



Residential Energy Efficiency DCOI-HEAL Offset Protocol 1.0

April 15, 2016



**Duke Carbon
Offsets Initiative**
DUKE UNIVERSITY

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Duke Carbon Offsets Initiative Background

In 2007, Duke University signed the American College and University Presidents' Climate Commitment (ACUPCC) and set a target of achieving climate neutrality by 2024. To be climate neutral, Duke will have to offset an estimated 185,000 metric tons per year of carbon dioxide in 2024. The Duke Carbon Offsets Initiative (DCOI) was created to help Duke University reach climate neutrality. Since the DCOI's beginning in 2009, it has developed a number of innovative carbon offset programs in swine waste-to-energy, energy efficiency, residential solar, and urban forestry. The DCOI is currently a branch of Sustainable Duke in the Office of the Executive Vice President.

Vision

To make Duke University a model climate-neutral institution and to lead peer institutions in their efforts to become climate neutral.

Mission

- To meet Duke University's climate neutrality goal by 2024 by **developing and implementing the University's strategy** for identifying, creating, and purchasing carbon offsets;
- To implement the strategy in a way that **provides educational opportunities** for students, faculty, and staff;
- To **prioritize local, state, and regional offsets that provide significant environmental, economic, and societal co-benefits** beyond the benefits of greenhouse gas reduction; and
- To **facilitate and catalyze high-integrity, unique offset projects** by serving as a resource for other institutions.

Scope

This protocol provides the procedure for determining carbon dioxide equivalent (CO₂e) emission reductions associated with energy efficiency retrofits performed in the home of employees at Duke University as a part of the DCOI Home Energy Affordability Loan (DCOI-HEAL) program. This protocol is modeled after the approved Verified Carbon Standard (VCS) methodology "[VM0008 – Weatherization of Single Family and Multi-Family Buildings.](#)"

Protocol Developer

This protocol was developed by the Duke Carbon Offsets Initiative at Duke University.

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We encourage questions, comments, and feedback on this protocol and will update the protocol on an annual basis. Please send all questions, comments, and feedback to Charles Adair, DCOI Program Manager, at Charles.Adair@duke.edu.

http://sustainability.duke.edu/carbon_offsets/

Abbreviations and Acronyms

C	Carbon
CCI	Clinton Climate Initiative
CH ₄	Methane
CO ₂	Carbon dioxide
CO ₂ e	Carbon dioxide equivalent
DCOI	Duke Carbon Offsets Initiative
GHG	Greenhouse gas
HEAL	Home Energy Affordability Loan
MtCO ₂ e	Metric ton of carbon dioxide equivalent
N ₂ O	Nitrous oxide

Definitions

This protocol uses the following definitions directly provided by the VCS-Weatherization methodology¹:

- **“Building Envelope** means the exterior thermal boundary of the physical structure of an individual building. Thermal boundary typically includes the ceiling/roof, wall, floor, attic floor, window, or door that separates the habitable, occupied, and conditioned spaces from the outdoor weather.”
- **“Cooling Degree Days (CDD)** measure the cumulative degree difference between the warmer outside temperature and the base temperature of the conditioned space on a daily basis during the cooling season. CDD are determined by summing the daily degree days, which are calculated as the average daily temperature minus the base temperature. The average daily temperature is calculated by summing the daily high temperature and the daily low temperature and dividing by two. The average daily temperature can also be calculated by averaging the daily temperature over shorter time intervals, rather than just the high and low temperature. CDD reported by weather stations are often reported in sixty or thirty minute time intervals. In this program, the base temperature used for cooling is 70° F.²”
- **“Energy Load** means the sum of the heat load, cooling load and the remaining electricity demand per dwelling. Heat load means the total fuel consumed, including electricity and natural gas, to provide comfort in a conditioned space in a given year. Cooling load means the total electricity consumed to remove heat from the conditioned space to provide comfort in a given year.”³
“Heating Degree Days (HDD) measure the cumulative degree difference between the colder outside temperature and the base temperature of the conditioned space on a daily basis during the heating season. HDD are determined by summing the daily degree days, which are calculated as the base temperature minus the average daily temperature. The average daily temperature is calculated by summing the daily high temperature and the daily low temperature and dividing by two. The average daily temperature can also be calculated by averaging the daily temperature over shorter time intervals, rather than just the high and low temperature. HDD reported by weather stations are often reported in sixty or thirty minute time intervals. In this program, the base temperature used for heating is 60° F.”
- **“Weatherization** means energy efficiency measures in dwellings. Weatherizing shall refer to the act of installing energy efficiency measures in dwellings.”

¹ These verbatim definitions are provided by the Approved Verified Carbon Standard Methodology [“VM0008 – Weatherization of Single Family and Multi-Family Buildings”](#) and can be found in section three of the methodology.

² For more information regarding degree days, see the section on Weather Normalization

³ The U.S. Energy Information Administration’s estimated residential energy use:

<https://www.eia.gov/tools/faqs/faq.cfm?id=96&t=3>

This protocol uses the following definitions that differ from the VCS-Weatherization methodology:

- **Appliance** means any device or piece of equipment in the home that is powered by electricity or other fuel source and which is used to perform a particular job (e.g., stove, dishwasher, refrigerator, and microwave). All equipment removed from the home that contains Ozone Depleting Substances regulated under 40 CFR 82 is considered an appliance under this program. In addition, all heating and cooling equipment removed from the house (e.g., HVAC systems and heat pumps) is considered to be an appliance under this program.
- **Dwelling** means a single family house.

The following verbatim definitions are from the Environmental Protection Agency⁴:

- **“Carbon Dioxide Equivalent (CO₂e) Emissions** is a metric measure used to compare the emissions from various greenhouse gases based upon their global warming potential (GWP). Carbon dioxide equivalents are commonly expressed as metric tons of carbon dioxide equivalents (MtCO₂Eq). The carbon dioxide equivalent for a gas is derived by multiplying the tons of the gas by the associated GWP.”
- **“Global Warming Potential (GWP)** is a measure of the total energy that a gas absorbs over a particular period of time (usually 100 years), compared to carbon dioxide.”
- **“Greenhouse Gas (GHG)** means any gas that absorbs infrared radiation in the atmosphere. Greenhouse gases include: carbon dioxide, methane, nitrous oxide, ozone, chlorofluorocarbons, hydrochlorofluorocarbons, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride.”

Protocol Description

This residential energy efficiency protocol outlines the methodology for developing and measuring the carbon offsets generated from energy efficiency retrofits. This protocol should be used to ensure that the carbon offsets generated from the project meet the basic criteria of a carbon offset:

- **P**ermanent – The reduction must last in perpetuity;
- **A**dditional – The reduction would not have occurred during a business-as-usual scenario;
- **V**erifiable – The reduction must have been monitored and confirmed to have occurred;
- **E**nforceable – The reduction must be counted only once and then retired; and
- **R**eal – The reduction must actually have occurred and not be the result of flawed accounting.

In addition to P.A.V.E.R., this protocol provides information on co-benefits – the non-GHG reduction benefits of a carbon offset. Below are a few examples of co-benefits that Duke University considers when developing projects⁵:

- **Education**—Homeowners learn about how they use energy within their home and are empowered to make better decisions with regards to the upgrading of appliances, HVAC/water heater replacement, and appropriate insulation levels.

⁴ <http://www.epa.gov/climatechange/glossary.html>

⁵ Learn more about co-benefits by reading the [DCOI Co-Benefits Guide](#).

- ***Social***—Duke employees have opportunities to interact with other employees through educational meetings, and after participating in the program employees are able to share stories about their energy saving practices. This program also helps build the employee-employer relationship through the offering of a non-traditional benefit program.
- ***Environmental***—Upgrading the energy efficiency of an employee’s home can lead to a reduction in energy use and the associated emissions, as well as improving the indoor air quality leading to a decrease of allergy and asthma symptoms.
- ***Economic*** – Saving energy means a reduction in energy bills and some major retrofits (e.g. HVAC or water heater replacement) can improve the value of the home. This program also provides a low-interest loan to help offset the up-front cost of improvements.
- ***Scalability***—This program could be scaled across the Duke University system and best practices can be shared with other schools, businesses, and governments.
- ***Public Relations and Partnerships***—This program would not be possible without the partnerships with the Clinton Climate Initiative, local energy efficiency contractors, managers of similar program, and the employees at Duke University.

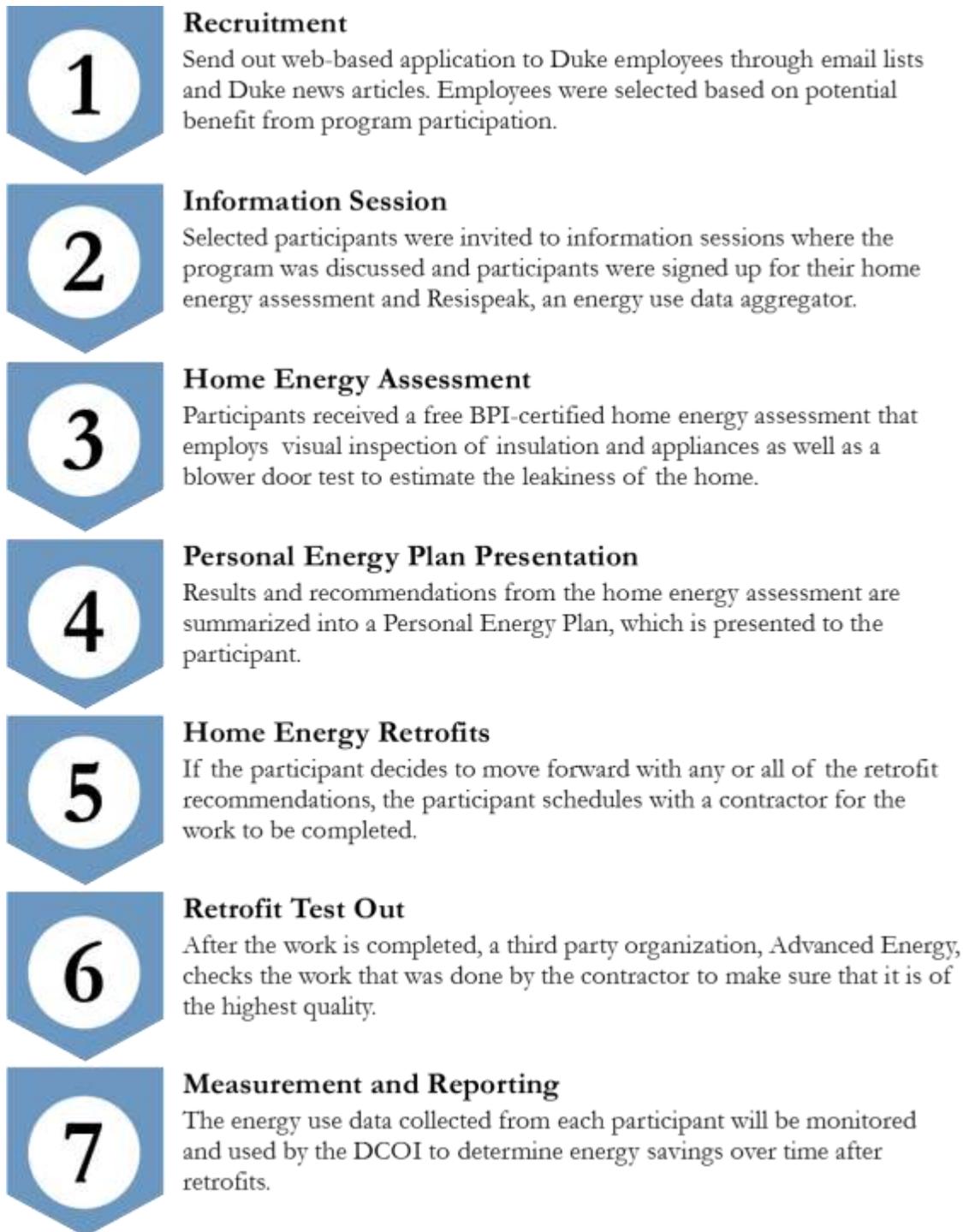
This protocol is modeled after the Approved Verified Carbon Standard Methodology “[VM0008 – Weatherization of Single Family and Multi-Family Buildings](#)” (“VCS-Weatherization”). In addition, this protocol draws from the following sources:

- National Oceanic and Atmospheric Administration – Climate Prediction Center: [Degree Day Monitoring and Data](#)
- [DegreeDays.net](#) – Compiled weather data and information from [Weather Underground](#)
- Carbon Trust – “[Degree Days for Energy Management](#)”
- American College and University Presidents Climate Commitment (ACUPCC) document “[Investing in Carbon Offsets: Guidelines for ACUPCC Institutions](#)”

Program Description

The DCOI-HEAL residential energy efficiency program (“Program”) was developed to generate carbon offsets with high environmental, social, and economic co-benefits within the Duke University community. The design of the DCOI-HEAL program is based on the results and best practices learned from a pre-pilot residential energy efficiency program at Duke University that occurred during 2012/2013. Below is the process from recruitment to reporting.⁶

⁶ Final program report available at <http://www.efc.sog.unc.edu/reslib/item/designing-effective-employee-energy-efficiency-program-review-duke-carbon-offsets>

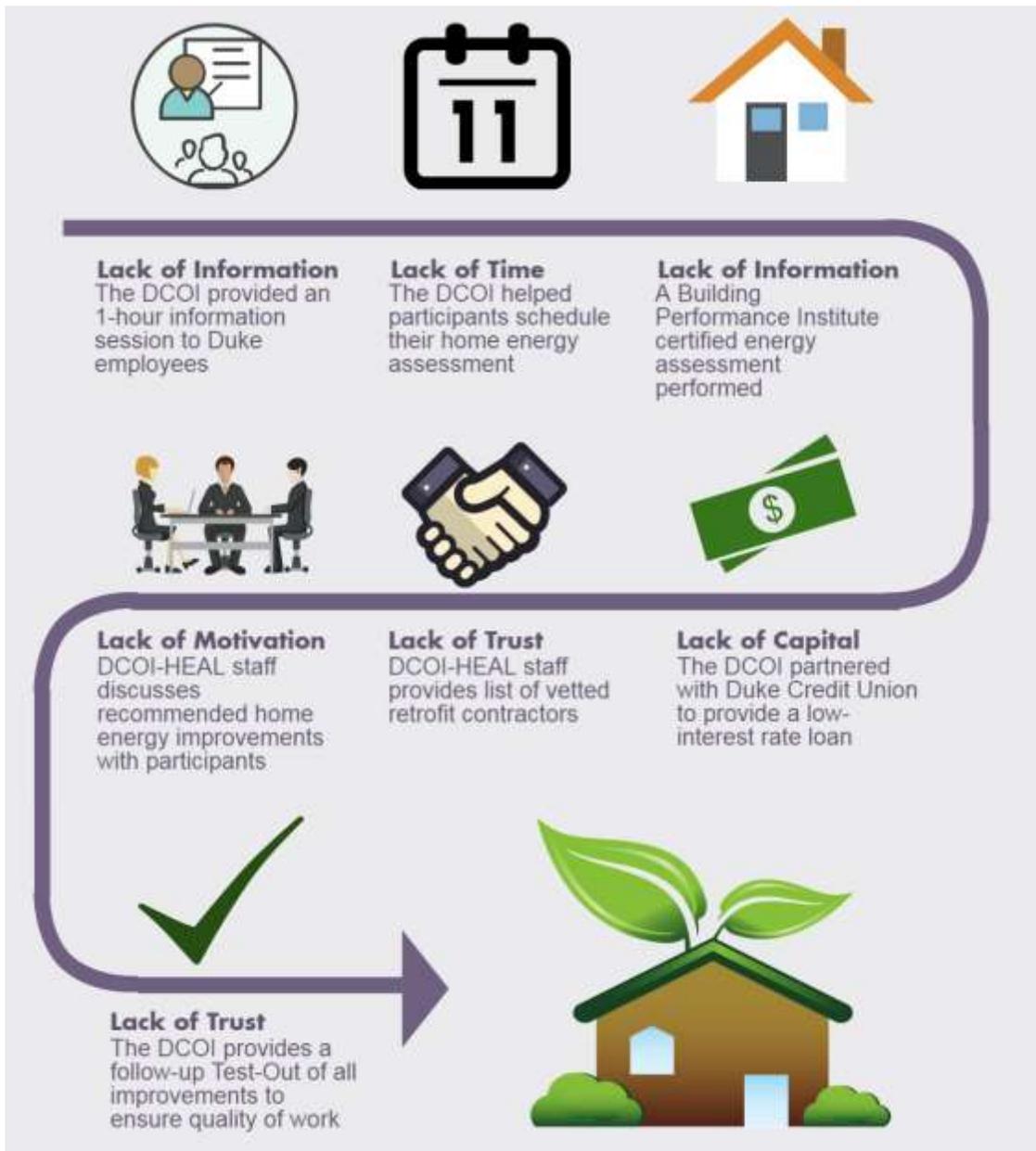


To facilitate this process, the program is designed to remove barriers that prevent Duke employees from undertaking energy efficiency retrofits within their home, including, but not limited to:

- **Lack of information** – A general lack of knowledge about the benefits of energy efficiency or the scope of a home retrofit can prevent many employees from investing in an energy upgrade.

- **Lack of trust** – Many employees lack trust in contractors, whose expertise is frequently needed to complete energy efficiency retrofits.
- **Lack of capital** – The upfront costs of energy efficiency retrofits can be significant and prevent many homeowners from taking action, especially if low interest rate loans are not available.
- **Lack of time** – An energy efficiency retrofit requires a significant time commitment on the part of the resident.
- **Lack of motivation** – With multiple demands on employees’ time and finances, it is sometimes difficult for employees to prioritize an investment into energy efficiency, despite an understanding of the health, environmental and financial benefits.

The following flowchart demonstrates how the DCOI-HEAL program helped remove barriers.



In exchange for the program benefits outlined above, employees agree to transfer ownership of all carbon offsets associated with the reduced energy use due to the energy efficiency measures completed through the employee's participation in the program to Duke University.

This protocol covers energy efficiency measures implemented to reduce the consumption of energy within single family homes, including, but not limited to, adding insulation, sealing ducts, and replacing appliances and heating, ventilation, and air conditioning (HVAC) units.

In the following sections, "Program" refers to the DCOI-HEAL Program, whereas "Project" refers to the activities required to retrofit a single house participating in the Program.

Applicability Conditions

This protocol uses the following applicability conditions provided by the VCS-Weatherization methodology:

Any dwelling included in a project shall meet the following conditions:

- "The condition of the dwelling shall be and remain adequate for project activities according to weatherization best practice standards as recognized by the Department of Energy Weatherization Assistance Program and the Building Performance Institute."
- "The dwelling must be occupied. Vacancy is permitted on an intermittent basis for up to three months, or if the dwelling is occupied seasonally on an annual basis."

Any weatherization included in a project shall meet the following conditions:

- "Project activities may not result in a violation of health and safety, environmental, or other relevant regulations."
- "The capacity of any replacement appliance or replacement component of a central heating/cooling system shall satisfy the post-retrofit heat load, cooling load and electricity demand ("Energy Load") within the dwelling."
- "The project activity must not be mandated, or required by local, state or federal law or regulation."⁷

This protocol uses the following applicability conditions that differ slightly from the VCS-Weatherization methodology:

- The methodology is applicable to implementing individual energy efficiency measures within existing dwellings including, but not limited to, Building Envelope retrofits (i.e. air infiltration, insulation), improving the efficiency of the central heating and/or cooling system, and reducing energy consumption of Appliances (i.e. replacement of refrigerators, air conditioning units, lamps, water heater units).
- All new appliances must replace existing appliances.

The following applicability conditions are unique to this protocol:

- Dwellings must be located within Durham County. However, homes located outside of Durham County will be evaluated on a case-by-case basis.
- Dwellings must be customers of Duke Energy.

⁷ These applicability conditions are provided by the Approved Verified Carbon Standard Methodology "[VM0008 – Weatherization of Single Family and Multi-Family Buildings](#)" and can be found in section four of the methodology.

Project Boundary

Similar to the VCS-Weatherization methodology, the project boundary is focused on the building envelope of the dwelling and its heating/cooling equipment. However, since emission reductions in this program are based on energy bills, items like exterior lighting and any other energy used outside of the main building envelope are included. The DCOI-HEAL program will only include CO₂e emissions from the Dwelling’s grid electricity and fossil fuel consumption when calculating the Dwelling’s baseline and the emission reductions created by the program.

This protocol follows the VCS-Weatherization methodology for leakage:

“Appliances, heating/cooling equipment and/or mobile homes that are replaced shall be properly disposed of and their disposal shall be documented. The disposal documentation shall confirm that: 1) the appliances have been disposed of in a manner that prevents operation of the appliance, and 2) the disposal procedure complies with applicable law and regulations. If not documented, CO₂e emissions from continued operation of replaced Appliances and heating/cooling equipment... and HFC emissions from refrigerators or air conditioners shall be accounted for as leakage.”⁸

The contractor should fill out the appropriate disposal documentation and ensure that the appliance(s) was disposed of properly. If it is not feasible to obtain disposal documentation for each appliance replaced, a 3% leakage penalty should be added to the amount of offsets that could be generated from the home.

The disposal documentation required by this protocol is included in this document under Appendix B.

Procedure for Demonstrating High Quality Offsets

This section will discuss the components of a high-quality carbon offset with in-depth descriptions of P.A.V.E.R. requirements and co-benefits.

Offset Criteria and Definition	Required Data and Program Procedures
<p>Permanent The reduction must last in perpetuity and the emission reductions cannot be reversed.</p>	<p>Offsets must only be calculated after they have occurred to guarantee their permanence.</p> <p>It is unlikely that any weatherization work performed through this program will be reversed. Under the scenario of a participant removing the program retrofits and returning the dwelling to its original state, the dwelling would return to the baseline scenario. This dwelling would no longer generate carbon offsets, but the reductions that already occurred would not be reversed.</p> <p>In addition, collection of the signed participation agreement prior to program start allows the DCOI to remove the participant from the program if the participant takes any action that is not within the specified objectives of the program.</p>

⁸ This policy on leakage is provided by the Approved Verified Carbon Standard Methodology “[VM0008 – Weatherization of Single Family and Multi-Family Buildings](#)” and can be found in section five of the methodology.

	<p>The VCS methodology uses a 10 year lifespan for energy efficiency retrofits. This timeline is determined by combining the average lifespan of retrofits – appliances last 8-10 years while duct sealing and other weatherization improvements can last up to 15 years.</p>
<p>Additional The reduction would not have occurred during a business-as-usual scenario</p>	<p>The DCOI is planning to use the barriers test to determine additionality. The baseline is the business as usual scenario – the participant does not perform any major retrofit. To demonstrate additionality, the DCOI must show that the participant has encountered barriers to implementing an energy efficiency retrofit and is unlikely to complete a retrofit on his/her own. The DCOI must then show that the Program has removed barriers and resulted in the participant following through with an energy efficiency retrofit and subsequent energy reductions</p> <p>The process for determining additionality is provided in more detail in the “Procedure for Determining Additionality” section of this document.</p>
<p>Verifiable The reduction must have been monitored and confirmed to have occurred</p>	<p>All offsets will be tracked and verified internally at Duke University using data provided on the participants’ actual utility bills.</p> <p>All offsets generated using this protocol must be verified either by a third-party organization or internally by program staff. This depends highly on whether the offsets are meant for a compliance market or a voluntary market. It is recommended that if offset generation is verified internally by program staff that an external organization validate the calculations for accuracy. If verified internally, all data and procedures must be transparent and available to the public.</p> <p>For the DCOI-HEAL program, Resispeak, an online portal, was used to automatically collect participant energy use data. Once a participant completes retrofit work, DCOI-HEAL staff can input the information on the participant’s Resispeak profile. This allows the DCOI-HEAL staff to compare energy use before the retrofit to the use after to compute savings and carbon offsets.</p> <p>Screenshots of the Resispeak portal are located in Appendix C.</p>
<p>Enforceable The reduction must be counted only once by a single organization and then retired.</p>	<p>The signed Participant Agreement is to be collected from the participant prior to acceptance into the program. This agreement includes a clause that transfers the rights to all offsets generated from the program from the participating employee to Duke University.</p>
<p>Real The reduction must actually occurred and not the result of flawed accounting</p>	<p>All participants in the DCOI-HEAL Program are required to submit pre- and post-retrofit data. This data will be used to determine the weather-normalized energy reductions generated through the program. These reductions result in a direct decrease in energy generation requirements and an actual reduction in GHG emissions based on Duke Energy’s marginal emissions factor.</p>

Co-Benefits of Residential Energy Efficiency Programs

In addition to the emission reductions, there are many other benefits associated with residential energy efficiency. This section will highlight the categories that Duke University considers and assess the qualitative co-benefits of this type of program.⁹

- **Education** – Energy efficiency could provide the following educational co-benefits:
 - Offer students with an opportunity to develop a carbon offset program
 - Provide opportunities to students to learn about home retrofitting and calculating energy savings from energy efficiency retrofits
 - Educated homeowners about their energy use and the efficiency and health of their home
- **Social** – Energy efficiency could provide the following social co-benefits
 - Create a network of employees who have gone through the program where they can share lessons learned
 - Provide opportunities for homeowners to educate their co-workers and neighbors about energy efficiency
- **Environmental** – Energy efficiency could provide the following environmental co-benefits:
 - Improve indoor air quality leading to a decrease in respiratory issues
 - Reduce the emissions impact from the energy saved
- **Economic** – Energy efficiency could provide the following economic co-benefits:
 - Reduce energy bills
 - Provide access to low-interest financing for individuals installing home retrofits
 - Increase the value of the home with larger retrofits
- **Scalability** –
 - Providing free home energy audits can be expensive (particularly with the tax implications of providing benefits to employees). However, there are many other ways to provide information at a much lower cost. For example, Duke University could adopt a train-the-trainer style program where individuals who have gone through the DCOI-HEAL program could show colleagues and neighbors the type of work they did and how it could work similarly in other houses. As of March 2016, the DCOI is identifying the best way to create an energy saving program that could reach a much larger audience.
- **Public Relations and Partnerships** –
 - The DCOI has partnered with UNC’s Environmental Finance Center to develop this program. Also, there are opportunities to partner with local contractors that provide home energy assessments. In terms of public relations, this has been a popular program that has been highlighted on the Duke Today news website.

Data and Information Collection and Reporting

The following is a list of data and information that this protocol requires to determine the baseline, demonstrate additionality, and calculate CO₂e emissions reductions for each dwelling:

⁹ For more information on co-benefits that Duke University considers, see the carbon offsets and co-benefits guide on the DCOI website: http://sustainability.duke.edu/carbon_offsets/cobenefitsguide.pdf

- Energy consumed by each dwelling in the Program, collected monthly for at least 1 year prior to project implementation;
- Energy consumed by each dwelling in the project, collected monthly for at least three (3) years starting on the first day of the month following project implementation;
- Energy data will be collected through an energy use data aggregator program called [Resispeak](#). A program participant is recommended to create a Resispeak account and add their utility sign-in information. Then Resispeak will download monthly energy use data and any historical energy use data available. If the participant prefers to provide a spreadsheet of their energy use data, the DCOI will upload the data for the participant;
- Monitoring survey, if energy use is markedly different than anticipated (attached in Appendix D);
- Monthly energy use data collected by Resispeak or some other external form (screenshots of Resispeak can be found in Appendix C);
- Participation Agreement from each participant that commits all CO₂e offsets created from the Project implementation in the participant's home to Duke University;
- An online employee application form (Appendix A), which collects the following information:
 - Participant information (contact information, Duke department information)
 - Home characteristics (age and size of home, type of HVAC and water heater, insulation levels, images of attic and crawlspace, and past home retrofit work)
 - Energy use (estimation of average monthly bills in summer and winter)
 - Energy Efficiency information (barriers to not doing energy efficiency, likelihood of doing retrofits without the DCOI-HEAL program)
- A copy the participant feedback survey that includes the participant's responses to questions regarding previous barriers to retrofits (Appendix E)
- Follow-up feedback form filled out by participant that highlights questions regarding barriers removed by the program.
- Total cost to the DCOI for each participant (cost of home energy assessment and follow-up test out of any retrofits);
- Greenhouse gas emission factor per kilowatt-hour for Duke Energy's peak power generation. This Carolinas specific emission factor data will be collected directly from Duke Energy through the Duke Sustainability Office.
- Disposal documentation for any replaced appliances (Appendix B)

All of the data and documents in the list above will be stored on-site at the DCOI on the password protected Duke University shared drive. This drive is only accessible by DCOI employees when they are logged onto a Duke computer via their Duke University employee account.

In addition, each participant will be given a unique identifier that will be used for reporting and research purposes. All data that is shared externally will use the unique identifier in place of the participants name and address in order to ensure the participant's privacy.

Quantifying Net Greenhouse Gas Emissions Reductions

This section will discuss the concept of additionality further, identify how to calculate a participant's energy use baseline, and provide assistance in estimating carbon offset generation.

Procedure for Determining Additionality

The following steps are required to establish that each participant's energy reductions and the CO₂e offsets associated are additional.

- **Identify the implementation barriers** by collecting answers to the program application (Appendix A). These answers must indicate that the participant would be unlikely to implement retrofits without the existence of the DCOI-HEAL program. In addition, these answers must identify the barriers that the participant is currently facing that prevent him/her from implementing major energy retrofits.
- **Provide proof that a retrofit was completed by the program** by completing a test-out report for each house retrofitted by the Program. By providing the test-out report, the DCOI shows that a retrofit was completed, and that barriers to the retrofit were removed.
- **Calculate the business as usual scenario** by using historical data to calculate a baseline (see the following "Procedure for Determining a Dwelling's Baseline" section for additional discussion). In addition, an electricity correction factor is used when calculating energy reductions to account for any changes in the general population's use of energy. Thus, if the participant's community sees a change in energy intensity over time, this will be adjusted for when energy reductions are calculated.
- **Calculate the average annual energy savings from the retrofit using actual energy data from years 1 through 3.** By using the participant's *actual* household energy data, the energy reductions are calculated on an annual basis for years 1 through 3 by comparing annual energy use to the baseline energy use. By using a pre-retrofit, post-retrofit comparison, we can establish a causal relationship between the retrofit and energy reductions for years 1 through 3. This is further confirmed annually through the Annual Monitoring Survey and adjusted (if necessary) using an electricity correction factor to correct for changes in community energy use (see description above in #3). Once the annual energy reductions are calculated for years 1 through 3, they are averaged to determine expected annual energy reductions for years 4 through 10.
- **Calculate the carbon offsets generated years 4 through 10 using the average expected annual energy reductions.** In order to decrease the administrative needs of the program, an average expected annual energy reduction is used to calculate expected energy reductions for years 4 through 10. This number is a conservative estimate of energy reductions from the Program as many of the larger retrofits, including HVAC and weatherization, are expected to last well past 10 years. The longer lifespans of these retrofits balance out the potential for smaller retrofits to last fewer than 10 years, such as appliances (8-10 year expected lifespan). This approach is used by many carbon offset protocols including the VCS methodology.

Procedure for Determining a Dwelling's Baseline

The baseline scenario for participants is represented by the following scenario:

The employee does not complete any major energy efficiency retrofits on their home. The employee's dwelling continues to consume fuel and electricity at the same rate as its current consumption, normalized for weather.

The DCOI uses participant responses to questions on the participant application form to help determine the baseline scenario. The DCOI then selects employees who are unlikely to perform major energy upgrades on their own to be participants in the program and are likely to benefit greatly from this program.

After a participant is accepted into the program, the baseline scenario energy use is calculated and confirmed using the following steps:

- Use Resispeak to download participant's past energy use (both electricity and natural gas) data.

- Collect monthly local heating degree day (HDD) and cooling degree day (CDD) data from online databases for the past 10 years to establish an average HDD and CDD for each month.
- The HDD and CDD data are used to normalize energy use for local weather so that the baseline data can be later compared to the post-retrofit data (See the following section on the procedure for calculating offsets for more information about this calculation).

Procedure for Calculating Carbon Offsets

Calculating carbon offsets and energy savings from energy efficiency retrofits has variety of methods. Regardless of the method used, it is required that the data collected is weather normalized. This process includes the collection of heating degree day and cooling degree day data. This data is dependent on the baseline static temperature (if heating and cooling baselines are not different) or variable temperatures (if heating and cooling baselines are different). The Department of Energy has an online resource for weather normalization.¹⁰ A few methods that were considered for the DCOI-HEAL program are discussed below. This section is not meant to be an exhaustive list, but rather provide some examples that could be used and adapted to fit different programs' needs.

Verified Carbon Standard

The Verified Carbon Standard (VCS) protocol¹¹ outlines a calculation methodology that was adopted for the DCOI-HEAL program initially. This method begins on page 18 of the Verified Carbon Standard Protocol “Weatherization of Single Family and Multi-Family Buildings” (Version 1.1).

Resispeak

As mentioned above, the Duke Carbon Offsets Initiative partnered with Resispeak, an online energy use portal that aggregates and analyzes energy data. This portal compares pre-retrofit and post-retrofit energy use to compare savings over time. In a future version of this DCOI-HEAL protocol, the calculations used by the Resispeak portal will be made available.

Procedure for Preventing Double Counting of Carbon Offsets

One of the risks of an offset program is the possibility that two organizations might both claim – or double count – carbon offsets. The ACUPCC states that “double counting” occurs when an emissions reduction credit gets used by more than one entity and/or for more than one purpose. For example, if a one-metric ton emissions reduction were counted toward meeting a city or state’s reduction target, but was also sold as an offset to an outside institution, that would be a case of double counting.

The risk of double counting can be amplified when carbon offsets also produce co-benefits. Co-benefits are additional benefits derived from the project generating carbon offsets and can take multiple forms including, but not limited to, social, educational, and environmental benefits. For example, the DCOI-HEAL pilot energy efficiency project is expected to generate carbon offsets, but also provide energy savings for Duke employees and educational opportunities for Duke students. Thus, the program is expected to have both social and educational co-benefits. Similarly, an energy efficiency program that generates energy efficiency credits as the main product could also generate carbon offsets as a co-benefit.

¹⁰ <https://portfoliomanager.energystar.gov/pdf/reference/Climate%20and%20Weather.pdf>

¹¹ The VCS Protocol: <http://www.v-c-s.org/sites/v-c-s.org/files/VM0008%20v1.1%2C%20FINAL.pdf>

If there is only a single project developer, it is likely that it would collect all benefits generated from the project, including the carbon offsets and additional co-benefits. Project developers must be careful to review federal and state regulations to ensure the benefits generated are not claimed by another party for regulatory reasons. In a project that has multiple partners/developers, these benefits can be split between partner/developers if allowed by federal and state regulations¹². Thus, all partner/developers must come to an agreement on how to split the benefits associated with the project. If more than one partner/developer claims the same benefit, this would also be a case of double counting.

For the DCOI-HEAL Program, the DCOI is partnering with Duke Energy, a regulated utility that must meet current state and federal regulations. Under the current regulatory landscape Duke Energy must meet the requirements laid out by North Carolina’s Renewable Energy and Energy Efficiency Portfolio Standard (REPS). The REPS requires that Duke Energy generates a certain percentage¹³ of their generation mix from renewable energy resources. For every MWH of electricity that Duke Energy generates from renewable energy, they receive a Renewable Energy Certificate (REC) that they can then use to meet the requirements of the REPS. Duke Energy can also negotiate to purchase RECs from third party generation. Duke Energy then tracks their RECs through the NC Renewable Energy Tracking System (NCRETS) to monitor how much renewable energy is being produced in the state and their progress towards meeting the REPS. In addition, Duke Energy can choose to retire the RECs, thus eliminating future double-counting.

Similar to RECs, energy efficiency credits (EECs) are generated for each MWH of energy saved by Duke Energy through its energy efficiency programs. For example, if a Duke Energy customer uses a Duke Energy rebate to replace their current HVAC system with a more efficient HVAC system, then Duke Energy gets to calculate the amount of energy saved and claim the EECs associated. Duke Energy can use these EECs for up to 25% of the REPS requirements, as reducing energy use has similar positive effects to generating renewable energy. Both RECs and EECs can be banked for future use, so any RECs and EECs that go above and beyond the requirements for that specific year can be saved to help Duke Energy meet its REPS requirements in a future year.

There are contradictory viewpoints regarding whether RECs and EECs are bundled with the environmental benefits and greenhouse gas reductions associated with the production of the renewable energy or reduction in energy use that generated the REC or EEC. The North Carolina REPS legally states¹⁴ that all associated

¹² Some states require that certain benefits be bundled together, meaning they cannot be separated and sold separately. For example, many states follow the Environmental Protection Agency’s Green Power Partnership’s definition of [RECs](#) that bundle the environmental benefits with the REC.

¹³ From North Carolina statute 62-133.8: “Each electric public utility in the State shall be subject to a Renewable Energy and Energy Efficiency Portfolio Standard (REPS) according to the following schedule:

Calendar Year	REPS Requirement
2012	3% of 2011 North Carolina retail sales
2015	6% of 2014 North Carolina retail sales
2018	10% of 2017 North Carolina retail sales
2021 and thereafter	12.5% of 2020 North Carolina retail sales”

¹⁴ From North Carolina statute 62-133.8: "Renewable energy certificate" means a tradable instrument that is equal to one megawatt hour of electricity or equivalent energy supplied by a renewable energy facility, new renewable energy facility, or reduced by implementation of an energy efficiency measure that is used to track and verify compliance with the requirements of this section as determined by the Commission. A

benefits are separated for a REC; therefore in this case the carbon offsets can be unbundled from the EEC. However, this definition differs from the Environmental Protection Agency's Green Power Partnership's definition of RECs¹⁵ that bundles the environmental benefits with the REC which many other states follow. Thus, many businesses, especially those that operate in multiple states, still look to retain the rights to any co-benefits that are produced with the REC or EEC, in this case the carbon offset. In a scenario where co-benefits are not explicitly included with the transfer or creation of the REC/EEC via language within the contract between parties, it is likely that the legal definition separating co-benefits from the REC/EEC would hold. However, this scenario will likely occur less often as more businesses recognize these potential issues and include within the contract terms that all RECs/EECs generated by their project retain the co-benefits associated, and in turn the carbon offsets.

One of the main goals of this pilot program is to determine what retrofits are completed and what Duke Energy rebates are utilized by participants. This will provide information for future agreements on how to distribute the EECs and carbon offsets produced by similar programs. The goal is to develop a partnership between the DCOI and Duke Energy that will support future programs via the utilization of Duke Energy rebates and working together to identify ideal participants, audit the houses, collect data, and provide additional customer service to participants, while splitting the EECs and carbon offsets in a way that is beneficial to both organizations. Potential options for this type of partnership include:

Duke University and Duke Energy operate under North Carolina's definition of EECs that allows for separation of the EEC from the carbon offsets created through the reduction in energy use¹⁶. Under this scenario, Duke University claims all associated carbon offsets and Duke Energy claims all EECs.

Duke University and Duke Energy operate under a definition of EECs that bundles co-benefits into the EEC¹⁷. Duke University and Duke Energy determine how to split the EECs produced by the Program between the two parties.

However, if Duke University and Duke Energy operate under a definition of EECs that bundles co-benefits into the EEC and Duke Energy retains all rights to EECs, then Duke University will re-evaluate whether/how to scale the Program beyond the pilot.

The purpose of this pilot program is to determine the feasibility of scaling the program to additional Duke University employees. If Duke University is unable to negotiate a beneficial partnership with Duke Energy for future programs, then the DCOI will have to re-evaluate whether to continue the partnership with Duke Energy or determine whether the program is scalable enough to achieve the number of carbon offsets necessary to meet the University's demand without a Duke Energy partnership.

It is important to note that this protocol applies specifically to Duke University in the state of North Carolina. Other universities looking to create a similar program may find that the policies in their state may apply differently to offsets and RECs. For guidance on the options for claiming RECs and Offsets through a similar program please see the following section.

"renewable energy certificate" does not include the related emission reductions, including, but not limited to, reductions of sulfur dioxide, oxides of nitrogen, mercury, or carbon dioxide.

¹⁵ <http://www.epa.gov/greenpower/gpmarket/rec.htm>

¹⁶ See Footnote 7

¹⁷ See Footnote 8 as an example

Guidance for External Replication

In addition to providing guidance within Duke University, this protocol also provides support for other schools, non-profit organizations and businesses that are looking to generate carbon offsets through a similar employee benefit program. Each entity's location will play a vital role in determining the specifics of the program and how carbon offsets are claimed. For example, an entity located in a state that does not have a REPS and whose utility does not claim RECs or EECs could easily claim all associated carbon offsets. Thus, any entity looking to replicate the DCOI-HEAL program should explore the following topics prior to developing and scaling the program in order to determine how offsets will be claimed by the entity:

- Will your program generate high-quality carbon offsets that are additional to the business-as-usual scenario (see the “Procedure for Determining High-Quality Offsets” and “Procedure for Determining Additionality” sections for details)?
- What regulations does your state have in place?
 - Is there a REPS?
 - Is there an energy efficiency standard?
 - Do utilities generate energy efficiency and count EECs for each MWH of energy saved?
 - Is your utility required by the state to provide energy efficiency programs?
 - How are these programs and their effects tracked?
 - Does the utility claim EECs or offsets? Or do they only report on their results?
 - Are the utilities required to achieve a certain amount of energy efficiency? Or are they required to provide energy efficiency programs to their customers by the state's utilities commission?
- For RECs and EECs in the state, are carbon offsets and environmental benefits included in the legal definition as defined by the state?
 - Is your utility willing to unbundle EECs from carbon offsets if allowed by state regulations?
 - Is your utility willing to split the EECs or EE as part of a partnership?

Any EE program that has the goal of claiming carbon offsets will likely fall into one of the following scenarios with 1 being the most preferred scenario and 6 being the least preferred scenario:

- No state regulations for energy efficiency and no state mandates for utility energy efficiency programs
 - Result: The utility can partner with the program and the program can claim all carbon offsets while the utility receives the benefits of the energy efficiency program on demand management.
- Program does not involve utility at all (does not use rebates, etc.)
 - Result: Since the program is not using any of the utility programs, the utility cannot lay claim to either the EECs or the carbon offsets, thus the program can claim all EECs and carbon offsets generated.
- State regulations for energy efficiency do not bundle RECs/EECs with offsets. Utility agrees to take EECs and allows the program to take the carbon offsets.
 - Result: If the program is reaching additional people for the utility and is not pushing other people out of the utility's energy efficiency program, the program can claim all carbon offsets. Note: if the utility's energy efficiency program is limited (a cap on number of people served), then your program would not be reaching additional people as the total number of people served stays the same.

- State regulations for energy efficiency do bundle RECs/EECs with offsets. The utility and the program agree to a contract that splits the EECs between the two parties.
 - Results: The program can claim the carbon offsets associated with any EECs generated through the program that are not taken by the utility. Carbon offsets for each entity should be calculated based on the amount of energy saved and the associated emissions reductions from reduced energy use. Then the parties would decide on EEC allocation based on participation. For example, each entity could receive a number of offsets that corresponds to the relative percentage amount of their investment into the program.
- State regulations exist for voluntary energy efficiency programs and the utility can choose to institute energy efficiency programs to help meet state requirements.
 - Result: This is a gray area - if both the utility's program and the carbon offsets program are voluntary, they technically do not affect each other. However, this is more difficult to justify if both are counting the benefits of energy efficiency and also may not prove to be additional.
- State regulations for energy efficiency do bundle RECs/EECs with offsets. The utility claims all EECs.
 - Result: Under this scenario, it may not be possible for the school to claim carbon offsets from the energy efficiency program.

Appendix A – DCOI-HEAL Application for Participation

Q1 Name:

- First
- Last

Q2 Are you currently a Duke University employee?

- Yes
- No

Q3 Duke Department:

Q4 Email address:

Q5 Day phone (555-555-5555):

Q6 Night phone (555-555-5555):

Q7 How long have you worked at Duke University in total?

- Less than 1 year
- 1-3 Years
- 3-5 Years
- 5-10 Years
- 10 or more years

Q8 Do you own your own home?

- Yes
- No

Q9 Is your home a free-standing single family home?

- Yes
- No

Q10 Is your home located in Durham County?

- Yes
- No

Q11 Home address information:

- Address
- Address 2
- City
- State
- Postal Code

Q12 How many people live in your home for at least six months out of the year, including yourself?

Q13 How many years have you lived in your current home?

Q14 How many more years do you plan on living in your home?

- 0-2 years
- 2-4 years
- 4+

Q14 Approximately what year was your home built?

Q15 How many square feet is your home?

Q16 How many floors does your home have?

Q17 Which utility supplies electricity to your home?

- Duke Energy
- Duke Progress Energy
- Other (please specify): _____

Q18 Which utility supplies natural gas to your home?

- Piedmont Natural Gas
- PSNC Energy
- None
- Other (please specify): _____

Q19 Would you be willing to share your utility bill information with Duke Carbon Offsets Initiative?

- Yes
- No
- Possibly, but need more information about the program

Q20 What is the main fuel used to heat your home in the winter?

- Electricity
- Natural Gas
- Oil
- Wood
- Solar
- Geothermal
- Other (please specify): _____

Q21 How many central AC units does your home have?

No central AC unit

- 1
- 2
- 3+

Q22 How many window AC units does your home have?

No window AC unit

- 1
- 2
- 3
- 4
- 5+

Q23 What type of hot water heater do you have?

- Electric
- Natural Gas
- Solar Thermal
- Other (please specify): _____

Q24 Approximately how old is your hot water heater?

- Less than one year old
- 1-5 years old
- 5-10 years old
- 10-15 years old
- Over 15 years old
- Not sure

Q25 Where is your ductwork located?

- Attic
- Crawl space
- Both in attic and crawl space
- Other (please explain): _____

Q26 Is your attic and/or crawl space easily accessible?

- Yes
- No

Q27 Are there any rooms that feel uncomfortable (e.g. too hot, too cold)?

- Yes, in the winter
- Yes, in the summer
- Yes, in both the winter and in the summer
- No, all rooms feel comfortable

Q28 Have any additions been installed on your home (by either you or previous owners)?

- Yes
- No
- Not Sure

Q29 In the past 12 months, what were your highest monthly utility bills (in dollars)?

- \$_____ Electricity in Summer
- \$_____ Natural Gas in Summer
- \$_____ Electricity in Winter
- \$_____ Natural Gas in Winter

Q30 Has your home previously received an energy audit or assessment?

- Yes
- No
- Not Sure

Q31 Have you completed any major energy upgrades in your home?

- Yes
- No
- Not Sure

Q32 If you have completed major energy upgrades, what major energy upgrades have you completed?

Q33 If you have not completed major energy upgrades, what has prevented you from completing such upgrades? Please select all or any that apply.

- Lack of information
- Lack of trust in contractors
- Lack of funds
- Lack of access to low interest rate loans
- Other (please explain): _____

Q34 If you do not participate in this program, how likely are you to complete a major energy upgrade in the **next 12 months**?

- Highly Unlikely
- Unlikely
- Undecided
- Likely
- Highly Likely

Q35 If you do not participate in this program, how likely are you to complete a major energy upgrade in the **next 5 years**?

- Highly Unlikely
- Unlikely
- Undecided
- Likely
- Highly Likely

Q43 If you do not participate in this program, how likely are you to complete a major energy upgrade in the next 10 years?

- Highly Unlikely
- Unlikely
- Undecided
- Likely
- Highly Likely

Q44 Are you aware of any similar programs for energy efficiency retrofits?

- Yes
- No
- Not sure

Q45 If you are aware of similar programs, please list the program(s) below.

Q46 Are there any factors that would prevent you from undertaking recommended energy efficiency measures? If you are not aware of any factors, please write N/A.

Q47 Are you or another primary decision-maker generally available Monday through Friday between 9 AM to 5 PM in order to schedule the home energy assessment visit? The home energy assessments typically last between 3-4 hours.

- Yes
- No

Q49 For the following questions, please take photos of your attic and/or crawlspace and attach them below. Please note that these questions are optional. If you do not have access to a digital camera, please feel free to skip this section.

Q50 Attic entrance:

Q51 Attic:

Q52 Crawl space entrance:

Q53 Crawl space:

Q55 What type of insulation does your attic have?

- Batting (fiberglass, mineral wool, plastic or natural fiber)
- Loose fill (cellulose, fiberglass, mineral wool)
- Foam board or rigid foam
- Reflective insulation or radiant barrier
- No insulation
- Not sure
- Other (please explain): _____

Q56 How much insulation does your attic have?

- 1-3 inches
- 4-6 inches
- 7-9 inches
- 10 or more inches
- Not sure
- None
- Additional comments: _____

Q57 What type of access do you have to your attic?

- Permanent stairs
- Pull-down stairs
- Scuttle hole
- Attic not accessible
- Other (please explain): _____

Q58 Is the access to your attic (scuttle hole, pull-down stairs, door) insulated or sealed?

- Sealed (i.e. weather stripping)
- Insulated
- None
- Not sure
- Other (please explain): _____

Q59 Do you have a vapor barrier in your crawl space?

- Yes
- No
- Not Sure

Q60 If you do not have a vapor barrier, would you be willing to install one?

- Yes
- No
- Not sure

Appendix B – Appliance Disposal Requirements

Section 1: Explanation of Appliance Disposal Documentation Requirements and Definitions

Any appliances removed during a retrofit must be properly disposed of in order to prevent additional carbon dioxide (CO₂e) emissions and adhere to all local, state, and federal laws and regulations. Thus, the contractor is required to provide disposal documentation verifying that all appliances removed are (1) disposed of in a manner that prevents operation of the appliance, and (2) the disposal procedure complies with applicable law and regulations.

In North Carolina the applicable laws and regulations include, but are not limited to:

- The U.S. Environmental Protection Agency's (EPA's) refrigerant recycling requirements - located in [Section 608 of the Clean Air Act](#). EPA identifies the final person in the disposal chain (e.g., a scrap metal recycler or landfill owner) as the responsible party for ensuring that refrigerants are recovered from equipment before final disposal. In addition, EPA requires that individuals be certified in refrigerant handling before a contractor can purchase or handle refrigerants. For more information visit EPA's Ozone Layer Protection – Regulatory Programs website, available at <http://www.epa.gov/ozone/title6/608/608fact.html>.
- N. C. State Law General Statute – [Chapter 66 Article 45 Part 3](#) requires an individual to possess a permit in order to transport or sell any amount of nonferrous metal. Nonferrous metals are metals not containing significant quantities of iron or steel.

Appliance Definition

Appliance refers to any device or piece of equipment in the home that is powered by electricity or other fuel source and which is used to perform a particular job (e.g., stove, dishwasher, refrigerator, microwave, and HVAC [heating, ventilation and air conditioning] systems). All equipment removed from the home that contains Ozone Depleting Substances regulated under 40 CFR 82 is considered an appliance under this program. In addition, all heating and cooling equipment removed from the house (e.g., HVAC systems and heat pumps) is considered to be an appliance under this program.

Document Procedures

The appliance disposal certificate is provided below and must be completed and returned to DCOI by the contractor no later than two months after project completion. This disposal certificate identifies the number and type of appliances removed during the retrofit and the location of disposal. Failure to complete and submit this documentation in a timely manner may result in removal from the program.

Section 2: Certificate of Proper Disposal (to be completed by Contractor/Retrofitter)

Name of Contractor/Retrofitter: _____

Project Name: _____

Project Address/Location: _____

List of Appliances Removed

Appliance	Number Removed	Serial Number(s) of Appliances Removed	Disposal Location (Address & Phone Number)

- All appliances removed from the site are accurately identified above
- All appliances removed from the site were disposed of in a manner that prevents operation of the appliance
- All appliances removed from the site were disposed of in a manner that fully complies with local, state, and federal law and regulations, including, but not limited to, the federal and state laws identified

The signatory of this form certifies that all appliances were removed from service and disposed of in accordance with the above disposal requirements.

Signed

Authorized Representative for Contractor/Retrofitter

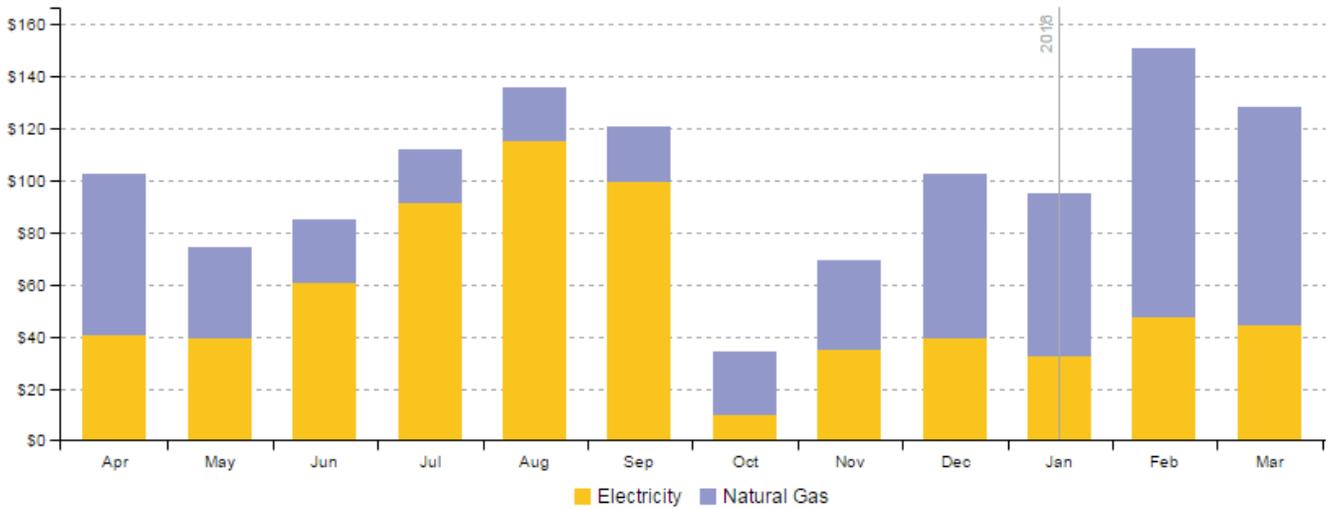
Date

Appendix C – Screenshots of Online Resispeak Portal

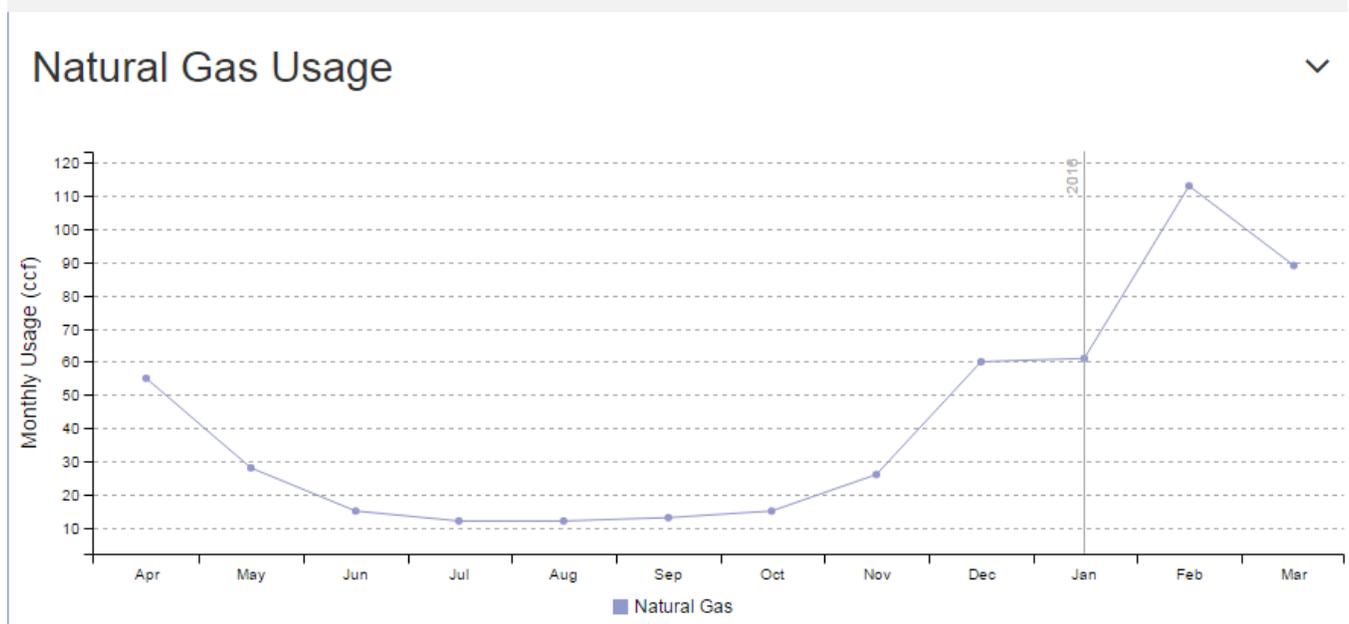
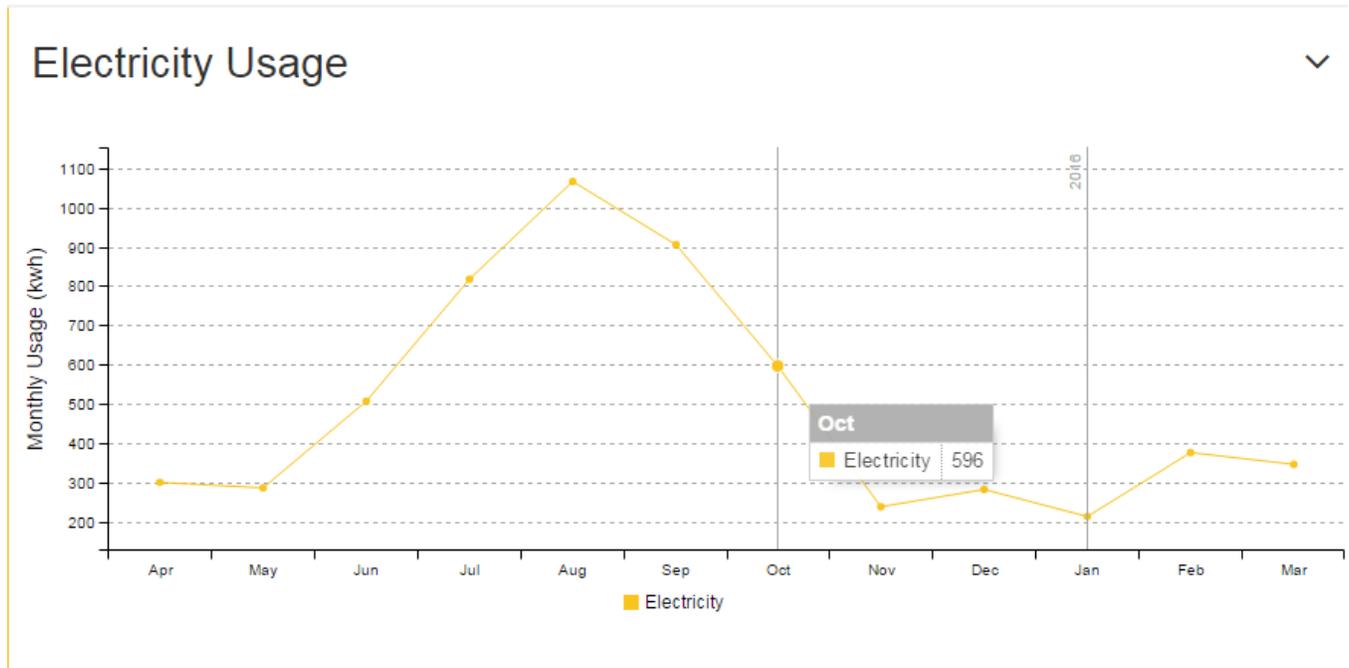
This section provides screenshots of the Resispeak portal that participants use to collect and summarize their energy use data, analyze weather normalized energy savings, and a ranking chart to compare energy use per square footage for all participants. Resispeak collects participants' energy use data by downloading use directly from the utilities if account information is provided by participants. The following three screenshots show what an individual participant would see when using Resispeak.

Screenshot 1: Summary of a household's past year's monthly electricity and natural gas costs.

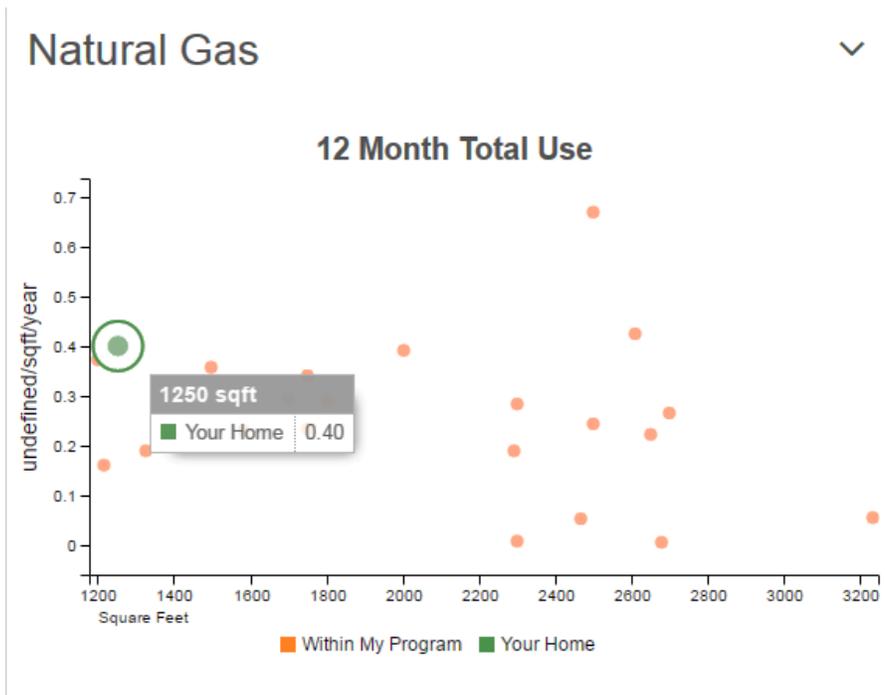
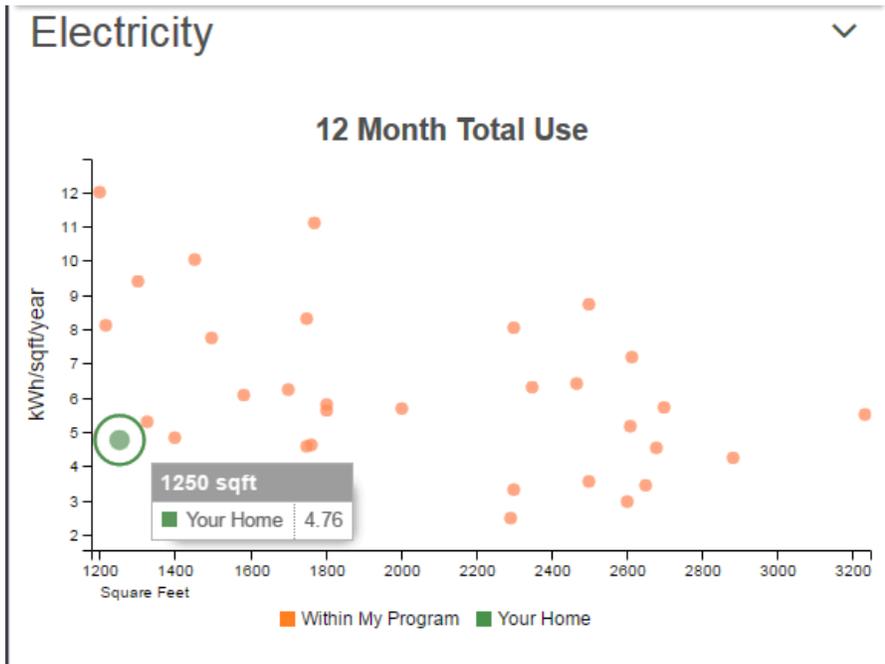
Monthly Costs



Screenshot 2: A household's past year's electricity (kWh) and natural gas (ccf) use.



Screenshot 3: Graph of participant's rank among other participants within the program based on energy use and square footage.



Appendix D – Monitoring Survey

MONITORING SURVEY

This document is to be completed by the DCOI-HEAL participant if requested by the Duke Carbon Offsets Initiative. Please return the form to Charles Adair at Charles.adair@duke.edu.

First Name: [Click here to enter text.](#)

Last Name: [Click here to enter text.](#)

Day Phone: [Click here to enter text.](#)

Email Address: [Click here to enter text.](#)

Has the number of people living in your house changed in the past year?

Yes, more people

Yes, fewer people

No

If Yes, how many more or less? [Click here to enter text.](#)

Have you performed any additional energy efficiency upgrades in the past year?
(this includes weatherization, replaced appliances and HVAC systems, etc.)

Yes

No

If Yes, please describe the upgrades: [Click here to enter text.](#)

Have you significantly changed your energy use behavior over the past year?

Yes

No

If Yes, please describe: [Click here to enter text.](#)

Ex. Started a baking business or my kids are now teenagers and they watch TV all the time.

Please add any additional comments below:

Signed

Employee Participant

Date

Appendix E – DCOI-HEAL Program Feedback

We want to thank you for being a part of the DCOI-HEAL program! This program would not have been successful without you and your enthusiasm. As you know this is a pilot program so your thoughts on the program will help with future DCOI programs. We would greatly appreciate your feedback on all aspects of DCOI-HEAL from the initial information session to any improvements you may have made. This survey should take no more than 10 minutes.

Which round of the program did you participate?

- Round 1 (November 2014 - January 2015)
- Round 2 (February 2015 - May 2015)
- Round 3 (September 2015 - January 2016)
- Not sure

PRIOR to your participation in the program, what energy efficiency improvements did you make to your current home? (Select any or all that apply)

- Replaced light bulbs with CFL or LED bulbs
- Installed weather stripping on doors and windows
- Installed a programmable thermostat
- Replaced or upgraded windows
- Sealed ductwork
- Sealed leaks in windows, doors, or cracks or holes in walls
- Added new or repaired insulation
- Replaced appliances with Energy Star appliances
- Installed a more efficient water heater
- Installed a more efficient heating and/or cooling system
- Partial or full sealing of crawlspace
- Other (please list): _____

PRIOR to your participation in the program, which of the following potential barriers were limiting your ability to improve your home's energy efficiency? (Select any or all that apply)

- Lack of information
- Lack of trust of contractors
- Lack of up front funding
- Lack of access to low interest loans
- None of the above
- Other (please list): _____

On a scale of 1 (not at all satisfied) to 5 (very satisfied), how satisfied were you with the following parts of the DCOI-HEAL program?

	Not at all Satisfied	Dissatisfied	Neutral	Satisfied	Very Satisfied	NA
Information Session	<input type="radio"/>					
Home Energy Audit	<input type="radio"/>					
Personal Energy Plan Presentation	<input type="radio"/>					
Loan Application Process	<input type="radio"/>					
Home Retrofit Work	<input type="radio"/>					
Final Test-Out	<input type="radio"/>					

Overall, how satisfied were you with the entire program?

- Very Satisfied
- Satisfied
- Neutral
- Dissatisfied
- Not at all Satisfied

On average, how many hours did you or other household members spend on each of the following parts of the DCOI-HEAL program?

	< 1 hour	1-2 hours	2-3 hours	3-4 hours	4+ hours	NA
Home Energy Audit	<input type="radio"/>					
Home Retrofit Work	<input type="radio"/>					
Final Test-Out	<input type="radio"/>					

Since you have participated in the program, what energy efficiency improvements did you or are planning to make to your home? (Select any or all that apply)

- Replaced light bulbs with CFL or LED bulbs
- Installed weather stripping on doors and windows
- Installed a programmable thermostat
- Replaced or upgraded windows
- Sealed ductwork
- Sealed leaks in windows, doors, or cracks or holes in walls
- Added new or repaired insulation
- Replaced appliances with Energy Star appliances
- Installed a more efficient water heater
- Installed a more efficient heating and/or cooling system
- Partial or full sealing of crawlspace
- Other (please list): _____

Since you have participated in the program, how much more knowledgeable about your home and energy use do you feel?

- A great deal
- A lot
- A moderate amount
- A little
- None at all

Which of the following barriers did this program help to remove? (Select any or all that apply)

- Lack of information
- Lack of trust of contractors
- Lack of up front funding
- Lack of access to low interest loans
- None of the above
- Other (please list): _____

If you installed any energy efficiency improvements in your home, how do you feel they impacted the comfort of your home? (Select any or all that apply)

- My home seems to heat and cool more effectively/consistently
- The humidity in my home has decreased
- The humidity in my home has increased
- The air feels cleaner to breathe
- Some rooms feel less drafty
- Other (please explain): _____

If you installed any energy efficiency improvements in your home, have you noticed any difference in your energy bills?

- Increased
- Stayed the same
- Decreased

Since participating in the program, have you changed any of the following behaviors that may lead to a change in your household's energy use? (Select any or all that apply)

- Turn off lights when not in use
- Turn down water heater temperature
- Replace air filters
- Program thermostat for a lower temperature in the winter and/or a higher temperature in the summer
- Program thermostat for a higher temperature in the winter and/or a lower temperature in the summer
- Wash clothes in cold water
- Strongly consider energy efficient appliances when needing to buy them
- Take shorter showers
- Close the flue in your fireplace
- Unplug devices not in use or use power strips
- Other (please explain): _____

How likely are you to recommend a program similar to the DCOI-HEAL program to a friend or colleague?

- Highly likely
- Somewhat likely
- Neutral
- Somewhat unlikely
- Not at all likely

If you were given the opportunity to do this program again, would you (assuming you hadn't done it before)?

- Yes
- No

As you know this is a pilot program and we welcome your ideas and feedback for future program improvement. Do you have any final thoughts or suggestions for the DCOI-HEAL program?