HOUSING DECARBONISATION IN THE UNITED KINGDOM

Document Prepared by Earthood Services Private Limited

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Report Title	Validation Report for “Housing Decarbonisation in the United Kingdom”
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Summary:

Earthood Services Private Limited (hereafter referred to as ESPL) has been contracted by Arctica Partners Limited (hereafter referred as Arctica Partners) to conduct the validation of the Grouped project - "Housing Decarbonisation in the United Kingdom" (VCS ID -2649), with regard to the relevant requirements of VCS program guidelines and standard (VCS standard version 4.3 and VCS program guide version 4.2)/1,2/. Relevant requirements as well as criteria for consistent project development and reporting has been applied for validation.

The purpose of this project activity is to apply the decarbonization measures to the existing single-family dwellings in the United Kingdom. The Decarbonisation here refers to various Energy Efficiency measures applied through building envelop design modifications and improving the efficiency of the central heating and/or cooling system and reducing fossil fuel consumption of appliances. By application of these measures, the energy consumption (Natural Gas and electricity) for heating and cooling purposes will be reduced as compared to the baseline consumption, which will ultimately result in the saving of energy and reduction of carbon emissions.

The project is being developed as a grouped project by Arctica Partners and new PAIs will be implemented in future. The project activity consists of identification, selection, implementation of energy efficiency building measures and monitoring of existing single-family dwellings in the United Kingdom. The Project Proponent has included 28 dwelling as initial PAI as a part of this validation which were validated and included. The additional dwellings will be added as subsequent PAIs throughout the crediting period of the project activity based on their eligibility.

Earthood Services Private Limited (hereafter referred as ESPL) has been contracted by Arctica Partners for the Validation and Verification of the Grouped project activity. The overall validation, from Contract Review to Validation and Verification Report & Opinion, was conducted following ESPL's internal quality control procedures.

The Validation of the project activity consisted of three phases:

i) desk review of the project;
ii) follow-up onsite visit and interviews with project stakeholders;

iii) resolution of outstanding issues and the issuance of the final validation report and opinion.

During the validation and verification process, a total of 18 CLs, 01 CARs and 06 FARs were raised, which were closed upon receiving satisfactory responses from the Project Proponent. These are discussed in detail in Appendix IV of this report.

A risk-based approach has been followed to perform this validation. ESPL's validation approach is based on the understanding of the risks associated with reporting of GHG emission data and the controls in place to mitigate these. ESPL planned and performed the validation by obtaining evidence and other information and explanations that it considered necessary, to give reasonable assurance that the project activity is valid as per project standard requirements, and the reported GHG emission reductions are fairly stated.

The VVB has confirmed that:

- the PA is in accordance with all relevant host country criteria (United Kingdom) and VCS rules and requirements;
- the PA is in accordance with all conditions of the latest version of applied methodology VM0008**,** Version 1.1: "Weatherization of Single Family and Multi-Family Buildings"
- the local stakeholders' consultation has been performed in accordance with host country and VCS requirements;
- the environmental assessment is appropriate and sufficient;
- the monitoring plan is transparent and adequate;
- all information has been consistently applied in the VCS-PD;

It can be concluded that the implementation of the project has been done as per description in the VCS-PD.

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1 INTRODUCTION

1.1 Objective

Earthood Services Private Limited has been contracted by Arctica Partners, to undertake the validation of the group project activity titled “Housing Decarbonisation in the United Kingdom” in line with the VCS requirements. The validators have reviewed the project design and its supplementary documents as a part of the validation.

The purpose of this validation is to have an independent third-party assessment of whether the project activity conforms to the qualification criteria set out in the VCS standard Version 4.3/1/to attain real, measurable, additional, and permanent emission reductions. The validation statement/opinion is a written assurance that:

- The project complies with all the applicable VCS requirements and has the ability to generate the emission reductions stated over the project’s crediting period.
- The validation followed the requirements of the current version of the VCS Standard Version 4.3/1/and VCS Program Guide V4.2/2/ to ensure the quality and consistency of the validation work and the report.
- The project will result in emission reductions as declared by the organisation or GHG project’s GHG assertion;
- The data reported is accurate, complete, consistent, transparent and free of material error or omission.

1.2 Scope and Criteria

The validation scope is given as an independent and objective review of the project design, which is included in the VCS-PD and other relevant supporting documents.

The scope of work covered in the validation is described below:

- To validate whether the project activity meets the requirements of latest applicable VCS Standard Version and VCS program guide.
- To confirm that the information presented is completed, consistent, transparent and free of omission or material error
- Background investigation and follow up interviews
- Issuance of draft validation report with CARs, CRs & FARs, if any
- Final validation opinion

The information in the VCS-PD is reviewed against the criteria of VCS Standard 4.3/1/, the VCS Program Guide 4.2/2/.

ESPL has performed validation based on a risk-based approach focusing mainly on the significant risks to meet the qualification criteria and the ability to generate Verified Carbon Units (VCUs).

The validation is not meant to provide any consulting towards the client. However, stated request for clarifications and/or corrective actions may provide input for improvement of the project design.

1.3 Level of Assurance

The level of assurance of the validation report falls under reasonable level of assurance engagements. Reasonable assurance is a high level of assurance regarding material misstatements, but not an absolute one.

Reasonable assurance includes the understanding that there is a remote likelihood that material misstatements will not be prevented or detected on a timely basis. To achieve reasonable assurance, the auditor needs to obtain sufficient appropriate audit evidence to reduce audit risk to an acceptably low level. This means that there is some uncertainty arising from the use of sampling, since it is possible that a material misstatement will be missed.

ESPL's validation approach is based on the understanding of whether the information in the VCS-PD is materially correct and is a fair representation of the actual project details in our opinion and whether it is prepared in accordance with the VCS requirements for information pertaining to the GHG quantification, monitoring and reporting.

The ESPL Team has also checked the criteria of latest applicable VCS Program Guide, version 4.2/2/, VCS Standard, version 4.3/1/, criteria of applied approved methodology VM0008 V1.1/3/ and compliance with relevant laws and regulations.

ESPL planned and performed the validation by obtaining evidence and other information and explanations that ESPL considers necessary to give reasonable assurance that reported estimated GHG emission reductions are fairly stated. All documentary evidence were checked, and site audit was conducted with Project Proponent representatives to arrive at a verification conclusion by the assessment team.

In our opinion, project is carried out with in conformity of all above mentioned details and we confirm that all the information provided is accurate and estimated GHG emissions reductions were calculated correctly on the basis of the approved baseline and monitoring methodology VM0008, version 1.1/3/ and VCS Standard version 4.3/1/.

1.4 Summary Description of the Project

The proposed project activity is developed as a group project activity/4/. The project activity involves the selection of the existing single-family dwellings in the area of the United Kingdom and installation of building energy efficiency measures in the existing old dwellings in order to decrease the heat loss and air infiltration during the heating and cooling periods and improve the efficiency of the central heating and/or cooling system and reduce fossil fuel consumption of appliances. Thus, after implementation of the project activity, it is expected that the consumption of Natural Gas will reduce during the crediting period. Being a conventional fossil fuel source, the reduction in the consumption of the Natural Gas will lead to the GHG emission reduction.

The project activity employs the approved VCS methodology VM0008, version 1.1 – Weatherization of Single Family and Multi-Family Buildings/3/. The project activity falls under the VCS Sectoral Scope 3: Energy Demand.

2 VALIDATION PROCESS

2.1 Method and Criteria

The overall validation from Contract Review to Validation Report & Opinion, was conducted using ESPL's internal procedures. The Project was validated and verified against the latest requirements and guidance set out in VCS Standards as applicable. The validation process consists of the following three phases;

A document review of the VCS-PD (described in Section 2.2)

Site audit and follow up interviews with project stakeholders (described in further Sections of report)

The resolution of outstanding issues and issuance of the final report and opinion.

In order to ensure transparency, a validation protocol was prepared for the project according to the VVM issued by Verra and VCS Standard.

The Clarification Requests (CAR) were issued where additional information was needed to clarify issues, and Forward Action Requests (FAR) for issues relating to project implementation that required review during the first verification of the project activity.

VVB's Sampling Approach: No sampling approach was required for undertaking the current validation and validation of the same has been described in the further sections of this report.

2.2 Document Review

The validation for project activity is performed primarily as a Desk review of the documents submitted at various stages of assessments. The review is performed by assessment team using dedicated protocols. The assessment team cross checks the information provided in the documents (VCS-PD, additionality calculation and other supplementary documents) and information from sources other than those used, if available, and also conducts independent background investigations. ESPL conducted a desk review as under;

- A review of the data and information presented to verify their completeness.
- A review of the VCS-PD, the approved methodology including applicable tool(s) and, where applicable, the applied standardized baseline, paying particular attention to the additionality and baseline selection, the quality of monitoring plan and the quality assurance and quality control procedures.

An evaluation of data management and the quality assurance and quality control system in the context of their influence on the generation and reporting of emission reductions.

2.3 Interviews

The assessment team has carried out interviews in order to verify the information included in the project documentation and to gain additional information regarding the compliance of the project with the VCS requirements. Representatives of the Project Proponent were interviewed. The names and designations of the personnel interviewed are mentioned in section 2.4 below.

The main topics covered during the interview are as follows:

- General Aspects of the project
- Project Implementation and Methodology application
- Selection of Baseline data and Additionality
- Data collection, recording and archiving procedure
- QA/QC procedures
- VCS documentation
- Emission reduction calculations
- Stakeholders' engagements
- Local laws and regulation

2.4 Site Inspections

A physical site visit was conducted for the project activity from 22/03/022 to 23/03/2022. During the site audit, the PP representatives were interviewed about the implementation of the project activity. While conducting the site visit several checks conducted to check, but not limited to, baseline, project emission, leakages, additionality, monitoring, project location, implementation status of the project, commissioning date of the initial PAIs project ownership and carbon right. Technical details about project energy efficiency measures implementation and specification were also discussed. All documents were crosschecked to ensure conservative estimation of emission reduction. Interviews with the local stakeholders were also conducted on 28/03/2022 to ensure their participation in the consultation process, and it was verified that no negative comments were received. The details of the persons interviewed during site visit are given below:

No.	Interviewee			Date	Subject	Team Member
	Last name	First name	Affiliation			
1.	Turek	Simon	Arctica Partners	22/03/22 & 23/03/22	Project idea and location Baseline, additionality, monitoring, etc.	Kaviraj Singh
2.	Parker	Martin	Arctica Partners		Project Implementation	
3.	Jenkinson	Barry	Raven Housing Trust	28/03/22	Participation as PAI and carbon rights	
4.	Holt	Billy	HACT	28/03/22	Participation and carbon rights	

2.5 Resolution of Findings

The list of findings and their resolution are presented in Appendix 4 of this validation report. The section also includes the response, if provided, by the project participants and an assessment by the assessment team if it was closed or otherwise. It is to be noted that all the findings have been satisfactorily resolved by the assessment team.

A total of 06 FARs, 01 CAR and 18 CL were raised in the current validation. All the findings that are raised and communicated to project participant are included under Appendix 4. The section also includes the response, if provided, by the project participants and an assessment if it was closed out or otherwise.

2.5.1 Forward Action Requests

06 FAR was also raised which needs to be reviewed and closed during next verification.

3 VALIDATION FINDINGS

3.1 Project Details

Project type, technologies and measures implemented, and eligibility of the project

The project activity employs the approved VCS methodology VM0008, version 1.1 – Weatherization of Single Family and Multi-Family Buildings/3/ and it falls under the VCS Sectoral Scope 3: Energy

Demand. The project activity involves the selection of the existing single-family dwellings in the area of the United Kingdom and installation of building energy efficiency measures in the existing old dwellings in order to decrease the heat loss and air infiltration during the heating and cooling periods and improve the efficiency of the central heating and/or cooling system and reduce fossil fuel consumption of appliances. Thus, after implementation of the project activity, it is expected that the consumption of Natural Gas will reduce during the crediting period. Being a conventional fossil fuel source, the reduction in the consumption of the Natural Gas will lead to the GHG emission reductions.

Project design, including eligibility criteria for grouped projects

Initially, the project activity involves installing the following energy efficiency measures in the existing building envelop of the PAIs. However, the Project Proponent confirms to also add additional decarbonisation measures during the crediting period as new installations happen and new PAIs are added to the group:

a. Adding insulation that increases the resistance to conductive heat loss and reduces air infiltration either singularly or in aggregate within the building envelope, e.g., loft insulation; cavity wall insulation; external wall insulation; draught-proofing; replacing existing window glazing and/or floor insulation
b. Improving the efficiency of, or replacing, the central heating components, e.g., cylinder insulation; thermostat, boiler, or heat pump controls; upgrade boiler with a condensing equivalent; and/or replace gas boiler with a heat pump
c. Reducing fossil fuel consumption of appliances, e.g., replacement of ventilation units and lamps.

The project activity has identified every individual household as a single PAI. The eligibility criteria for inclusion of dwellings have been explained below. The Project Developer has included 28 dwellings (individual households) as initial PAI at the time of validation. Although none of these PAIs have been implemented by the date of the site visit by the VVB. During the crediting period, additional PAIs will be included in the project activity as implementation happens. The Project Developer has designed 16 points inclusion criteria for the inclusion of any PAIs in the project activity. Every PAI will be assessed against the 16 points criteria before inclusion by the Project Developer. The evidence of such assessment will be recorded by the Project Proponent.

The 16 points inclusion criteria and the validation of inclusion of the 28 initial PAIs by the assessment team, has been summarized below:

1) **Criteria:** Dwellings in the same state are dwellings which are in the United Kingdom. Geographic areas with initial project activity instances that are subject to the same baseline scenario and rationale for the demonstration of additionality are the United Kingdom.

   Validation of inclusion: The PP has included 28 initial PAIs and plans to implement the energy efficiency measures in the coming months in these PAIs. All these PAIs are owned by Raven Housing Trust and a letter of intent with Raven has already been signed by the PP/5/. Every PAI has been given a unique code or serial number, for these 28 PAIs the serial

number starts from 10001 to 10028. In the UK every property has a Unique Property Reference Number (UPRN) and all 28 UPRN applicable to these PAIs were recorded and provided to VVB/6/. The UPRN can be cross-checked on the government website for the verification of address and geo-co-ordinates/7/. The address and geo-coordinates of all these 28 dwellings was cross verified from the website, and it was confirmed that location for all these dwelling is Surrey, England.

2) **Criteria:** Dwellings in the same category (single-family) are dwellings which are not a "house in multiple occupation" as defined in the Housing Act 2004.

   Validation of inclusion: Local Authorities issue a license for any house to be a house of multiple occupants and maintain a record and make it public (Register of Licenses of Houses in Multiple Occupants)/8/. The register was reviewed and found that the no dwelling is categorized as house in multiple occupation/9/. It is therefore confirmed that all of the 28 PAIs is a single-family dwelling.

3) **Criteria:** Dwellings in the same income group (low-income) are dwellings which are social housing as defined in the Housing and Regeneration Act 2008, dwellings with household income up to £40,212 as defined by the Living Wage Commission, or dwellings located in a neighborhood identified as 'deprived' as defined by the Department for Levelling Up, Housing and Communities.

   Validation of inclusion: All the 28 initial PAIs are owned by Raven Housing Trust which is a registered provider of social housing under the Housing and Regeneration Act 2008/10/. All these 28 PAIs are therefore falling in the low-income group as per the definition/11/. The status of the dwellings is social housing stock and therefore its confirmed that all 28 PAIs are falling in the same income group/5/.

4) **Criteria:** Dwellings in the same income group (middle-income) are dwellings with household income above £40,212 and up to £70,004 as defined by the Department for Education, or dwellings which are not located in a neighborhood identified as 'deprived' as defined by the Department for Levelling Up, Housing and Communities.

   Validation of inclusion: Please refer validation for criteria 3. None of the 28 initial PAIs fall in the middle-income group as per the definition.

5) **Criteria:** Dwellings in the same income group (high-income) are not included in this project.

   Validation of inclusion: Please refer validation for criteria 3. None of the 28 initial PAIs fall in the high-income group as per the definition.

6) **Criteria:** The condition of the dwelling is and will remain adequate for project activities according to nationally recognised best practice standards.

Validation of inclusion: All 28 initial PAIs will have a Building Regulation Compliance Certificate, a certificate under Publicly Available Specifications (PAS) or equivalent standard, a declaration by the dwelling owner that work was carried out by a person registered with a competent person scheme, or a declaration by a regulated provider of social housing or public entity, for confirmation that dwellings remain adequate for living and project activities don't violate health, safety, environment and other regulations/14,15/. Such certificates or declarations will be available only after the installation of energy efficiency measures are complete. A FAR for checking compliance with national best practice standards has been issued and such certificates or declarations will be checked at the first verification.

7) **Criteria:** Project activities do not result in a violation of health and safety, environmental, or other relevant regulations.

Validation of inclusion: Please refer validation for criteria 7

8) **Criteria:** The replacement appliances replace functioning appliances.

Validation of inclusion: The Contract for Provision of Verified Carbon Unit Services to be signed between the PP and dwelling owner requires the confirmation and declaration from the owner that the replacement of appliances replaces functioning appliances. The template contract was reviewed and found correct/13/. However, implementation of the project hasn't started and therefore a FAR has been raised for checking the declaration of the replacement of functioning appliances at the time of first verification.

9) **Criteria:** The dwelling is occupied. Vacancy is permitted on an intermittent basis for up to three months, or if the dwelling is occupied seasonally on an annual basis.

Validation of inclusion: The occupancy of dwellings was checked from the records of the Regulator of Social Housing Register, and it was confirmed that all 28 initial PAIs are occupied as social housing stock at the time of the site visit/16/.

10) **Criteria:** The capacity of any replacement appliance or replacement component of a central heating system satisfies the energy load (the sum of the heat load and the electricity demand) within the dwelling.

Validation of inclusion:

All 28 initial PAIs will have a Building Regulation Compliance Certificate, Gas Safety Certificate, a certificate under Publicly Available Specifications (PAS) or equivalent standard, a declaration by the dwelling owner that work was carried out by a person registered with a competent person scheme, or a declaration by a regulated provider of social housing or public entity, for confirmation that capacity of any replacement appliance or replacement component of a central heating system satisfies the energy load. Such certificates or declarations will be available only after the installation of energy efficiency measures are complete. A FAR has been raised for checking at the time of first verification that capacity

of any replacement appliance or replacement component of a central heating system satisfies the energy load.

11) **Criteria:** In the case of heating systems that serve multiple dwellings, all residential dwellings connected to the system are included in the project.

Validation of inclusion: The 28 initial PAIs are not connected to a heating system which serves multiple dwellings. It was checked from the records of Raven Housing Trust. However, it will be further checked at the time of post-retrofit assessment by the PP.

12) **Criteria:** The project activity is not mandated or required by law or regulation.

Validation of inclusion: No energy efficiency measures which are part of the project activity are mandated by the local laws and it was cross checked by the against the relevant Regulator of Social Housing's requirements/16/. Confirmation that the project activity is not mandated by law has also been included as a condition of the Contract for Provision of Verified Carbon Unit Services to be signed between the PP and dwelling owners/13/.

13) **Criteria:** The dwelling meets or exceeds the performance benchmark as calculated for the Same Building Stock.

Validation of inclusion: The PP has calculated the performance benchmark using the model which uses data collected from the pre-retrofit energy assessment for every dwelling and then a post-retrofit energy assessment after the implementation of energy efficiency measures. These assessments are conducted by third party accredited energy assessors certified by a public authority, or a private certification program recognised by a public authority. Energy assessments are conducted using the Standard Assessment Procedure (SAP) which is the Government-approved National Calculation Methodology for assessing the energy performance of dwellings/17/. The performance benchmark reported in the VCS-PD for all 28 initial PAIs has been cross checked with the actual data and calculations and found correct/4/.

14) **Criteria:** To control the risk of leakage, all boilers that are replaced as part of the project activity are disposed of properly.

Validation of inclusion: Please refer validation for criteria 11.

15) **Criteria:** Project ownership is accorded to the Project Proponent by an enforceable and irrevocable agreement with the holder of the statutory, property or contractual right in the plant, equipment or process that generates GHG emission reductions.

Validation of inclusion: The letter of intent signed between the PP and dwelling owner confirms that the project ownership vests in the Project Proponent for these 28 initial PAIs/13/.

16) **Criteria:** Any decarbonisation measures included in the project activity will fall into one of the following categories:

Category A — A combination of energy efficiency measures directed at the enhancement of the building envelope (i.e., air infiltration, insulation), and improving the efficiency of the central heating and/or cooling system and reducing fossil fuel consumption of appliances (i.e., replacement of ventilation units and lamps).

Category B — A combination of energy efficiency measures directed at the enhancement of the building envelope (i.e., air infiltration, insulation), and improving the efficiency of the central heating and/or cooling system only.

Decarbonisation measures will use and apply electricity or another fuel source that was already a source of emissions in the dwelling prior to project activity.

Validation of inclusion: Following the information provided in VCS-PD, the planned energy efficiency measures for all 28 initial PAIs fall into category B/4,18/. Confirmation will be available only after the installation of energy efficiency measures are complete. A FAR has been raised for checking at the time of first verification that the implemented energy efficiency measures for all 28 PAIs fall into either category A or category B as defined by the methodology and VCS-PD.

Project proponent and other entities involved in the project & Ownership

The project activity is being developed by Arctica Partners, which is also the Project Proponent. The Project Proponent works as a central coordinator for the project and will be involved towards implementation of the project activity and responsible for development, execution and monitoring of the VCS project throughout the area of the United Kingdom. The Project Proponent will collect, monitor, and aggregate data necessary to demonstrate additionality and quantify GHG emission reductions. Arctica Partners as Project Proponent will also be responsible for executing validation and registration of the project with the VCS and managing the verification and sale of the resulting emission reduction credits. Any individual dwelling owner, group housing scheme, or registered provider of social housing or public entity can be part of this project if the dwellings meet the set eligibility criteria for inclusion.

The registered provider of social housing, 'Raven Housing Trust', has signed a letter of intent to be part of this group project and all 28 initial dwellings which are being included are owned by them/5/. The validation assessment of the inclusion of these 28 PAIs has been included in the following section of the report.

Project start date

This is a green field project, and no implementation has started by the date of the site visit by the VVB/6/. The VVB auditor has interviewed the housing provider (Raven) and confirmed that no implementation of project has started yet. However, PP intends to complete the implementation of energy efficiency measures by 01/07/2022 in the first dwelling. A FAR (06) has been raised to

validate and confirm the start date of the project during the first verification. Considering it is a green field project and therefore no project start date can be validated.

Project crediting period

The Project Proponent has chosen the renewable crediting with crediting period start date as 01/07/2022 and the same date is mentioned in the VCS-PD/4/. The PP expects that on that date the certificate or declaration of conformity and completed installation for an initial PAI will be available and the project will start generating actual emission reductions. Being a renewal crediting period, the first crediting period will be of seven years up to 30/06/2029 and eligible for twice renewal for total of 21 years.

Project scale and estimated GHG emission reductions or removals

The project activity falls under the category of 'Project' in scale as per the VCS standard, version 4.3. with initial PAI inclusion. The project is expected to achieve emission reductions of 82 tCO_{2e} per year from the 28 initial PAIs/5/. During the crediting period additional PAI will be added to the project, however the total emission reductions will not exceed the limit as defined in the 'Project' category.

Project location

The project activity locations are selected as within the boundaries of the United Kingdom. All dwellings to be added to the project activity, will fall within the following geo-coordinates:

- Project Latitude (Decimal Degrees): 49°51′N to 59°48'N
- Project Longitude (Decimal Degrees): 6°27′W to 1°46′E

During the project activity implementation, the PP will record the geodetic coordinates of each individual dwelling in the project activity and assign them a unique identification number.

Conditions prior to project initiation

All the dwellings included in the project activity will be existing (old) dwellings. In the absence of the project activity, the pre-project scenario of low building envelop thermal and energy efficiency is expected to be continued. It was verified from the pre-retrofit energy assessment that none of the 28 initial PAIs has any of the suggested measures implemented/17/.

Project compliance with applicable laws, statutes and other regulatory frameworks

There are no laws and regulations governing mandatory building envelope modification or improvements to the central heating and/or cooling system or consumption of appliances with respect to the energy efficiency of existing dwellings in the United Kingdom.

The Project Proponent has included an analysis of regulatory surplus finding that decarbonisation activity to improve the energy efficiency of dwellings housing is not mandated by enforced law, statute, or another regulatory framework in the UK.

The Project Proponent highlights the independent statutory Committee on Climate Change, which in its 2022 Progress Report to UK Parliament, concluded the government's climate change strategy will not deliver net zero and pointed to the poor insulation and dependence of the housing stock on fossil fuel for space and water heating as two of the main areas of material policy failure. In a statement accompanying the report, the Committee on Climate Change identified a "a shocking gap in policy for better insulated homes".

The Project Proponent identifies the UK Government had set out its plans to decarbonise the buildings sector in its Heat and Buildings Strategy of which the Committee on Climate Change published an independent assessment in March 2022. Finding that decarbonisation activity to improve the energy efficiency of the housing stock is not mandated by enforced law, statute, or another regulatory framework. The Government's approach to housing decarbonisation is instead reliant on market-based incentives and mechanisms to drive delivery, notably for energy efficiency in owner-occupied homes and social housing. Therefore, VVB is in opinion that project activity is not mandated by any applicable laws and pass the regulatory surplus.

Eligibility condition 8 requires the dwelling owners to confirm that the energy efficiency measures are in compliance with the Building Regulations. The project is a voluntary effort by the Project Proponent. There is no legal requirement on the choice of a particular technology or method for efficiency enhancement. This was checked by reviewing the latest regulations from the related government department and the VVB concluded that there are no such regulations in UK which mandates the initiatives of energy efficiency being adopted in this project/19/. The project activity meets all applicable laws and regulations in the UK.

Participation under other GHG programs:

The project activity is not registered or has applied for registration under any other GHG program. This was confirmed during the interview with the PP's representative and the PP has also provided a declaration that carbon or any other environmental benefits will not be claimed other than VCU from VERRA/20/. The PP has a system in place wherein all dwelling owners will sign an agreement which defines clearly that GHG emission reductions created by the dwellings under this project will not be registered or credited with any other program/13/. A declaration for the same has been provided by the Project Proponent and the same is declared in the VCS-PD.

Sustainable development contributions

The project promotes sustainable development through the following aspects:

a) Environmental: Since the project activity leads to reduction in fossil fuel-based energy consumption, it will reduce GHG emissions and climate change impacts/4/

b) Social: the implementation of project activity will create new jobs especially for SMEs and their supply chains in construction and building envelope modification. The project activity will contribute to developing a skilled labour force for the building construction sector/4/

c) Affordable and sustainable energy: By reducing the fuel consumption and thus saving energy costs, the project activity also contributes to providing affordable and sustainable energy to people with low-income and addresses fuel poverty

d) Health and well-being: The installation of energy efficiency measures directed at reducing the fossil fuel consumption in dwellings is an effective form of preventative healthcare for both physical and mental ill health. The project activity promotes healthy life and well-being.

e) Cleaner Air: Since the project activity leads to lesser GHG emissions it results in better air quality.

The VCS-PD mentions the direct contribution to achieving UN Sustainable Development Goals as below and the same is deemed appropriate.

- **Goal 7**: Ensure Access to Affordable, Reliable, Sustainable and Modern Energy
- **Goal 11**: Make cities inclusive, safe, resilient and sustainable
- **Goal 10**: Reduce inequality within and among countries
- **Goal 1**: End poverty in all its forms everywhere
- **Goal 8:** Promote sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all
- **Goal 9:** Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation
- **Goal 13**: Take urgent action to combat climate change and its impacts
- **Goal 3**: Ensure healthy lives and promote well-being for all at all ages.

In the ESPLs assessment team's opinion, the project activity is meeting all requirements of the VCS standard and applied methodology. The information provided in the final VCS-PD and other documentation reviewed during the audit process is authentic and free of any misinterpretations which is confirmed through desk-based review of documents followed by project on-site visit by the assessment team. The provided project description is accurate, complete and provides a complete understanding of the nature of the project.

3.2 Safeguards

3.2.1 No Net Harm

The VCS-PD does not see and identify any potential negative environmental and socio-economic impacts. The Assessment team also cross checked this by assessing the project design and interviewing stakeholders during the visit and confirms that there are not any potential negative environmental and socio-economic impacts attributed to the project activity.

3.2.2 Local Stakeholder Consultation

The Project Proponent has consulted with local stakeholders following the VCS requirements for the project activity. The Project Proponent has identified the following stakeholders.

- Dwelling owners
- Residents
- Fuel poverty charities
- Decarbonisation measure installers
- Carbon credit buyers
- Data vendors
- Government and local authorities

The stakeholder consultation which included focus group meetings was started in November 2021. The engagement with potential local stakeholders took place around two major housing conferences with the aim of identifying local stakeholders who may be impacted by the project. A set of follow-up virtual meetings took place with the following local stakeholders:

- A Registered Provider of Social Housing with 7,000 homes in the South-East of England. A virtual meeting on 16th November 2021 with the Director of Assets and Services was conducted. The records of the online meeting were checked and found acceptable/21/.
- An Honorary Professor of Low Carbon Energy. A virtual meeting on 29th November 2021 was conducted. The records of the online meeting were checked and found acceptable/22/.
- A Registered Provider of Social Housing with 13,000 homes in the Midlands of England. A virtual meeting on 7th December 2021 with the Sustainability Manager was conducted . The records of the online meeting were checked and found acceptable/23/.
- A Registered Provider of Social Housing with 60,000 homes in the South-West of England. A virtual meeting on 13th December 2021 with the Director of Asset

Management, Director of Construction and Director of Finance was conducted. The records of the online meeting were checked and found acceptable/24/.

- A Registered Provider of Social Housing with 50,000 homes in the South of England. A virtual meeting on 5th January 2022 with the Director of Asset Management and Director of Strategy & Partnerships was conducted. The records of the online meeting were checked and found acceptable/25/.
- An innovation agency for the housing sector and charity focussed on addressing fuel poverty. A virtual meeting on 6th January 2022, with the Chief Executive and Managing Director was conducted. The records of the online meeting were checked and found acceptable/26/.

The project proponent has also established a mechanism for ongoing communication with local stakeholders by promoting an email address to which local stakeholders have been invited to provide feedback (*housing@arcticapartners.com*). The project proponent has also partnered with HACT, the charity of the social housing sector and specialists in helping organisations active in the housing sector to evaluate, monitor and improve their services. HACT has supported the transformation and development of housing provision in the UK for over 60 years. HACT will keep engaging with the local stakeholders on regular intervals during the project lifetime.

3.2.3 Environmental Impact

The project activity involves energy saving through building envelop modifications and improving the efficiency of the central heating and/or cooling system and reducing fossil fuel consumption of appliances of existing old dwellings and poses no negative environmental impact. The assessment team has confirmed this based on its local and sectoral expertise. Also, there is no local regulation found which requires project activity to conduct any environmental impact assessment.

3.2.4 Public Comments

The project was made public on the VCS registry https://registry.verra.org/app/projectDetail/VCS/2649 from 24/12/2021 to 23/01/2022 for public consultation. There were no comments received during the public commenting period.

3.2.5 AFOLU-Specific Safeguards

The project activity is a non-AFOLU project, and this section is not required.

3.3 Application of Methodology

3.3.1 Title and Reference

VCS Methodology: VM0008, version 1.1 – "Weatherization of Single Family and Multi-Family Buildings". The assessment team has confirmed that the selected baseline methodology is the approved baseline methodology available on Verra web site. The applied methodology is the latest version. The selected baseline methodology, i.e., VM0008, version 1.1 is correctly applied to this type of project. All the applicability criterion of the applied methodology is appropriately justified in the updated VCS-PD provided by the Project Proponent/3,4/.

3.3.2 Applicability

For each of the applied methodology's applicability conditions, the steps taken to assess compliance of the project with the applicability condition is below. A conclusion is provided with respect to each applicability condition.

Similarly, where the applied methodology provides the project with a number of tools or modules to choose from, the steps taken to assess that the appropriate tool or module has been selected is described below. A conclusion is provided with respect to each selected tool or module.

An overall conclusion is provided regarding the applicability of the methodology, and any tools or modules selected by the Project Proponent.

Applicability criteria for the applied methodology in the VCS-PD against these criteria were assessed by the validation team by means of document review and interviews. Thus, the validation team confirms that the Project Participant has correctly applied the approved methodology and the selected version of the methodology is valid at the time of validation.

The applicability of each condition is discussed as below.

Para & Sl No	Eligibility condition	Methodology Requirement	Project Justification	Means of Validation
Para 4.1 (a)	7&8	The condition of the Dwelling shall be and remain adequate for Project activities according to nationally recognized Weatherization best practice standards. Project activities may not result in a violation of health and safety, environmental, or	Installation of the decarbonization measures is carried out in accordance with Building Regulations, in accordance with Publicly Available Specification (PAS), or an equivalent standard, or carried out by a person registered with a competent person scheme	This requirement will be met by three options: If decarbonization work is regulated, the dwelling owner will submit to the PP on completion of the work a certificate of compliance issued by the Building Control Body which is appointed by relevant government department of local authority or submit a declaration that work was carried out by a person registered with a competent person scheme/14/. If measures are not regulated then the dwelling owner will

		other relevant regulations.		submit to the PP on completion of the work a PAS certification issued by Trust Mark (accredited by the government to administer a voluntary framework) or issued under an equivalent standard or submit a declaration that work was carried out by a person registered with a competent person scheme/15/. If the household owner is a regulated body (like a regulated provider of social housing) or a public body (like a local authority), a declaration by them that the work done is as per best practice is also acceptable. The PAS framework has been checked by the assessment team/14/. The standard provides the nationally recognized Weatherization best practice specifications for the UK/15/. A sample certificate has also been checked by the assessment team. The compliance to these requirements confirms that the project activities meet the criteria of nationally recognized best practice standards and will not result in a violation of health and safety, environmental, or other relevant regulations.
Para 4.1 (2)	9	The replacement Appliances and mobile homes must replace functioning Appliances, and/or occupied homes.	Declaration by the dwelling owner and N/A	This requirement for appliances will be met by a declaration by the building owner. Replacement of mobile homes in not part of the initial project activity.

Para 4.1 (3)	10	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.	Utility bills or mortgage statements relating to the dwelling or other indicators such as mortgage deeds, the existence of a lease or license (such as a tenancy agreement), or a declaration by the dwelling owner will be checked.	PP has clarified that it will maintain documentation related to utility bills or mortgage documentation or leases or licenses or a declaration from the dwelling owner for all the PAIs. Based on these documents the occupancy of the dwellings will be verified. Accordingly, the occupancy of the building has been added as an eligibility criteria and will be checked at the time of PAI inclusions. Since, no measures have so far been implemented in initial PAIs, the assessment team has not verified any such sample documents but this criteria will be checked during verification and a FAR in section 3.1 has been raised in this regard. However, PP has provided the copy of agreement to be signed with participating dwelling owners, which sets out the occupancy requirement/13/.
Para 4.1 (4)	11	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.	This will be checked and confirmed by installation carried out in accordance with Building Regulations, in accordance with PAS or an equivalent standard or installation carried out by a person registered with a competent person scheme	This requirement will be met by three options: If decarbonization work is regulated, the dwelling owner will submit to the PP on completion of the work a certificate of compliance issued by the Building Control Body which is appointed by the relevant government department or local authority or submit a Gas Safety Certificate or declaration that work was carried out by a person registered with a competent person scheme/14/.

				If measures are not regulated then the dwelling owner will submit to the PP on completion of the work a PAS certification issued by Trust Mark (accredited by the government to administer a voluntary framework) or issued under an equivalent standard or submit a declaration that work was carried out by a person registered with a competent person scheme/15/. If the household owner is a regulated body (like a regulated provider of social housing) or a public body (like a local authority), a declaration by them that the work done is as per best practice is also acceptable. The compliance to these requirements confirms that the capacity of any replacement Appliance or replacement component of a central heating/cooling system satisfies the post-retrofit heat load, cooling load and electricity demand within the dwelling.
Para 4.1 (5)	12	In the case of heating/cooling systems that serve multiple Dwellings, all residential Dwellings connected to the system shall be included in the Project.	-	The currently included PAIs are not connected to any heating system which serves multiple dwellings. This was checked from the records of Raven Housing Trust.
Para 4.1 (6)	13	The Project activity must not	This will be checked through	No energy efficiency measures which are part of the project

		be mandated, or required by local, state or federal law or regulation.	declaration from the dwelling owner.	activity are mandated by the local laws and this was cross checked against the Regulator of Social Housing's requirements/16/. That the project activity is not mandated by law has also been included as a condition of the agreement to be signed between the PP and dwelling owners/13/.
Para 4.1 (7)	14	The Dwelling must meet or exceed the performance benchmark as calculated for the Same Building Stock. As evidenced by data, dwellings exceeding this performance benchmark would, with 90% certainty, not have happened without the intervention created by the Project.	Reports required for demonstrating additionality for each project activity instance are generated from the centralised data repository by the Project Proponent in accordance with the approach outlined in section 3.5 (Additionality) of the VCS-PD.	PP has calculated the performance benchmark using the model which uses the data collected in pre-retrofit energy assessment for every dwelling and then a post-retrofit energy assessment after the implementation of energy efficiency measures. These assessments are conducted by third party accredited energy assessors certified by a public authority, or a private certification program recognised by a public authority. Energy assessments are conducted using the Standard Assessment Procedure (SAP) which is the Government-approved National Calculation Methodology for assessing the energy performance of dwellings/17/.
Para 4.2	17	The methodology is applicable to Weatherizing whole buildings, replacing mobile homes or implementing individual energy efficiency measures within existing Dwellings. Applicable	The PP has only included PAIs in Category B within the project activity.	The current project activity is planned to involve the implementation of energy efficiency measures and improvements to the efficiency of central heating/cooling systems only. This does not include retrofit/replacement of appliances or mobile homes. Following the information provided in the VCS-PD, the planned energy efficiency

		interventions fall into one of the following categories: Category A, Category B, Category C, Category D		measures for all 28 initial PAIs fall into category B/4,18/.
Para 4.3	17	The methodology does not cover fuel switching.	-	The project activity does not involve any fuel switch. This was verified by the records of baseline established by the PP.
Para 4.4	NA	In the case of "replacement" of a mobile home, the word "retrofit" shall be read to mean replacement throughout the methodology.	-	Not applicable as project activity does not involve the replacement of mobile homes.
Para 4.5	1	The methodology may be applied in any geographic region, provided appropriate data exist to establish the level of the performance benchmark for the Same Building Stock of a Project's geographic region.	Documentation: the physical address and geodetic coordinates of the dwellings are obtained and checked to ensure the dwelling is within the physical boundaries of the United Kingdom; the address of the dwelling is checked against the Local Authority's register of houses in multiple occupation to ensure the	The project is applied to the geographical location of the United Kingdom only/4/. In the UK, every property has a Unique Property Reference Number (UPRN) and all 28 UPRNs applicable to these PAIs were recorded and provided to the VVB/6/. The UPRN can be cross-check on the government website for the verification of address and geo-co-ordinates/7/. The address and geo-coordinates of all 28 initial PAIs was cross verified from the website, and it was confirmed the location for all these dwellings is Surrey, England

			dwelling is an individual (single family) dwelling and not a multi-family dwelling; and the income group of the dwelling is checked to ensure the dwelling forms part of the low-income or middle-income group Documentation is maintained in the project activity files	
Para 4.6		The PP needs to follow the details provided under Para 4.6 of the methodology when sampling is done.	-	The PP will establish the number of quality assurance monitored dwellings by multiplying 0.6 by the square root of the total number of PAIs.

3.3.3 Project Boundary

The PP has covered the physical boundary of the project activity as all individual dwellings within the boundaries of the United Kingdom. Since the geographical implementation area for this group project is the United Kingdom, the same is deemed appropriate to the assessment team. The Longitude and Latitude covering these areas are:

Longitude: 6°27′W to 1°46′E

Latitude: 49°51′N to 59°48′N

Below the table depicts the inclusion of GHG sources in the baseline and project scenarios:

Source		Gas	Included?	Justification/Explanation	Assessment team conclusion
Baseline	Emissions from fuel combustion by central heating systems	CO2	Included	Source of GHG emissions. Fuel combustion other than to satisfy the heat load is negligible and not separately accounted for	In line with methodology
		CH4	Excluded	Negligible	
		N2O	Excluded	Negligible	
		Other	Excluded	Negligible	
	Emissions from grid electricity consumption by heating/cooling systems or other electric appliances	CO2	Included	Source of GHG emissions. Only GHG emissions from grid connected electricity generation are accounted for	In line with methodology
		CH4	Excluded	Negligible	
		N2O	Excluded	Negligible	
		Other	Excluded	Negligible	
	Emissions for wood combustion for heat	CO2	Excluded	Excluded in the baseline to maintain conservativeness. Currently, the purchase and consumption of wood as fuel and emissions associated therewith are difficult to monitor on any reliable basis	Assessment team has checked that the dwellings included are not using wood
		CH4	Excluded	Negligible	In line with the methodology
		N2O	Excluded	Negligible	
		Other	Excluded	Negligible	
Project	Emissions from fuel combustion by heating systems	CO2	Included	Source of GHG emissions. Fuel combustion other than to satisfy the heat load is negligible and not separately accounted for	In line with the methodology

Source		Gas	Included?	Justification/Explanation	Assessment team conclusion
		CH4	Excluded	Negligible	
		N2O	Excluded	Negligible	
		Other	Excluded	Negligible	
	Emissions from grid electricity consumption by heating/cooling systems or other electric appliances	CO2	Included	Source of GHG emissions. Only GHG emissions from grid connected electricity generation are accounted for	In line with the methodology
		CH4	Excluded	Negligible	
		N2O	Excluded	Negligible	
		Other	Excluded	Negligible	
	Emissions for wood combustion for heat	CO2	Excluded	Excluded in the project activity to maintain conservativeness. Currently, the purchase and consumption of wood as fuel and emissions associated therewith are difficult to monitor on any reliable basis	In line with the methodology
		CH4	Excluded	Negligible	
		N2O	Excluded	Negligible	
		Other	Excluded	Negligible	

3.3.4 Baseline Scenario

The applied methodology gives four categories of the baseline scenario which are most likely to occur in absence of project activity. The applicable pre-project scenarios in the case of project activity are Category A which involves continued use of the same level of fossil fuel and electricity consumption for the purpose of heating/cooling and for the operation of appliances, or Category B which involves continued use of the same level of fossil fuel and electricity consumption for the purpose of heating/cooling.

In order to establish the baseline, the Project Proponent has calculated the most recent 12-month average for fossil fuel and electricity consumption by households in each category of Same Building

Stock (low and middle- income groups). The Project Proponent has calculated the baseline using actual consumption data published by the Department of Business, Energy and Industrial Strategy (BEIS) for natural gas and energy consumption across the building stock of England, Wales and Scotland /28/. The selected approach for establishing the baseline is in line to the requirement of the applied methodology/3/.

The following types of Same Building Stock and their respective energy consumption for the baseline has been calculated by the Project Proponent using the actual consumption data published by BEIS as follows:

- Low-income single-family dwellings- Fossil fuel consumption: 11,500 kWh annually
- Low-income single-family dwellings- Grid electricity consumption: 3,000 kWh annually
- Middle-income single-family dwellings- Fossil fuel consumption: 14,400 kWh annually
- Middle-income single-family dwellings- Grid electricity consumption: 3,900 kWh annually

3.3.5 Additionality

The additionality of the project activity is demonstrated in accordance with applied methodology VM0008, version 1.1. The methodology requires that additionality be demonstrated through the performance method which uses a performance benchmark to demark the decrease in consumption of fossil fuel and electricity that is unlikely to occur in the absence of the project activity.

The performance benchmark is a value that represents a percent savings in energy consumption during the operation phase that the project activity PAIs are not likely to reach with 90% certainty in the absence of the implemented measures.

The calculation of performance benchmark as per applied methodology VM0008, version 1.1 requires using the 90^{th} percentile value within a numerically ordered sample where the data does not follow the normal distribution. In the United Kingdom, the distribution of fossil fuel and electricity consumption by dwellings is non-Gaussian. This is demonstrated by the PP by means of the actual property level natural gas and electricity consumption data published by BEIS as part of the NEED Framework/28/. Thus, the Project Proponent has used the 90^{th} percentile value in order to derive the performance benchmark.

The proposed project activity comprises the installation of energy efficiency measures in category A or category B. Category A deals with all energy load retrofits while Category B covers efficiency enhancements to the building envelope and/or improvements to the central heating/cooling systems only. As per the applied methodology the same performance benchmark can be used if the percent savings is calculated for the entire energy consumption of the dwelling and not just for the consumption of heating and cooling energy. In the current project, the same approach has been followed and a common performance benchmark has been derived for total energy savings across both categories of measures and each type of Same Building Stock (income category of dwellings).

Performance Benchmark at Project level on Validation stage:

The project participant has used the same dataset of fossil fuel and electricity consumption as discussed in the baseline scenario section.

The Department for Business, Energy & Industrial Strategy has published the data for natural gas and electricity meter point readings as reported by the respective vendors as part of the National Energy Efficiency Data Framework (NEED) in England and Wales. This data has been further processed by the Project Proponent in order to evaluate the performance benchmark for the project activity.

The methodology states that "The Performance Standard is equal to the 90th percentile value within the numerically ordered sample. To calculate the 90th percentile the sample data point values (v_1, v_2…v_N) must be ordered from least to greatest. The 90th percentile value is equal to the value of the data point with the rank at which 90% of the data falls below." As provided in equation 3 of the methodology.

N = (N*P90/100) + 0.05

Where:

n = Rank of the ordered data point falling at the 90th percentile

N = Total number of data points included in the sample

P_{90} = 90th percentile

The value of the data point at rank *n* calculated in above equation is the performance benchmark in that building stock.

For each of the dwellings in the project activity, the percent savings in energy consumption must be greater than the performance benchmark in order to be demonstrated as additional.

$$\frac{EL_{Pre,i} - EL_{Post,i}}{EL_{Pre,i}} \times 100 \geq performance\ Benchmark$$

Where:

$EL_{Pre,i}$ = Pre-retrofit energy load of dwelling i

$EL_{Post,i}$ = Post-retrofit energy load of dwelling i after installation of the intervention measures

The dataset published under the NEED framework has been further processed by the Project Proponent using a data engineering software platform (Google Cloud Dataprep by Trifacta).

The applied methodology sets out the following conditions for the selection and use of data in the calculation of the performance benchmark for additionality.

Requirement: Data should be directly collected from primary sources shall comply with relevant and appropriate standards, where available, for data collection and analysis, and

be audited at an appropriate frequency by an appropriately qualified, independent organization.

- Compliance: The Project Proponent has used data published under the NEED framework by a government department and directly sourced from the vendor meter readings and thus relevance, accuracy, authenticity and compliance with the appropriate standard is justified.

Requirement: Data collected from secondary sources shall be available from a recognized, credible source and must be reviewed for publication by an appropriately qualified, independent organization or appropriate peer review group, or be published by a government agency.

- Compliance: The Project Proponent has used data that are directly collected from primary sources and published by a government department.

Requirement: Where sampling is applied in data collection, the project proponent shall demonstrate that sampling results provide an unbiased and reliable estimate of the true mean value (i.e., the sampling does not systematically underestimate or overestimate the true mean value). Project proponents may choose to demonstrate the appropriateness of sampling results based on a qualitative description of data sources and methods, where appropriate.

- Compliance: The calculation is based on sampling results that provides an unbiased and reliable estimate of the true mean. The sampling was undertaken by the staff of a government department (BEIS) under supervision from the Office of National Statistics. Thus, appropriateness is ensured.

Requirement: Data shall be publicly available, where appropriate (not confidential). Proprietary data (e.g., data pertaining to individual facilities) may be aggregated, and therefore not made individually publicly available, as there are demonstrable confidentiality considerations. However, sufficient data shall be publicly available to provide transparency and credibility to the dataset.

- Compliance: The Project Proponent has used data that are sourced from a government authority publication and is available for access.

Requirement: All data shall be made available, under appropriate confidentiality agreements as necessary to the VCSA and each of the validation/verification bodies assessing the proposed performance benchmark, to allow them to reproduce the determination of the performance benchmark. Data shall be presented in a manner that enables them to independently assess the presented data.

- Compliance: The PP has developed a calculation model for assessment and has given access to validators to check the calculation as well as the logic for the calculation. The same can also been accessed and checked at the Verra end.

Requirement: All reasonable efforts shall be undertaken to collect sufficient data and the use of expert judgment as a substitute for data shall only be permitted where it can be demonstrated that there is a paucity of data. Expert judgment may be applied in interpreting data. Where expert judgment is used, good practice methods for eliciting expert judgment shall be used (e.g., IPCC 2006 Guidelines for National GHG Inventories).

- Compliance: Sufficient data has been collected, processed and any judgments are made by government experts under supervision from the Office of National Statistics.

Requirement: Where data must be maintained in a central repository on an on-going basis (e.g., in a database that holds sector data for use by project proponents in establishing specific performance benchmarks for their projects), there shall be clear and robust custody arrangements for the data and defined roles and responsibilities with respect to the central repository.

- Compliance: The PP has developed a software-based platform using Google Cloud Dataprep by Trifacta. The project data/files will be stored/maintained and updated on regular basis.

The independent data is collected and processed in a systematic or methodical way by the Project Proponent using a data engineering software platform.

The full range of available energy consumption data for nine twelve-month periods has been selected by the PP and is processed based on below step by step approach/29/. This process and approach has been verified by the assessment team.

- Dwellings in the project boundary of the geographical boundaries of England and Wales are isolated from the dataset for inclusion in the analysis
- Dwellings constructed after 1999 are removed from the analysis as they are not part of the eligibility criteria for the project
- Dwellings where either fossil fuel or electricity consumption data are not available for one of the 12-month periods are removed from the analysis
- Dwellings where either fossil fuel or electricity consumption data is not within a plausible range are removed from the analysis (fossil fuel consumption of 2,500 – 50,000 kWh and electricity consumption of 500 – 25,000 kWh per annum)
- Dwellings are divided by type of Same Building Stock based on income categories of low-income and middle-income.
- Estimated average percent savings in total fossil fuel and electricity consumption is calculated for each dwelling
- The performance benchmark is derived by arranging the average percent savings in total fossil fuel and electricity consumption for each dwelling in numerical order from least to greatest for each income group and identifying the 90^{th} percentile value for each income group (Same Building Stock).

Low-income single-family dwellings
Additionality is calculated using actual natural gas and electricity consumption data for approximately 1.48 million low-income single-family dwellings within England and Wales, representing approximately 10.43% of the total population of low-income single-family dwellings within England and Wales, which exceeds the equation for determining the minimum sample size for quality assurance purposes prescribed in the VM0008 Methodology. Performance Standard: 5.0152% is calculated through the software-based platform developed by the PP in line with the methodological equations and requirements. To be additional, every PAI included in the project needs to achieve at least 5.0152% of energy savings in the low-income group.

Middle-income single-family dwellings
Additionality is calculated using actual natural gas and electricity consumption data for approximately 2.19 million middle-income single-family dwellings within England and Wales, representing approximately 35.59% of the total population of middle-income single-family dwellings within England and Wales, which exceeds the equation for determining the minimum sample size for quality assurance purposes prescribed in the VM0008 Methodology. Performance Standard: 4.4992% is calculated through the software-based platform developed by the PP in line with the methodological equations and requirements. To be additional, every PAI included in the project needs to achieve at least 4.4992%% of energy savings in the middle-income group.

As per the VM0008 Methodology V1.1/3/, the project uses the level of the Performance Standard metric available at project validation for each verification event for the duration of all project crediting periods.

Performance Benchmark at PAIs level:

Low-income individual dwelling performance standard: x= 0.050152

Middle-income individual dwelling performance standard: x= 0.044992

During the verification or validation for inclusion of subsequent PAIs, the Project Proponent will conduct an energy assessment for each dwelling prior to implementation of the energy efficiency measures. The pre-retrofit energy assessment determines the heat load and electricity demand (energy load) in the baseline for each dwelling added to the project. Also, after the project implementation another energy assessment will be undertaken to determine the heat load and electricity demand (energy load) following the implementation of project activity.

These energy assessments will be undertaken by accredited energy assessors certified by a public authority, or a private certification program recognised by a public authority. Further quality of these energy assessments will be ensured by following Standard Assessment Procedure (SAP) of the Government-approved National Calculation Methodology for assessing the energy performance of dwellings.

Based on these actual data the performance benchmark as well as energy savings for each PAI will be established by the PP and assessed by the verifier at verification stage.

Based on the overall review of the description provided in the VCS-PD and assessment of the data and calculation software it can be concluded that the PP has defined the additionality assessment procedures in line with the applied methodology. The data used in the assessment and calculation of the performance benchmark are valid and appropriate as per the requirements of the applied methodology.

3.3.6 Quantification of GHG Emission Reductions and Removals

The quantification of the baseline, project and leakage emissions has been done in line with the applied methodology. The method and expressions used by PP are summarized below:

Baseline Emissions: The GHG emissions generated by consumption of energy (fossil fuel and electricity) in the pre-project scenario, prior to installation of the efficiency measures, are the baseline emissions which are identified correctly in the VCS-PD and validated above in the baseline section 3.4.4/4/.

Project Emissions: The GHG emissions generated by energy consumption in the project scenario after installation of energy efficiency measures are the project emissions. Once the installation is completed and the completion certificate or declaration is issued for any dwelling, the energy consumption and subsequent related emissions are part of the project activity. The project emissions are identified correctly in the VCS-PD/4/

Leakage Emissions: The leakage emissions are identified in line with the applied methodology. If any appliance or boiler is not disposed according to applicable laws, then there can be leakage emissions from continued operation, and these will be accounted for by their exclusion from the total emissions reduction. The leakage emissions will not be applicable for the current project activity as the replaced appliances/boilers will be disposed in accordance with the applicable laws and a completion certificate or declaration for the same will be recorded by the PP and provided to the VVB during verification. This will be monitored during the verification of each PAI/3,4/.

The PP has selected the following categories of the applied methodology VM0008 for calculating the baseline emissions and emission reductions:

- **Category A** — A combination of energy efficiency measures directed at the enhancement of the building envelope (i.e., air infiltration, insulation), and improving the efficiency of the central heating and/or cooling system and reducing fossil fuel consumption of appliances (i.e., replacement of ventilation units and lamps).
- **Category B** — A combination of energy efficiency measures directed at the enhancement of the building envelope (i.e., air infiltration, insulation), and improving the efficiency of the central heating and/or cooling system only.

The applied methodology VM0008, version 1.1 mentions three different approaches for the calculation of emissions reductions from the any project activity using category A and category B. PP has selected the option of using any of these approaches:

a) The adjusted consumption approach

b) The pre- and post-retrofit energy assessment approach

c) The control group approach

The Project Proponent has described all 3 approaches in the VCS-PD and has kept the option open for choosing any of above approaches for calculation of emission reductions in future PAIs which is in line with the applied methodology/3/. The selection of approach out of the three above options will be decided at the time of inclusion of the PAIs and will be fixed for the crediting period. Any switch between the approaches will not be undertaken during the crediting period for the included PAIs.

For the 28 initial PAIs included in the VCS-PD/4/, the Project Proponent has chosen the pre- and post-retrofit energy assessment approach. The expression to be used for the selected approach is validated below:

a) The pre- and post-retrofit energy assessment approach:

$$ER_y = \sum_{i=1}^{I} Elec_{b,i} \times EDF \times ECF_y \times HDDCF_y \times Elec_{CO2} + \sum_{i,j=1}^{I,J} F_{b,i,j} \times HLF \times HDDCF_y \times F_{CO2} - L_y$$

Where:

ER_y = Emission Reductions in year *y* in metric tons ("t") CO_2e/yr.

$Elec_{b,i,j}$ = Electricity consumed in the year prior to Project implementation for Dwelling *i* in kWh (baseline consumption)

EDF = Electricity demand reduction factor (no unit)

ECF_y = Electricity correction factor for year *y* to be applied to the baseline

$HDDCF_y$ = Heating Degree Days Correction Factor for year *y*

$Elec_{CO2}$ = Grid emission factor in tCO_{2e}/kWh

$F_{b,i,j}$ = Fuel type *j* consumed in the year prior to project implementation for dwelling *i* (baseline consumption)

HLF = Heat load reduction factor (no unit)

$F_{CO2,j}$ = The CO_2 emission factor per unit of energy of fuel type *j* expressed in tCO_{2e}/kWh

L_y = Leakage due to improper disposal of appliances

I = Number of Dwellings

I = Dwelling

J = Number of fuel types

j = Fuel type

y = Any consecutive twelve months during the project's crediting period, and is defined with an integer from 1 on in a consecutive manner

Further, Leakage, can be calculated as

$$L_y = L_{CO2,y} + L_{HFC,y}$$

Where:

$L_{CO2,y}$ = Leakage from improper disposal of, or continued operation of replaced boilers, in year *y*

$L_{HFC,y}$ = Leakage from improper disposal of, or continued operation of appliances using refrigerants, in year *y*

The proposed project activity does not deal with the refrigerant appliances. So the leakage would be calculated as follows if any boiler is not properly disposed of.

$$Ly = L_{CO2,y}$$

Since the current project activity is at implementation stage and installation and completion for 28 initial PAIs is not completed yet, the ex-ante emission reduction calculations have been undertaken by the PP based on the following assumptions:

ECF_y = 1 (for the baseline year)

$HDDCF_y$ = 1 (for the baseline year)

$Elec_{CO2}$ = 0.00021233

$F_{CO12,j}$ = 0.00021600

L_y = 0

I = 28

J = 1

j = Natural gas

y = 1

These are general assumptions for simplicity and demonstration. The actual emission reductions will be calculated based in the actual monitored data.

Further, the PP has defined that it will keep quality assurance samples for the project activity in line with approach given in the methodology. Under this approach the HLF and EDF will be corrected where a significant discrepancy occurs between the calculated reduction in energy load as calculated under the pre- and post-retrofit energy assessment approach for a sample of dwellings of the Same Building Stock and the actual reduction in consumption calculated from directly metered energy data for a quality assurance sample of dwellings. The difference in consumption between the control group and the intervention group, as

calculated under the control group approach for the project year is used to calculate the reduction in consumption from directly metered energy data.

The PP will establish the size of such quality assurance sample by multiplying by 0.6 the square root of the total number of dwellings included in the pre- and post-retrofit energy assessment approach for the project year.

For the 28 initial PAIs included in the project, the PP will use a quality assurance sample size of 4 dwellings.

The PP has also applied and demonstrated the ex-ante calculation based on general assumptions for the following other two approaches:

- Adjusted consumption approach
- Control Group Approach

The assessment team has checked the calculations / equations and approaches provided in the VCS-PD and found them to be in line with the applied methodology. However, the actual emission reductions for each PAI included in the project activity will be further verified at the inclusion stage.

The following estimation of baseline emissions and emission reduction for the first crediting period has been calculated. It is important to note that the following estimates were calculated for the 28 initial PAIs which are being included in the project activity at the time of validation. The actual number of GHG emission reductions will vary depending on the number of dwellings included in the project.

Table: Ex-ante calculation (estimate) of emission reductions for the initial instances of project activity

Year	Estimated number of cumulative dwellings	Estimated baseline emissions (tCO_2e)	Estimated project emissions (tCO_2e)	Estimated leakage emissions (tCO_2e)	Estimated net GHG emission reductions or removals (tCO_2e)
2022	28	46.5	5.5	0	41
2023	28	93	11	0	82
2024	28	93	11	0	82
2025	28	93	11	0	82
2026	28	93	11	0	82
2027	28	93	11	0	82
2028	28	93	11	0	82
2029	28	46.5	5.5	0	41

Total	28	651	77	0	574

3.3.7 Methodology Deviations

No methodological deviations are applied in the project activity.

3.3.8 Monitoring Plan

The monitoring plan in the VCS-PD is in compliance with the applied monitoring methodology VM0008, Version 1.1/3/ The monitoring plan will give opportunity for real measurement of emission reductions achieved. Leakage accounting has not been considered for the project since there would be a proper monitored disposal of the replaced boilers/appliances in accordance with applicable laws. The monitorable action plan for the same has been included in section 5.3 of the VCS-PD/4/. The Validation Team confirms that the project participant is able to implement the project as per the monitoring plan.

3.3.8.1 Data and parameters available at validation

1) Performance Standard (*a*): Average performance, defined as the annual average percent savings in weather normalised fossil fuel and electricity consumption in dwellings within the Same Building Stock.

The following values were calculated and fixed at the validation for the performance standard:

- Low-income single family dwelling performance standard x=5.0152
- Middle-income individual dwelling Performance Standard *x*= 4.4992

Data from the Department for Business, Energy & Industrial Strategy (BEIS) as part of the National Energy Efficiency Data Framework (NEED) has been used to calculate the performance benchmark. The source of the data and calculation method were checked and found correct/30/.

2) $Elec_{CO2}$: Grid emission factor for the regional electricity source; 0.000212 tCO2e/kWh. PP has taken the value directly from government data published for the Standard Assessment Procedure (SAP), the UK Government's National Calculation Methodology for assessing the energy performance of dwellings/17/. The source of data was checked and found correct.

3) F_{CO2j}: CO_2 emission factor for fuel type j; 0.000216 tCO_{2e}/ kWh. The value of emission factor for gas has been taken from the government data published for the Standard Assessment Procedure (SAP), the UK Government's National Calculation Methodology for assessing the energy performance of dwellings/17/. The source of data was checked and found correct.

3.3.8.2 Data and parameters to be monitored

The applied methodology requires parameters to be monitored in line with the approach used for the project activity emission reduction calculation. Since the Project Proponent intends to use all 3 approaches applicable for calculating the emission reductions, the PP has covered and included in the VCS-PD all the parameters required for emission reductions under these three approaches. The source, method and QA/QC procedures for monitoring of these parameters have been checked and found appropriate.

1) $EL_{pre,i}$: Pre-retrofit energy load of dwelling *i*: The value will be taken from Standard Assessment Procedures (SAP). The values are recorded, by the government approved energy assessor, in the Energy Performance Certificate (EPC) dataset/12/.

2) $EL_{post,i}$: Post-retrofit energy load of dwelling *i*: The value will be taken from Standard Assessment Procedures (SAP). The values are recorded, by the government approved energy assessor, in the Energy Performance Certificate (EPC) dataset.

3) $Elec_{b,i}$: Electricity consumed in the year prior to project implementation in dwelling *i* (baseline consumption); Low-income single-family dwelling – 3,000 kWh & Middle-income single-family dwelling – 3,900 kWh. These values are calculated from data published by the Department for Business, Energy & Industrial Strategy (BEIS)/19/.

4) $Elec_{p,y,i}$: Electricity consumed by the project in year *y* for Dwelling *i*: The parameter will be monitored by sampling once in a year. The minimum sample size will be identified by multiplying by 0.6 the square root of the total number of dwellings included in the adjusted consumption approach for the project year. This was found in line with the requirements of the applied methodology/3/.

5) $F_{b,i,j}$: Fuel type *(natural gas)* consumed in the year prior to project implementation ($F_{b,j,j}$) for dwelling *i* (baseline consumption): Low-income single-family dwelling – 11,500 kWh & Middle-income single-family dwelling – 14,400 kWh. These values are calculated from data published by BEIS on June 24, 2021, as part of the NEED Framework/30/.

6) $F_{p,y,j,j}$: Fuel type *(natural gas)* consumed by the project in year *y* ($F_{p,y,j,j}$) for dwelling *i* (project consumption); The parameter will be monitored by sampling once in a year. The minimum sample size will be identified by multiplying by 0.6 by the square root of the total number of dwellings included in the adjusted consumption approach for the project year. This was found in line with the requirements of the applied methodology/3/.

7) ECF_y : Electricity correction factor for year *y*: The factor is determined from national electricity household consumption data published by the Department for Business, Energy & Industrial Strategy (BEIS). However, following the applied methodology, the ECF is only to be applied in the equation if the energy trend in the geographical location is negative.

8) HDD_y: Heating degree days for year *y* after project activity: These values are calculated from data retrieved from the Department for Business, Energy & Industrial Strategy (BEIS). Degree days will be calculated from the maximum and minimum daily temperature as recorded at 17 meteorological stations, selected as representative of

fuel consumption in Britain with 2 in Scotland, 2 in Wales and 13 in England, 4 of which are counted twice. Data on temperatures recorded are provided by the Meteorological Office/31/.

9) HDD_b: Heating degree days for one year before project activity: These values are calculated from data retrieved from the Department for Business, Energy & Industrial Strategy (BEIS). Degree days will be calculated from the maximum and minimum daily temperature as recorded at 17 meteorological stations, selected as representative of fuel consumption in Britain with 2 in Scotland, 2 in Wales and 13 in England, 4 of which are counted twice. Data on temperatures recorded are provided by the Meteorological Office/31/.

10) *J:* Number of fuel types: The value will be obtained from the pre-retrofit energy assessment undertaken by accredited energy assessors certified by a public authority, or a private certification program recognised by a public authority. Energy assessments are conducted using the Standard Assessment Procedure (SAP) which is the Government-approved National Calculation Methodology for assessing the energy performance of dwellings/17/

11) *I:* Number of dwellings included in the adjusted consumption approach for the project year: This value will be monitored by PP directly and will be recorded in the centralized data repository.

12) Quality assurance sample group of fuel consumption within the Dwelling: If the samples are being conducted by the PP for monitoring a parameter the sample size will be established by multiplying by 0.6 the square root of the total number of dwellings, *i*, included in the adjusted consumption approach for the project year. This is found in line to the applied methodology/3/.

13) Quality assurance sample group of electricity consumption within the Dwelling: If the samples are being conducted by the PP for monitoring a parameter the sample size will be established by multiplying by 0.6 the square root of the total number of dwellings, *i*, included in the adjusted consumption approach for the project year. This is found in line to the applied methodology/3/.

14) $E_{dem,i}$: Pre-retrofit electricity demand for dwelling *i*: The values for this parameter will be taken from the Standard Assessment Procedure (SAP) which is the Government-approved National Calculation Methodology for assessing the energy performance of dwellings. The assessment is undertaken by accredited energy assessors certified by a public authority, or a private certification program recognised by a public authority/17/.

15) $E_{dem,post,i}$: For Post-retrofit electricity demand for dwelling *i*: The values of this parameter will be taken from the Standard Assessment Procedure (SAP) which is the Government-approved National Calculation Methodology for assessing the energy performance of dwellings. The assessment is undertaken by accredited energy assessors certified by a public authority, or a private certification program recognised by a public authority/12/.

16) $H_{load,pre,i}$: Pre-retrofit heat load for dwelling *i*: The values for this parameter will be taken from the Standard Assessment Procedure (SAP) which is the Government-approved National Calculation Methodology for assessing the energy performance of dwellings. The assessment is undertaken by accredited energy assessors certified by a public authority, or a private certification program recognised by a public authority/17/.

17) $H_{load,post,i}$: Post-retrofit heat load for dwelling *i*: The values of this parameter will be taken from the Standard Assessment Procedure (SAP) which is the Government-approved National Calculation Methodology for assessing the energy performance of dwellings. The assessment is undertaken by accredited energy assessors certified by a public authority, or a private certification program recognised by a public authority/17/.

18) *S*: Number of dwellings included in the sample group: This value will be monitored by PP directly and will be recorded in the centralized data repository.

19) $Elec_{SG,y,b}$: Mean electricity consumed by sample group dwellings in Building Stock *b* in year *y*: The values will be taken from data published by the Department for Business, Energy & Industrial Strategy (BEIS) as part of the National Energy Efficiency Data Framework (NEED)/19/.

20) $Elec_{CG,y,b}$: Mean electricity consumed by control group dwellings in Building Stock *b* in year *y:* The values will be taken from data published by the Department for Business, Energy & Industrial Strategy (BEIS) as part of the National Energy Efficiency Data Framework (NEED)/19/.

21) $F_{SG,y,j,b}$: Mean fuel type *j* consumed by intervention group dwellings in Building Stock *b* in year *y*: The values will be taken from data published by the Department for Business, Energy & Industrial Strategy (BEIS) as part of the National Energy Efficiency Data Framework (NEED)/19/.

22) $F_{CG,y,j,b}$: Mean fuel type *j* consumed by control group dwellings in Building Stock *b* in year *y:* The values will be taken from data published by the Department for Business, Energy & Industrial Strategy (BEIS) as part of the National Energy Efficiency Data Framework (NEED)/19/.

The overall description/procedure of the monitoring plan, along with the roles and responsibilities for the monitoring of the different parameters have been provided in the VCS-PD and also verified during the site visit to be correct.

Monitoring will be primarily conducted by Project Proponent staff and participating agencies/companies in the project activity.

All data obtained from outside sources will be collected in accordance with defined procedures in the VCS-PD and will be maintained in a centralized data repository. All necessary calculations will be undertaken based on data maintained in the centralized data repository.

3.3.8.3 Sampling Procedure

The PP has correctly defined the sampling procedure in accordance with the applied methodology VM0008, version 1.1. If the parameters are required to be monitored by sampling once a year, the minimum sample size will be identified by multiplying by 0.6 the square root of the total number of dwellings included in the relevant emission reductions approach for the project year. This was found in line with the requirements of the applied methodology.

3.3.8.4 Preliminary Data Collection: pre and post installation – monitoring and records

Project proponent staff or designated personnel who participate in the project activity, will collect and obtain the required information regarding the PAIs and will maintain the relevant data in the project activity files./6/

3.3.8.5 Monitoring Data Collection: Leakage

The Building Regulations Compliance Certificate, certificate under Publicly Available Specification (PAS) or an equivalent standard or declaration by the dwelling owner that work was carried out by a person registered with a competent person scheme or declaration by a regulated provider of social housing or public entity will be achieved and maintained by the PP for all disposed appliances/boilers. The records of such monitoring shall be maintained by the PP. If any appliance/boiler is not disposed as per the law, that shall be accounted for leakages.

The documents will be maintained in the project activity files and a leakage report will be generated each year for further submission during verification.

During the site visit, other aspects of the monitoring plan like roles and responsibilities, QA-QC procedures and data recording have been checked and found consistent with the VCS-PD/4/.

Overall, it is the assessment team's conclusion that the monitoring plan is in compliance with the applied methodology and the Project Proponent is able to implement the plan.

3.4 Non-Permanence Risk Analysis

There is no non-permanence risk identified for the project activity. Therefore, this section is not applicable.

4 VALIDATION CONCLUSION

Earthood Services Private Limited has been contracted by Arctica Partners to conduct the validation of the Grouped project – "Housing Decarbonisation in the United Kingdom" with regards to the relevant requirements of VCS programme guidelines and standard (VCS standard version 4.3, VCS and VCS program guide version 4.2). Relevant requirements as well as criteria for consistent project development and reporting have been applied for the validation.

ESPL has reviewed the project description documents and subsequently carried out a physical site visit and interviews to confirm the fulfilment of the stated criteria.

The purpose of this project activity is to apply the decarbonization measures to the existing single-family dwellings in the United Kingdom. By application of these measures, the energy consumption (Natural Gas and electricity) for heating and cooling purpose will be reduced as compared to the baseline consumption, which will ultimately result in the saving of energy and reduction of carbon emissions.

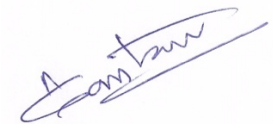
The project activity has applied the baseline and monitoring methodology, VM0008, Version 1.1: "Weatherization of Single Family and Multi-Family Buildings".

In summary, the validation team has been able to conclude that:

- The project is in line with all relevant host country criteria (United Kingdom) and all relevant VCS version 4.2 program guidelines requirements.
- The baseline scenario and project boundary have been correctly identified by the Project Proponent in accordance with the applied methodology.
- The Project Proponent has correctly and accurately identified the procedures to demonstrate the additionality in accordance with the applied methodology.
- The monitoring plan is transparent and adequate and in line with applied baseline and monitoring methodology of VM0008, version 1.1
- The procedures for calculation of the project emission reductions are identified in a transparent and conservative manner, so that the estimated emission reductions are most likely to be achieved within the crediting period considered under VCS.

The conclusions of this report show that the project, as it was described in the VCS-PD, is in line with all criteria applicable for the gap validation as outlined under VCS program guide version 04.2.

Approved by



Ashok K Gautam

Director

Earthood Services Privated Limited

Date: 21/11/2022

Place: Gurgaon, Haryana, IN

APPENDIX I: REFERENCES

Sr No	Title and details of the document/information referred
/1/	VCS Standard V4.3
/2/	VCS Program Guide V4.2
/3/	Applied methodology “Weatherization of Single Family and Multi-Family Buildings” V1.1
/4/	VCS-PD Version 9.1 dated 21/03/22 (Submitted for RFR) & Version 10.1 Dated 31/10/2022 (Submitted in response to VERRA review)
/5/	Letter of intent issued by Raven Housing Trust
/6/	Records of UPRN of 28 PAIs
/7/	Office of National Statistics and Ordnance Survey data (https://uprn.uk) for the verification of UPRN
/8/	Records of the Registers of Licenses of Houses in Multiple Occupants
/9/	https://www.gov.uk/house-in-multiple-occupation-licence
/10/	https://www.ravenht.org.uk/
/11/	https://www.livingwage.org.uk/living-wage-commission
/12/	EPC Certificates for all 28 PAIs and their source data
/13/	Draft contract for the provision of VCU units (agreement to be signed between PP & Dwelling owners)
/14/	Building Regulation Compliance Certificate
/15/	Certificate under Public Available Specifications (PAS)
/16/	Regulator of Social Housing Register, UK
/17/	Standard Assessment Procedure (SAP): National Calculation Methodology for assessing the energy performance of dwellings
/18/	List of the initial dwellings to be included as PAIs

/19/	Department of Business Energy and Industrial Strategy UK as part of the National Energy Efficiency Data Framework (NEED)
/20/	Declaration from PP for not claiming any other carbon benefits 22/03/2022
/21/	Records of an online meeting with a Registered Provider of Social Housing
/22/	Records of an online meeting with a Professor of Low Carbon Energy
/23/	Records of an online meeting with a Registered Provider of Social Housing
/24/	Records of an online meeting with a Registered Provider of Social Housing
/25/	Records of an online meeting with a Registered Provider of Social Housing
/26/	Records of an online meeting with an innovation agency for the Social Housing Sector
/27/	https://registry.verra.org/app/projectDetail/VCS/2649
/28/	Annual report of energy consumption in households published by Department of Business, Energy and Industrial Strategy (BEIS) on June 24th, 2021
/29/	Google cloud raw data and tools used to calculate the additionality (access control data)
/30/	Household natural gas consumption data published by BEIS on June 24, 2021, as part of the NEED Framework
/31/	Meteorological Office UK https://www.metoffice.gov.uk/

APPENDIX II: ABBREVIATIONS

Abbreviations	Full texts
BE	Baseline Emission
CA	Corrective Action / Clarification Action
CAR	Corrective Action Request
CH_4	Methane
CO_2	Carbon dioxide
CO_{2e}	Carbon dioxide equivalent
CL	Clarification Request
ER	Emission Reduction
ESPL	Earthood Services Private Limited
FAR	Forward Action Request
GHG	Greenhouse gas(es)
MP	Monitoring Plan
N_2O	Nitrous Oxide
PA	Project Activity
PP	Project Proponent
PE	Project Emission
PP	Project Participant
QA/QC	Quality Assurance / Quality Control
VCS	Verified Carbon Standard
VCS-PD/PD	VCS – Project Description
VCU	Verified Carbon Unit
VVB	Validation and Verification Body
IPCC	Intergovernmental Panel on Climate Change

APPENDIX III: COMPETENCE OF TEAM MEMBERS

Competence Statement			
Name	Kaviraj Singh		
Country	India		
Education	Ph.D. (Environmental Engineering), IIT Delhi Masters (Energy & Environmental), DAVV Indore		
Experience	15 Years +		
Field	Climate Change & Environment		
Approved Roles			
Team Leader	YES		
Validator	YES		
Verifier	YES		
Methodology Expert	AMS-I.D., AMS-II.D., ACM0006, AMS-I.A., AMS-I.C., AMS-II.B., AMS-III.H, ACM0002, ACM0001, AM0080, ACM0018		
Local expert	YES (India)		
Financial Expert	YES		
Technical Reviewer	YES		
TA Expert	YES (TA 1.1, TA 1.2, TA 3.1, TA 13.1, TA 13.2)		
Reviewed by	Abhishek Mahawar	**Date**	12/02/2020
Approved by	Ashok Gautam	**Date**	12/02/2020

Competence Statement	
Name	Harsh Raval
Education	Bachelor of Engineering in Chemical Engineering Masters of Science in Environmental and Energy Engineering
Experience	15 Years
Field	Climate Change, Environment and Waste Management
Approved Roles	
Team Leader	YES
Validator	YES
Verifier	YES
Methodology Expert	YES(AMS-I.D, ACM0002)
Local expert	YES (INDIA)

Financial Expert	NO		
Technical Reviewer	YES		
TA Expert (1.2)	YES		
Reviewed by	Deepika Mahala (Quality Manager)	**Date**	08/12/2021
Approved by	Ashok Gautam (Technical Manager)	**Date**	08/12/2021

Competence Statement	
Name	Ashok Gautam
Country	India
Education	M. Sc. (Environmental Sciences) M. Tech. (Energy & Environmental Management)
Experience	16 Years +
Field	Energy, Climate Change & Environment
Approved Roles	
Team Leader	YES
Validator	YES
Verifier	YES
Methodology Expert	AMS-I.D., AMS-I.A., AMS-I.C., AMS-I.E, AMS-II.D., AMS-II.G., AMS-III.E., AMS-III.H., AMS-III.Q, AMS-III.Z., AMS-III.AV., AM0029, AM0025, AM0056, ACM0001, ACM0002, ACM0004, ACM0012, ACM0006, AM0018, ACM0009, AM0034, AMS.I.B, ACM0003
Local expert	YES (India)
Financial Expert	YES
Technical Reviewer	YES
TA Expert	YES (TA 1.1, TA 1.2, TA 3.1, TA 13.1)

APPENDIX IV: FINDINGS

FAR ID	01 to 06	**Section no.**	3.1	**Date:** 22/03/2022
Description of FAR				
FAR- 01: A FAR has been raised to check the exact year of construction of the dwelling, from the declaration provided by dwelling owner, at the time of first verification for the 28 initial PAIs. FAR-02: A FAR has been raised to check compliance with national best practice standards and the certificates or declarations will be checked at the first verification. FAR-03: A FAR has been raised to check the declaration of the replacement of functioning appliances at the time of first verification. FAR-04: A FAR has been raised to check at the time of first verification that capacity of any replacement appliance or replacement component of a central heating system satisfies the energy load. Also, the replaced appliances/boiler, are disposed in compliance with applicable laws and a proper disposal of such appliances will be recorded by the PP and made available to the VVB at the time of verification. And if a boiler is not disposed as per the law, that shall be accounted for leakages. FAR-05: A FAR has been raised to verify that the implemented energy efficiency measures for all 28 initial PAIs fall into either category A or category B as defined by the methodology and PD. FAR-06:A FAR has been raised to validate and confirm the start date of the project at the time of first verification.				
Project participant response				**Date:** 23/03/2022
Data and documentation asked for by the VVB in the FARs will be collected and provided at the time of the first verification.				
Documentation provided by project participant				
N/A				
DOE assessment				**Date:** 26/03/2022
These FARs will be reviewed during first verification and are pending closure at the validation.				

CL ID	01	**Section no.**	1.2 of PD	**Date:** 02/09/2021
Description of CL				

Section 1.2 of the PD V4.0, should provide the information about the VCS Sectoral Scope (https://verra.org/project/vcs-program/projects-and-jnr-programs/vcs-sectoral-scopes/) the project activity is falling into.
Project participant response **Date:** 07/10/2021
Section 1.2 of the PD has been revised to reflect this project has been developed under the VCS Sectoral Scope 3: Energy Demand.
Documentation provided by project participant
Revised draft project document.
DOE assessment **Date:** 13/10/2021
The Project Proponent has correctly mentioned the sectoral scope (Scope 3) for the project activity under section 1.2 of the revised VCS PD, version 05 dated 04/10/2021. CL is closed.

CL ID	02	**Section no.**	1.4 of PD	**Date:** 02/09/2021
Description of CL				
Section 1.4 (Project Design) of the PD V4.0, doesn't provide any information, as required by section 3.59 of the VCS Standard V4.3 on the following points: a. No information has been provided about the PAIs which are part of this assessment and their implementation status with evidence b. How the eligibility of the PAIs to be part of this validation was assessed by the PP c. The definition of PAIs, if it is a separate independent dwelling or group of dwellings.				
Project participant response				**Date:** 07/10/2021
PAIs which are part of this assessment Section 1.4 of the PD has been revised to reflect the number of initial PAIs included in this validation is 28 individual dwellings. Information on the specific individual dwellings and their assessment against the eligibility criteria is included in Section 3.2. Definition of PAIs Section 1.4 of the PD has been revised to reflect the PAIs are individual dwellings. The PD has generally been revised to clarify this point. This project targets a range of individual single-family dwellings (referred to as "individual dwellings" or "project activity instances" throughout this document) all located in the United Kingdom. This project is defined as a "Grouped Project" where the project proponent acts as a central administrator towards the objective of gradually grouping together individual dwellings located in the United Kingdom inside a cluster.				
Documentation provided by project participant				

Revised draft project document.	
DOE assessment	**Date:** 15/10/2021
The Project Proponent has submitted the revised VCS PD, version 5 with following information and additional documents 1) The PP has included the information regarding 28 individual dwellings included in the project as a part of the initial PAIs. PP has also provided separate information regarding applicability, baseline, and ER calculation assessment for the initial PIAs as a separate document. However, PP is requested to include/demonstrate this objective information regarding initial PIAs for applicability, baseline selection, additionality, and ER calculation in the PD. 2) PP has provided sufficient information regarding the 28 individual dwellings and their assessment related to the eligibility criteria. However, the same needs to be included in the VCS PD. Further, PP needs to clarify in the PD if the same approach will be taken for the future PAI instances? The accuracy and relevance with respect to updating the information assessed based on the PINCODE like single family/ income group/Energy consumption needs to be justified. 3) The PP has defined the PAIs and their eligibility criteria in the PD. Closed.	
Project Participant Response	**Date:** 22/03/2022
Information regarding the PAIs and their assessment against the eligibility criteria has been included in the PD (Section 3.2). The eligibility criteria are applicable to all additional individual dwellings added throughout the crediting period. A centralised database has been established to record information regarding the PAIs, including their assessment against the eligibility criteria and implementation status.	
Documentation Provided by Project Participant	
Revised draft project document and centralised database.	
DOE Assessment	**Date:** 26/03/2022
PAIs and their assessment against the eligibility criteria has been included in the PD (Section 3.2). The eligibility criteria are applicable to all additional individual dwellings added throughout the crediting period. CL is closed.	

CL ID	03	**Section no.**	1.4 of PD	**Date:** 02/09/2021
Description of CL				

Section 1.4 (Project Design) of the VCS PD V4.0, doesn't provide sufficient information on how it will be ensured that the identified dwellings don't use electricity or any other fuel in the baseline for heating purposes.
Project participant response **Date:** 07/10/2021
Electricity is now included in the baseline and project scenario as set out in Section 3.3.
Documentation provided by project participant
Revised draft project document.
DOE assessment **Date:** 15/10/2021
The Project Proponent has clarified that they intend to include dwellings where fossil fuel or electricity are a primary source of heating.
Project participant response **Date:** 22/03/2022
Electricity is now included in the baseline and project scenario as set out in Section 3.3.
Documentation provided by project participant
Revised draft project document.
DOE assessment **Date:** 26/03/2022
Electricity is now included in the baseline and project scenario as set out in Section 3.3. CL is closed.

CL ID	04	**Section no.**		**Date:** 02/09/2021
Description of CL				
Eligibility criteria section on page 6 doesn't provide the information on the following applicable conditions of the methodology: a. The dwelling is a single-family dwelling (the provided link doesn't provide such information) b. The condition of the dwelling is adequate for the project activity? The provided justification is about the competency of the person doing the implementation but not about the dwelling condition. c. PAI doesn't result in a violation of health……regulations. d. The capacity of any replacement component of a central heating system satisfies the post retrofit heat load within the dwelling.				

Project participant response	**Date:** 07/10/2021

The PD has been revised so that assessment of the eligibility criteria is included in Section 3.2. The PD has been revised to provide additional clarification and evidence.

Single family dwellings

In the project a dwelling is categorized as a single-family dwelling where it is not a "house in multiple occupation" as defined in the Housing Act 2004. Each Local Authority keeps a register of multi-family dwellings ('Houses in multiple occupation'). By checking the dwelling is not on the Local Authority register, the dwelling is necessarily a single-family dwelling. A specific eligibility criterion has been added (Criterion 2) to check the address of each dwelling against the relevant Local Authority register.

Condition of the dwelling

Renovation of the thermal elements of a dwelling and replacement of heat producing systems are regulated activities that must comply with the Building Regulations which are the primary source of health and safety, environmental and energy conservation obligations.

Building Regulations are designed to make sure dwellings are safe to use and inhabit and include requirements that address the applicability conditions. Building Regulations are legal requirements that must be followed by those responsible for carrying out the work and compliance is demonstrated by a Building Regulations Compliance Certificate, a certificate under Publicly Available Specification (PAS) or an equivalent standard, or a declaration by the dwelling owner that work was carried out by a person registered with a competent person scheme, or a declaration by a regulated provider of social housing or public entity. PAS is the nationally recognised best practice standards for the installation of energy efficiency measures to residential dwellings.

PAS sets out minimum standards and requirements for the installation of energy efficiency measures in existing buildings. PAS includes requirements in respect of installation processes, process management and service provision and includes criteria relating to installation methods, equipment, tools, product or system and material suitability, the commissioning of installed measures and the training, skills and competence of the people undertaking such installation.

For example, PAS prescribes at:

a. 5.1. For each planned installation of an energy efficiency measure, the retrofit installer must obtain a dwelling-specific retrofit design complying with PAS for the complete package of measures to be installed as part of that project, at that location. The installer must not commence installation until the relevant design has been obtained and validated.
b. 5.1. The retrofit design must be environmentally compatible with the dwelling and with any other energy efficiency measures that are already installed or may later be installed in the same dwelling.
c. 5.2.2. The retrofit design is required to include a copy of an assessment report of the condition of the dwelling prior to installation, including identification of any repairs necessary before installation of the energy efficiency measures.

Violation of health regulations

Renovation of the thermal elements of a dwelling and replacement of heat producing systems are regulated activities that must comply with the Building Regulations which are the primary source of health and safety, environmental and energy conservation obligations.

Building Regulations are designed to make sure dwellings are safe to use and inhabit and include requirements that address the applicability conditions. Building Regulations are legal requirements that must be followed by those responsible for carrying out the work and compliance is demonstrated by a Building Regulations Compliance Certificate, a certificate under Publicly Available Specification (PAS) or an equivalent standard, or a declaration by the dwelling owner that work was carried out by a person registered with a competent person scheme, or a declaration by a regulated provider of social housing or public entity. PAS is the nationally recognised best practice standards for the installation of energy efficiency measures to residential dwellings.

PAS sets out minimum standards and requirements for the installation of energy efficiency measures in existing buildings. PAS includes requirements in respect of installation processes, process management and service provision and includes criteria relating to installation methods, equipment, tools, product or system and material suitability, the commissioning of installed measures and the training, skills and competence of the people undertaking such installation.

For example, PAS prescribes at:

a. 7.2. For each planned installation of an energy efficiency measure, the measure needs to comply with applicable statutory requirements.
b. Tables B1 to B13 in Annex B, and Tables C1 to C10 in Annex C, identify various regulations that must be complied when installing energy efficiency measures. For each type of energy efficiency measure, the respective tables prescribe specific regulations, including those related to workmanship; materials; structural stability; safety; and resistance to moisture. The tables related to gas installations also specify the installation must be compliant with current Gas Safety (Installation and Use) Regulations which prescribe that boilers are disposed of properly.

Capacity of any replacement component of a central heating system

For the capacity of any component of a central heating system and boilers that are replaced as part of the project activity, replacement of heat producing systems are regulated activities that must comply with the Building Regulations which include requirements that address the applicability conditions. Building Regulations are legal requirements that must be followed by those responsible for carrying out the work and compliance is demonstrated by a Building Regulations Compliance Certificate, a Gas Safety Certificate, a certificate under Publicly Available Specification (PAS) or an equivalent standard, or a declaration by the dwelling owner that work was carried out by a person registered with a competent person scheme, or a declaration by a regulated provider of social housing or public entity. PAS is the nationally recognised best practice standards for the installation of energy efficiency measures to residential dwellings.

PAS sets out minimum standards and requirements for the installation of energy efficiency measures in existing buildings. PAS includes requirements in respect of installation processes, process management and service provision and includes criteria relating to installation methods, equipment, tools, product or system and material suitability, the commissioning of installed measures and the training, skills and competence of the people undertaking such installation.

For example, PAS prescribes at:

a. Table C.1. Installation requirements for the installation of Condensing Boilers, Natural Gas-fired and Liquefied Petroleum Gas-fired. Requires the installation to be undertaken in accordance with the requirements in:
    I. BS 6798 Specification for installation and maintenance of gas-fired boilers of rated input not exceeding 70 kW net. This set of standards prescribes the **requirements for the selection of gas-fired boilers for central heating** and other purposes, which have a total rated heat input not exceeding 70 kW.
    II. BS 6644, Specification for installation of gas-fired boilers of rated inputs between 70 kW (net) and 1.8 MW (net). This set of standards prescribes the **requirements for the selection of gas-fired boilers for central heating** and other purposes, which have a total rated heat input n between 70 kW (net) and 1.8 MW.
b. These include a requirement for:
    I. 5.1 The installer to **check the data provided with the boiler to confirm the boiler capacity is appropriate for the installation**.

Combustion installations, such as gas boilers, must also be installed to comply with the Gas Safety Regulations which require that people who work on gas systems must be registered on the Gas Safe Register and compliance is demonstrated by a Gas Safety Certificate or a declaration by a regulated provider of social housing or public entity.

Documentation of compliance with these eligibility criteria is maintained in the project activity files.

Information regarding the PAIs and their assessment against the eligibility criteria has been included in the PD (Section 3.2). The eligibility criteria are applicable to all additional individual dwellings added throughout the crediting period. A centralised database has been established to record information regarding the PAIs, including their assessment against the eligibility criteria and implementation status.

Documentation provided by project participant	
Revised draft project document and centralised database.	
DOE assessment	**Date:** 15/10/2021

The PP has submitted a revised PD and supplementary documentation for assessment of applicability conditions.

a. A step and link to check the single or multi-family status is provided by the PP. Based on the location/Pin code of the dwelling, the status can be checked from the government records.

b. Compliance of the condition of the dwelling and implementation of the measures will be demonstrated by a Building Regulations Compliance Certificate, or a declaration by the dwelling owner that work was carried out by a person registered with a competent person scheme, or a certificate under Publicly Available Specification (PAS) or an equivalent standard, or a declaration by a regulated provider of social housing or public entity. The PP has submitted a copy of the relevant standards and it has been confirmed they provide for the applicability conditions. A certificate or declaration for compliance under this standard will suffice the requirements of establishing the pre-condition and implementation completion of the project activity measures. Such certificates will be maintained in records and can be checked at the time of PAI inclusion.

c. A Building Regulations Compliance Certificate, or a declaration by the dwelling owner that work was carried out by a person registered with a competent person scheme, or a certificate under Publicly Available Specification (PAS) or an equivalent standard, or a declaration by a regulated provider of social housing or public entity will confirm that a PAI doesn't result in a violation of any heath or other related regulations.

d. A Building Regulations Compliance Certificate, or a Gas Safety Certificate, or a declaration by the dwelling owner that work was carried out by a person registered with a competent person scheme, or a certificate under Publicly Available Specification (PAS) or an equivalent standard, or a declaration by a regulated provider of social housing or public entity will ensure that any retrofit in the central heating system will satisfy the post-retrofit heat load/cooling load.

CL is closed.

CL ID	05	**Section no.**	1.8 of PD	**Date:** 02/09/2021
Description of CL				
Section 1.8 of the VCS PD V4.0 defines the project start date as July 1-2021. However, activity or events considered as the project start date, in line with the VCS definition/requirement, have not been provided?				
Project participant response				**Date:** 07/10/2021
The project crediting period start date is the date upon which the project activity instance begins reducing or removing GHG emissions. Dwellings generate emission reductions beginning on the date of the certificate or declaration of completed installation. Evidence is provided for the initial PAIs for which decarbonisation works are planned. The project activity start date is expected to be July 1, 2022.				
Documentation provided by project participant				
Revised draft project document.				

DOE assessment	Date: 15/10/2021
The PP has revised the start date as 01/07/2022, which is the expected date when completion of the installation of measures will take place for initial PAIs. It is the estimated date on when the project activity starts generating GHG reductions and this can be checked with the certificate or declaration of completed installation. CL is closed.	

CL ID	06	Section no.	1.11 of PD	Date: 02/09/2021
Description of CL				
Section 1.11 of the VCS PD V4.0 defines that PAIs fall into category B of the applied methodology VM0008 and includes the installation of a range of decarbonisation measures in existing dwellings. Further clarity is required as to why the installation of condensing boilers shouldn't be considered in category A.				
Project participant response				**Date:** 07/10/2021
The VM0008 Methodology provides that Category A is for decarbonisation activities that include the reduction of fossil fuel consumption by Appliances (i.e., replacement of refrigerators, air conditioning units, lamps, showerheads) as well as energy efficiency enhancements to the building envelope (i.e., air infiltration, insulation), and improving the efficiency of the central heating and/or cooling system. Whereas Category B is for decarbonisation activities that involve only energy efficiency enhancements to the building envelope and improvements to the efficiency of the central heating and/or cooling system.				
Documentation provided by project participant				
N/A				
DOE assessment				**Date:** 15/10/2021
The PAIs do not involve replacement or retrofit of any appliances or equipment. They only intend to cover the replacement of condensing boilers for the central heating/cooling system. This is in accordance with the criteria defined for category B under the applied methodology. CL is closed.				

CL ID	07	Section no.	1.17 of PD	Date: 02/09/2021

Description of CL	
Section 1.17 described that the dwelling owner will not have any rights to the Verified Carbon Units, a letter to support this claim needs to be provided from the dwelling's owners already part of the initiatives or the template to be used for such purposes.	
Project participant response	**Date:** 07/10/2021
An agreement will be obtained from the dwelling owner which vests project ownership in the Project Proponent as evidenced by a draft contract ('Contract for Provision of Verified Carbon Unit Services'). A specific eligibility criterion has been added (Criteria 16) to check that project ownership is accorded to the Project Proponent. Documentation of compliance with this eligibility criterion is maintained in the project activity files. Information regarding the PAIs and their assessment against the eligibility criteria has been included in the PD (Section 3.2). The eligibility criteria are applicable to all additional individual dwellings added throughout the crediting period. A centralised database has been established to record information regarding the PAIs, including their assessment against the eligibility criteria and implementation status.	
Documentation provided by project participant	
Revised draft project document, draft contract and centralised database.	
DOE assessment	**Date:** 15/10/2021
The PP has provided the copy of the AP Participant contract which clearly mentions the clauses regarding the ownership of the carbon credits and VCS projects. The contract will be signed prior to the inclusion of any dwelling into the project activity and thus ownership of the carbon reduction credits, and VCS project will be with the PP only. CL is closed.	

CL ID	08	**Section no.**	3.4 of PD	**Date:** 02/09/2021
Description of CL				
The applied methodology required that replaced boilers need to be disposed of properly. No information has been provided in the VCS PD as to how it will be ensured that replaced boilers are not being used and are disposed of properly since no monitoring system has been proposed?				
Project participant response				**Date:** 07/10/2021

Leakage from condensate or the possible continued operation of improperly disposed of boilers is accounted for by the regulatory framework in the United Kingdom. The replacement of boilers as part of project activity is a regulated activity that must comply with the Building Regulations. Building Regulations are legal requirements that must be followed by those responsible for carrying out the work and compliance is demonstrated by a Building Regulations Compliance Certificate, a Gas Safety Certificate, or a declaration by the dwelling owner that work was carried out by a person registered with a competent person scheme, or a certificate under Publicly Available Specification (PAS) or an equivalent standard, or a declaration by a regulated provider of social housing or public entity.

PAS sets out minimum standards and requirements for the installation of energy efficiency measures in existing buildings. PAS includes requirements in respect of installation processes, process management and service provision and includes criteria relating to installation methods, equipment, tools, product or system and material suitability, the commissioning of installed measures and the training, skills and competence of the people undertaking such installation.

For example, PAS prescribes at:

a. 7.2. For each planned installation of an energy efficiency measure, the measure needs to comply with applicable statutory requirements.
b. Tables B1 to B13 in Annex B, and Tables C1 to C10 in Annex C, identify various regulations that must be complied when installing energy efficiency measures. For each type of energy efficiency measure, the respective tables prescribe specific regulations, including those related to workmanship; materials; structural stability; safety; and resistance to moisture. The tables related to gas installations also specify the installation must be compliant with current Gas Safety (Installation and Use) Regulations which prescribe that boilers are disposed of properly.

Documentation of compliance with this eligibility criterion is maintained in the project activity files.

Information regarding the PAIs and their assessment against the eligibility criteria has been included in the PD (Section 3.2). The eligibility criteria are applicable to all additional individual dwellings added throughout the crediting period. A centralised database has been established to record information regarding the PAIs, including their assessment against the eligibility criteria and implementation status.

Documentation provided by project participant
Revised draft project document and centralised database.

DOE assessment	**Date:** 15/10/2021
The PP has assured that they will obtain a Building Regulations Compliance Certificate, a Gas Safety Certificate, or a declaration by the dwelling owner that work was carried out by a person registered with a competent person scheme, or a certificate under Publicly Available Specification (PAS) or an equivalent standard, or a declaration by a regulated provider of social housing or public entity for dwellings installing the project activity measures.	

The certificates and declarations of conformity will ensure the replaced boilers are disposed of properly and PP is not required to include the leakage emissions due to disposal of boilers. CL is closed.

CL ID	09	**Section no.**	2.2 of PD	**Date:** 02/09/2021
Description of CL				
Section 2.2 should provide further information about local stakeholder consultation: a. How were the stakeholders invited? b. Summary of the feedback received c. How the raised concerned were addressed.				
Project participant response				**Date:** 07/10/2021
Consultation began in March 2021 and to date over 130 organisations and more than 210 individuals have been engaged around the project and its design. Based on these engagements, the project is expected to have high acceptance and support from stakeholders as well as from the local and national community.				
Documentation provided by project participant				
Supplementary document ‘Stakeholder Consultation’ and its associated exhibit.				
DOE assessment				**Date:** 15/10/2021
The PP has included brief information regarding the stakeholder consultation in section 2.2 of the PD. PP has also provided a detailed description of the stakeholder process conducted, a list of stakeholder’s names and a summary of the feedback received from some of the stakeholders. However, in the PD: 1. The section discusses consultation in future scenarios, details regarding consultation completed is not provided even in brief 2. There should be a brief and transparent discussion on the comments / feedback received from the stakeholders. 3. The current scenario is discussed in exhibits provided as feedback but there is no mention of any project specific feedback/observation received (positive/negative/constrains/appreciation) 4. The engagement list has been provided as an exhibit. PP needs to clarify if there is proof of consultation like MOM or a signed list of participation available? 5. The assessment team would like to consult/interview some of the active stakeholders consulted during the site visit.				

Project Proponent Response:	**Date:** 22/03/2022

The Project Proponent has consulted with stakeholders to inform the design of the project and maximise participation from stakeholders. A literature review and initial outreach with interested parties took place between March and October 2021.

From this work potential local stakeholders were identified as:

- Dwelling owners
- Residents
- Fuel poverty charities
- Decarbonisation measure installers
- Carbon credit buyers
- Data vendors
- Government and local authorities

Engagement with potential local stakeholders took place in November 2021 around two major housing conferences with the aim of identifying local stakeholders who may be impacted by the project.

A set of follow-up virtual meetings took place during November and December 2021 with a focus group of identified local stakeholders. Additionally, the project has partnered with HACT who work with social housing providers across England & Wales. HACT has discussed the project with groups of social housing providers, for example, during a public webinar in February 2021 where feedback was solicited from attendees.

During the design stage of the project, the Project Proponent has gathered useful feedback from local stakeholders. No adverse impacts on local stakeholders were identified.

Further consultation will take place during project implementation in coordination with HACT, including through the establishment of focus groups, roundtables, and webinars with local stakeholders.

Evidence of the public webinar and virtual meetings has been provided to the validation body.

The project proponent has established a mechanism for ongoing communication with local stakeholders by promoting an email address to which local stakeholders have been invited to provide feedback (*housing@arcticapartners.com*). The project proponent has also partnered with HACT, the charity of the social housing sector and specialists in helping organisations active in the housing sector to evaluate, monitor and improve their services. HACT has supported the transformation and development of housing provision in the UK for over 60 years.

HACT has reviewed the project documents and conducted interviews with representatives of the categories of local stakeholder identified above to understand the impact of this project. On an ongoing basis HACT will be monitoring the extent to which the project continues to be aligned

with stakeholder expectations and will suggest amendments where the project could be improved, drawing on examples of good practice from within and beyond the social housing sector. HACT has appointed a Relationship Lead for this project and has established a mechanism for ongoing communication with local stakeholders by promoting an email address to which local stakeholders have been invited to provide feedback (*retrofitcredits@hact.org.uk*). The project proponent and HACT regularly discuss the project with social stakeholders across the United Kingdom, for example, during a public webinar in August 2021 where they sought feedback about the project. A focus group of interested stakeholders has also been established and an inaugural roundtable will take place in November 2022.
Documentation provided by project proponent
Revised draft project document and evidence of the public webinar and virtual meetings.

DOE Assessment	**Date:** 26/03/2022
The evidence and explanation in the PD have been provided by the PP and its clearly evident that stakeholder consultation has been conducted in line with the VCS requirement. CL is closed.	

CL ID	10	**Section no.**	3.4 of PD	**Date:** 02/09/2021
Description of CL				
Section 3.4 of the VCS PD should provide information on how it is being ensured that there are no other sources of heating in the dwellings other than natural gas?				

Project participant response	**Date:** 07/10/2021
Electricity is now included in the baseline and project scenario as set out in Section 3.3.	

Documentation provided by project participant	
N/A	

DOE assessment	**Date:** 15/10/2021
The PP has clarified that they intend to include dwellings where fossil fuel or electricity are a primary source of heating in the project scenario. Further, this issue is also covered under CL#03. CL is closed.	

CL ID	11	Section no.	3.5 of PD	Date: 02/09/2021

Description of CL

Section 3.5 on additionality defines the performance standard that dwellings must achieve a percentage saving value of 5.0152% (low income) & 4.4992% (middle income). The basis of the calculation, which can be tracked back to the source values, needs to be provided to the VVB with all supporting evidence.

Project participant response **Date:** 07/10/2021

Additionality is demonstrated using the performance standard for dwellings in accordance with the VM0008 Methodology. The performance standard is based on the percent change in energy consumption in dwellings that are in the Same Building Stock over at least the three most recent 12-month periods for which data are available. Only project activity instances with projected energy savings that exceed the performance standard will be considered additional and therefore be included in the project activity.

This piece of the analysis was done using Google Cloud computing resources. The supplementary document 'Additionality' describes the steps taken to calculate the performance benchmark and the accompanying exhibit files provide the xls files to track back the source values/calculations.

The dataset used is the Property level gas and electricity consumption data which contains vendor reported meter point readings as collated by the Department for Business, Energy & Industrial Strategy (BEIS) and published as part of the National Energy Efficiency Data Framework (NEED).

This source data is published by a government agency and designated as an official national statistic meaning the dataset meets the highest standards of trustworthiness, quality, and public value. The source data comes from energy suppliers' administrative systems and covers every domestic meter (dwelling) in England and Wales. The data comprises a stratified random sample of approximately 15% of dwellings (approximately 3.6 million records). Sampling was undertaken by staff of BEIS under supervision from the Office of National Statistics.

The first step excludes records from the analysis if one of several conditions hold. The supplementary document explains this step. As exhibits to the document, the original Property level gas and electricity consumption dataset is provided (Exhibit 1), along with the dataset after application of the exclusion filters for each of the low-income and middle-income types of Building Stock (Exhibits 2a and 2b).

The second step calculates the percent change in energy consumption for each individual dwelling in the dataset. The supplementary document explains this step. As exhibits to the document, the dataset after application of the percentage change calculations is provided for each of the low-income and middle-income types of Building Stock (Exhibits 3a and 3b).

The third step numerically orders the percentage change in energy consumption for each individual dwelling from step two to calculate the 90th percentile value, which is the performance benchmark. The supplementary document explains this step.

Documentation provided by project participant

Revised draft project document and supplementary document 'Additionality' and its associated exhibits.

DOE assessment	**Date:** 15/10/2021

The project participant has provided the revised PD and supplementary document for additionality. A stepwise approach is included showing how the performance benchmark is calculated for additionality.

However,

- The actual calculation is not clear from the exhibits provided along with approach. PP is requested to provide the objective calculation based on a step-by-step approach
- The exhibits provided are extracted from some source and there is no marking of data headers for the calculation steps involved including the fixed values considered in the calculation
- It is not clear how energy saving/reductions are considered in order to calculate the benchmark. What source or data is considered for calculating the year-on-year savings
- Please reconfirm if the data considered are for the UK or only for England and Wales
- The values of 5.0152% (low income) & 4.4992% (middle income) are still not demonstratable from the calculation sheet.

Project Proponent Response:	**Date:** 22/03/2022

The PD has been revised so that a full description of the steps outlined above has been included in Section 3.5. The PD has been revised to provide additional clarification and evidence. The dataset involves 3.6 million meter-point readings and given its size a data engineering software platform is used to perform the calculations which will be demonstrated during the onsite visit. The data considered are only for England and Wales.

Documents Provided by Project Proponent:	
Revised draft project document	
DOE Assessment:	**Date:**26/03/2022
The PD has been revised to provide additional clarification and evidence. CL is closed.	

CL ID	12	**Section no.**		**Date:** 02/09/2021
Description of CL				
Section 3.5 on additionality of the VCS PD mentions that 'dwellings decarbonized as part of the project were not excluded for the estimation of performance standard analysis'. The number of such dwellings needs to be defined.				

Project participant response	**Date:** 07/10/2021
The number of initial PAIs is 28. The source data for calculating additionality comes from energy suppliers' administrative systems and covers every domestic meter (dwelling) in England and Wales. The dataset used comprises a stratified random sample of approximately 15% of dwellings (approximately 3.6 million records).	
Documentation provided by project participant	
N/A	
DOE assessment	**Date:** 15/10/2021
The PP has defined the initial PIA number as 28. The performance benchmark is calculated based on the random sampling of national data for England and Wales. The sample considers a very large amount of data set and further it is practically impossible to identify any single project activity instance in the dataset. Further it can also be assumed that as the performance benchmark is re-calculated based on revised data, it can also be improved based on project activity instances. CL is closed.	

CL ID	13	**Section no.**	Deviation	**Date:** 02/09/2021
Description of CL				
VCS PD proposes a deviation which needs to be further elaborated further as follows: • Which requirement of the applied methodology is this deviation is for? • How is the deviation more conservative than the provisions of the methodology (should be presented with an example)				
Project participant response				**Date:** 07/10/2021
This is not a deviation but was a misunderstanding of the Methodology. The PD has been revised to reflect this.				
Documentation provided by project participant				
Revised draft project document.				
DOE assessment				**Date:** 15/10/2021
The PP has clarified that it has not sought any deviation. The correction has been made in the PD. CL is closed.				

CL ID	14	Section no.	4.4 of PD	Date: 02/09/2021
Description of CL				
Table 4 of the VCS PD provides the summary of estimated emissions. Please provide the xls file wherein the final number can be tracked back to source values.				
Project participant response				**Date:** 07/10/2021
In the initial draft PD, projected emission reductions had been included based on expansion of the project beyond the initial set of PAIs. The PD has been revised so that it only relates to the PAIs planned to be included in the project at the point of validation. The emission reduction calculations for the initial PAIs are included in Section 4 of the PD.				
Documentation provided by project participant				
Revised draft project document.				
DOE assessment				**Date:** 15/10/2021
The PP has provided the additional exhibits explaining the sources and calculation of the ex-ante emission reduction calculations. The emission reduction calculation sheet is explained. However, PP is requested to provide the revised ER calculation sheet which mentions and explains the source values considered and include these in the PD, with explanation of the approach which is currently provided as separate exhibits. This would help the third-party reader to understand the calculation source values, without going through the exhibits.				
Project participant response			**Date:** 07/10/2021	
Further detail has been added to the PD. There are now three approaches to calculating emission reductions and the pre- and post-retrofit energy assessment approach is being used for the calculation of emission reductions for the PAIs. Energy modelling software is used as part of the pre- and post-retrofit energy assessment approach which generates an ER calculation sheet in xls format. This sheet has been provided to the validation body. A centralised database has been established to record information regarding the PAIs, including the ER calculations and resulting data.				
Documentation provided by project participant				
Revised draft project document, ER calculation sheet and centralised database.				
DOE Assessment			**Date:** 26/03/2022	
Sufficient steps have been mentioned in the PDD. CL is closed.				

CL ID	15	Section no.	4.2 of PD	Date: 02/09/2021
Description of CL				
The applied methodology also requires the Standard Deviation of the annual percent savings to be included as a parameter available at validation. However, this parameter has not been included in section 5.1 of the VCS PD.				
Project participant response				**Date:** 07/10/2021
The draft PD has been revised to add tables to section 5 for each parameter relating to the calculation of additionality and emission reductions that is referenced in the monitoring section of the Methodology. Where a parameter is not applicable, we had not previously included a table. We have now included a table for every parameter and instead indicated the explanation for why a particular parameter is not relevant. Standard deviation for the performance benchmark has been added although is not calculated for this project because, in accordance with the Methodology, the 90th percentile is to be used when the dataset does not follow a normal distribution. VM0008 Methodology requires the performance benchmark to be calculated using the standard deviation (sigma) of the percent savings in the Same Building Stock where the underlying data follows a normal distribution (non-Gaussian). For data not following a normal distribution, the Methodology requires the performance benchmark to be equal to the 90th percentile value within the numerically ordered sample. As set out in section 3.5 (Additionality) of the PD, the distribution of fossil fuel consumption by dwellings in England and Wales is non-Gaussian (as evidenced by the Property level gas and electricity consumption data published by BEIS on December 19, 2019, as part of the NEED Framework). Accordingly, the standard deviation is not calculated.				
Documentation provided by project participant				
Revised draft project document.				
DOE assessment				**Date:** 15/10/2021
The PP has justified the non-inclusion of the Standard Deviation of the annual percent savings, in accordance with the methodological approach. CL is closed.				

CL ID	16	Section no.	4.5 of PD	Date: 02/09/2021

Description of CL	
The data and parameters selected for monitoring are not in line with the applied methodology. Further clarification is required.	
Project participant response	**Date:** 07/10/2021
The draft PD has been revised to add tables to Section 5 for each parameter relating to the calculation of additionality and emission reductions in accordance with the monitoring section of the Methodology. Where a parameter is not applicable, this had previously been excluded from Section 5. The PD now includes a table for every parameter and where a parameter is not applicable, and explanation has been provided.	
Documentation provided by project participant	
Revised draft project document.	
DOE assessment:	**Date:** 15/10/2021
The PP has revised the PD and included all the parameters considered ex-ante and monitored in accordance with the calculation and monitoring approach. CL is closed.	

CL ID	17	**Section no.**	Global Stakeholder consultation	**Date:** 15/10/2021
Description of CL				
The PP is requested to provide an update regarding publication of the PD under the VCS pipeline at Verra registry.				
Project participant response				**Date:** 22/03/2022
Following the procedures and guidelines established by the VCS Program this project was open for public comment from December 24th, 2021, for a 30-day public comment period. No comments were received.				
Documentation provided by project participant				
https://registry.verra.org/app/projectDetail/VCS/2649				
DOE assessment:				**Date:** 26/03/2022
The stakeholder consultation has been conducted for the 30-day period on the VCS website. CL is closed.				

CL ID	18	Section no.	Project design	Date: 22/03/2022

Description of CL

Applicability condition number 6 as set out in PD for the inclusion of PAIs requires that the dwelling was constructed before 1999. This condition will be checked by the pre-retrofit energy assessment (EPC certificate) or as provided by the dwelling owner in a declaration pursuant to the participant contract.

During the on-site visit, the produced EPC certificates for the 28 PAIs don't provide the date of construction for the dwelling. However, the source data of the EPC report does provide a range of the years the building might have been construction based on the assessment conducted by the energy assessor.

It is not very clear, as to how it will be established that the building was constructed before 2000? There is also no clarity if the date of construction provided in the declaration by the PP can be verified by any means?

Project participant response	Date: 22/03/2022

Any dwelling included in the project activity is required to meet the following eligibility condition:

- The dwelling was constructed prior to 1999.

This criterion is not prescribed by the Methodology but is specific to building stock in England and Wales. It was introduced by the Project Proponent because post-1999 properties have specific installation standards regarding loft and wall insulation. These dwellings are not included in this project as they are not insufficiently thermally efficient.

The PD had been revised so that assessment of this eligibility criterion is included in Section 3.2. Evidence of the age band of the dwelling was proposed to be obtained from the dwelling owner. In response to this audit finding, the PD has been further revised such that the age band will be obtained from the pre-retrofit energy assessment, or a declaration by the dwelling owner.

Information regarding the PAIs and their assessment against the eligibility criteria has been included in the PD (Section 3.2). The eligibility criteria are applicable to all additional individual dwellings added throughout the crediting period. A centralised database has been established to record information regarding the PAIs, including their assessment against the eligibility criteria and implementation status.

Documentation provided by project participant

Revised project document and centralised database.

DOE assessment:	Date: 26/03/2022

PP has clarified that a centralized database has been established to record information regarding the PAIs, including their assessment against the eligibility criteria and implementation status. CL is closed.

CAR ID	01	**Section no.**	3.2 of PD	**Date:** 02/09/2021
Description of CAR				
Section 3.2 of the VCS PD will provide information on how methodology applicability conditions are addressed and demonstrate how the project meets these conditions, as applicable. Please refer to the following guidance from VCS PD template; Demonstrate and justify how the project activity(s) meet each of the applicability conditions of the methodology(s), and tools (where applicable) applied by the project. Address each applicability condition separately.				
Project participant response				**Date:** 07/10/2021
Supplementary documentation has been provided regarding the eligibility criteria in Section 3.2.				
Documentation provided by project participant				
Revised draft project document and supplementary document ‘Applicability Condition’ and its associated exhibits.				
DOE assessment				**Date:** 15/10/2021
The PP has submitted the revised PD along with supplementary information. The revised PD includes the table for justification of the applicability condition of the methodology. However, the PP is requested to add all the conditions to the PD as a step-by-step approach as mentioned in the methodology i.e., like Para 4.1 (4), Para 4.1 (5), and Para 4.6 which is missing.				
Project Participant Response			**Date:** 23/03/2022	
The PD has been revised so that assessment of the eligibility criteria is included in Section 3.2. The PD has been revised to provide additional clarification and evidence. Information regarding the PAIs and their assessment against the eligibility criteria has been included in the PD (Section 3.2). The eligibility criteria are applicable to all additional individual dwellings added throughout the crediting period. A centralised database has been established to record information regarding the PAIs, including their assessment against the eligibility criteria and implementation status.				
Documentation provided by project participant				
Revised draft project document and centralised database.				
DOE assessment			**Date:** 26/03/2022	

The PP has revised the PD to include the assessment of the eligibility criteria in Section 3.2. CL is closed.