP)	250,000	331,000	587,000	663,000	713,000	2,544,000
Residential Retrofit (RR)	200,000	520,000	800,000	1,000,000	1,200,000	3,720,000
Nonresidential Retrofit (NR)	100,000	216,000	306,000	432,000	654,000	1,708,000
New Construction (NC)	135,000	273,000	479,000	638,000	782,000	2,307,000
Behavior and Education (BE)	-	320,000	510,000	735,000	735,000	2,300,000
Portfolio-wide Costs	950,000	730,000	780,000	800,000	850,000	4,110,000

Table 11. Projected Efficiency Portfolio Budgets by Program (2015$)

Program	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY '17 - '21
EE Total	**$2,271,006**	**$3,902,727**	**$5,356,313**	**$6,392,752**	**$6,915,295**	**$24,838,093**
Residential Prescriptive (RP)	691,638	1,639,316	2,141,968	2,507,765	2,512,138	9,492,824
Nonresidential Prescriptive (NP)	241,494	313,468	545,009	603,502	636,289	2,339,762
Residential Retrofit (RR)	193,195	492,458	742,772	910,259	1,070,893	3,409,577
Nonresidential Retrofit (NR)	96,597	204,559	284,110	393,232	583,637	1,562,136
New Construction (NC)	130,407	258,540	444,735	580,746	697,866	2,112,293
Behavior and Education (BE)	-	303,051	473,517	669,041	655,922	2,101,531
Portfolio-wide Costs	917,676	691,335	724,202	728,208	758,550	3,819,970

The portfolio-wide cost lines from the previous two tables are costs that apply to all programs in the EE portfolio. They are costs incurred at the portfolio level for program development, design, tracking, reporting, and administrative overhead. Development costs for the portfolio occur in the first year as programs are designed and reporting infrastructure is put in place. Costs then fall sharply in the second year before climbing as the portfolio grows. In the final year, the

portfolio wide costs represent 11% of the portfolio total cost, however, over the five-year period they represent 15% of the portfolio's costs.

The following tables provide a portfolio-level look at costs by category in nominal and real 2015 dollars.

Table 12. Projected Efficiency Portfolio Budgets by Category (Nominal)

Program	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY '17 - '21
EE Total	**$2,351,000**	**$4,121,000**	**$5,769,000**	**$7,023,000**	**$7,749,000**	**$27,013,000**
Customer Incentives	$551,000	$2,068,000	$3,670,000	$4,804,000	$5,198,000	$16,291,000
Administration	1,447,000	1,588,000	1,440,000	1,556,000	1,690,000	7,721,000
Marketing	329,000	338,000	322,000	367,000	396,000	1,752,000
Inspections	24,000	87,000	137,000	181,000	205,000	634,000
Evaluation	-	40,000	200,000	115,000	260,000	615,000

Table 13. Projected Efficiency Portfolio Budgets by Category (2015$)

Program	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY '17 - '21
EE Total	**$2,271,006**	**$3,902,727**	**$5,356,313**	**$6,392,752**	**$6,915,295**	**$24,838,093**
Customer Incentives	$532,252	$1,958,466	$3,407,465	$4,372,886	$4,638,754	$14,909,824
Administration	1,397,765	1,503,890	1,336,989	1,416,364	1,508,175	7,163,183
Marketing	317,806	320,097	298,966	334,065	353,395	1,624,329
Inspections	23,183	82,392	127,200	164,757	182,944	580,476
Evaluation	-	37,881	185,693	104,680	232,027	560,281

1.7 CHP Program Benefits and Costs

The following tables show the net primary energy savings installed annually for the CHP program.

Table 14. Projected Net Primary Energy Savings from CHP (MMBtus)

Savings	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY '17 - '21
First Year Savings	169,855	169,855	455,460	455,460	455,460	**1,706,090**
Lifetime Savings	2,547,828	2,547,828	6,831,898	6,831,898	6,831,898	**25,591,350**

The following table provides the net CO_2 emission reductions due to the CHP program.

Table 15. Net CO_2 Emission Reductions due to CHP (Short Tons)

Savings	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY '17 - '21
Incremental Annual	17,155	17,155	22,271	22,271	22,271	**101,124**
Cumulative	17,155	34,310	56,582	78,853	101,124	**101,124**

The following table provides the annual projected budget for the CHP program in nominal and real 2015 dollars.

Table 16. Projected CHP Program Budgets

Spending	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY '17 - '21
Nominal	$418,500	$435,650	$852,825	$922,412	$997,821	**$3,627,208**
2015$	$387,500	$373,500	$677,000	$678,000	$679,100	**$2,795,100**

The following table provides the combined EE Program and CHP budgets in real 2015 dollars by category for FY 2017, which is used as the reference year in UGI Gas's Base Rate Case filing.

Table 17. Reference Year (FY 2017) Budget by Category and Sector

Program Category	R/RT	Non-Residential	Total
Customer Incentives	$ 471,396	$ 310,856	$ 782,252
Administration	$ 1,108,417	$ 339,349	$ 1,447,765
Marketing	$ 172,955	$ 209,851	$ 382,806
Inspections	$ 16,422	$ 9,262	$ 25,683
Evaluation	$ -	$ 20,000	$ 20,000
Total Expenses	$ 1,769,189	$ 889,317	$ 2,658,506

1.8 Cost-Effectiveness Analysis

This section provides cost-effectiveness projections for EE&C using the TRC test, which is the primary metric by which UGI Gas judges the portfolio.

Table 18. Cost-effectiveness Summary of Energy Efficiency Programs for Five-Year Portfolio (2015$)

Program	Total Resource PV Benefits	Total Resource PV Costs	Total Resource PV Net Benefits	Total Resource BCR
EE&C Total	**$172,528,340**	**$104,668,959**	**$67,859,381**	**1.65**
Residential Prescriptive (RP)	$31,130,604	$14,907,355	$16,223,249	2.09
Nonresidential Prescriptive (NP)	$8,708,345	$3,813,860	$4,894,485	2.28
Residential Retrofit (RR)	$4,816,226	$3,509,802	$1,306,423	1.37
Nonresidential Retrofit (NR)	$3,347,061	$1,739,899	$1,607,162	1.92
New Construction (NC)	$3,671,531	$1,919,760	$1,751,772	1.91
Behavior and Education (BE)	$2,178,476	$1,624,141	$554,335	1.34
Portfolio-wide Costs	$-	$3,108,352	$(3,108,352)	-
EE Programs	**$53,852,243**	**$30,623,169**	**$23,229,074**	**1.76**
CHP Program	$118,676,097	$74,045,790	$44,630,307	1.60

1.8.1 Cost-Effectiveness Analysis Methodology

The cost-effectiveness results reported in the Plan followed standard industry practices for utilizing the TRC test for cost-effectiveness. The TRC test methodology used is similar to the test utilized by the electric utilities under Act 129 of 2008, and presents results from the standpoint of the entire service territory. To calculate benefits, projected natural gas, electricity, and water savings are multiplied by avoided costs and this stream of future values is discounted to the present.[11] For measures that have an increase in resource usage, such as CHP projects, the increase in usage may offset some, or all, of the positive benefit derived from resource savings. The cost side of the test consists of the present value of all incremental costs incurred by participants, including net operation and maintenance costs, and the non-incentive costs incurred by the portfolio administrator. If the benefits outweigh the costs (the benefit-cost ratio is above one), then the total cost of energy services for an average customer within the territory will fall and the portfolio is considered cost-effective. Results for the Program Administrator Cost (PAC) test are also included. The PAC only includes the costs for program administration and incentives, not additional customer costs. Since UGI Gas is a natural gas utility, the benefits for the PAC test are the natural gas savings.

The analysis used a real discount rate (RDR) of 5.88%. The RDR was calculated using an assumption of a nominal discount rate (NDR) of 8.00%, based on UGI Gas's weighted average cost of capital (WACC), and an inflation rate of 2.0%. UGI Gas employed an Excel spreadsheet-based tool to calculate the cost-effectiveness of the EE&C Portfolio.

1.8.2 Avoided costs

UGI Gas developed avoided costs following the approach used by the Pennsylvania PUC in the Act 129 proceedings. Gas costs were based on the Henry Hub forwards for 2016–2020, followed by a mix of forwards and Annual

[11] Savings are not currently adjusted for free-ridership or spillover, meaning there is a net-to-gross assumption of 1.0, which is in line with current assumptions by PGW and Act 129 utilities.

Energy Outlook values through 2025, and the Annual Energy Outlook projections thereafter. The costs of baseload, winter storage and peaking capacity were added (paralleling the inclusion of generation capacity in the electric avoided costs), along with avoidable local distribution costs, using the same method employed by the Statewide Evaluator and adopted by the PUC in the Act 129 TRC proceeding.[12]

Evaluation of some gas-efficiency programs and CHP also requires estimates of avoided electric costs, which were taken directly from the analysis by the Statewide Evaluator for PPL Electric Utilities Corporation and Metropolitan Edison Company, the two major EDCs whose service territories overlap with UGI Gas's service territory, restated to constant 2015 dollars.[13] Both the electric and gas avoided costs reflect the benefits of reduced supply prices and emissions. A table showing the annual values for gas and electric avoided costs is included in Appendix 3.1.

UGI Gas plans to use these avoided costs for the full five-year plan. However, future market volatility or a change in the regulatory environment may require that UGI Gas update some or all of the avoided costs. If so, UGI will file an updated avoided cost document which includes details on the changes to avoided costs, establishes an effective date for the application of new avoided costs, and provides updated cost-effectiveness projections.

1.9 Implementation

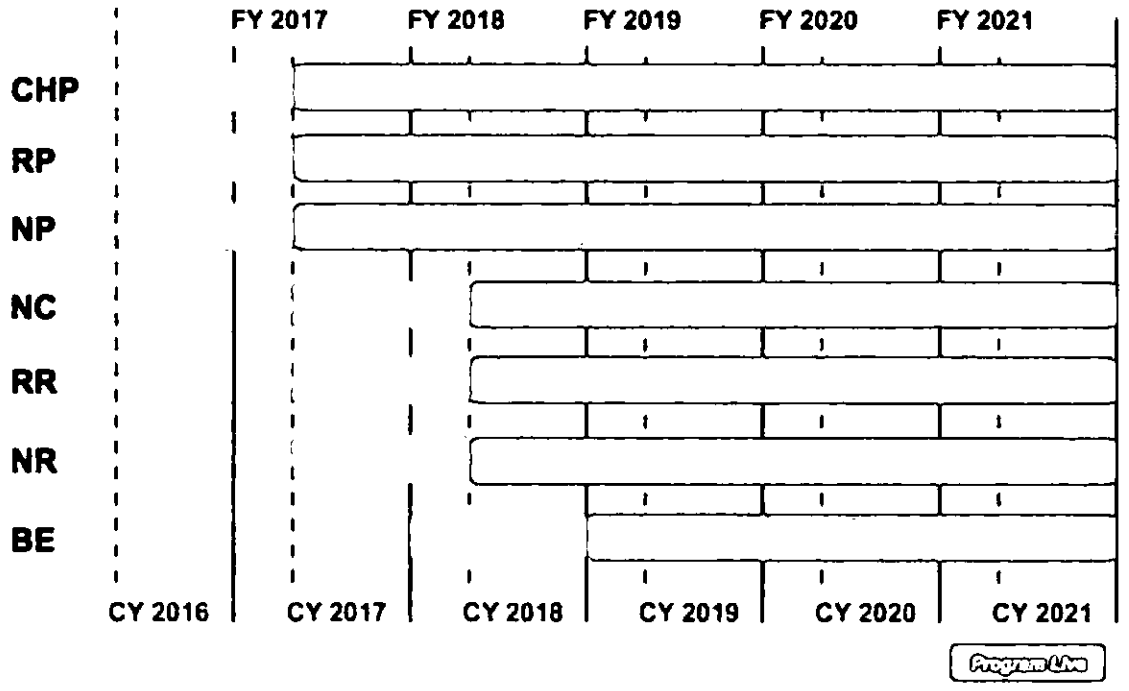
1.9.1 Program Staging

The staging of the EE&C Portfolio is dependent on the approval of the plan, which is anticipated to occur in mid-2016. Each program will require a setup period during which services are contracted through a competitive bidding process, protocols are put in place, reporting systems are established, and

[12] *See 2016 Total Resource Cost (TRC) Test*, Docket No. M-2015-2468992 (Final Order, entered June 22, 2015).
[13] Act 129 SWE Distributed Generation Potential Study, Docket No. M-2014-2424864 (February 13, 2015).

marketing initiatives are finalized before the program is officially launched and open for participation. Once launched, each program will ramp up for three or four years before reaching full participation levels. Figure 3 provides a high-level overview of the planning and launching of each program in the portfolio.

Figure 3. Overview of Program Staging



Once the Plan has been approved, the initial focus will be on rolling out the two prescriptive lost-opportunity energy efficiency programs, RP and NP, with anticipated launch dates in January of 2017. These programs are the cornerstone of the portfolio. The CHP program will also be launched at the same time in order to allow for the very long lead times required for CHP projects.

The NC, RR, and NR programs require a longer setup phase since the programs are more complex than the two prescriptive rebate programs. These three programs are anticipated to launch in January of 2018, and will benefit from the infrastructure developed from the launch of the first three programs.

Rounding out the portfolio is the BE program. It is anticipated to start in October of 2018, in coordination with planned upgrades to UGI Gas's customer

information systems. After all programs are launched, they will continue to ramp up until the Plan reaches its maximum funding levels in FY 2021. Additional details on each program's staging can be found in the individual program description.

1.9.2 Marketing

The EE&C Plan has a two-pronged marketing approach consisting of raising general customer awareness through a campaign around a cohesive portfolio brand, combined with targeted outreach and strategic partnerships with community based organizations and trade allies. Marketing efforts will be coordinated at the program level in order to leverage opportunities for multiple programs at the same time, and focus on opportunities tailored to the customer, regardless of which program incentives will ultimately be offered.

General Awareness and Branding

UGI Gas will develop an overall brand for the EE&C Plan that will be used as an umbrella for all program activity. This will create a cohesive picture of UGI Gas's efficiency and conservation efforts that should translate into higher engagement levels and more customer participation. The general awareness campaign will be the top of the sales funnel, driving customers to more targeted opportunities (providing the "push"). The central component of the campaign will be a branded micro-website for the portfolio. To do this, the campaign will utilize many approaches including, but not limited to, TV, print, radio, billboards, online ads, social media, bill inserts, sponsorships, grass-roots outreach, residential canvassing efforts, and event sponsorship. Once a customer reaches the website, he or she will be funneled towards appropriate programs and incentives through activities and targeted links. While the website will be the center of the portfolio brand, it will be supplemented with physical handouts and applications. These efforts are anticipated to be particularly important for driving residential sector participation.

Targeted Outreach and Partnerships

The second prong of the marketing campaign is to engage customers through outreach efforts and strategic partnerships (providing a "pull"). These efforts are likely to be the best way to drive nonresidential participation. Successful activities involve all sectors within the community and may include such activities as:

- Partnering with local businesses and trade organizations (builders, contractors, electricians, plumbers, HVAC service providers, equipment suppliers, etc.) to familiarize them with program opportunities, energy efficiency practices and implementation requirements and to utilize them, where appropriate, as one of the program's service delivery channels.
- Targeting equipment manufacturers, distributors, installation contractors and retailers/vendors to make sure they offer high-efficiency equipment and can make customers aware of available incentives.
- Connecting with local business organizations to provide opportunities to address their specific needs and translate them to their tenants, management, and facility operations personnel.
- Assisting school systems in developing comprehensive, standards-based curricula, resources, materials and professional development for educators, school facility audits, and special events.
- Partnering with community-based organizations to develop outreach and program delivery strategies.
- Leveraging any available federal tax credits, if applicable, as well as supplemental consumer incentives (e.g., equipment manufacturers) as a means to increase consumer adoption of high efficiency heating equipment.
- Working with Act 129 electric administrators to combine marketing and delivery options and address all aspects of efficiency at the same time.

1.9.3 Administration

UGI Gas will be the primary administrator of the Plan. UGI Gas will engage the services of various contractors to fulfill all the roles required to implement the Plan. Contractors will be selected through a competitive bidding

process, and UGI Gas will streamline operations across programs as much as possible by hiring a single rebate processor for multiple programs. The table below describes the main roles in the management of the EE&C Plan.

Table 19. Overview of Administration Roles

Role	Description
Plan Administrator	Primarily responsible for program and portfolio planning, management and reporting. Supervises and manages all other roles.
Implementation and Design Consultants	Provides assistance in the design and implementation of many different aspects of the portfolio, including, but not limited to, program design, reporting, marketing, and training. UGI Gas will leverage internal resources wherever possible to provide these services.
Implementation Contractor	Directly responsible for main aspects of program delivery, including but not limited to, customer engagement and retention, technical assistance, measure installation, rebate processing, program tracking, and reporting.
Third-party Inspector	Responsible for measure and project inspections separately from the implementation contractor.
Evaluator	Performs independent program and portfolio evaluations that are used to verify savings and guide future plans.

1.9.4 Reporting

UGI Gas will submit an annual report on the EE&C Plan each January following the close of the fiscal year, approximately three months after the end of the program year. This report will provide information on activity for the previous year and progress towards five-year goals, including, but not limited to:

- First year and lifetime savings;
- Participation;
- Spending;
- Cost-effectiveness;
- Highlights of portfolio and program activity; and

- Updates to program delivery and design.

In order to tie savings and costs together as effectively as possible, results will be reported based on commitments made. Any measures that have been verified as installed within a program year along with any costs committed to these measures, including administration costs, will be counted for that Plan year.

1.9.5 Program Flexibility

In order to make sure that the EE&C Portfolio is able to address changing market conditions and improve service delivery as quickly as possible, UGI Gas requires flexibility in the allocation of budgets and implementation of program improvements. This plan document provides the principles and five-year goals that UGI Gas is seeking, but certain adjustments, such as providing incentives for new measures or moving budgets between years and programs, may be required in order to meet these goals. UGI will include any such adjustments in its annual report, but does not anticipate seeking initial approval for such updates. However, UGI Gas will file an updated EE&C Plan in anticipation of material changes that may have a serious effect on five-year goals, such as:

- The addition or removal of a program.
- A need for total funding levels above those approved for the five-year period.
- Significant changes to cost-effectiveness projections, such as an update to avoided costs or a large reduction in portfolio spending projections.

1.10 Evaluation, Measurement, and Verification

UGI Gas will monitor the ongoing progress of the EE&C Plan in order to provide the highest possible service to customers, while maintaining rigorous processes and controls to ensure that savings and costs are being properly accounted for. UGI Gas will closely track program data, perform independent inspections of completed projects, and perform periodic evaluations for all the programs.

1.10.1 Technical Reference Manual

As discussed above, in order to maintain consistency with existing gas efficiency programs in Pennsylvania, UGI Gas has developed a Technical Reference Manual (TRM) based on the one currently used by PGW's EnergySense portfolio. The UGI Gas TRM calibrates certain measure assumptions to UGI Gas's service territory (such as equivalent full load heating hours) and includes new entries for measures not covered in the PGW TRM. Any results from program evaluations that affect deemed savings calculations will also be added to the UGI Gas TRM.

1.10.2 Tracking System

UGI Gas will require that implementation contractors collect all relevant customer, application, measure, and contractor information and that this data is provided to UGI Gas in a timely fashion. UGI Gas will in turn maintain a program and portfolio-level aggregation of this information to be used for program management and assessment, as well as for annual reporting.

1.10.3 Third-party inspections

Each program will have a third-party inspector, separate from the contractor that performed the work, who will solicit customer feedback and will examine whether the work was done properly and whether the installed measures match the application data. Inspections for large, complex, and custom projects will be mandatory. Inspections rates for prescriptive programs will be designed to gather a statistically significant sample of program activity. See individual program plans for additional details.

1.10.4 Evaluations

With the exception of the BE (Behavior and Education) program, UGI Gas will evaluate each of its programs once adequate participation levels have been reached and a full 12 months of post-participation billing data has been collected. The program will be evaluated again after another two years have passed. Due to the unique nature of the BE program, evaluation activities will begin as soon

as the program starts up and continue on an annual basis throughout the program's existence.

As part of the initial program development, UGI Gas will work with the selected evaluator to establish the methodology and goals of the process evaluation. Initial objectives include:

- Verifying energy savings and associated costs;
- Assessing market attitudes towards the program, including contractors, customers, and efficient equipment suppliers; and
- Measuring the effectiveness of current program design, marketing, and service delivery.

The evaluation section of the individual program plans includes additional details on evaluation schedules and goals unique to that program.

2 Program Plans

2.1 Residential Prescriptive

Objective

The Residential Prescriptive (RP) program is designed to overcome market barriers to energy efficient space and water heating equipment in the residential sector through rebates and customer awareness. The objective of the program is to avoid lost opportunities by encouraging consumers to install the most efficient gas heating technologies available when replacing older, less efficient equipment. The program also aims to strengthen UGI Gas's relationship with HVAC contractors, suppliers, and other trade allies.

Eligible Rate Class

R/RT

Cost Effectiveness

Five-Year Cost-Effectiveness Results (2015$)

CE Test	PV Benefits	PV Costs	PV Net	BCR
TRC	$31,130,604	$14,907,355	$16,223,249	2.09
Gas Admin	$26,480,582	$7,479,279	$19,001,303	3.54

Savings Projections

Five-Year Savings Projections

	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY '17 – FY '21
Natural Gas (MMBtus)						
First Year	11,969	37,009	49,384	60,395	60,395	219,152
Lifetime	222,047	691,542	922,911	1,128,987	1,128,987	4,094,474
Electric Energy (kWh)						
First Year	248,350	753,969	1,002,319	1,231,218	1,231,218	4,467,074
Lifetime	4,819,127	14,635,782	19,454,909	23,899,518	23,899,518	86,708,853

	Peak (kW)	54.6	165.9	220.5	270.9	270.9	982.8
	Water (Gallons)						
	First Year	-	-	-	-	-	-
	Lifetime	-	-	-	-	-	-

Budget Projections

Five-Year Budgets (Nominal)

Category	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY '17 – FY '21
Customer Incentives	$488,000	$1,528,000	$2,040,000	$2,500,000	$2,500,000	**$9,056,000**
Administration	112,000	73,000	79,000	84,000	84,000	**432,000**
Marketing	99,000	67,000	77,000	85,000	85,000	**413,000**
Inspections	17,000	53,000	71,000	86,000	86,000	**313,000**
Evaluation	-	10,000	40,000	-	60,000	**110,000**
Total	**$716,000**	**$1,731,000**	**$2,307,000**	**$2,755,000**	**$2,815,000**	**$10,324,000**

Five-Year Budgets (2015$)

Category	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY '17 – FY '21
Customer Incentives	$471,396	$1,447,068	$1,894,068	$2,275,649	$2,231,028	**$8,319,208**
Administration	108,189	69,133	73,349	76,462	74,963	**402,096**
Marketing	95,631	63,451	71,492	77,372	75,855	**383,802**
Inspections	16,422	50,193	65,921	78,282	76,747	**287,565**
Evaluation	-	9,470	37,139	-	53,545	**100,154**
Total	**$691,638**	**$1,639,316**	**$2,141,968**	**$2,507,765**	**$2,512,138**	**$9,492,824**

Participation Projections

Five-Year Participation Projections

	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY '17 – FY '21
Furnace - ENERGY STAR	520	1,580	2,100	2,580	2,580	**9,360**
Boiler - 94+ AFUE	40	140	180	230	230	**820**
Combi Boiler - 94+ CAE	-	10	20	20	20	**70**
Wi-Fi Thermostat	1,020	3,060	4,080	5,000	5,000	**18,160**
Tankless Water Heater - 82 EF	110	340	460	525	525	**1,960**
Tankless Water Heater - ENERGY STAR	110	340	460	560	560	**2,030**
Total	**1,800**	**5,470**	**7,300**	**8,915**	**8,915**	**32,400**

Program Rollout

June 2016 – December 2017	Finalize program process and implementation details, select vendors, and develop initial marketing push.
January 2017	Launch Program.
FY 2018 - FY 2019	Continue engagement activities with customers and trade allies.
FY 2020	Reach full participation levels.

Program Design

The RP program offers mail-in rebates for qualifying residential-sized space and water heating equipment. Customers will be made aware of opportunities through traditional marketing efforts, such as bill inserts and media advertisements, as well as from installation contractors. For most measures, customers will have a contractor install the measure and receive a cash rebate to offset most of the incremental cost of the higher efficiency equipment. Smaller measures, such as Wi-Fi enabled thermostats, will only require a valid proof of purchase before a cash rebate is issued.

UGI Gas will continue to examine other equipment for potential inclusion in the program, as well as

	the relative market adoption of equipment already receiving incentives. Any new equipment added to the program will have a TRC BCR above 1.0. If program funds begin to run low in a given year, incentive levels may be lowered or equipment removed from the program if additional budget adjustments cannot be made. UGI Gas will aim to provide as little interruption to customers as possible due to such adjustments.
Target Market and End Uses	The RP targets residential consumers who use natural gas to heat their homes and/or generate hot water. In general, the program aims to incentivize only the highest levels of efficient equipment on the market. On the space heating side, the program provides incentives for Wi-Fi enabled thermostats, ENERGY STAR® labeled furnaces, high efficiency boilers, and combination boilers. Wi-Fi enabled thermostats offer the potential for deeper savings than traditional programmable thermostats due to the wide range of features and feedback they offer. ENERGY STAR® requirements for furnaces drive customers toward the highest efficiency tier of condensing units (95+ AFUE) and also require efficient fans that save electricity. The program would require boilers to also go towards the highest efficiency tier with an AFUE of at least 94. Finally, offering incentives for combination space and water heating boilers addresses two types of end-use with one piece of equipment. These "combi boilers" also address issues with orphaned water heaters having existing atmospheric venting systems that are no longer adequate, when switching to condensing heating equipment. The program addresses water heating by offering incentives for tankless water heaters at two

<table>
<tr><td></td><td>different efficiency levels due to the relatively low penetrations of this measure in UGI Gas's territory.</td></tr>
<tr><td>Financial Incentives</td><td>Incentives were designed to be in line with other offerings in the region and/or cover approximately two-thirds of the incremental cost of the measure. The table below lists the proposed incentive schedule.

Proposed Residential Prescriptive Program Rebates (Nominal)
<table><tr><th>Equipment</th><th>Minimum Efficiency</th><th>Proposed Incentive</th></tr><tr><td>Wi-Fi Thermostat</td><td>ENERGY STAR®</td><td>$100</td></tr><tr><td>Furnace</td><td>ENERGY STAR®</td><td>$500</td></tr><tr><td>Boiler</td><td>94+ AFUE</td><td>$1,500</td></tr><tr><td>Combi Boiler</td><td>94+ CAE</td><td>$1,800</td></tr><tr><td>Tankless Water Heater</td><td>82+ EF</td><td>$200</td></tr><tr><td>Tankless Water Heater</td><td>ENERGY STAR®</td><td>$400</td></tr></table>All equipment must be powered by natural gas.</td></tr>
<tr><td>Marketing Approach</td><td>The RP program will be a cornerstone of the two-pronged marketing approach for the portfolio. The program is expected to be a large portion of the general call-to-action on the residential side as well as a key part of trade ally outreach efforts. This will include placement on the UGI.com website as well as a general social media push. This program will also include more tailored messages for realtors, developers, owners, and managers of larger multi-family properties in order to make sure that high efficiency options are considered when bulk-purchasing decisions may be made.</td></tr>
</table>

Evaluation, Measurement, and Verification	Quality Assurance All applications will require proof of purchase and a valid UGI Gas account number. All equipment, except for Wi-Fi thermostats, will also require proof of installation, including information about the installing contractor. The rebate processor will verify that the equipment is eligible for the rebate based on the model number before issuing any rebate. The program's rebate processor will maintain a real-time database of rebate activity, which will be periodically reviewed by UGI Gas and stored separately for long-term purposes. A third-party inspector will perform on-site inspections on five percent (5%) of non-thermostat equipment rebates and three percent (3%) of Wi-Fi thermostat rebates in order to get a statistically significant sample of activity. The inspection will consist of verifying that the rebated equipment is installed and operational and conclude with a short informational interview with the participant. Evaluations The program is expected to have enough activity to allow for an impact evaluation to start at the end of FY 2018 with a second evaluation scheduled for FY 2021. The initial evaluation will have a particular focus on Wi-Fi thermostats in order to determine the best way to utilize them as a measure. The RP evaluations will also include feedback from installation contractors and supply houses about current market conditions, such as availability and adoption of high efficiency technology, and awareness of the program.

Program Administration	Rebate Processing UGI Gas will engage a contractor to be the main rebate processor. This may include accepting customer applications, tracking and verifying application information, notifying the customer of any issues, maintaining a call center, and reporting results to UGI Gas. The rebate processor may also be responsible for other rebate programs in order to streamline portfolio management. Marketing and Outreach The main marketing and outreach contractor in combination with the UGI Gas internal marketing team will handle marketing and outreach for the RP program. Inspector A separate contractor will perform on-site inspections and collect customer feedback. Evaluator A third-party evaluator will be retained to perform regular evaluations.
Special Notes	The program is currently designed so that a cash rebate will be offered for Wi-Fi thermostats. If initial evaluation, and participant and trade ally feedback are positive, UGI Gas will move towards offering upstream incentives for this technology. This could result in much higher levels of participation, but would have a lower impact on budgets due to the size of the incentive offered. A key risk factor for the program is a changing baseline for furnaces in the Northern United States.

	There is a possibility that new federal standards and/or a general market shift towards condensing furnaces may necessitate a higher baseline for high efficiency furnaces. While the current efficient condition for natural gas furnaces would still exceed an anticipated baseline shift, savings and incentive levels would be adjusted downwards and savings and/or spending goals may need to be adjusted accordingly.

2.2 Nonresidential Prescriptive

Objective

The Nonresidential Prescriptive (NP) Program is designed to overcome market barriers to energy efficient equipment in the small business and commercial sector through rebates and customer outreach. The objective of the program is to encourage business owners to install the most efficient gas heating and process technologies available to replace older, less efficient equipment. The program also aims to strengthen UGI Gas's relationship with HVAC contractors, suppliers, and other trade allies.

Eligible Rate Class

N/NT

Cost Effectiveness

Five-Year Cost-Effectiveness Results (2015$)

CE Test	PV Benefits	PV Costs	PV Net	BCR
TRC	$8,708,345	$3,813,860	$4,894,485	2.28
Gas Admin	$8,138,290	$1,845,275	$6,293,015	4.41

Savings Projections

Five-Year Savings Projections

	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY '17 – FY '21
Natural Gas (MMBtus)						
First Year	2,800	10,017	19,819	24,548	24,548	81,733
Lifetime	46,161	166,851	329,005	408,224	408,224	1,358,465
Electric Energy (kWh)						
First Year	-	-	-	-	-	-
Lifetime	-	-	-	-	-	-
Peak (kW)	-	-	-	-	-	-
Water (Gallons)						
First Year	573,340	2,231,055	4,362,355	5,509,035	5,509,035	18,184,820
Lifetime	3,440,040	13,386,330	26,174,130	33,054,210	33,054,210	109,108,920

Budget Projections

Five-Year Budgets (Nominal)

Category	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY '17 – FY '21
Customer Incentives	$63,000	$225,000	$450,000	$550,000	$550,000	$1,838,000
Administration	100,000	50,000	50,000	50,000	50,000	300,000
Marketing	80,000	31,000	32,000	33,000	33,000	209,000
Inspections	7,000	15,000	25,000	30,000	30,000	107,000
Evaluation	-	10,000	30,000	-	50,000	90,000
Total	**$250,000**	**$331,000**	**$587,000**	**$663,000**	**$713,000**	**$2,544,000**

Five-Year Budgets (2015$)

Category	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY '17 – FY '21
Customer Incentives	$60,856	$213,083	$417,809	$500,643	$490,826	$1,683,217
Administration	96,597	47,352	46,423	45,513	44,621	280,506
Marketing	77,278	29,358	29,711	30,039	29,450	195,835
Inspections	6,762	14,206	23,212	27,308	26,772	98,259
Evaluation	-	9,470	27,854	-	44,621	81,945
Total	**$241,494**	**$313,468**	**$545,009**	**$603,502**	**$636,289**	**$2,339,762**

Participation Projections

Five-Year Participation Projections

	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY '17 – FY '21
C&I Custom Rebate	3	10	21	24	24	83
Commercial Boiler - 85+ Et	7	26	50	62	62	207
Commercial Boiler - 90+ Et	2	8	16	21	21	68
Unit Heater (Warm Air)	24	88	171	214	214	711
Steam Trap (<15 PSIG)	2	8	15	19	19	63
Steam Trap (15<= PSIG < 75)	2	8	15	19	19	63
Steam Trap (>= PSIG)	4	15	31	39	39	128
Commercial Water Heater	12	46	89	111	111	369
Commercial Gas Fryer	3	10	19	24	24	80
Commercial Gas Fryer (Large Vat)	1	3	6	8	8	26
Commercial Gas Steam Cooker	1	2	4	5	5	17
WaterSense Pre-Rinse Spray Valve	5	15	29	37	37	123
Total	**66**	**239**	**466**	**583**	**583**	**1,938**

Program Rollout	*June 2016 – December 2017*	Finalize program process and implementations details, select vendors, and develop initial marketing push.
	January 2017	Launch Program.
	FY 2018 - FY 2019	Continue engagement activities with customers and trade allies.
	FY 2020	Reach full program participation.
Program Design	The NP program offers rebates for qualifying commercial-sized space heating, water heating, commercial kitchen, and custom applications. Customers will be made aware of opportunities through traditional marketing efforts, such as bill inserts and media advertisements, installation contractors, and supply houses. Customers will have a contractor install the measure and receive a cash rebate to offset most of the incremental cost of the higher efficiency equipment. Given the anticipated enrollment numbers, a comprehensive (multi-measure) prescriptive rebate form is a good choice for documenting and reporting measures to UGI Gas managers. UGI Gas will continue to examine other equipment for potential inclusion in the program, as well as the relative market adoption of equipment already receiving incentives. Any new equipment added to the program will have a TRC BCR above 1.0. If program funds begin to run low in a given year, incentive levels may be lowered or equipment removed from the program if additional budget adjustments cannot be made. UGI Gas will aim to provide as little interruption to customers as possible due to such adjustments.	
Target Market and End Uses	The NP program will serve the small business and commercial market such as office buildings,	

	restaurants, and agricultural facilities, and targets three main end-uses. The first and largest end-use targeted is space heating, through commercial boilers, unit heaters, and steam traps. The second target end-use is commercial water heaters. The last end-use is for addressing both cooking and hot water heating through gas fryers, steam cookers, and pre-rinse spray valves. The program also offers a custom application track for single-measure projects that are not already covered by prescriptive rebates. The custom track is expected to cover technology like heat-recovery systems, infrared heaters, controls, range-hood ventilation make-up air systems, and other more site-specific applications. The custom track will be a source for potential technologies to include as prescriptive rebates.
Financial Incentives	Incentives were designed to be in line with other offerings in the region and/or cover approximately two-thirds of the incremental cost of the measure. The table below lists the proposed incentive schedule. ***Proposed Nonresidential Prescriptive Program Rebates (Nominal)***

Equipment	Minimum Efficiency	Proposed Incentive
Commercial Boiler (>= 300MBh)	85+ Et	$2 / MBh
Commercial Boiler (>= 300MBh)	90+ Et	$2 / MBh + $2,000
Unit Heater (Warm Air)	90+ Et/AFUE	$2 MBh
Steam Trap	<15 PSIG	$50
Steam Trap	15<= PSIG <75	$150
Steam Trap	>= 75 PSIG	$250

	Commercial Water Heater	ENERGY STAR®	$4 / MBh
	Commercial Fryer	ENERGY STAR®	$1,400
	Commercial Fryer (Large)	ENERGY STAR®	$1,900
	Commercial Steam Cooker	ENERGY STAR®	$600
	Pre-Rinse Spray Valve	WaterSense®	$50
	An application on the custom track will be analyzed for cost-effectiveness and a custom incentive will be offered based on the internal rate of return and simple payback of the project. The incentive will not be larger than the gas benefits or incremental cost of the project, and the maximum incentive allowed for a custom project will be $25,000. All equipment must be powered by natural gas.		
Marketing Approach	The NP marketing approach focuses on targeted outreach to trade allies and supply houses. Outreach efforts will attempt to reach the decision maker at the time of, and in advance of, the need for equipment replacement. UGI Gas will provide regular outreach and training sessions on efficiency opportunities with HVAC contractors, heating suppliers, kitchen equipment suppliers, local business organizations, and other parties that deal with commercial equipment to provide education on opportunities for engagement with the program, hand out rebate applications, and encourage the stocking of high efficiency equipment. Good penetration rates will rely heavily on an educated contractor network to understand how to up-serve participants with more efficient		

	products when a service call is requested or new equipment is needed. Contractor training will be provided to those already part of the existing contractor network and qualified for commercial work. UGI Gas will also promote the program through its UGI.com website and other online outreach activities.
Evaluation, Measurement, and Verification	Quality Assurance All applications will require proof of purchase and a valid UGI Gas account number. All rebates will require proof of equipment installation, including information about the installing contractor. The rebate processor will verify that the equipment is eligible for the rebate based on the model number before issuing any rebate. The program's rebate processor will maintain a real-time database of rebate activity, which will be periodically reviewed by UGI Gas and stored separately for long-term purposes. A third-party inspector will perform on-site inspections on all custom rebates and five percent (5%) of all prescriptive rebates in order to get a statistically significant sample of ongoing activity. The inspection will consist of verifying that the rebated equipment is installed and operational and conclude with a short informational interview with the participant. Evaluations The program is expected to have enough activity to allow for an impact evaluation to start at the end of FY 2018 with a second evaluation scheduled for FY 2021. The initial evaluation will have a particular focus on the accuracy of heating savings for varying customer types.

	The NP evaluations will also include feedback from installation contractors and supply houses about current market conditions, such as availability and adoption of high efficiency technology, and awareness of the program.
Program Administration	Rebate Processing UGI Gas will engage a contractor to be the main rebate processor. This may include accepting customer applications, tracking and verifying application information, notifying the customer of any issues, maintaining a call center, and reporting results to UGI Gas. The rebate processor may also be responsible for other rebate programs in order to streamline portfolio management. Marketing and Outreach The main marketing and outreach contractor in combination with the UGI Gas internal marketing team will handle marketing and outreach for the RP program. Inspector A separate contractor will perform on-site inspections and collect customer feedback. Evaluator A third-party evaluator will be retained to perform regular evaluations.
Special Notes	Due to the complex nature of the nonresidential equipment market, the exact mix of measures and adoption of different technologies is not easily predicted. While UGI Gas is confident that the

	projected budget levels are appropriate, the exact mix of measures may vary. In order to relieve busy business owners of the paperwork barrier and reduce pressure on the program's rebate processor, UGI Gas will explore batching rebates and paying them directly to contractors, with the rebate amount clearly indicated on the participant's invoice.

2.3 New Construction

Objective

The New Construction (NC) Program is designed to overcome market barriers to energy efficient space and water heating equipment, as well as high efficiency thermal envelopes, in both the residential and nonresidential new construction sector through rebates offered to builders and developers, and general potential buyer awareness. The objective of the program is to avoid lost opportunities by encouraging builders and developers to install the most efficient gas heating technologies available instead of less efficient baseline equipment, as well as promote thermal envelope best practices. The program also aims to strengthen UGI Gas's relationship with architects, builders, HVAC contractors, suppliers, and other trade allies.

Eligible Rate Class

R/RT, N/NT

Cost Effectiveness

Five-Year Cost-Effectiveness Results (2015$)

CE Test	PV Benefits	PV Costs	PV Net	BCR
TRC	$3,671,531	$1,919,760	$1,751,772	1.91
Gas Admin	$3,443,519	$1,643,772	$1,799,747	2.09

Savings Projections

Five-Year Savings Projections

	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY '17 – FY '21
Natural Gas (MMBtus)						
First Year	-	2,737	5,475	8,742	9,570	26,524
Lifetime	-	52,791	105,582	170,564	189,612	518,550
Electric Energy (kWh)						
First Year	-	12,007	24,014	45,011	59,058	140,089
Lifetime	-	275,822	551,645	1,034,239	1,357,319	3,219,026
Peak (kW)	-	2.0	4.0	7.6	10.0	23.7

	Water (Gallons)						
	First Year	-	118,382	236,763	355,145	355,145	1,065,435
	Lifetime	-	2,130,870	4,261,741	6,392,611	6,392,611	19,177,832

Budget Projections

Five-Year Budgets (Nominal)

Category	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY '17 – FY '21
Customer Incentives	$-	$106,000	$212,000	$350,000	$400,000	$1,068,000
Administration	85,000	103,000	130,000	167,000	182,000	667,000
Marketing	50,000	55,000	70,000	94,000	109,000	378,000
Inspections	-	9,000	17,000	27,000	31,000	84,000
Evaluation	-	-	50,000	-	60,000	110,000
Total	**$135,000**	**$273,000**	**$479,000**	**$638,000**	**$782,000**	**$2,307,000**

Five-Year Budgets (2015$)

Category	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY '17 – FY '21
Customer Incentives	$-	$100,386	$196,835	$318,591	$356,964	$972,775
Administration	82,108	97,544	120,700	152,013	162,419	614,785
Marketing	48,299	52,087	64,993	85,564	97,273	348,215
Inspections	-	8,523	15,784	24,577	27,665	76,549
Evaluation	-	-	46,423	-	53,545	99,968
Total	**$130,407**	**$258,540**	**$444,735**	**$580,746**	**$697,866**	**$2,112,293**

Participation Projections

Five-Year Participation Projections

	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY '17 – FY '21
Residential Project	-	25	50	94	123	292
C&I Project	-	5	10	15	15	45
Total	**-**	**30**	**60**	**109**	**138**	**337**

Program Rollout

January 2017 – January 2018	Finalize program process and implementations details, select vendors, and develop initial marketing. Start initial engagement with builders and architects and solicit projects to begin technical assistance process.
January 2018	Launch program.

	FY 2018 - FY 2021 Continue engagement activities with customers reaching full program participation in FY 2021.
Program Design	*Addressing efficiency when a building is first built is the cheapest and longest lasting way to* change energy consumption patterns. The NC program offers incentives to builders and/or developers for going beyond building code to reduce natural gas consumption. The program targets both residential and nonresidential projects. UGI Gas will provide a technical assessment provider that will review customer applications, assess the project plans, verify that each project meets program eligibility requirements and help the customer to achieve the highest feasible and cost-effective savings. Residential Projects The program offers a streamlined prescriptive approach for residential new construction projects to go beyond the opportunities offered under the RP program. The NC residential track is designed to offer builders a higher incentive than they would otherwise receive from just combining RP measures. It encourages participants to go as deep as possible by addressing the space heating system, water heating system, and building envelope. Nonresidential Projects Each nonresidential project will require building simulation modeling showing the gas usage for a baseline building just meeting code and another model with the proposed modifications. UGI Gas will offer an incentive based on the percentage difference in gas usage between the baseline and

	proposed building. The technical assessment provider will provide guidance and propose revisions, which may last several iterations, in order to fully incorporate efficiency in to the design process.
Target Market and End Uses	The NC program targets all new construction projects (including "gut rehab") contemplating use of natural gas to provide space and hot water heating. For the purposes of this program, gut rehabilitation is defined as a project where the interior space of the building exposes the studs or two or more of the mechanical systems are being replaced and are required to meet current energy code standards. In general, the program aims to incentivize only the highest levels of efficient equipment and construction practices on the market. The NC program takes a whole-building approach, acquiring savings from multiple measures compared to a baseline building just meeting code. For single family and small multi-family buildings, measures might include thermal envelope insulation, heating equipment, and water heating equipment and fixtures. Commercial or large apartment buildings might include HVAC equipment and controls, tighter and better-designed ducts, hot water heating equipment, and thermal envelope insulation.
Financial Incentives	Residential customers will receive a lump sum incentive for achieving 20% gas savings or greater, compared to a house only meeting code. The incentive amount will be designed to cover approximately 80% of the incremental cost. Nonresidential customers will receive an incentive calculated from a dollar per first-year MMBtu saved, depending on what percentage savings tier it falls in. The first tier will be greater than 15%

	but less than 20% savings, the second tier will be greater than or equal to 20% but less than 30%, and the third tier will be greater than or equal to 30% savings.
Marketing Approach	The NC program will focus on tailored messages for realtors, developers, and builders (including ENERGY STAR® builders) in order to ensure that high efficiency options are considered when engaging in major rehab projects as well as in new construction. UGI Gas will also explore ways in which to highlight the efficiency of homes to potential buyers, including through social media.
Evaluation, Measurement, and Verification	Quality Assurance All applications will require information confirming installation and proof of UGI Gas service for heating. Inspections will be performed on 25% of residential new construction projects and all nonresidential retrofit projects before a final rebate is issued. Inspections must verify that the measures proposed for the building were installed as planned and that savings targets have been met, and must conclude with a short informational interview with the owner and/or developer. The program's rebate processor will maintain a real-time database of rebate activity, which will be periodically reviewed by UGI Gas and stored separately for long-term purposes. Evaluations The program is expected to have enough activity to allow for an impact evaluation to start at the end of FY 2019 with a second evaluation scheduled for FY 2021. The NC evaluations will also include feedback from installation contractors and supply houses about current market conditions, such as availability and adoption of high efficiency technology and

	building practices, and awareness of the program and its efficiency tiers.
Program Administration	Technical Assistance and Rebate Processing UGI Gas will engage a contractor to be the main program implementation contractor. The contractor will be responsible for technical review of projects as well as assisting potential customers with including efficiency in their project design. This role will also include accepting program applications, tracking and verifying application information, notifying the applicant of any issues, maintaining a call center, and reporting results to UGI Gas. Marketing and Outreach The main marketing and outreach contractor, in combination with the UGI Gas internal marketing team, will handle marketing and outreach for the NC program. Inspector A separate contractor will perform on-site inspections and collect customer feedback. The same firm responsible for providing technical assistance may perform this role. Evaluator A third-party evaluator will be retained to perform regular evaluations.
Special Notes	The new construction market is highly cyclical and participation levels in the program will be highly influenced by broader economic trends beyond the control of UGI Gas.

2.4 Residential Retrofit

Objective

The Residential Retrofit (RR) Program is designed to overcome market barriers to energy efficiency in the existing residential sector through rebates offered either to customers undergoing a retrofit project or to their installation contractor(s). The program encourages improvements to the thermal envelope of the structure, particularly reductions in building air leakage and increases in insulation levels, as well as installation of the most efficient gas heating technologies. The program also aims to strengthen UGI Gas's relationship with HVAC contractors, suppliers, and other trade allies.

Eligible Rate Class

R/RT

Cost Effectiveness

Five-Year Cost-Effectiveness Results (2015$)

CE Test	PV Benefits	PV Costs	PV Net	BCR
TRC	$4,816,226	$3,509,802	$1,306,423	1.37
Gas Admin	$4,614,808	$2,661,253	$1,953,556	1.73

Savings Projections

Five-Year Savings Projections

	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY '17 – FY '21
Natural Gas (MMBtus)						
First Year	-	2,772	6,856	8,676	12,678	30,982
Lifetime	-	66,524	164,539	208,232	304,279	743,574
Electric Energy (kWh)						
First Year	-	5,010	12,390	15,681	22,914	55,994
Lifetime	-	120,229	297,372	376,339	549,924	1,343,864
Peak (kW)	-	3.6	8.9	11.3	16.4	40.2
Water (Gallons)						
First Year	-	130,508	322,795	408,513	596,939	1,458,755
Lifetime	-	3,132,192	7,747,080	9,804,318	14,326,537	35,010,128

Budget Projections

Five-Year Budgets (Nominal)

Category	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY '17 – FY '21
Customer Incentives	$-	$169,000	$418,000	$529,000	$773,000	$1,889,000
Administration	150,000	265,000	287,000	297,000	319,000	1,318,000
Marketing	50,000	81,000	82,000	83,000	85,000	381,000
Inspections	-	5,000	13,000	16,000	23,000	57,000
Evaluation	-	-	-	75,000	-	75,000
Total	**$200,000**	**$520,000**	**$800,000**	**$1,000,000**	**$1,200,000**	**$3,720,000**

Five-Year Budgets (2015$)

Category	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY '17 – FY '21
Customer Incentives	$-	$160,049	$388,098	$481,527	$689,834	$1,719,508
Administration	144,896	250,964	266,469	270,347	284,679	1,217,356
Marketing	48,299	76,710	76,134	75,552	75,855	352,549
Inspections	-	4,735	12,070	14,564	20,525	51,895
Evaluation	-	-	-	68,269	-	68,269
Total	**$193,195**	**$492,458**	**$742,772**	**$910,259**	**$1,070,893**	**$3,409,577**

Participation Projections

Five-Year Participation Projections

	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY '17 – FY '21
Residential Retrofit	-	100	247	313	457	1,118

Program Rollout

January 2017 – January 2018	Finalize program process and implementations details, select vendors, and develop initial marketing. Start initial engagement with contractors and provide initial training in protocols and program delivery.
January 2018	Launch program.
FY 2018 - FY 2021	Continue engagement activities with customers, reaching full participation in FY 2021.

Program Design

The RR program offers incentives to customers retrofitting or weatherizing their homes by installing qualifying residential-sized space and water heating equipment, programmable thermostats

	(including Wi-Fi enabled), and making thermal envelope improvements through use of approved contractors who may also receive an incentive to encourage comprehensiveness. Customers must have an in-home audit performed that includes a blower-door test. After the audit, the customer receives a list of recommended efficiency measures. The customer has a contractor perform the recommended measures, after which he or she receives an incentive. Audits and thermal envelope improvements must be made by a contractor previously selected by the program as meeting program standards for high quality and technical performance. The rebate will be given to the customer upon submission of suitable documentation. Thermal envelope improvement rebates will require submittal of pre-post blower door measurements to document leakage rate reductions, and pre-post R-values, along with affected square footage, to document insulation improvements. Program participation levels will dictate allocation of funds from year to year, as well as the incentive levels offered. Initially, both participating customers and contractors each will be given an incentive based on first-year MMBtu projected savings. UGI Gas will aim to provide as little interruption as possible to the general community due to any program adjustments made to accommodate market conditions.
Target Market and End Uses	The RR program targets all residential homes that can benefit from improved space and water heating efficiency by encouraging a whole house approach to consider the full implications of specific measures to the overall performance of the house. The program aims to incentivize only

	the highest levels of efficient equipment on the market and the overall reduction in gas usage, including the interactive effects of equipment efficiency and thermal envelope improvements. On the space and water heating side, the program effectively ties in closely with the RP program measures to provide incentives for installing such equipment as Wi-Fi enabled thermostats, ENERGY STAR® labeled furnaces, high efficiency boilers, and combination boilers as part of the home retrofit package. To qualify for even the lowest incentive tier, customers are guided toward the highest efficiency units (95+ AFUE) as well as envelope improvements. The highest incentive tier requires both the customer and the contractor to aggressively embrace the whole-house approach.
Financial Incentives	Incentives are designed to be in line with other offerings in the region and/or other companion programs in the UGI Gas portfolio such as the RP program. UGI Gas anticipates an incentive of approximately $60 per first year MMBtu savings for eligible projects. This incentive is designed to offset most of the incremental cost of the higher efficiency equipment and to provide a significant contribution to the cost of qualifying thermal envelope improvements.
Marketing Approach	Customers will be made aware of the RR program through the general media and bill inserts, as well as through equipment distributors, HVAC and plumbing contractors, and others in a position to affect equipment installation and thermal envelope improvement choices. The contractor network will play a large role in generating program leads. Approved program contractors will be encouraged to do their own marketing to enlist high quality leads to promote

	high lead conversion rates, and to up-serve comprehensive retrofit packages qualifying for the highest incentive tier(s). They will be supported in these efforts through training and the development of co-branding materials that the contractor can use to promote the program. UGI Gas also anticipates identifying qualified leads through an online audit tool. The tool will help homeowners identify opportunities for saving energy and put them in contact with a qualified contractor. Customers that have particularly large savings opportunities may be offered further rebates.
Evaluation, Measurement, and Verification	Quality Assurance A contractor previously approved by UGI Gas will supervise all audits and installation work. It is anticipated that an "approved contractor" will be required to possess Gold Star Contractor certification from the Building Performance Institute (BPI) to ensure quality business practices. Approved contractors must employ site technicians and site supervisors with BPI professional certifications appropriate to their duties. The approved contractor must also be trained in program protocols and the contractor's first three projects will require confirmation of quality installation by an approved third party before moving from probationary status to becoming fully approved. Subsequent contractor work will be sampled up to 10% of projects submitted. Program infraction penalties can range from a return to probationary status to being removed from the program. In the event of a significant customer complaint, which has been verified, or failure of an inspection, contractors must provide satisfactory resolution within 15 business days or face termination from

	program participation or reversion to probationary status, depending on the severity of the infraction or the continuation of relatively minor infractions. An initially approved contractor may be barred from program participation upon documentation that the contractor has not met program requirements even when given the opportunity to correct failings consistent with the probationary process. Rebate Processing The rebate processor must verify that the contractor is eligible to participate in the program and that any issues brought to the program's attention either by a customer or by the third party inspector has been resolved. The program's rebate processor will maintain a real-time database of program activity, including such metrics as leads and lead source, which will be periodically reviewed by UGI Gas and stored separately for long-term purposes. Inspections must verify that the project meets the requirements for incentive level offered by the contractor to the customer. Evaluations The program is expected to have enough activity to allow for an impact evaluation in FY 2020. The RR program evaluations will also include feedback from installation contractors, participating customers and supply houses about current market conditions, such as availability and adoption of high efficiency technology, barriers to participation and awareness of the program.

Program Administration	Contractor Network UGI Gas will put in place an approved contractor network that will perform energy audits, natural gas retrofit projects, and submit project and incentive application information to the program manager. Program Manager UGI Gas will engage a program manager to oversee the contractor network, accept program applications, track and verify application information, communicate with customers if necessary, and report results to UGI Gas. Marketing and Outreach The main marketing and outreach contractor, program administrator, and contractor network will be responsible for the marketing and outreach of the RR program. Inspector A separate contractor will perform on-site inspections and collect customer feedback. The inspector may also spend a portion of their time directed towards onsite mentoring for contractors. The program manager may perform the inspection role. Evaluator A third-party evaluator will be retained to perform regular evaluations.

Special Notes	UGI Gas will explore ways in which to encourage contractors to go after deeper savings. This may include setting aside a portion of incentives to go directly towards contractors in the form of a performance bonus. Through its parent company, UGI Gas has a network of over 400 contractors in Pennsylvania, many of which serve UGI Gas's territory. Contractors that express interest in participating, provide contact information, description of their business, and the territory that they serve. UGI Gas is able to provide leads to contractors regarding customers who have inquired about switching to natural gas. UGI Gas will examine ways to leverage this existing platform and contractor list to provide a launching off point for an enhanced contractor network able to deliver the services required under the RR program.

2.5 Nonresidential Retrofit

Objective

The Nonresidential Retrofit (NR) Program will provide incentives for overcoming market barriers for natural gas efficiency retrofits in existing commercial and multi-family buildings.

Eligible Rate Class

N/NT (R/RT as part of multi-family projects)

Cost Effectiveness

Five-Year Cost-Effectiveness Results (2015$)

CE Test	PV Benefits	PV Costs	PV Net	BCR
TRC	$3,347,061	$1,739,899	$1,607,162	1.92
Gas Admin	$2,954,830	$1,212,029	$1,742,801	2.44

Savings Projections

Five-Year Savings Projections

	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY '17 – FY '21
Natural Gas (MMBtus)						
First Year	-	1,780	4,543	9,086	13,815	29,223
Lifetime	-	25,660	64,097	128,193	192,184	410,134
Electric Energy (kWh)						
First Year	-	4,950	9,901	19,801	24,751	59,404
Lifetime	-	99,006	198,012	396,024	495,029	1,188,071
Peak (kW)	-	0.4	0.9	1.8	2.2	5.3
Water (Gallons)						
First Year	-	364,872	867,507	1,735,014	2,513,176	5,480,569
Lifetime	-	5,903,958	13,598,841	27,197,681	38,474,414	85,174,894

Budget Projections

Five-Year Budgets (Nominal)

Category	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY '17 – FY '21
Customer Incentives	$-	$40,000	$100,000	$200,000	$300,000	$640,000
Administration	50,000	67,000	94,000	138,000	185,000	534,000
Marketing	50,000	104,000	61,000	72,000	84,000	371,000
Inspections	-	5,000	11,000	22,000	35,000	73,000
Evaluation	-	-	40,000	-	50,000	90,000
Total	**$100,000**	**$216,000**	**$306,000**	**$432,000**	**$654,000**	**$1,708,000**

Five-Year Budgets (2015$)

Category	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY '17 – FY '21
Customer Incentives	$-	$37,881	$92,846	$182,052	$267,723	$580,503
Administration	48,299	63,451	87,276	125,616	165,096	489,738
Marketing	48,299	98,492	56,636	65,539	74,963	343,928
Inspections	-	4,735	10,213	20,026	31,234	66,208
Evaluation	-	-	37,139	-	44,621	81,759
Total	**$96,597**	**$204,559**	**$284,110**	**$393,232**	**$583,637**	**$1,562,136**

Participation Projections

Five-Year Participation Projections

	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY '17 – FY '21
C&I Retrofit Project	-	7	20	40	63	130
MF Retrofit Project	-	1	2	4	5	12
Total	**-**	**8**	**22**	**44**	**68**	**142**

Program Rollout

January 2017 – January 2018	Finalize program process and implementations details, select vendors, and develop initial marketing. Start initial engagement with contractors and provide initial training in protocols and program delivery.
January 2018	Launch program.
FY 2018 - FY 2021	Continue engagement activities with customers, reaching full participation in FY 2021.

Program Design	The NR program offers incentives to commercial buildings and multi-family projects that wish to upgrade some portion of the building's performance. A technical assistance provider will evaluate projects for both savings opportunities and cost-effectiveness. A custom package of measures will be determined that is cost-effective and an incentive offer will be extended to the customer based on the project's financial characteristics. The customer then has a set amount of time to perform the upgrades and receive a test-out audit after which the incentive will be paid.
Target Market and End Uses	The NR program primarily targets commercial buildings and multi-family housing projects, but is also open to agriculture and small industrial applications. Any measure that saves natural gas is eligible, with space heating, water heating, and process heating expected to be the largest opportunities.
Financial Incentives	Incentives for NR projects will all be based on the financial characteristics of the project. UGI Gas will negotiate with the customer to find an incentive that makes the project attractive enough for the customer to pursue without paying. The first approach for calculating an incentive will be to determine an acceptable internal rate of return (IRR) for the project that the customer will accept. A secondary approach will be to buy down the project's simple payback to between 5 and 10 years. The incentive for a single project will be capped at the lessor of the project's gas benefits, incremental cost, or $100,000.
Marketing Approach	Customers will be made aware of the NR program through the general media and bill inserts, as well as through equipment distributors, HVAC and plumbing contractors, housing program

	administrators, and others in a position to affect equipment installation and thermal envelope improvement choices.
Evaluation, Measurement, and Verification	Quality Assurance The technical assistance provider will monitor all projects from the outset. This includes monitoring the installation specifications and practices as well as the final project inspection to verify that all program requirements have been met for issuance of the requested incentive. Evaluations The program is expected to have enough activity to allow for an impact evaluation to start at the end of FY 2019 with a second evaluation scheduled for FY 2021. Since the number of projects anticipated to be completed under the program is so small, evaluations will be more focused on a "case study" approach that verifies performance once a project is complete and sufficient post data is collected.
Program Administration	Technical Assistance Provider The technical assistance provider will be responsible for the initial project analysis and design assistance, ongoing project monitoring, and the final inspection of all projects. Evaluator A third-party evaluator will be retained to perform regular evaluations.

2.6 Behavior and Education

Objective

The objective of the BE program is to motivate a large group of residential customers to save energy by changing their behavior through education, outreach, and energy monitoring. The premise is that the delivery of timely, salient, and personalized information allows for informed decision-making. Small changes with noticeable results pave the way for wider program participation and increased future savings.

Eligible Rate Class

R/RT

Cost Effectiveness

Five-Year Cost-Effectiveness Results (2015$)

CE Test	PV Benefits	PV Costs	PV Net	BCR
TRC	$2,178,476	$1,624,141	$554,335	1.34
Gas Admin	$2,178,476	$1,624,141	$554,335	1.34

Savings Projections

Five-Year Savings Projections

	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY '17 – FY '21
Natural Gas (MMBtus)						
First Year	-	-	64,948	97,422	97,422	259,792
Lifetime	-	-	64,948	97,422	97,422	259,792
Electric Energy (kWh)						
First Year	-	-	-	-	-	-
Lifetime	-	-	-	-	-	-
Peak (kW)	-	-	-	-	-	-
Water (Gallons)						
First Year	-	-	-	-	-	-
Lifetime	-	-	-	-	-	-

Budget Projections

Five-Year Budgets (Nominal)

Category	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY '17 – FY '21
Customer Incentives	$-	$-	$450,000	$675,000	$675,000	$1,800,000
Administration	-	300,000	20,000	20,000	20,000	360,000
Marketing	-	-	-	-	-	-
Inspections	-	-	-	-	-	-
Evaluation	-	20,000	40,000	40,000	40,000	140,000
Total	**$-**	**$320,000**	**$510,000**	**$735,000**	**$735,000**	**$2,300,000**

Five-Year Budgets (2015$)

Category	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY '17 – FY '21
Customer Incentives	$-	$-	$417,809	$614,425	$602,378	$1,634,612
Administration	-	284,110	18,569	18,205	17,848	338,733
Marketing	-	-	-	-	-	-
Inspections	-	-	-	-	-	-
Evaluation	-	18,941	37,139	36,410	35,696	128,186
Total	**$-**	**$303,051**	**$473,517**	**$669,041**	**$655,922**	**$2,101,531**

Participation Projections

Five-Year Participation Projections

	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY '17 – FY '21
Participants	-	-	50,000	75,000	75,000	200,000

Program Rollout

October 2017 – October 2018	Finalize program process and implementations details, select vendors, and integrate energy reporting software with existing customer information system.
October 2018	Launch program.
FY 2019	Initial pilot year.[14]

[14] A single year pilot program will be performed in order to gauge the potential success of the program before it is rolled out to a wider customer base.

	FY 2020 – FY 2021 Run full program.
Program Design	The program pairs behavioral science with data analytics to provide clearly defined and actionable information that motivates customers to lower their energy use. An external vendor will be enlisted to deliver the service. The vendor will collect (from various sources) and analyze customer data including gas use, weather data, demographic and parcel information, and service interactions such as web visits and use of UGI Gas's call center data. Insights will be gathered and analyzed for each customer in order to develop personalized content and messaging to participants. The program will follow an "opt-out" model in which customers will be automatically enrolled to receive the service, but subsequently may choose to decline participation. Participants will receive an energy report detailing their gas usage and how their use compares with neighbors or others in a similar demographic. The report offers insights into how the household uses gas, provides tips on how to lower consumption, provides billing analysis, and promotes other UGI services. Customers are further engaged via access to a web portal that embeds the vendor's analytics into UGI's webpages, and stays connected with the service in real time by setting and tracking goals, receiving alerts indicating high use trends, weather or utility events, and receiving periodic home energy reports by email which may also contain UGI messaging.
Target Market and End Uses	The program will target residential heating customers who are identified as high users based on usage per customer analytics.
Financial Incentives	The service will be delivered at no cost to customers and is anticipated to cost approximately $9

	per customer per year.
Marketing Approach	UGI Gas will work with the selected vendor to produce a targeted rollout of the programs offerings. The program is expected to engage with a sub-section of UGI Gas's highest usage heating customers.
Evaluation, Measurement, and Verification	Since behavior programs are relatively new to the efficiency market, and particularly new to gas efficiency in Pennsylvania, extra care will be taken with verifying and measuring program savings. UGI Gas will retain an evaluator at the same time as a vendor is selected to be the service provider. All three parties will work closely to ensure that proper systems are set up so that data can be collected from the start to ensure that savings are being properly accounted for. Once the program launches, evaluation will be continuous. Some of the initial goals of the evaluation will be the following: • Selecting a proper control group; • Quantifying savings across different market segments; • Accounting for the effects of participation in other efficiency programs to measure the "channeling" effect of the BE program and avoid double counting savings; and • Examining the persistence of savings beyond a single year.
Program Administration	Service Provider UGI Gas will retain a service provider to provide the platform and analysis to deliver the energy

	reports and provide customer support. Evaluator A third-party evaluator will be retained to perform regular evaluations.
Special Notes	Evaluation results from similar programs have had a wide range of savings. The assumptions used for this program are conservative; however, market conditions in UGI Gas's territory may be very different from those experienced in other locations with successful programs.

2.7 Combined Heat and Power

Objective

The Combined Heat and Power (CHP) Program seeks to promote the installation of cost-effective and net-primary-energy-saving CHP projects and provide meaningful CO_2 emission reductions that may be counted toward Pennsylvania's Clean Power Plan goals. A CHP plant produces electricity at a commercial or industrial site while at the same time using the waste heat from the production of the electricity to serve a thermal load. Net efficiencies come from the recovered heat that is typically wasted in grid electricity production and avoided transmission and distribution losses from delivering the electricity from the generator to the customer site.

Eligible Rate Class

N, NT, DS, LFD

Cost Effectiveness

Five-Year Cost-Effectiveness Results (2015$)

CE Test	PV Benefits	PV Costs	PV Net	BCR
TRC	$118,676,097	$74,045,790	$44,630,307	1.60

Savings Projections

Five-Year Savings Projections

	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY '17 – FY '21
Net Primary Energy Savings (MMBtus)						
First Year	169,855	169,855	455,460	455,460	455,460	1,706,090
Lifetime	2,547,828	2,547,828	6,831,898	6,831,898	6,831,898	25,591,350
Net Customer Gas Usage Increase (MMBtus)						
First Year	118,258	118,258	442,318	442,318	442,318	1,563,470
Lifetime	1,773,876	1,773,876	6,634,772	6,634,772	6,634,772	23,452,067

Budget Projections

Five-Year Budgets (Nominal)

Category	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY '17 – FY '21
Customer Incentives	$270,000	$291,600	$629,856	$680,244	$734,664	**$2,606,365**
Administration	54,000	59,486	65,505	72,106	79,491	**$330,588**
Marketing	70,200	58,320	125,971	136,049	146,933	**$537,473**
Inspections	2,700	2,916	6,299	6,802	7,347	**$26,064**
Evaluation	21,600	23,328	25,194	27,210	29,387	**$126,719**
Total	**$418,500**	**$435,650**	**$852,825**	**$922,412**	**$997,821**	**$3,627,208**

Five-Year Budgets (2015$)

Category	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY '17 – FY '21
Customer Incentives	$250,000	$250,000	$500,000	$500,000	$500,000	**$2,000,000**
Administration	50,000	51,000	52,000	53,000	54,100	**$260,100**
Marketing	65,000	50,000	100,000	100,000	100,000	**$415,000**
Inspections	2,500	2,500	5,000	5,000	5,000	**$20,000**
Evaluation	20,000	20,000	20,000	20,000	20,000	**$100,000**
Total	**$387,500**	**$373,500**	**$677,000**	**$678,000**	**$679,100**	**$2,795,100**

Participation Projections

Five-Year Participation Projections

	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY '17 – FY '21
3326 kW CHP	1	1	1	1	1	**5**
7038 kW CHP	0	0	1	1	1	**3**
Total Projects	**1**	**1**	**2**	**2**	**2**	**8**

Program Rollout

June 2016 – December 2017	Finalize program process and implementations details, select vendors, and develop initial marketing.
January 2017	Launch Program.
FY 2018 - FY 2021	Continue engagement activities with customers.

Program Design

Customers that are considering CHP need to submit the project details including CHP installation costs, annual electricity production, and gas usage before and after the CHP project is completed.

	Based on the particular CHP project details, verified by UGI Gas or its contractor, UGI Gas will determine whether it is cost-effective from the TRC perspective and reduces net primary energy usage. If both of these criteria are met, then the CHP project is eligible for an incentive from UGI Gas. Though the customer has primary responsibility for developing the CHP costs, savings, and technical details, UGI Gas may provide some technical assistance, as well as business development for new projects.
Target Market and End Uses	The CHP Program targets large commercial and industrial customers with high thermal and electric loads. This program is most likely applicable to customers with year-round thermal requirements and high hours of use. Customer types that are likely candidates include hospitals, campuses and multi-shift industrial. Based on current avoided electric and gas avoided costs, only larger CHP projects (over 1,000 MW) are typically cost-effective from the TRC perspective. If avoided costs change or the costs for micro turbines decline, then some smaller projects may become cost-effective. UGI Gas will continue to closely monitor the CHP market and identify opportunities for all ranges of CHP technology and sizes.
Financial Incentives	$750/kW with a maximum of $250,000 per CHP project and no more than 50% of the CHP project cost.
Marketing	UGI Gas will market its CHP program through a combination of the portfolio's mass-market

Approach	awareness campaign and by contacting specific customers that are likely candidates for CHP. UGI Gas will work with its internal gas planning and marketing team to make sure that potential users are aware of possible technical support and incentives for pursuing CHP projects.
Evaluation, Measurement, and Verification	Every CHP project will be inspected and its receipts reviewed to ensure that the expected technology is correctly installed and operational. A third party evaluator will be chosen to assess the actual versus projected electric and gas, generation and usage, respectively. Since the number of projects anticipated to be completed under the program is small, evaluations will be more focused on a "case study" approach that verifies performance once a project is complete and sufficient post data is collected.
Program Administration	The CHP program may be implemented either solely by UGI Gas or with assistance from an independent contractor chosen through an RFP.
Special Notes	The CHP Program's costs and savings will be reported separately from the other efficiency programs, due to this program's increase in gas usage, whereas the other efficiency programs decrease gas usage. This is similar to the separation made by PGW in its Phase II filing, as well as by other electric utilities that separate energy efficiency programs from load reduction programs. While UGI Gas is asking for general flexibility in annual program costs for the entire EE&C Portfolio, this flexibility is particularly important for the CHP program. CHP projects are complex and require long-term planning. Moreover, incentives represent a large percentage of the program budget. Because of these factors, it is difficult to predict the outcome for a single year. UGI Gas will

	limit its total spending to the five year projected total spending, and under-spending from one year may be carried over to the next year.

3 Appendices

3.1 Avoided Cost Tables

	Natural Gas			Other			
	Baseload	Space heating	Water heating	Energy	Peak Capacity	Capacity T&D	Water
Year	$/MMBtu	$/MMBtu	$/MMBtu	$/kWh	$/kW-Yr	$/kW-Yr	$/Gallon
2016	$ 5.23	$ 10.34	$ 6.51	$ 0.0619	$ 42.682	$ 29.979	$ 0.0080
2017	$ 5.39	$ 10.53	$ 6.68	$ 0.0662	$ 42.207	$ 29.983	$ 0.0080
2018	$ 5.45	$ 10.56	$ 6.73	$ 0.0707	$ 42.208	$ 29.981	$ 0.0080
2019	$ 5.51	$ 10.61	$ 6.78	$ 0.0759	$ 42.204	$ 29.979	$ 0.0080
2020	$ 6.66	$ 11.83	$ 7.95	$ 0.0774	$ 42.204	$ 29.980	$ 0.0080
2021	$ 6.70	$ 11.85	$ 7.99	$ 0.0809	$ 42.207	$ 29.980	$ 0.0080
2022	$ 8.08	$ 13.22	$ 9.36	$ 0.1003	$ 42.206	$ 29.979	$ 0.0080
2023	$ 8.13	$ 13.26	$ 9.41	$ 0.0983	$ 42.207	$ 29.976	$ 0.0080
2024	$ 8.17	$ 13.30	$ 9.45	$ 0.0936	$ 42.211	$ 29.980	$ 0.0080
2025	$ 9.60	$ 14.84	$ 10.91	$ 0.0978	$ 42.209	$ 29.982	$ 0.0080
2026	$ 9.48	$ 14.71	$ 10.79	$ 0.0949	$ 42.209	$ 29.978	$ 0.0080
2027	$ 9.56	$ 14.78	$ 10.86	$ 0.0959	$ 42.210	$ 29.976	$ 0.0080
2028	$ 9.68	$ 14.89	$ 10.98	$ 0.0987	$ 42.206	$ 29.976	$ 0.0080
2029	$ 9.74	$ 14.93	$ 11.04	$ 0.1004	$ 42.210	$ 29.978	$ 0.0080
2030	$ 10.04	$ 15.24	$ 11.34	$ 0.1033	$ 42.208	$ 29.980	$ 0.0080
2031	$ 10.38	$ 15.58	$ 11.68	$ 0.1064	$ 42.206	$ 29.980	$ 0.0080
2032	$ 10.71	$ 15.91	$ 12.01	$ 0.1078	$ 42.205	$ 29.981	$ 0.0080
2033	$ 11.04	$ 16.25	$ 12.34	$ 0.1085	$ 42.204	$ 29.979	$ 0.0080
2034	$ 11.34	$ 16.55	$ 12.64	$ 0.1112	$ 42.210	$ 29.980	$ 0.0080
2035	$ 11.65	$ 16.86	$ 12.95	$ 0.1138	$ 42.208	$ 29.979	$ 0.0080
2036	$ 11.88	$ 17.09	$ 13.18	$ 0.1168	$ 42.206	$ 29.981	$ 0.0080
2037	$ 12.21	$ 17.42	$ 13.51	$ 0.1199	$ 42.210	$ 29.979	$ 0.0080
2038	$ 12.73	$ 17.96	$ 14.04	$ 0.1230	$ 42.206	$ 29.977	$ 0.0080
2039	$ 13.37	$ 18.62	$ 14.68	$ 0.1266	$ 42.206	$ 29.978	$ 0.0080
2040	$ 13.74	$ 19.00	$ 15.05	$ 0.1288	$ 42.206	$ 29.982	$ 0.0080
2041	$ 14.11	$ 19.38	$ 15.43	$ 0.1311	$ 42.209	$ 29.978	$ 0.0080
2042	$ 14.50	$ 19.78	$ 15.82	$ 0.1334	$ 42.205	$ 29.980	$ 0.0080
2043	$ 14.89	$ 20.18	$ 16.21	$ 0.1356	$ 42.210	$ 29.980	$ 0.0080
2044	$ 15.29	$ 20.58	$ 16.61	$ 0.1379	$ 42.206	$ 29.979	$ 0.0080
2045	$ 15.69	$ 21.00	$ 17.02	$ 0.1402	$ 42.206	$ 29.979	$ 0.0080
2046	$ 15.94	$ 21.26	$ 17.27	$ 0.1402	$ 42.206	$ 29.979	$ 0.0080
2047	$ 16.20	$ 21.54	$ 17.54	$ 0.1402	$ 42.206	$ 29.979	$ 0.0080
2048	$ 16.47	$ 21.82	$ 17.81	$ 0.1402	$ 42.206	$ 29.979	$ 0.0080
2049	$ 16.75	$ 22.11	$ 18.09	$ 0.1402	$ 42.206	$ 29.979	$ 0.0080
2050	$ 17.03	$ 22.41	$ 18.38	$ 0.1402	$ 42.206	$ 29.979	$ 0.0080
2051	$ 17.33	$ 22.72	$ 18.67	$ 0.1402	$ 42.206	$ 29.979	$ 0.0080
2052	$ 17.63	$ 23.03	$ 18.98	$ 0.1402	$ 42.206	$ 29.979	$ 0.0080

All values in 2015 dollars and include internalized market price of CO2, and DRIPE

Developed by Resource Insight, Inc.

3.2 Detailed Program and Portfolio Cost-effectiveness

	Total Resource					Gas Energy System				
	Present Value		PV of Net	Benefit-Cost	Levelized Cost	Present Value		PV of Net	Benefit-Cost	Levelized Cost
	Benefit [2]	Cost [3]	Benefits [4]	Ratio [5]	$/MMBTU	Benefit [10]	Cost [11]	Benefits [12]	Ratio [13]	$/MCF
Portfolio Total	$53,852,243	$30,623,169	$23,229,074	1.76	8.62	$47,810,505	$19,574,100	$28,236,405	2.44	5.51
Non-Measure Costs		$7,990,223					$7,990,223			
Total Measure Costs	$53,852,243	$22,632,946	$31,219,297	2.38	6.37	$47,810,505	$11,583,877	$36,226,628	4.13	3.26
Program										
Residential Prescriptive (RP)										
Program Total	$31,130,604	$14,907,355	$16,223,249	2.09	7.67	$26,480,582	$7,479,279	$19,001,303	3.54	3.85
Non-Measure Costs		$943,425					$943,425			
Total Measure Costs	$31,130,604	$13,963,930	$17,166,674	2.23	7.19	$26,480,582	$6,535,854	$19,944,728	4.05	3.36
Nonresidential Prescriptive (NP)										
Program Total	$8,708,345	$3,813,860	$4,894,485	2.28	5.78	$8,138,290	$1,845,275	$6,293,015	4.41	2.80
Non-Measure Costs		$535,287					$535,287			
Total Measure Costs	$8,708,345	$3,278,573	$5,429,772	2.66	4.97	$8,138,290	$1,309,988	$6,828,302	6.21	1.99
Residential Retrofit (RR)										
Program Total	$4,816,226	$3,509,802	$1,306,423	1.37	11.37	$4,614,808	$2,661,253	$1,953,556	1.73	8.62
Non-Measure Costs		$1,346,932					$1,346,932			
Total Measure Costs	$4,816,226	$2,162,871	$2,653,355	2.23	7.00	$4,614,808	$1,314,321	$3,300,488	3.51	4.26
Nonresidential Retrofit (NR)										
Program Total	$3,347,061	$1,739,899	$1,607,162	1.92	8.23	$2,954,830	$1,212,029	$1,742,801	2.44	5.73
Non-Measure Costs		$772,997					$772,997			
Total Measure Costs	$3,347,061	$966,902	$2,380,159	3.46	4.57	$2,954,830	$439,032	$2,515,798	6.73	2.08
New Construction (NC)										
Program Total	$3,671,531	$1,919,760	$1,751,772	1.91	8.06	$3,443,519	$1,643,772	$1,799,747	2.09	6.90
Non-Measure Costs		$898,922					$898,922			
Total Measure Costs	$3,671,531	$1,020,837	$2,650,694	3.60	4.29	$3,443,519	$744,849	$2,698,670	4.62	3.13
Behavior and Education (BE)										
Program Total	$2,178,476	$1,624,141	$554,335	1.34	8.49	$2,178,476	$1,624,141	$554,335	1.34	8.49
Non-Measure Costs		$384,309					$384,309			
Total Measure Costs	$2,178,476	$1,239,832	$938,644	1.76	6.48	$2,178,476	$1,239,832	$938,644	1.76	6.48
Portfoliowide Costs										
Program Total	-	$3,108,352	$(3,108,352)	-	-	-	$3,108,352	$(3,108,352)	-	-
Non-Measure Costs		$3,108,352					$3,108,352			
Total Measure Costs	-	-	-	-	-	-	-	-	-	-