Cascade Natural Gas Corporation
Annual Conservation Achievement Report
Calendar Year 2016

Background

On October 1, 2007 the Washington Utilities and Transportation Commission (WUTC) approved an addendum to Cascade Natural Gas's Conservation Alliance Plan (CAP) and associated Decoupling Pilot, which was developed in compliance with the Commission's Order 06 in Docket UG-060256. As part of this addendum, the Company agreed to submit "an annual report to the Commission on the achievement of the Calendar Year (CY) therm savings target, along with its Commission Basis results of operations report." Following this order the Company submitted an annual report by March 31 of each year, to report prior years' conservation achievements and associated CAP deferrals. As of October 1, 2010, the Pilot Decoupling Mechanism and accompanying Conservation Plan, approved by the WUTC on October 1, 2007, were no longer in effect. Per its commitment in the 2010 Annual Conservation Report, the Company voluntarily continued this reporting with the WUTC, submitting its conservation achievements by July 1st of the following program year. As of CY 2016 per Docket UG-152286 the Company has committed to submitting the Annual Conservation Report to the WUTC by June 1 each year, with advanced copies provided to the Company's Conservation Advisory Group 30 days prior to filing with the Commission.

The Annual Conservation Report is intended as a synopsis of Cascade's Energy Efficiency achievements and activities in the previous calendar year. This report contains the following information:

- The year's conservation achievement by program and customer type
- Total expenditures for the year by program and customer class
- Cost effectiveness calculations
- Program evaluations completed during the calendar year

Forecasting of savings potential is available for review within the Demand Side Management (DSM) section of the Company's Integrated Resource Plan (IRP). As of CY 2015 the Company submits an Annual Conservation Plan by December 1st which includes the energy efficiency targets for the following year by program and customer class, program development, measure portfolios, projected budgets, an estimate of program cost effectiveness and a list of measures or alterations planned for the following year as well as a synopsis of planned outreach efforts.

Cost-Effectiveness Inputs

In an effort to more fully integrate and standardize the DSM efforts with those employed in the Company's resource planning efforts as part of the Integrated Resources Plan in future iterations of this report the DSM calculations will utilize the same long term discount rate as that noted in the most recently acknowledged Integrated Resource Plan. For this iteration, the Company used the same Long-Term discount rates, inflation rates and avoided costs as those included in the Company's submitted 2014 IRP which was 4.17% for the DSM efforts, 8.76% long-term discount rate for the avoided costs and an inflation rate of 2.00%. Also of note, this year's report includes discrete non-energy benefits in an attempt to approach the value of energy efficiency measures in as nuanced a manner as feasible for the Residential and Commercial/Industrial programs and a 10% across-the-board adder for the Low Income programs. These non-energy benefits traditionally have the greatest impact on the Total Resource Cost Test (TRC) which is included in this report. For the purposes of program valuation and the continuation of robust, multi-faceted energy conservation programs, Cascade continues to utilize the Utility

Cost/Program Administrator Cost test as is allowed under UG-121207 in accordance with guidance from the Conservation Advisory Group (CAG) as the primary metric of program success and cost-effectiveness. Please note avoided costs can have a significant impact on program cost-effectiveness.

Summary of 2016 Program Achievements

Residential and Commercial
When reviewing program achievements for 2016 it is significant to note goals assigned for the 2016 Calendar Year were aggressive and far exceeded previous program accomplishments. The avoided costs were relatively low compared to those now calculated in the 2016 IRP for 2017 and 2018 planning. The avoided costs in effect for the programs delivered in 2016 have negatively affected the cost-effectiveness of the programs because they were so low.

In Calendar Year 2016, Cascade Natural Gas Corporation achieved a deemed therm savings of **171,620** for its **Residential** program. This represents 42% of the projected goal of 409,975 therms as noted in the 2016 Conservation Plan submitted to the Commission in December 2015. CY 2016 displays a slight decrease of 10,227 therms from those reported for the 2015 program year.

Cascade achieved a deemed therm savings of **222,194** in its **Commercial and Industrial** program. This is 39% of the Company's projected savings goal of 565,940 for CY 2016, and 415,736 fewer than was achieved in the prior year.

On a portfolio level the projected savings total between Residential, Commercial and Industrial was 393,814 therms for CY 2016. When Low Income is included in the total the programs accomplished a combined **405,557** therms of savings. Neither the Residential nor Commercial/Industrial (C&I) program was able to achieve the projected goal savings in 2016.

The year has proved a valuable opportunity to evaluate program incentive levels and its resultant impact on customer program participation. Based on this year's results it is apparent the incentive levels are not adequately enticing to drive additional efficiency efforts above historic levels. Incentive levels were set near 30% of the incremental cost of the upgrade per guidelines recommended as part of the Company's 2013/2014 potential study which were established to provide enough of an incentive to increase uptake without encouraging free-ridership. The Company has spent considerable time evaluating the existing incentive levels, cost-effectiveness thresholds and possible improvements to come to a recommendation on what the program can support. The Company will be submitting significant increases to the current levels as part of an upcoming Tariff filing that is planned for submission to the Commission in June.

On an individual basis, the Residential program proved cost effective at a Utility Cost (UCT) of **1.134**. The Commercial/Industrial program was not cost effective (due to lack of participation) at a UCT of **0.933**. At a portfolio level, the combined program is cost effective at a UCT of **1.015.** See Appendix A for the full cost-effectiveness calculations including the Total Resource Costs.

Although the Company gauges cost-effectiveness primarily based on the UCT, the Total Resource Cost test is also provided for reference. As expected, the programs would not be considered cost-effective under the lens of a TRC with the residential program calculating out to a 0.646 TRC, the Commercial/Industrial at a 0.710, and a combined 0.686 at a portfolio level.

As holds true from past years, programmatic achievements in the C&I sectors are dependent upon a few critical deep therm-savings projects. The Company's conservation team helps customers identify key Commercial and Industrial project opportunities and aggressively aids customers in reducing their energy consumption by pursuing energy-efficiency projects in partnership with local energy services Companies and assists customers with capitalizing on other utility incentive

program offerings as available. At some point it is out of the program's hands and ultimately up to the customer as to whether or not he/she will move forward with a project. It is also common for C&I projects to stretch beyond the program year in which they were initiated. In such cases, the Company ends up building a queue, or pipeline of projects with deep energy savings potential in future years. For this reason it is sometimes more accurate to gauge C&I program accomplishments from a two year perspective. This also plays a key role in why the Company has elected to raise rebates, where possible, to encourage businesses to engage in these upgrades sooner in their planning processes to curtail some of this standard delay.

It is important to recognize the number and impact generated by custom conservation projects, which are variable from year to year, meaning the numbers achieved in following years will vary in an ebb and flow pattern. The Company remains committed to pursuing all possible opportunities for deeper energy savings throughout its service area and will continue to solicit projects from customers to drive rebate participation for promoting sustainable, efficient natural gas consumption through its conservation incentive programs.

Table A represents the total therm savings, measures installed and associated Carbon offset by the Cascade CY 2016 CIP efforts.

Table A: 2016 Program Achievements

Totals	**Residential**	**Commercial**	**Total**
Therms Achieved	**171,620**	**222,194**	**393,814**
Measures Installed	**1,552**	**203**	**1,755**
Carbon Offset (pounds CO_{2e} avoided)	**2,007,954**	**2,599,700**	**4,607,654**

Table B represents the total program expenditures for incentives and programmatic delivery and/or administrative costs associated with delivering the Company's Washington energy-efficiency programs.

Table B: 2016 Residential/Commercial Programmatic Expenditures and Rebates Paid

Total Expenses	**Residential**	**Commercial**
Incentives Paid	$458,287	$443,695
Programmatic Expenditures	$519,634	$925,322
NEEA Gas Market Transformation	$244,944	
Residential Software Implementation	$86,072	

Costs associated with the Northwest Energy Efficiency Alliance (NEEA) Gas Market Transformation efforts and one time software implementation costs have been separated out from general programmatic expenditures for the purposes of assessing program cost-effectiveness for CY 2016. A second calculation in Appendix A can be viewed to assess cost-effectiveness of the program portfolio including the software implementation fees and the NEEA Gas Market Transformation Collaborative expenses for the second year of the Company's involvement in the five year pilot. Note - expenses associated with the NEEA Collaborative effort will increase throughout the five year pilot.

Current Year Highlights
Some CY 2016 noteworthy highlights are provided in the following section for both the Residential and Commercial/Industrial programs in Tables C&D.

Residential
Of note, Cascade more than doubled the uptake for Combination Radiant Heat and Hot Water measures, from 13 in 2015 to 29 in 2016. Also in 2016, Cascade's Residential Conservation Incentive Program grew the Built Green measure's uptake considerably. Compared to 2015's single Built Green participant, in 2016 Cascade captured 38 Built Green certified new homes in the Company's rebate program, thus encouraging a whole home approach toward efficiency in the new home industry. Finally, the success of the Tankless Hot Water Heaters should be noted – an increase of 35 percent, from 111 units for 2015 to 150 for 2016.

Table C: Residential Program Highlights

Residential Highlights	**2015**	**2016**	**Percent Change**
High Efficiency Natural Gas Combination Heat and Hot Water	**13**	**29**	**223%**
Built Green Homes	**1**	**38**	**3800%**
High-Efficiency Natural Gas Tankless Hot Water Heater	**111**	**150**	**135%**

Commercial
Fryer uptake grew more than six-fold in 2016, from 7 in 2015 to 44 in 2016. The Commercial Conservation Incentive Program more than doubled its Energy Savings Kit uptake in 2016, from 106 units in 2015 to 225 in 2016, in conjunction with an increase in Motion Control Faucets from a single unit in 2015 to 8 in 2016. In addition, Warm Air Furnaces also more than doubled its kBtu/hr. year over year, from 1,234 in 2015 to 3,386 for 2016. Focus given to a summer spiff for insulation paid off, with 40,725 square feet of insulation installed in 2015 yielding to a 33 percent increase to 61,048 square feet in 2016.

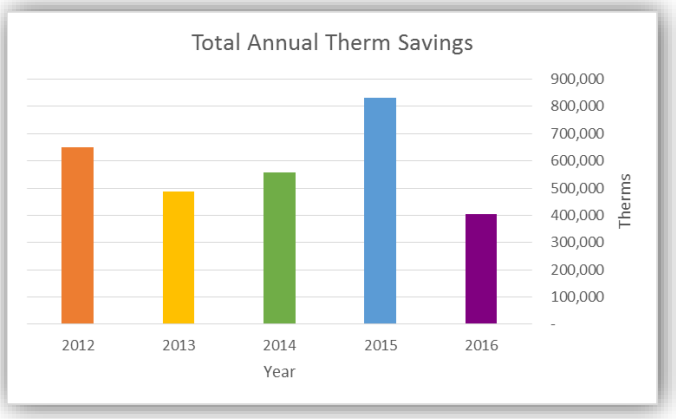
Table D: Commercial Program Highlights

Commercial Highlights	**2015**	**2016**	**Percent Change**
Motion Control Faucets	**1**	**8**	**800%**
Warm Air Furnace	**1234**	**3386**	**274%**
Insulation	**40,725**	**61,048**	**150%**
Fryer	**7**	**44**	**629%**
Energy Savers Kits	**106**	**225**	**212%**

Cumulative Savings – Overview of the larger impact

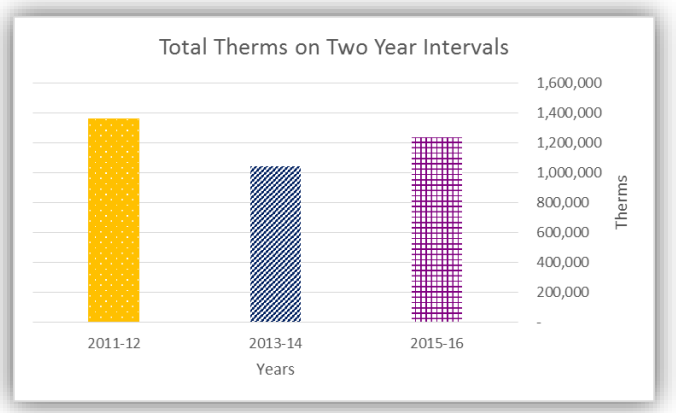
Over the last five years, Cascade's Conservation Incentive Programs have saved a total of 2.9 million therms which equates to 33.93 million pounds of avoided CO_{2e}. See Figure A for a visual of the therm savings for the past five years.

Figure A: Five Year Total Annual Therm Savings



Viewed as a 2 year accomplishment
Demand Side Management forecasting is provided in the Conservation Plan with a two year time horizon. Figure B provides a brief summary of the two year program achievements for Cascade's CIP therm savings in line with the Plan's two year focus.

Figure B: Two-Year Combined Achievements

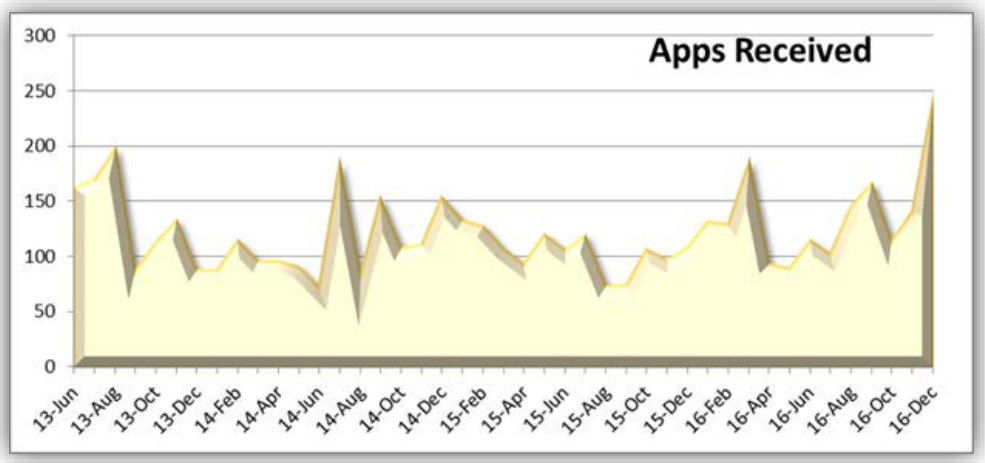


Reporting Format
As mentioned in the CY 2015 Annual Achievements Report, and in order to meet requests from the Conservation Advisory Group to provide closer to real-time tracking of program performance, Cascade records its Conservation Incentive Program annual performance based on the year in which the upgrade was paid by the Company vs when the measure was installed. The Company still keeps a record of the install dates on rebate eligible upgrades, but does not report the therms based on that install date. This alteration in reporting format has had the beneficial side effect of reducing the need for a true-up of the previous year's report as it is less likely the Company will need to revisit the previous year's accomplishments to later include outlying applications.

Conversely, projects that were received in December of 2016 that previously would have been counted toward program achievements for CY2016 based on install date, did not complete processing in the same month and will instead be attributed to 2017 program accomplishments based on paid dates. It is of interest to note, the Company had a significant uptick of submitted residential rebate applications from late November, through December 2016 and into January of

2017 far above historical trends. In fact, December of 2016 submitted applications reflected the highest number of applications received in a month for the past three years - see Figure C.

Figure C: Total Applications Received by Month



Low Income

Cascade has partnered with the Low Income Weatherization Assistance Program (WAP) since 2008, offering rebates to the agencies delivering whole-home energy improvements to its customers in the State of Washington. The Company believes weatherization offers a long-term solution to energy poverty by improving the overall efficiency of customers' homes. Whereas bill assistance addresses the immediate crisis, weatherization takes a long-lived sustainable approach by addressing the performance of the home, and reducing the amount of energy needed to heat that home, thus supporting long-term affordability. It is therefore in the Company's interest to ensure as many low income natural gas homes receive weatherization services as possible within Cascade's service area.

Since the discontinuation of ARRA funds, Cascade has experienced an ongoing decrease in the number of homes served by the WAP in its Washington service area. In 2015, the number dropped to 19 homes served and a total of 11,724 therms saved, reaching near-historical lows. Table E demonstrates the number of homes served and therms saved per year since the inception of WIP.

Table E: Weatherization Incentive Program Participation Levels and Savings by Year

Year	Number of Homes Served	Therms Saved
2008	46	13,985
2009	54	14,733
2010	112	30,809
2011	84	24,130
2012	64	21,824
2013	38	14,960
2014	21	7,338
2015	19	11,724
2016	24	11,743

In 2016, the Company experienced a marginal uptick in the number of homes served to **24**, and the number of therms saved, **11,743** (7,000 therms was the goal based on previous year accomplishments). This outcome pointed to the fact that without further program adjustments or expansions, significant improvements in participation levels would not be experienced.

Concerned, the Company reached out to its Conservation Advisory Group and weatherization partners to determine and address the root causes of lowered participation, and to remove remaining barriers to program success. Challenges identified through these conversations included adhering to the DOE priority list in light of the lower cost of natural gas, and not having adequate funds available from the utility to address the higher costs inherent to weatherization in natural gas homes.

The Company was directed by Commission Order No. 04, issued in Docket No. UG-152286 to develop a proposal for overcoming barriers to empowering the agencies to serve more natural gas homes. The Order instructed the Company and stakeholders to "consider approaches that Cascade has employed in other states, such as the low-income weatherization pilot tariff currently operating in the State of Oregon." This offered a promising direction for the Company's WA program. The Company already had a strong starting-point for its efforts as it had experienced similar challenges in Oregon which it had been able to overcome through the use of a conservation achievement tariff (CAT). This regulatory mechanism bridged the gap between the avoided cost payment available under the traditional Oregon Low Income Conservation Program (OLIEC) and total installed cost of eligible (tariff approved) weatherization measures. The CAT portion of funding was a breakthrough tariff that allowed the non-energy/societally beneficial portions of natural gas weatherization to be funded through the utility much in the way Cascade was allowed to provide bill assistance support to eligible customers in need.

On Wednesday, October 5, 2016, the Company presented the CAG with potential revisions to Cascade's Weatherization Incentive Program (WIP). Points of discussion included:

- Barriers to success, such as program design constraints, natural gas weatherization costs, Federal guidelines, and Federal prioritization methods for use of public funds

- Areas of potential improvement

- Potential solutions to increasing program viability by addressing the limitations associated with the current funding mechanism; and potentially reconfiguring the current program design to meet the needs of the Agencies delivering the program.

Following this discussion, Cascade drafted revisions to WIP using feedback from the CAG. Per the Commission Order, Cascade presented proposed program revisions to the Commission by December 31, 2016, which then became effective February 1.

Revisions to the Company's WIP included:

- Expanding the list of qualified energy efficiency measures to align more closely with the Washington State Department of Commerce's Weatherization Priority List.

- Increasing rebate payments to cover the total installed cost of approved measures. Payments per dwelling are capped at $10,000 to manage program costs and ensure as many homes as possible receive weatherization services.

- Adding a $550 audit reimbursement and $300 inspection payment. Cascade will annually review these amounts to ensure they are adequate to cover the Agency's costs.

- Requiring Agencies to execute a memorandum of understanding that defines their role as program administrators and establishes annual performance targets.

Expanded rebate offerings include:

- Water heater insulation
- Low-flow faucet aerators
- Low-flow showerheads
- Natural gas furnaces (95% AFUE or greater)
- Furnace tune-up and filter replacement
- Direct vent space heater (90% AFUE or greater)
- Natural gas water heaters (0.91 EF or greater tankless)
- Natural gas water heaters (0.64 EF or greater storage)

A weatherization partner must identify a savings-to-investment ratio of 1.0 or greater under TREAT or the Washington Department of Commerce Weatherization Priority List in order to receive an incentive. To receive a rebate, an Agency will provide Cascade with documentation demonstrating the measure is cost effective under the appropriate climate zone and housing type under the Priority List or that it has a savings-to-investment (SIR) ratio of 1.0 or higher when modeled in the Agency's TREAT energy audit software.

The Company's weatherization tariff was also expanded to include an *Enhanced* Weatherization Incentive Program (E-WIP). The avoided cost of natural gas can be provided for all tariff-approved measures under WIP, and the total installed cost of each measure can be provided under E-WIP. Projects are also allocated up to $500 for health and safety repairs. Total project costs may not exceed $10,000.

As of the time this report is being issued, eight of the twelve agencies in the Company's service area have submitted the paperwork necessary to qualify for E-WIP funding. The Company looks forward to working with each qualified agency to serve as many homes as possible in the years to come.

Please note the Low Income program does not fall under the same cost-effectiveness criteria as the rest of the portfolio, and while both the Utility Cost and Total Resource Cost are provided in Appendix A, they are not included in the full portfolio cost effectiveness calculation.

Table F: 2016 Low Income Programmatic Achievements

Totals	**Low Income**
Therms Achieved	**11,743**
Measures Installed	87
Customers Served	24
Carbon Offset (pounds CO_{2e} Avoided)	137,393

Table G: 2016 Low Income Programmatic Costs

Total Costs	**Low Income**
Incentives Paid	$87,064
Programmatic Costs	$6,313

Goal Setting

As previously mentioned the Company's platform for goal setting is housed within the Conservation Plan. This Annual Report is, however, a good opportunity to delve into some of the factors that can affect whether the Company is able to reach and exceed the goals set at the achievable level through its modeling software. Currently Cascade uses the TEA-Pot modeling tool provided by Nexant, Inc. Portfolios are shaped by the Company based on the TEA-Pot model and are periodically reevaluated and updated as necessary in order to balance cost-effectiveness (in keeping with current avoided costs), participation outcomes and updated building codes. The Company also confers with its Conservation Advisory Group as appropriate when alterations to the program portfolios are planned and implemented.

In 2013, Cascade hired Nexant, Inc. to produce a Conservation Potential Assessment, which included a tool for modeling future programs' potential therm savings. The Technical, Economic, Achievable Potential model (TEA-Pot) was delivered in February 2014 for use in the Demand Side Management chapter of the Integrated Resource Plan (IRP) in accordance with the Company's internal program design planning and construction.

The original iteration of the TEA-Pot model did not allow for the addition of the administrative costs into its calculations. This meant, as the total demand forecast was whittled down using a technical screen for available measures and an economic screen for cost-effectiveness, followed by the achievable funneling down of therms attributed to adoption rates, the final forecast was not realistic since it failed to take into account the program's administrative budget constraints.

The Company then had the model updated to accommodate the inclusion of administrative costs in the cost-effectiveness calculations. Last fall, Cascade ran the model for the 2016 Conservation Plan at multiple incentive levels in order to gain clearer insight into ways to grow the program and maximize therm savings potential while sending an enticing price signal to the end user to engage in energy-efficiency practices. As mentioned, incorporating the administrative costs into the model produced a sizeable increase in therm savings target above past year performances. In light of the increase in goals Cascade remains committed to achieving as many therms saved, as efficiently as possible, for its customers using available assets.

Please note the Company will be submitting a Request for Proposal to update, and or replace, the TEA-Pot model as the therm savings forecasting tool in the 2017 CY to be employed for program planning beginning in the 2018 IRP cycle.

For this reason, Cascade sought to capture all savings opportunities by streamlining the application process for customers in 2016 and improving review and processing procedures to significantly reduce disqualification of applications with incomplete data. It is also important to note the achievable level of potential noted above is unable to fully account for all possible reasons a customer would not apply for, or qualify for, a rebate. At a program specific level there are instances where customers install higher-efficiency upgrades, but choose not to notify the Company of the install and do not complete an application. Alternatively, some customers take the step to apply but do not qualify for the rebate due to lack of documentation, late submission of an application or a general misunderstanding of program requirements (including rules around using licensed contractors vs self-installs). As part of the Company's efforts to increase customer participation and satisfaction, the Company aggressively sought to remove traditional barriers to successful rebate submittal, which is discussed in the following section.

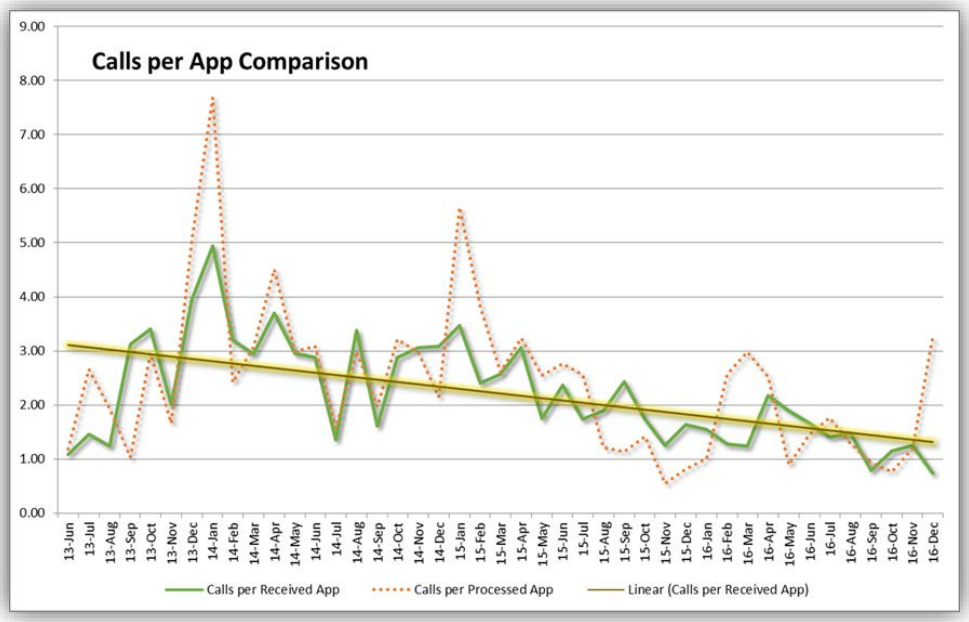
Program Evaluations

CY 2016 allowed the Company to critically evaluate its programs with an eye to improving the customer experience in tandem with setting the groundwork to reach more customers through higher savings goals. The following areas were evaluated, addressed and rectified:

Customer service and processing review

- Bi-weekly analysis of the residential rebate processing cycles to identify bottlenecks with an aim toward continual process improvements to reduce customer pain points
- Rolling 30, 60, 90 day Commercial/Industrial plan review with vendor to identify barriers and opportunities for customer and contractor outreach
- Increased focus and research into builder-centric outreach and assistance needed to encourage whole-home energy-efficiency upgrades
- Evaluation of language barriers in the Company's service territory for the Latino community resulting in development of Spanish speaking pieces and internal energy efficiency staff accommodating Spanish speaking customer requests
- Initial foray into residential customer energy-efficiency financing options and potential for inclusion into the CNGC programs
- Research and evaluation into the support necessary to provide technically proficient resources for pre-purchase/pre-application inquiries from partners including encouraging installation of high-efficiency natural gas combination water heat/space heat units and whole home energy partner customized application program solutions
- Extensive review and evaluation of factors contributing to disqualification (DNQ) of applications and measures with consistent internal improvements and education to Trade Allies to reduce DNQ rates and frequencies.
- Internal tracking and visibility into the impact of bill inserts as evidenced by upticks in calls to the department for featured measures.
- Monthly call log analysis to understand primary drivers prompting residential customers to call the dedicated energy-efficiency line to improve the customer's experience, reduce the need for calling and reduce admin overhead while encouraging repeat use of the CIP – See Figure D for an indication of the reduction in number of calls per application submitted through December 2016.

Figure D: Steady Decrease in Calls per Application



Software Applicability and Customization

- Evaluation of the purchased software solution from the vendor with an eye toward improved tracking of rebates through the fully integrated system
- Missing information analysis and follow-up with identification of improvements to reduce reoccurrence of omitted data and need for additional administrative time and cost to go toward tracking down data not included by the customer or contractor
- Trade Ally management support of the CIP efforts through best use and development of the software solution
- Evaluation of the customer's ability to track current rebate status and work with the vendor to improve visibility to encourage future upgrades and program use
- Thorough review of the Public User Interface (PUI) accessed through the residential rebate submission process – resulting in an increase from 0.4% of applications submitted through the PUI in early 2016 to an increase of over 7% at the time this report is being written.

Application Evaluation

- Analysis showed high impact missing information areas, which were rectified by redesigning the Residential Rebate application to include:
    - Focus on customer acknowledgement and signature (frequent missing signature)
    - Indication of natural gas as primary heating source for heating measures requiring confirmation that home is not heated with an electric heat pump
- Highlighting 90-day window for submission of rebate after install to increase program reportability and real-time tracking
- Simplification of application form to ease customer application process burden
- Reduction of the length of the application as well as increased reliance on installing contractor to provide pertinent measure data

A significant amount of time has also been committed toward working with the residential software vendor Nexant Inc. to develop the Evaluation, Measurement and Verification (EM&V) tracking feature of the iEnergy software which is currently in use by the Company for residential rebate processing, Trade Ally management and will shortly be implemented for the Low-Income program. These collaborative efforts with the vendor have an aim toward accommodating weather normalized project EM&V for participating residential projects.

The Company also performed Quality Control inspections on both Commercial/Industrial projects and Residential projects. All C&I projects over $5,000 had quality control inspections performed, and up to 5% of the applications submitted for the residential rebate program were assigned quality control inspections. In the residential program, 20 inspections were performed in Climate Zone 1 (Northwest portion of the Company's service territory), 17 in Zone 2 (Western/Coastal region) and 18 in Zone 3 (East of the Cascade Mountains).

Quality Control Inspections

Cascade performs Quality Control Inspections on a portion of the projects installed as part of the Conservation Incentive Programs. Any Commercial project exceeding $5000 is inspected, and up to 5 percent of the residential program applications are inspected consisting of a combination of randomly selected and flagged residential submissions.

All Commercial inspections are performed by the Company's C&I vendor as part of their program delivery. The C&I inspection includes one of four elements - either a pre-installation, post-installation, study review and/or general project review. The Reviewer verifies all measures listed on the application have been installed, are operational, meet the program requirements, include start up reports and invoices and often include photos of the installed equipment for

verification and proof of install at qualifying locations. The reviewer then confirms their approval and signs and dates the form.

The residential program inspections are performed through a combination of internal staff review and third party contracting through the Sustainable Living Center located out of Walla Walla Washington. Table H provides a breakdown of the number of residential inspections performed in 2016 per climate zone.

Table H: Residential Program 2016 Inspection Summary

Climate Zone	QC performed
Zone 1	**20**
Zone 2	**17**
Zone 3	**18**
Total	**55**

The residential inspections are geared toward confirming the submitted applications match those measures actually installed including meeting minimum efficiency requirements, that all pertinent health and safety requirements have been addressed, and that generally accepted industry best practices have been demonstrated as part of the installation by a contractor. The program verifies the reported efficiency of the equipment as well as the beginning and ending R-values and U-values on weatherization projects to confirm deemed savings are viable for those projects. If an issue is noted as part of an inspection the customer and contractor are notified of the issue and in most cases given an opportunity to address and correct. Cascade also uses quality control inspections as a means to confirm the quality of installations performed by Trade Ally contractors to the program as well as vet contractors seeking admittance to the program.

The following demonstrate some of the issues addressed as part of the inspection process in 2016:

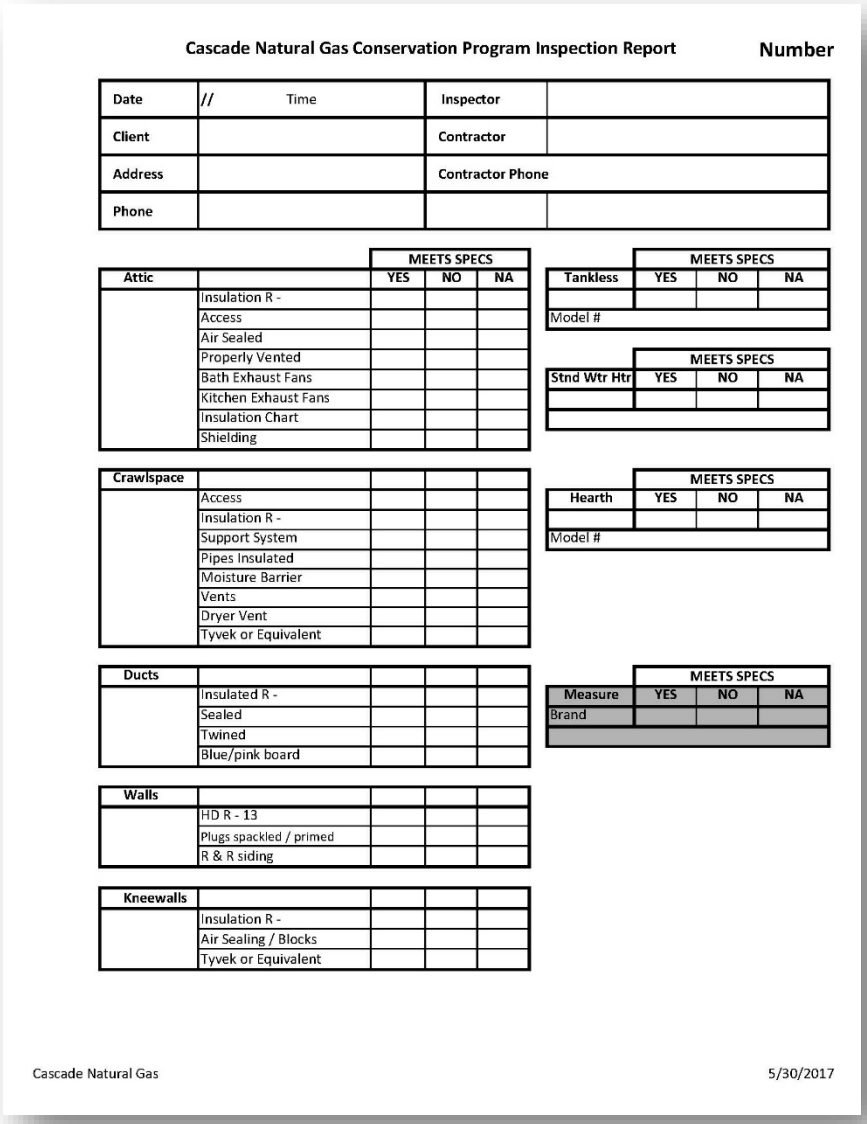
- When Cascade contacted a customer to arrange an inspection the customer requested a Cascade representative schedule the inspection for a tankless natural gas water heater while their contractor was onsite repairing the newly installed piece of equipment. The water heater was not functioning properly as hot water was not reaching the kitchen and/or bath. The neighbors had also complained of an odor from the exhaust vent installed by the contractor. The customer had requested Cascade be on site and serve as a trusted advisor for the repair and liaison with the contractor to confirm the product operated as required. The inspection failed, resulting in the contractor replacing the unit as repair was not viable. The customer was pleased with the program experience and indicated Cascade's presence was appreciated and felt the assistance during the repair and inspection helped encourage the contractor to replace the faulty unit vs simply repairing it.
- A customer requested Cascade inspect an insulation project installed by a Trade Ally as their invoice indicated a higher R-value than had apparently been installed in the floor. The customer was seeking assurance of the contractor's integrity as well as confirmation of the work performed. Cascade inspected the project and found the floor insulation installed by the contractor met industry best practices and filled the joist cavity as required to receive the rebate and allow the installation to achieve the deemed therm savings. The invoice was then updated to reflect the correct R-value for the insulation and the Customer was satisfied with the work.
- A home was flagged for inspection due to an indication of a ductless heat pump being installed in conjunction with a natural gas furnace and combination hydronic tankless hot water heater system. Customers who use a heat pump as the primary heating source for their homes are not eligible for natural gas space heating rebates so Cascade sought to

verify the heat pump was not capable of providing the primary heat for the home. The Company representative inspected the project and found the ductless heat pump was installed in a separate room and was capable of heating approximately 200 square feet of conditioned space, as opposed to the full 3,500 plus square footage of the home. The customer was eligible for the incentives and was pleased to have received the inspection and service.

- Cascade District Staff informed the Energy Efficiency program of an issue with improper piping performed by a Trade Ally installing natural gas fireplaces and hearths in the Company's service territory. Program staff met with both the district manager and the installer to clarify program requirements as a member of the Trade Ally network, and reeducate the installer on company safety requirements for piping installations. As a result of the inspection and discussions the Trade Ally was put on probation, and was temporarily removed from the online referral available through Cascade's website until they provided evidence of following the correct processes moving forward.

See Figure E for a sample of the residential checklist used by program inspectors:

Figure E: Residential Program 2016 Inspection Checklist



Cascade Natural Gas Conservation Program Inspection Report **Number**

Date	// Time	Inspector	
Client		Contractor	
Address		Contractor Phone	
Phone			

		MEETS SPECS		
Attic		YES	NO	NA
	Insulation R -			
	Access			
	Air Sealed			
	Properly Vented			
	Bath Exhaust Fans			
	Kitchen Exhaust Fans			
	Insulation Chart			
	Shielding			

		MEETS SPECS		
Crawlspace		YES	NO	NA
	Access			
	Insulation R -			
	Support System			
	Pipes Insulated			
	Moisture Barrier			
	Vents			
	Dryer Vent			
	Tyvek or Equivalent			

		MEETS SPECS		
Ducts		YES	NO	NA
	Insulated R -			
	Sealed			
	Twined			
	Blue/pink board			

		MEETS SPECS		
Walls		YES	NO	NA
	HD R - 13			
	Plugs spackled / primed			
	R & R siding			

		MEETS SPECS		
Kneewalls		YES	NO	NA
	Insulation R -			
	Air Sealing / Blocks			
	Tyvek or Equivalent			

	MEETS SPECS		
Tankless	YES	NO	NA
Model #			

	MEETS SPECS		
Stnd Wtr Htr	YES	NO	NA

	MEETS SPECS		
Hearth	YES	NO	NA
Model #			

	MEETS SPECS		
Measure	YES	NO	NA
Brand			

Cascade Natural Gas 5/30/2017

Participation Summary

A full breakdown of therm savings, Utility Costs and Total Resource Costs by all measures and programs for the 2016 program year can be found in Appendix A.

Updates to CY15 Program Achievements

Cascade has not included a true-up of the Company's previous year's report as no additional expenditures or rebates were submitted after the report was filed. As mentioned earlier this is due in large part to the transition to reporting by paid vs install date.

APPENDIX A

CASCADE NATURAL GAS CORPORATION

2016 Program Participant Cost Effectiveness Estimate Summary excluding NEEA Market Transformation Expenses

PROGRAM	Participants	TOTAL ANNUAL THERM SAVINGS	TOTAL INCREMENTAL COSTS	NON-ENERGY BENEFITS	WEIGHTED MEASURE LIFE	DISCOUNTED THERM SAVINGS	PROGRAM DELIVERY & ADMIN	TOTAL PROGRAM REBATE	PROGRAM UTILITY COST	UC W/DELIVERY & ADMIN	BENEFIT COST RATIO		PROGRAM TOTAL RESOURCE COST	TRC W/DELIVERY & ADMIN	BENEFIT COST RATIO
RESIDENTIAL (includes units of insulation)	1,552	171,620	$ 1,716,650	$ 746,770	22.86	2,391,466	$ 519,634	$ 458,287	$ 0.192	$ 0.409	1.134		$ 0.406	$ 0.623	0.646
COMMERCIAL	203	222,194	$ 1,211,836	$ 538,175	18.04	2,674,050	$ 925,322	$ 443,695	$ 0.166	$ 0.512	0.933		$ 0.252	$ 0.598	0.710
TOTAL	**1,755**	**393,814**	**$ 2,928,486**	**$ 1,284,945**	**20.14**	**5,065,516**	**$ 1,444,956**	**$ 901,982**	**$ 0.178**	**$ 0.463**	**1.015**		**$ 0.324**	**$ 0.610**	**0.686**

PROGRAM	MEASURES	TOTAL ANNUAL THERM SAVINGS	TOTAL INSTALLED COSTS	NON-ENERGY BENEFITS	WEIGHTED MEASURE LIFE	DISCOUNTED THERM SAVINGS	PROGRAM DELIVERY & ADMIN	TOTAL PROGRAM REBATE	PROGRAM UTILITY COST	UC W/DELIVERY & ADMIN	BENEFIT COST RATIO		PROGRAM TOTAL RESOURCE COST	TRC W/DELIVERY & ADMIN	BENEFIT COST RATIO
LOW INCOME	**87**	**11,743**	**$ 143,088**	**$ 14,309**	**26.52**	**184,401**	**$ 6,313**	**$ 87,065**	**$ 0.472**	**$ 0.506**	**0.887**		**$ 0.698**	**$ 0.733**	**0.522**

Nominal interest rate (post tax cost of cap.)	8.76%
Inflation rate	2.00%
Long term real discount rate	4.17%
NEEA Market Transformation Expenses 2016	$244,944
Nexant Software Implementation	$86,072

The Company devised an intuitive and focused approach to measuring non-energy benefits for our Commercial and Residential program measures. Note the Low Income program uses a blanket 10 percent adder for yearly achievements.

2016 Program Participant Cost Effectiveness Estimate Summary including NEEA Market Transformation and Nexant Software Implementation Expenditures

PROGRAM	UNITS	TOTAL ANNUAL THERM SAVINGS	TOTAL INCREMENTAL COSTS	NON-ENERGY BENEFITS	WEIGHTED MEASURE LIFE	DISCOUNTED THERM SAVINGS	PROGRAM DELIVERY & ADMIN W/ NEEA	TOTAL PROGRAM REBATE	PROGRAM UTILITY COST	UC W/DELIVERY & ADMIN	BENEFIT COST RATIO		PROGRAM TOTAL RESOURCE COST	TRC W/DELIVERY & ADMIN	BENEFIT COST RATIO
RESIDENTIAL (includes units of insulation)	1,552	171,620	$ 1,716,650	$ 746,770	23	2,391,466	$ 605,706	$ 458,287	$ 0.192	$ 0.445	1.042		$ 0.406	$ 0.659	0.611
COMMERCIAL	203	222,194	$ 1,211,836	$ 538,175	18	2,674,050	$ 925,322	$ 443,695	$ 0.166	$ 0.512	0.933		$ 0.252	$ 0.598	0.710
TOTAL	**1,755**	**393,814**	**$ 2,928,486**	**$ 1,284,945**	**20.14**	**5,065,516**	**$ 1,689,900**	**$ 901,982**	**$ 0.178**	**$ 0.512**	**0.919**		**$ 0.324**	**$ 0.658**	**0.636**

Program Year:
2016

CASCADE NATURAL GAS CORPORATION
COMMERCIAL Program Participant Cost Effectiveness

MEASURE	DESCRIPTION	EFFICIENCY TYPE FOR QUALIFICATION	TOTAL MEASURE COUNT	ANNUAL THERM SAVINGS/UNIT	UNITS	UNITS INSTALLED	TOTAL ANNUAL THERM SAVINGS	MEASURE INCREM COST	TOTAL INCREMENTAL COST	SOCIETAL NEBS	PARTICIPANT NEBS	NET INCREMENTAL COST	LIFE	DISCOUNTED THERM SAVINGS	PROGRAM DELIVERY & ADMIN	PROGRAM REBATE	TOTAL REBATES COST	UTILITY COST	LOADED UC	BENEFIT COST RATIO	TOTAL RESOURCE COST	LOADED TRC	BENEFIT COST RATIO
Standard Measures																							
Warm Air Furnace	High Efficiency Condensing Furnace	Minimum 91% AFUE	37.00	1.10	kBtu/hr	3,386.00	3,724.60	$ 6.72	$ 22,753.92	$ 2.09	$ 0.73	$ 13,218	18	46,506	$ 15,510.99	$ 3.00	$ 10,158.00	$ 0.218	$ 0.552	0.834	$ 0.284	$ 0.618	0.662
Domestic Hot Water Tanks	Condensing Tank	Minimum 91% AFUE or 91% Thermal Efficiency	36.00	0.79	kBtu/hr	8,878.59	7,014.09	$ 6.06	$ 53,804.26	$ 1.36	$ 0.47	$ 37,539	15	77,066	$ 29,209.97	$ 2.50	$ 22,196.48	$ 0.288	$ 0.667	0.712	$ 0.487	$ 0.866	0.488
Clothes Washer	Commercial Gas Washer	1.8 MEF	1.00	90.00	each	10.00	900.00	$ 200.00	$ 2,000.00	$ 124.47	$ 41.57	$ 340	10	7,238	$ 3,748.02	$ 180.00	$ 1,800.00	$ 0.249	$ 0.766	0.631	$ 0.047	$ 0.565	0.779
Boiler	High Efficiency Condensing Boiler	Min 90% Thermal Eff & 300 kBtu input	38.00	1.50	kBtu/hr	62,231.80	93,347.70	$ 8.89	$ 553,240.70	$ 3.00	$ 1.05	$ 300,691	20	1,249,741	$ 388,743.90	$ 4.00	$ 248,927.20	$ 0.199	$ 0.510	0.886	$ 0.241	$ 0.552	0.728
DHW Tankless Water Heater	Energy Star	.82 EF	2.00	35.00	gpm	10.15	355.25	$ 137.90	$ 1,399.69	$ 66.44	$ 23.17	$ 490	18	4,436	$ 1,479.43	$ 60.00	$ 609.00	$ 0.137	$ 0.471	0.978	$ 0.111	$ 0.444	0.922
Attic Insulation Tier 1 (New Tariff)	Attic Insulation Tier 1	Minimum R-30	4.00	0.31	sq. ft.	27,244.00	8,445.64	$ 1.35	$ 36,779.40	$ 0.75	$ 0.27	$ 9,099	30	143,074	$ 35,171.63	$ 0.50	$ 13,622.00	$ 0.095	$ 0.341	1.281	$ 0.064	$ 0.309	1.202
Wall Insulation Tier 2 (New Tariff)	Wall Insulation Tier 2	Minimum R-19	1.00	0.19	sq. ft.	920.00	174.80	$ 1.70	$ 1,564.00	$ 0.46	$ 0.16	$ 991	30	2,961	$ 727.95	$ 0.56	$ 515.20	$ 0.174	$ 0.420	1.041	$ 0.335	$ 0.581	0.641
Motion Control Faucet	Motion Control Faucet	<= 1.8 gpm, Watersense Certified	1.00	136.00	each	8.00	1,088.00	$ 315.00	$ 2,520.00	$ 131.10	$ 40.72	$ 1,145	5	4,821	$ 4,530.95	$ 105.00	$ 840.00	$ 0.174	$ 1.114	0.436	$ 0.238	$ 1.178	0.383
Radiant Heating (New Tariff)	Direct Fired Radiant Heating	None	7.00	4.330	kBtu/hr	600.00	2,598.00	$ 21.00	$ 12,600.00	$ 8.22	$ 2.87	$ 5,948	18	32,439	$ 10,819.30	$ 6.95	$ 4,170.00	$ 0.129	$ 0.462	0.997	$ 0.183	$ 0.517	0.792
Door Type Dishwasher Low Temp Gas	Energy Star	≤ 6 kw Idle Rate/ ≤1.18 gallon/rack	3.00	448.000	each	3.00	1,344.00	$ 1,800.00	$ 5,400.00	$ 684.55	$ 232.15	$ 2,650	12	12,490	$ 5,597.05	$ 650.00	$ 1,950.00	$ 0.156	$ 0.604	0.787	$ 0.212	$ 0.660	0.655
Gas Fryer - Restaurant	Energy Star	None	29.00	685.000	each	44.00	30,140.00	$ 1,400.00	$ 61,600.00	$ 1,046.69	$ 354.96	$ (73)	12	280,096	$ 125,517.19	$ 600.00	$ 26,400.00	$ 0.094	$ 0.542	0.877	$ (0.000)	$ 0.448	0.966
Gas Convection Oven - Lodging	Energy Star	≥44% Cooking Eff/ ≤13,000 Btu/hr Idle Rate	3.00	219.000	each	5.00	1,095.00	$ 900.00	$ 4,500.00	$ 334.63	$ 113.48	$ 2,259	12	10,176	$ 4,560.10	$ 450.00	$ 2,250.00	$ 0.221	$ 0.669	0.711	$ 0.222	$ 0.670	0.645
Gas Convection Oven - Restaurant	Energy Star	≥44% Cooking Eff/ ≤13,000 Btu/hr Idle Rate	2.00	649.000	each	3.00	1,947.00	$ 900.00	$ 2,700.00	$ 991.68	$ 336.31	$ (1,284)	12	18,094	$ 8,108.23	$ 450.00	$ 1,350.00	$ 0.075	$ 0.523	0.910	$ (0.071)	$ 0.377	1.147
Gas Convection Oven - School	Energy Star	≥44% Cooking Eff/ ≤13,000 Btu/hr Idle Rate	1.00	141.000	each	4.00	564.00	$ 900.00	$ 3,600.00	$ 215.45	$ 73.07	$ 2,446	12	5,241	$ 2,348.76	$ 450.00	$ 1,800.00	$ 0.343	$ 0.792	0.601	$ 0.467	$ 0.915	0.473
Insulation-Attic	Attic Insulation (Tier 2)	Minimum R-45	1.00	0.320	sq. ft.	5,005.00	1,601.60	$ 1.63	$ 8,158.15	$ 0.77	$ 0.28	$ 2,909	30	27,132	$ 6,669.82	$ 0.65	$ 3,253.25	$ 0.120	$ 0.366	1.194	$ 0.107	$ 0.353	1.053
Insulation-Attic	Attic Insulation (Tier 2) Promo Rate	Minimum R-45	3.00	0.320	sq. ft.	9,573.00	3,063.36	$ 1.63	$ 15,603.99	$ 0.77	$ 0.28	$ 5,564	30	51,895	$ 12,757.28	$ 0.78	$ 7,466.94	$ 0.144	$ 0.390	1.121	$ 0.107	$ 0.353	1.053
Insulation-Roof	Roof Insulation (Tier 2) Promo Rate	Minimum R-30	2.00	0.360	sq. ft.	46,470.00	16,729.20	$ 2.15	$ 99,910.50	$ 0.87	$ 0.31	$ 45,082	30	283,403	$ 69,668.29	$ 0.96	$ 44,611.20	$ 0.157	$ 0.403	1.083	$ 0.159	$ 0.405	0.918
ESK A *	Energy Saver Kit A (LF PRSV and Aerator)	NA	17.00	109.000	each	26.00	2,834.00	$ 119.00	$ 3,094.00	$ 105.07	$ (91.43)	$ 2,739	5	12,556	$ 11,802.11	$ -	$ 3,094	$ 0.246	$ 1.186	0.409	$ 0.218	$ 1.158	0.390
ESK B *	Energy Saver Kit B (LF Showerheads)	NA	6.00	14.000	each	199.00	2,786.00	$ 44.00	$ 8,756.00	$ 19.36	$ (22.49)	$ 9,378	10	22,407	$ 11,602.22	$ -	$ 8,756	$ 0.391	$ 0.909	0.532	$ 0.419	$ 0.936	0.470
Custom Measures																							
FruitSmart Inc. Custom Economizer	COMCUSTOTH	Custom Other	1.00	18,347	/unit	1	18,347.00	$ 49,450.00	$ 49,450.00	$ 17,685.67	$ 5,492.70	$ 26,272	5	81,289	$ 76,405.57	$ 8,485.00	$ 8,485	$ 0.104	$ 1.044	0.465	$ 0.323	$ 1.263	0.357
Bellingham Towers Steam Traps Custom	COMCUSTSTM	Custom Steam Traps	1.00	5,312	/unit	1	5,312.00	$ 8,122.00	$ 8,122.00	$ 9,160.74	$ 3,157.62	$ -	15	58,365	$ 22,121.68	$ 4,061.00	$ 4,061	$ 0.070	$ 0.449	1.059	$ -	$ 0.379	1.114
Shari's Restaurant Custom Catalyst DCV Controller	COMCUSTDDC	Custom Controls	1.00	837	/unit	1	837.00	$ 1,161.00	$ 1,161.00	$ 1,443.44	$ 497.54	$ -	15	9,196	$ 3,485.66	$ 581.00	$ 581	$ 0.063	$ 0.442	1.074	$ -	$ 0.379	1.114
North Mason High School Custom and Standard	COMCUSTOTH	Custom Other	1.00	380	/unit	1	380.00	$ 3,500.00	$ 3,500.00	$ 580.64	$ 196.91	$ 2,722	12	3,531	$ 1,582.50	$ 394.00	$ 394	$ 0.112	$ 0.560	0.850	$ 0.771	$ 1.219	0.355
Buffalo Wild Wings Kennewick Standard and Custom	COMCUSTOTH	Custom Other	1.00	250	/unit	1	250.00	$ 1,200.00	$ 1,200.00	$ 345.74	$ 115.48	$ 739	10	2,011	$ 1,041.12	$ 223.00	$ 223	$ 0.111	$ 0.629	0.769	$ 0.367	$ 0.885	0.497
Meridian Middle School Standard & Custom	COMCUSTOTH	Custom Other	1.00	3,923	/unit	1	3,923.00	$ 26,080.00	$ 26,080.00	$ 6,765.36	$ 2,331.96	$ 16,983	15	43,103	$ 16,337.22	$ 4,945.00	$ 4,945	$ 0.115	$ 0.494	0.962	$ 0.394	$ 0.773	0.546
City of Prosser Waste Water Treatment Plant Biogas Custom	COMCUSTOTH	Custom Other	1.00	8,900	/unit	1	8,900.00	$ 174,500.00	$ 174,500.00	$ 19,847.30	$ 7,035.72	$ 147,617	25	136,572	$ 37,063.80	$ 16,031.00	$ 16,031	$ 0.117	$ 0.389	1.140	$ 1.081	$ 1.352	0.285
Leopold Retirement Residence Custom Shower Heads	COMCUSTOTH	Custom Other	1.00	684	/unit	1	684.10	$ 810.00	$ 810.00	$ 1,045.31	$ 354.50	$ -	12	6,357	$ 2,848.92	$ 405.00	$ 405	$ 0.064	$ 0.512	0.929	$ -	$ 0.448	0.965
Washington State Patrol Custom Control Upgrade	COMCUSTDDC	Custom Controls	1.00	3,809.000	/unit	1	3,809.00	$ 47,028.00	$ 47,028.00	$ 6,568.76	$ 2,264.19	$ 38,195	15	41,851	$ 15,862.47	$ 4,801.00	$ 4,801	$ 0.115	$ 0.494	0.962	$ 0.913	$ 1.292	0.327
TOTAL PROGRAM							222,194		1,211,836			$ 673,660	18.04	2,674,050	$ 925,322		$ 443,695.27	$ 0.166	$ 0.512	0.933	$ 0.252	$ 0.598	0.710

Long-term discount rate for avoided costs 8.76%
Inflation rate 2.00%

Long-term discount rate for DSM 4.17%

Total Non-Energy Benefits = $ 538,175.49

Total 2016 Program Admin
$925,322.14

custom admin
$462,661.07

prescriptive admin
$462,661.07

Program Year:
2016

CASCADE NATURAL GAS CORPORATION
RESIDENTIAL Program Participant Cost Effectiveness

MEASURE	ZONE	EFFICIENCY RATING	PARTICIPANTS	MEASURES INSTALLED	ANNUAL THERM SAVINGS	TOTAL ANNUAL THERM SAVINGS	MEASURE INCREMENTAL COST	SOCIETAL NEBS	PARTICIPANT NEBS	TOTAL INCREMENTAL COST	TOTAL NET INCREMENTAL COST WITH NEBS	MEASURE LIFE	TRC DISCOUNTED THERM SAVINGS	UCT DISCOUNTED THERM SAVINGS	PROGRAM DELIVERY & ADMIN	PROGRAM REBATE	TOTAL REBATES COST	UTILITY COST	UC	LOADED UTILITY BENEFIT TO COST RATIO	TOTAL	TRC	LOADED SOCIETAL BENEFIT TO COST RATIO
Built Green Certified Home	Zone 3	Built Green Certified	38	38	210	7,980	$ 1,142.00	$ 515.98	$ 537.29	$ 43,396.00	$ 3,371.60	30	135,186	135,186	$ 24,162.05	600	$ 22,800.00	$ 0.169	$ 0.347	1.257	$ 0.025	$ 0.204	1.826
Ceiling Insulation	Zone 1	Equal to or Greater than R-38	91	100843	0.062	6,252	$ 0.67	$ 0.18	$ 0.13	$ 67,564.81	$ 67,537.32	45	126,085	126,085	$ 18,930.77	0.3	$ 30,252.90	$ 0.240	$ 0.390	1.058	$ 0.536	$ 0.686	0.501
Ceiling Insulation	Zone 2	Equal to or Greater than R-38	26	30988	0.057	1,766	$ 0.67	$ 0.16	$ 0.12	$ 20,761.96	$ 20,754.60	45	35,620	35,620	$ 5,348.10	0.3	$ 9,296.40	$ 0.261	$ 0.411	1.003	$ 0.583	$ 0.733	0.469
Ceiling Insulation	Zone 3	Equal to or Greater than R-38	48	61897	0.067	4,147	$ 0.67	$ 0.19	$ 0.13	$ 41,470.99	$ 41,455.58	45	83,631	83,631	$ 12,556.69	0.3	$ 18,569.10	$ 0.222	$ 0.372	1.109	$ 0.496	$ 0.646	0.532
.91 Tankless Hot Water Heater	Zone 1	0.91 Energy Factor or Greater	103	103	54	5,562	$ 1,171.00	$ 104.54	$ 336.42	$ 120,613.00	$ 75,194.44	18	69,448	69,448	$ 16,840.76	150	$ 15,450.00	$ 0.222	$ 0.465	0.990	$ 1.083	$ 1.325	0.309
.91 Tankless Hot Water Heater	Zone 2	0.91 Energy Factor or Greater	27	28	54	1,512	$ 1,171.00	$ 104.54	$ 336.42	$ 32,788.00	$ 20,441.21	18	18,879	18,879	$ 4,578.07	150	$ 4,200.00	$ 0.222	$ 0.465	0.990	$ 1.083	$ 1.325	0.309
.91 Tankless Hot Water Heater	Zone 3	0.91 Energy Factor or Greater	19	19	54	1,026	$ 1,171.00	$ 104.54	$ 336.42	$ 22,249.00	$ 13,870.82	18	12,811	12,811	$ 3,106.55	150	$ 2,850.00	$ 0.222	$ 0.465	0.990	$ 1.083	$ 1.325	0.309
.67 Water Heater	Zone 1	0.67 Energy Factor or Greater	11	11	33	363	$ 139.00	$ 60.11	$ 31.94	$ 1,529.00	$ 516.52	16	4,177	4,177	$ 1,099.10	45	$ 495.00	$ 0.118	$ 0.382	1.234	$ 0.124	$ 0.387	1.083
.67 Water Heater	Zone 2	0.67 Energy Factor or Greater	4	4	33	132	$ 139.00	$ 60.11	$ 31.94	$ 556.00	$ 187.83	16	1,519	1,519	$ 399.67	45	$ 180.00	$ 0.118	$ 0.382	1.234	$ 0.124	$ 0.387	1.083
.67 Water Heater	Zone 3	0.67 Energy Factor or Greater	4	4	33	132	$ 139.00	$ 60.11	$ 31.94	$ 556.00	$ 187.83	16	1,519	1,519	$ 399.67	45	$ 180.00	$ 0.118	$ 0.382	1.234	$ 0.124	$ 0.387	1.083
Energy Savings Kit 1	Zone 1	Low Flow Showerhead plus Aerators	14	14	17	238	$ 10.00	$ 24.07	$ 69.17	$ 140.00	$ -	10	1,914	1,914	$ 720.62	10	$ 140.00	$ 0.073	$ 0.450	1.076	$ -	$ 0.376	1.169
Energy Savings Kit 1	Zone 2	Low Flow Showerhead plus Aerators	2	2	17	34	$ 10.00	$ 24.07	$ 69.17	$ 20.00	$ -	10	273	273	$ 102.95	10	$ 20.00	$ 0.073	$ 0.450	1.076	$ -	$ 0.376	1.169
Energy Savings Kit 1	Zone 3	Low Flow Showerhead plus Aerators	2	2	17	34	$ 10.00	$ 24.07	$ 69.17	$ 20.00	$ -	10	273	273	$ 102.95	10	$ 20.00	$ 0.073	$ 0.450	1.076	$ -	$ 0.376	1.169
Energy Savings Kit 2	Zone 1	Low Flow Showerhead plus Aerators	23	23	31	713	$ 16.00	$ 43.90	$ 69.17	$ 368.00	$ -	10	5,734	5,734	$ 2,158.84	16	$ 368.00	$ 0.064	$ 0.441	1.098	$ -	$ 0.376	1.169
Energy Savings Kit 2	Zone 2	Low Flow Showerhead plus Aerators	16	16	31	496	$ 16.00	$ 43.90	$ 69.17	$ 256.00	$ -	10	3,989	3,989	$ 1,501.80	16	$ 256.00	$ 0.064	$ 0.441	1.098	$ -	$ 0.376	1.169
Energy Savings Kit 2	Zone 3	Low Flow Showerhead plus Aerators	24	24	31	744	$ 16.00	$ 43.90	$ 69.17	$ 384.00	$ -	10	5,984	5,984	$ 2,252.70	16	$ 384.00	$ 0.064	$ 0.441	1.098	$ -	$ 0.376	1.169
ENERGY STAR Certified Home	Zone 3	HERS 75	2	2	207	414	$ 1,142.00	$ 508.61	$ 534.88	$ 2,284.00	$ 197.02	30	7,013	7,013	$ 1,253.52	600	$ 1,200.00	$ 0.171	$ 0.350	1.249	$ 0.028	$ 0.207	1.798
Floor Insulation	Zone 1	Equal to or Greater than R-30 or to fill cavity	116	129,589	0.056	7,257	$ 1.08	$ 0.16	$ 0.16	$ 139,956.12	$ 139,918.96	45	146,346	146,346	$ 21,972.88	0.3	$ 38,876.70	$ 0.266	$ 0.416	0.992	$ 0.956	$ 1.106	0.311
Floor Insulation	Zone 2	Equal to or Greater than R-30 or to fill cavity	22	23,621	0.054	1,276	$ 1.08	$ 0.15	$ 0.16	$ 25,510.68	$ 25,503.80	45	25,723	25,723	$ 3,862.09	0.3	$ 7,086.30	$ 0.275	$ 0.426	0.969	$ 0.991	$ 1.142	0.301
Floor Insulation	Zone 3	Equal to or Greater than R-30 or to fill cavity	25	20,808	0.059	1,228	$ 1.08	$ 0.17	$ 0.16	$ 22,472.64	$ 22,464.35	45	24,758	24,758	$ 3,717.18	0.3	$ 6,242.40	$ 0.252	$ 0.402	1.026	$ 0.907	$ 1.058	0.325
High Efficiency Combination Radiant Heat	Zone 1	90% Eff Condensing Tankless Combo w/ WH	24	24	475	11,400	$ 2,500.00	$ 993.23	$ 768.82	$ 60,000.00	$ 17,710.91	21	157,457	157,457	$ 34,517.21	825	$ 19,800.00	$ 0.126	$ 0.345	1.329	$ 0.112	$ 0.332	1.201
High Efficiency Combination Radiant Heat	Zone 2	90% Eff Condensing Tankless Combo w/ WH	4	4	468	1,872	$ 2,500.00	$ 978.59	$ 764.22	$ 10,000.00	$ 3,028.74	21	25,856	25,856	$ 5,668.09	825	$ 3,300.00	$ 0.128	$ 0.347	1.321	$ 0.117	$ 0.336	1.184
High Efficiency Combination Radiant Heat	Zone 3	90% Eff Condensing Tankless Combo w/ WH	1	1	476	476	$ 2,500.00	$ 995.32	$ 769.47	$ 2,500.00	$ 735.21	21	6,575	6,575	$ 1,441.24	825	$ 825.00	$ 0.125	$ 0.345	1.330	$ 0.112	$ 0.331	1.203
High Efficiency Entryway Door	Zone 1	Door U-Factor <0.21 Energy Star Door	5	5	13	65	$ 200.00	$ 29.51	$ 29.48	$ 1,000.00	$ 705.05	25	997	997	$ 196.81	50	$ 250.00	$ 0.251	$ 0.448	0.989	$ 0.707	$ 0.904	0.426
High Efficiency Entryway Door	Zone 3	Door U-Factor <0.21 Energy Star Door	2	2	13	26	$ 200.00	$ 29.51	$ 29.48	$ 400.00	$ 282.02	25	399	399	$ 78.72	50	$ 100.00	$ 0.251	$ 0.448	0.989	$ 0.707	$ 0.904	0.426
95% AFUE New Gas Furnace (New & Existing)	Zone 1	95% AFUE Rating	539	539	111	59,829	$ 1,024.00	$ 214.88	$ 355.53	$ 551,936.00	$ 244,485.87	18	747,034	747,034	$ 181,151.75	250	$ 134,750.00	$ 0.180	$ 0.423	1.089	$ 0.327	$ 0.570	0.718
95% AFUE New Gas Furnace (New & Existing)	Zone 2	95% AFUE Rating	108	110	110	12,100	$ 1,024.00	$ 212.95	$ 354.93	$ 112,640.00	$ 50,173.26	18	151,083	151,083	$ 36,636.68	250	$ 27,500.00	$ 0.182	$ 0.425	1.085	$ 0.332	$ 0.575	0.712
95% AFUE New Gas Furnace (New & Existing)	Zone 3	95% AFUE Rating	321	324	111	35,964	$ 1,024.00	$ 214.88	$ 355.53	$ 331,776.00	$ 146,963.68	18	449,052	449,052	$ 108,892.71	250	$ 81,000.00	$ 0.180	$ 0.423	1.089	$ 0.327	$ 0.570	0.718
70% FE Hearth - Hearth Tier 1	Zone 1	70 % FE Rating	34	34	56	1,904	$ 425.00	$ 114.32	$ 278.93	$ 14,450.00	$ 1,079.48	20	25,491	25,491	$ 5,764.98	150	$ 5,100.00	$ 0.200	$ 0.426	1.060	$ 0.042	$ 0.269	1.497
70% FE Hearth - Hearth Tier 1	Zone 2	70 % FE Rating	19	20	56	1,120	$ 425.00	$ 114.32	$ 278.93	$ 8,500.00	$ 634.99	20	14,995	14,995	$ 3,391.16	150	$ 3,000.00	$ 0.200	$ 0.426	1.060	$ 0.042	$ 0.269	1.497
70% FE Hearth - Hearth Tier 1	Zone 3	70 % FE Rating	11	12	56	672	$ 425.00	$ 114.32	$ 278.93	$ 5,100.00	$ 380.99	20	8,997	8,997	$ 2,034.70	150	$ 1,800.00	$ 0.200	$ 0.426	1.060	$ 0.042	$ 0.269	1.497
80% AFUE Hearth - Hearth Tier 2	Zone 1	80 % AFUE Rating	2	2	75	150	$ 600.00	$ 153.10	$ 308.52	$ 1,200.00	$ 276.76	20	2,008	2,008	$ 454.17	250	$ 500.00	$ 0.249	$ 0.475	0.951	$ 0.138	$ 0.364	1.104
95% AFUE Gas Furn Upgrade E*	Zone 2	95% AFUE Rating	1	1	110	110	$ 1,024.00	$ 212.95	$ 354.93	$ 1,024.00	$ 456.12	18	1,373	1,373	$ 333.06	250	$ 250.00	$ 0.182	$ 0.425	1.085	$ 0.332	$ 0.575	0.712
95% AFUE Gas Furn Upgrade E*	Zone 3	95% AFUE Rating	2	2	111	222	$ 1,024.00	$ 214.88	$ 355.53	$ 2,048.00	$ 907.18	18	2,772	2,772	$ 672.18	250	$ 500.00	$ 0.180	$ 0.423	1.089	$ 0.327	$ 0.570	0.718
Wall Insulation	Zone 1	Equal to or Greater than R-11 to fill cavity	38	30863	0.071	2,191	$ 1.18	$ 0.20	$ 0.19	$ 36,418.34	$ 36,403.62	45	44,190	44,190	$ 6,634.79	0.35	$ 10,802.05	$ 0.244	$ 0.395	1.046	$ 0.824	$ 0.974	0.353
Wall Insulation	Zone 2	Equal to or Greater than R-11 to fill cavity	6	9682	0.065	629	$ 1.18	$ 0.18	$ 0.18	$ 11,424.76	$ 11,422.57	45	12,691	12,691	$ 1,905.50	0.35	$ 3,388.70	$ 0.267	$ 0.417	0.989	$ 0.900	$ 1.050	0.327
Wall Insulation	Zone 3	Equal to or Greater than R-11 to fill cavity	18	17870	0.076	1,358	$ 1.18	$ 0.22	$ 0.19	$ 21,086.60	$ 21,079.29	45	27,388	27,388	$ 4,112.15	0.35	$ 6,254.50	$ 0.228	$ 0.379	1.090	$ 0.770	$ 0.920	0.374
Residential Air Sealing	Zone 1	Comprehensive shell air sealing / infiltration control: to achieve CFM of 1250	3	3	75	225	$ 750.00	$ 122.33	$ 110.20	$ 2,250.00	$ 1,552.40	13	2,223	2,223	$ 681.26	100	$ 300.00	$ 0.135	$ 0.441	1.071	$ 0.698	$ 1.005	0.427
TOTAL PROGRAM			**1552**	**427,534**		**171,620**		**6,439**	**7,987**	**$ 1,716,650**	**$ 969,880**	**22.86**	**2,391,466**	**2,391,466**	**$ 519,634**		**$ 458,287**	**$ 0.192**	**$ 0.409**	**1.134**	**$ 0.406**	**$ 0.623**	**0.646**

IRP Discount Rate 8.76%
Inflation Rate 2.00%
Long-term Discount Rate 4.17%
Total Expenditures **$ 519,634.13**

Total Non-Energy Benefits = 746,770

CASCADE NATURAL GAS CORPORATION
2016 LOW INCOME Program Participant Cost Effectiveness Estimates
TOTAL IN FIRST YEAR by MEASURE

MEASURE	PARTICIPANTS	TOTAL ANNUAL THERM SAVINGS	MEASURE INSTALLED COST	NON-ENERGY BENEFITS (10% of cost)	MEASURE LIFE	DISCOUNTED THERM SAVINGS	PROGRAM DELIVERY & ADMIN	PROGRAM REBATE	UTILITY COST	UC W/DELIVERY & ADMIN	BENEFIT COST RATIO	TOTAL RESOURCE COST	TRC W/DELIVERY & ADMIN	BENEFIT COST RATIO
Attic/Ceiling Insulation	18	2057	$ 31,938.72	$ 3,194	30	34,845	$ 1,105.80	$ 16,640.23	$ 0.478	$ 0.509	0.86	$ 0.825	$ 0.857	0.434
Floor Insulation	18	3123	$ 42,758.78	$ 4,276	30	52,908	$ 1,679.03	$ 25,266.20	$ 0.478	$ 0.509	0.86	$ 0.727	$ 0.759	0.490
Wall Insulation	14	2471	$ 29,332.82	$ 2,933	30	41,865	$ 1,328.57	$ 19,992.50	$ 0.478	$ 0.509	0.86	$ 0.631	$ 0.662	0.561
Duct Insulation	14	2470	$ 20,637.96	$ 2,064	20	33,068	$ 1,327.90	$ 15,190.50	$ 0.459	$ 0.500	0.90	$ 0.562	$ 0.602	0.668
Air Infiltration Reduction	23	1622	$ 18,420.08	$ 1,842	20	21,715	$ 872.00	$ 9,975.30	$ 0.459	$ 0.500	0.90	$ 0.763	$ 0.804	0.500
TOTAL PROGRAM	**87**	**11,743**	**$ 143,088.36**	**$ 14,309**	**26.52**	**184,401**	**$ 6,313**	**$ 87,064.73**	**$ 0.472**	**$ 0.506**	**0.887**	**$ 0.698**	**$ 0.733**	**0.522**

Nominal interest rate (post tax cost of cap.)	8.76%
Inflation rate	2.00%
Long term real discount rate	4.17%