



# 2016 ANNUAL REVIEW

# WHS

HOME  
ENERGY  
EFFICIENCY  
PROGRAMMES  
SCOTLAND



Scottish Government  
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## WHS Glossary

AFIP	Armed Forces Independence Payment
DECC	Department of Energy and Climate Change
DLA	Disability Living Allowance
DNQ	Did Not Qualify
ECO	Energy Companies Obligation
EPC	Energy Performance Certificate
ESA	Employment Support Allowance
ESP	Employment and Skills Plan
EST	Energy Saving Trust
EU	European Union
GDAR	Green Deal Advice Report
GSHP	Ground Source Heat Pump
HEEPS	Home Energy Efficiency Programmes for Scotland
HES	Home Energy Scotland
JSA	Job Seekers Allowance
KPI	Key Performance Indicator
LLP	Limited Liability Partnership
LPG	Liquid Petroleum Gas
MCS	Microgeneration Certification Scheme
PAS	Publicly Available Specification
PAT	Portable Appliance Testing
PCL	Pennington Choices Limited
PIP	Personal Independence Payment
rdSAP	Reduced Data Standard Assessment Procedure
RFT	Right First Time
RTC	Referral To Completion
SAP	Standard Assessment Procedure
SG	Scottish Government
SME	Small and medium-sized enterprises
VAT	Value Added Tax
WHS	Warmer Homes Scotland
WIP	Work In Progress
WW	Warmworks Scotland LLP

## Introduction

Warmer Homes Scotland is the Scottish Government's flagship national fuel poverty scheme. It is part of the Home Energy Efficiency Programmes for Scotland framework and is a key driver in efforts to tackle fuel poverty in Scotland. It is centred on the installation of insulation, heating and micro-generation measures in homes of customers identified as living in or at risk of fuel poverty.

The contract for the delivery of Warmer Homes Scotland was awarded to Warmworks Scotland LLP, a joint venture partnership between the Energy Saving Trust, Changeworks and Everwarm, in May 2015. Warmworks is responsible for managing the end-to-end customer journey from referral, through the survey, installation and inspection phases to a follow-up and after-care service 12 months down the line.

Following a brief period of mobilisation, Warmer Homes Scotland was formally launched by the First Minister in September 2015. By 31st March 2016, Warmworks had helped 1372 customers and installed more than 8000 measures in their homes.

The Warmer Homes Scotland stated objectives are to:

- reduce fuel poverty by reducing heating costs to vulnerable households;
- contribute to a reduction in the emissions of carbon dioxide from Scottish homes;
- improve Scotland's housing stock;
- offer good value for money by leveraging additional funding into the scheme; and
- provide benefits to the wider community through vocational training and employment opportunities.

It also impacts on four of the Scottish Government's five National Objectives and our overarching purpose of sustainable economic growth (see Figure 1).

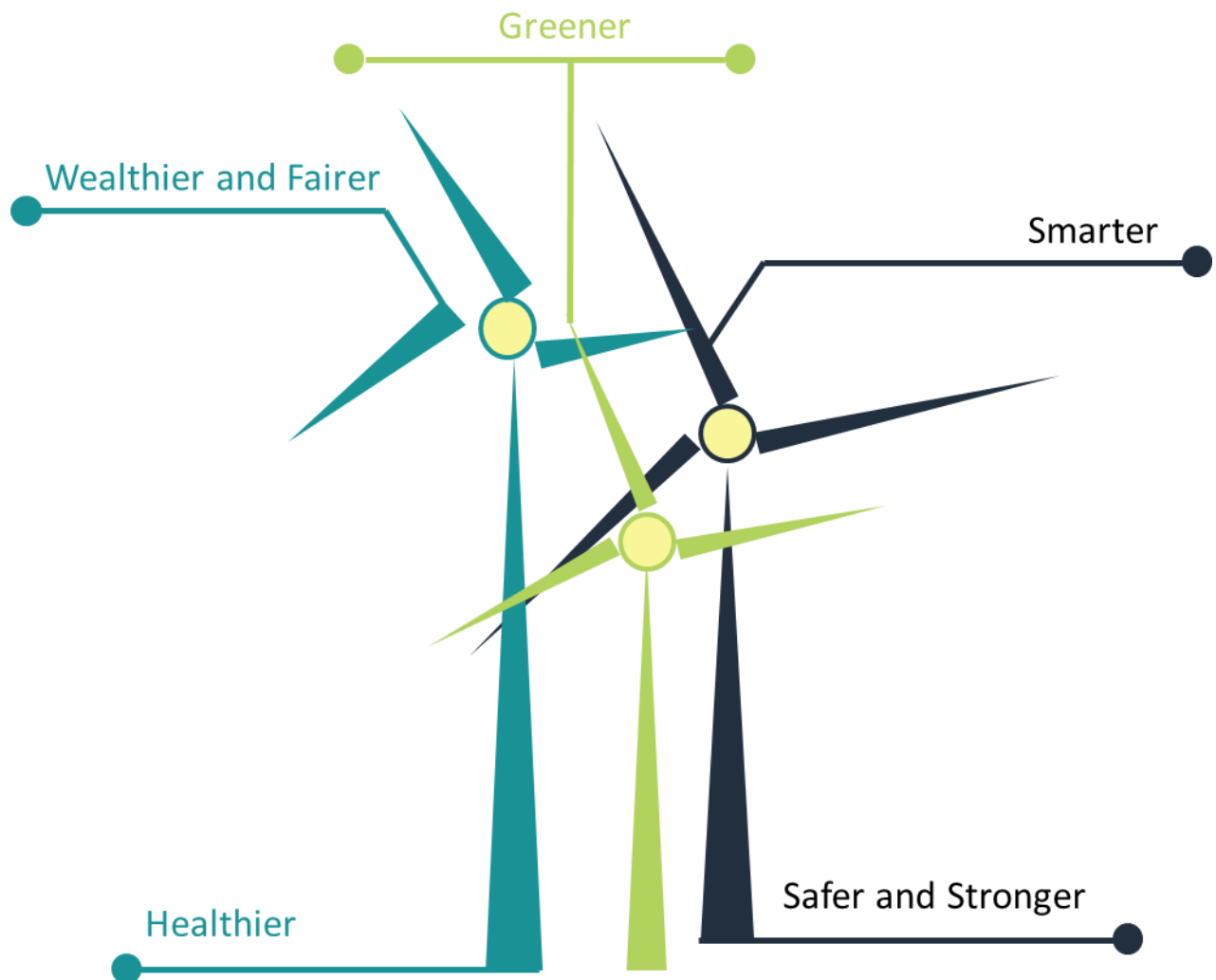
Alongside these objectives, Warmer Homes Scotland was developed with several guiding principles in mind:

- It should be customer focussed and provide a first class service to customers regardless of where they live;
- It should set high standards in terms of quality and health and safety even going beyond industry norms;
- It should encourage the involvement of local SMEs as far as possible;
- Its impacts should be long term and sustainable.

The Scottish Government has committed to reviewing Warmer Homes Scotland in each of the five years the scheme will operate to ensure it continues to meet its

objectives and delivers according to its guiding principles. The reviews will also be used to identify resulting areas for improvement.

**Figure 1 – Overarching national objectives<sup>1</sup>**



## Scope

The scope of the review encompasses each of Warmer Homes Scotland's objectives to make an early determination of whether or not they are being met and whether or not the scheme is delivering in line with its guiding principles. The review considers operational delivery in the period from go live on 1 September 2015 to the end of that financial year on 31 March 2016. The review also examines policy decisions that were made as the scheme was being developed to consider issues including:

<sup>1</sup> <http://www.gov.scot/About/Performance/scotPerforms/objectives>

- Is the scheme reaching the people who need it?
- What behaviours are being driven by the contractual Key Performance Indicators?
- Does the scheme offer the right mix of measures? And
- Is there equity in delivery between rural and urban areas?

The review does not consider the period of mobilisation from May to September 2015 as this has already been the subject of an internal gateway review and audit by Pennington Choices.

The scope of the review was agreed by the HEEPS Delivery Board and Warmer Homes Scotland Strategic Board.

## Methodology

In developing the scope of the review, a number of questions were raised against each of the objectives that would help to determine whether or not it is being met and to what degree. It was also established at this time what data or other evidence would be required to make these determinations.

Table 1 is an extract from the scoping document showing an example of the questions that were raised alongside the evidence requirement for each of the objectives.

Based on this, data and evidence, both quantitative and qualitative, were gathered from a number of sources. It was primarily gathered by the Scottish Government review team, overseen by Internal Audit and each of the Boards. Data for the technical review was also gathered by Pennington Choices.

## Data Sources

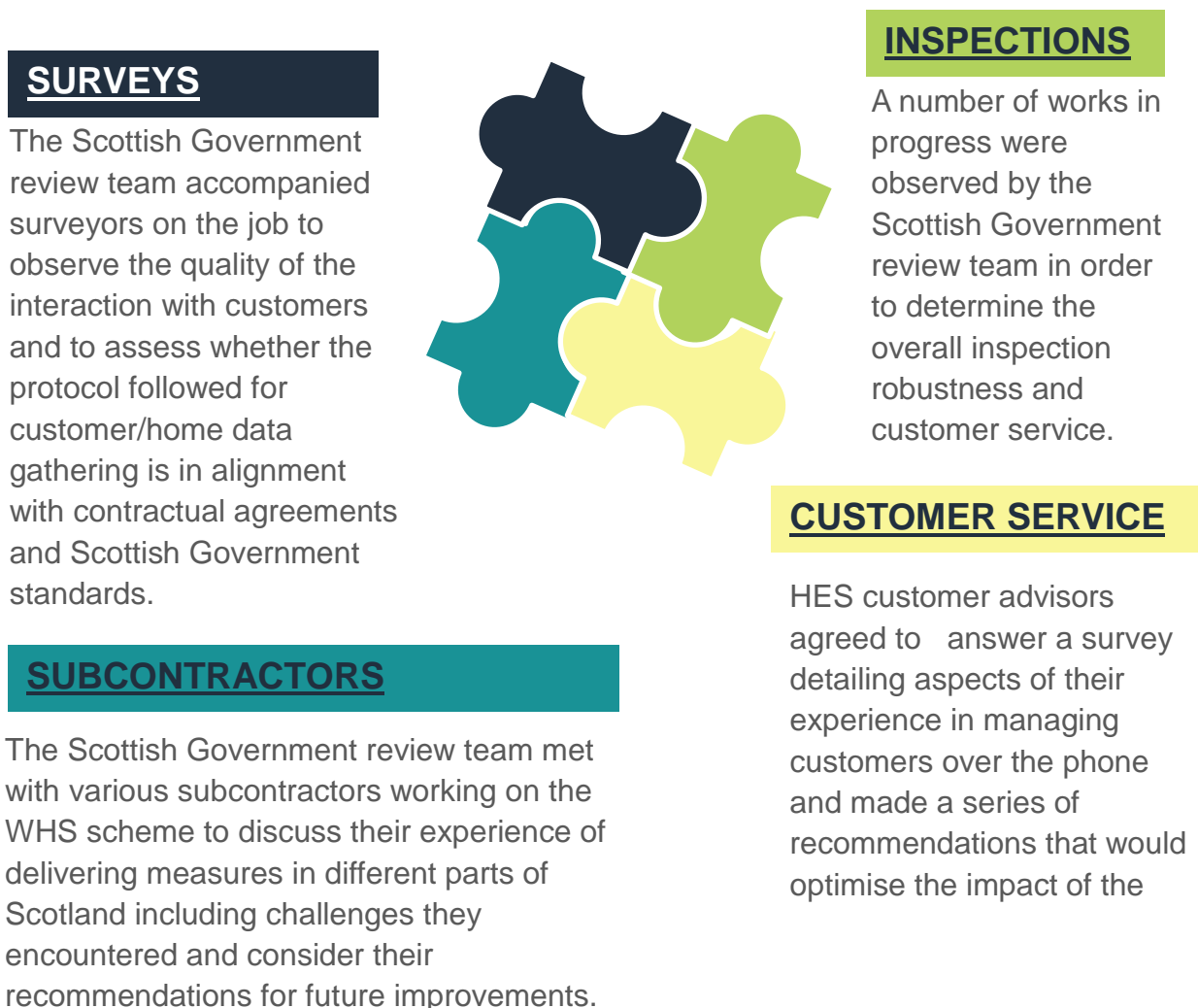
In order to gain a comprehensive understanding on how the scheme is being implemented, the Scottish Government review team conducted field research engaging with members of the Warmer Homes Scotland supply chain, customers, Home Energy Scotland, and Warmworks surveyors & inspectors in order to cover all delivery aspects of the scheme (see Figure 2).

This qualitative data was used to assess key aspects around the customer service component, community engagement and supply chain delivery model.

In addition to field research, a set of “customer outcomes” data sourcing from both Warmworks’ invoices and EST’s Customers Records Management tools was used in much of the analysis regarding the fuel poverty objective.

As part of this review, Scottish Government commissioned Pennington Choices to undertake a Technical Review of the scheme which included examining which measures had been taken up by customers, which hadn’t, why customer applications were cancelled, which measures they think should remain or be removed and which new measures they think should be included going forward. The Technical Review considered data from September 2015 to June 2016 unlike the rest of the review which covered the period from September 2015 to end March 2016) and can be found at Annex 1.

**Figure 2 - Qualitative data sources**





## Objective 1 - Fuel poverty

The primary objective of the Warmer Homes Scotland scheme is to tackle fuel poverty. It is therefore important to ensure that it is accessible to those households living in or most at risk of fuel poverty and it should do so in three main ways:

### i. Eligibility

### ii. Awareness

### iii. Attractiveness

For the purposes of this review, we have sought to answer the following questions to ensure that Warmer Homes Scotland is helping fuel poor households and is therefore meeting this objective.

- Who have been our customers so far and were they in fuel poverty?
- Are there people in fuel poverty who cannot access the scheme due to the eligibility criteria?
- How can we reach more people?

## i. Eligibility

In line with the fuel poverty definition, WHS aims to reach those households who have a low or fixed income and higher than average fuel bills. Those households are identified via proxies including a threshold on the energy rating of the property (SAP 55 during the period of the review) and receipt of certain qualifying benefits. Eligible households are also in the private housing sector and have lived at their current address for at least six months. The full eligibility criteria are published on the Greener Scotland website<sup>2</sup>.

The criteria were based on that of the previous Energy Assistance Scheme to ensure a large enough eligible group, but refined slightly in line with changes to the income thresholds for benefit qualification at a UK level and for easier administration by Home Energy Scotland.

The criteria for WHS were agreed by a sub-group of the Fuel Poverty Forum and relevant Scottish Government policy teams in March 2015. It was therefore assumed that any household meeting the WHS criteria would fall within the definition of fuel poverty and should be eligible for Scottish Government support.

This review set out to examine two main aspects of the eligibility criteria:

<sup>2</sup> <http://www.greenerScotland.org/home-energy/advice-and-grants/warmer-homes-scotland>



- a. To ensure that it does identify fuel poor households; and
- b. To determine whether or not other households who could be considered fuel poor do not meet the criteria.

Figure 3 shows the customers who received a measure from Warmer Homes Scotland broken down by primary benefit receipt. What this shows is that for the majority of customers, Disability Living Allowance (DLA) is the benefit that qualifies them for support. Figure 4 shows the same group of customers broken down by age.

The analysis of the data would therefore suggest that WHS is supporting vulnerable households who are likely to be at risk of fuel poverty given their age or that they have young children or a disability. However, as DLA is not a means tested benefit, it cannot be concluded that WHS supports low income households in all cases. It should be noted though that only the primary qualifying benefit is recorded by both Home Energy Scotland and Warmworks. Customers in receipt of DLA may also be in receipt of other, income-related benefits.

In terms of fuel poor households who do not qualify for WHS, Table 2 shows that in the period of this review, 536 customers were cancelled post-referral because they did not meet the eligibility criteria. The majority of these were due to the SAP 55 threshold and this has already been considered and raised to 65. There were also 72 customers cancelled because there were no suitable measures for their property and this is examined in more detail in the Technical Review.

For the remaining 107 customers, a further investigation would be required to determine whether or not they could be considered fuel poor in line with the definition and therefore whether the criteria should be widened to take account of these circumstances.

**Figure 3 – Primary benefits of WHS customers**

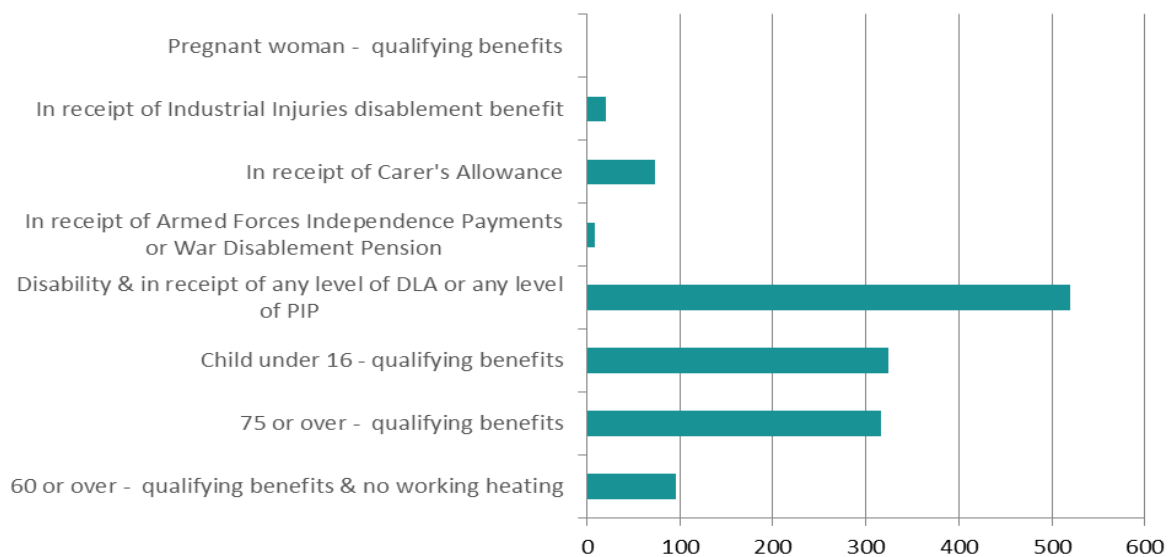


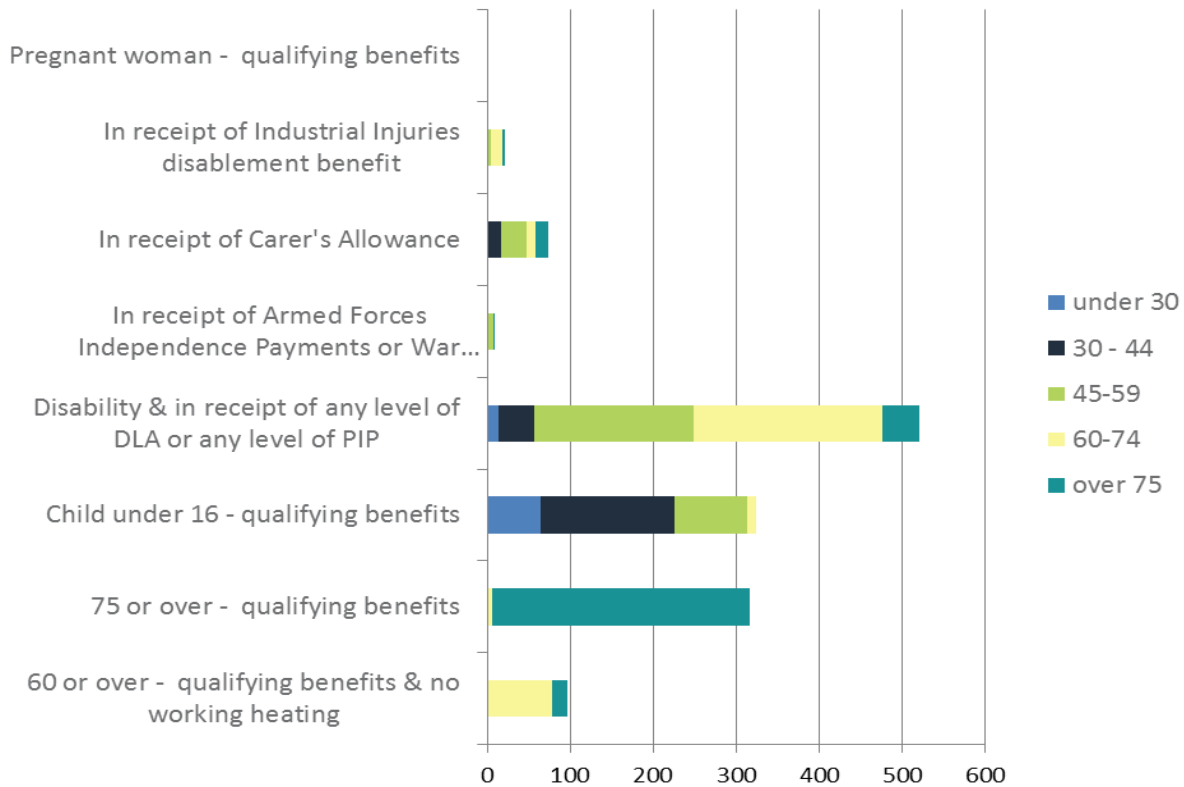
Table 1 – Extract from the scoping document

Area	Target	Review	Analysis
Fuel Poverty	Identifying fuel poor households as likely based on pre-established eligibility criteria	Numbers breakdown per type of eligibility	Cross-referencing invoice and EST data to determine the percentages of customers and the benefits they are on
		Profiling based on given data	Charts determining the customer age group and the benefits they are likely to be on
		Fuel poor people outside eligibility criteria (other benefits, working poor, fuel poor families, etc.)	Cancelled customers reasons (solstice document) and discussions with HES
		Fuel poor within eligibility criteria who drop out of the scheme (reasons)	
	Acting mostly in areas in fuel poverty	Scotland wide distribution	Scotland fuel poverty maps compared with Warmworks measures distribution
	Reaching the fuel poor through marketing efforts	Marketing campaign response/results/impact	A graph showing call trends and HES advisors on why people call
Climate Change	Customers on oil (numbers across Scotland total, divided per regions)	Number of customers who switched	Analysis of customers who switched vs those who could have but didn't
		Number who could have switched but didn't	
	Improve carbon emission numbers	Carbon emission review	What is in the contract + future reporting structure
Housing Stock	People with a SAP under 55 are more likely to be in fuel poverty	Number of people outside SAP threshold but still in fuel poverty based on income, house condition, bills, benefits, etc.	Cancellation reasons EST or WW
		Number of cancellations due to SAP	ESP data analysis

Area	Target	Review	Analysis
Value for Money	Quality of installations will be improved due to higher standards put in place	Quality standards trends (how difficult was it for companies to adapt)  New delivery structure through WW – fieldwork	Fieldwork
	Using WW delivery model	National partnerships	WW partnerships - added value
	Using the existing network of HES will be easier for people to access the scheme through a one stop shop	HES advisers on people calling	
	The scheme will complement other existing schemes	Islands Pilot	
		HEEPS Loans	
SEEP			
REEPS			
Community Benefits	Helping people in fuel poverty	People in fuel poverty – through future projects	Future projects as stated in the community strategy
	Creating jobs	ESP to date	ESP to date in march
		Living wage – declaration from all subcontractors	
	Adding value to the community (using local contractors)	Subcontractor views	
		Warmworks delivery model (SME)	

**Table 2**—Breakdown of reasons customers did not qualify post-referral

Reason	No.
Applicant Less than 6 months at property	12
Applicant Not of Eligible Age and No Eligible Children	1
Applicant Not on Benefits	62
Applicant Proofs Missing	9
Property Housing Association / (Council Tenant)	8
SAP - Too high	357
SAP Qualifies but no suitable measures	72
Unknown	15
<b>Total</b>	<b>536</b>

**Figure 4 – Age profile of Warmer Homes Scotland customers**

These cancellation numbers are also reflected in the feedback received from Home Energy Scotland advisers who suggested a number of amendments to widen the eligibility criteria and include more customers as follows:

- Include those 60 and over who are not in receipt of benefits;
- Consider very elderly households with very low SAP but not in receipt of benefits;
- Include uncommon or “outdated” benefits such as Reduced Earnings Allowance or Contribution Based JSA
- Remove the requirement for those aged 60 to 64 to have broken or no heating;
- Include Attendance Allowance as a qualifying benefit;
- Consider including those under 60 with broken or no heating;
- Change the 6 month rule – which requires for customers to have lived in the property for at least 6 months prior to referral

- Include any kind of pension credit, not just the guarantee element; and
- Consider including the single person discount for Council Tax as an eligibility criteria.

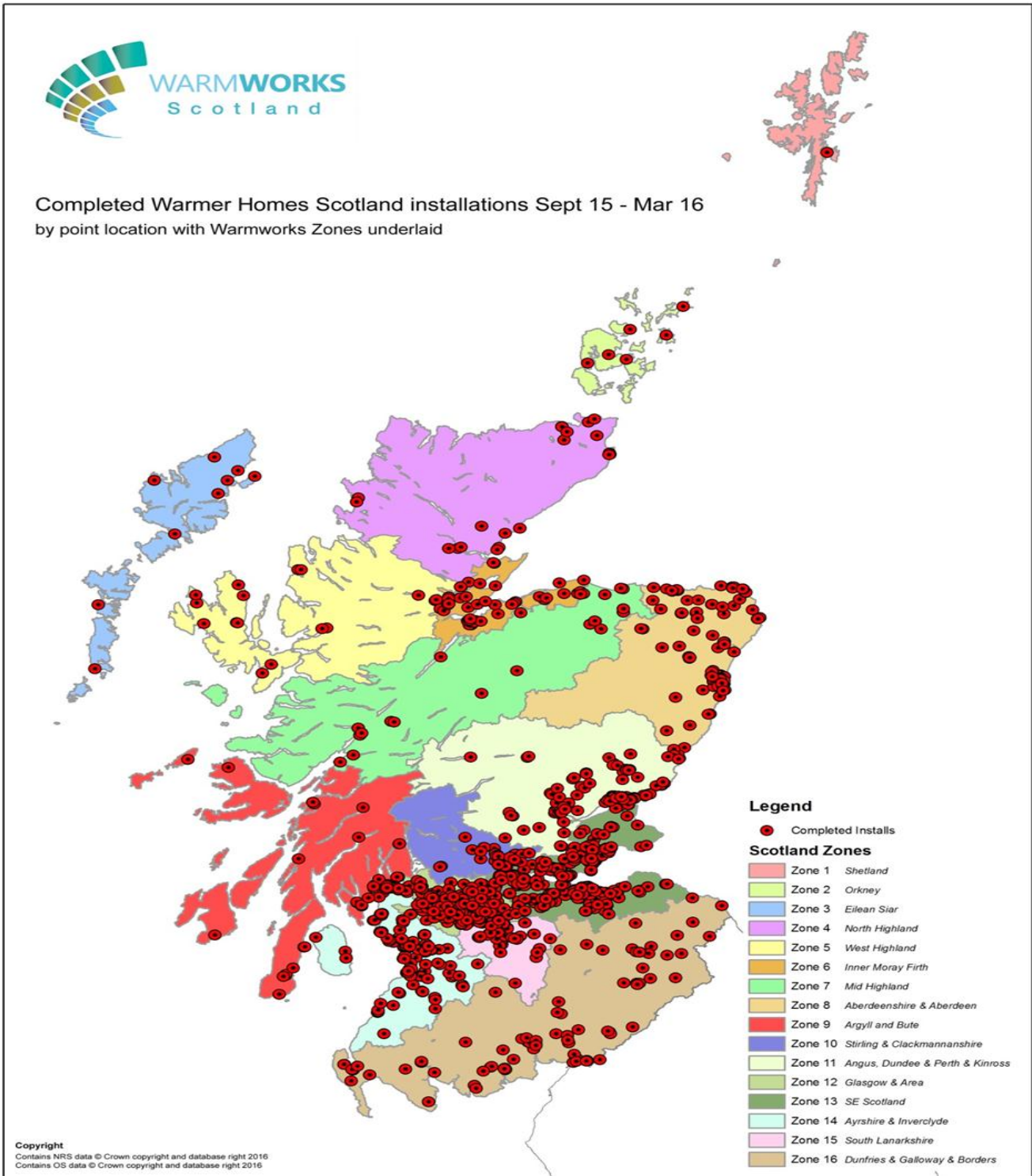
The views of the supply chain members interviewed were that the volume of customers was low and this may be attributable to eligibility criteria that are too narrow. Although it should be noted that the total number of referrals to Warmworks in the period of the review was in line with the range outlined in the Invitation to Tender, albeit at the lower end.

Taken together, the analyses carried out for this review suggest that whilst the current eligibility criteria appear to capture households at risk of fuel poverty, they may not strictly adhere to the definition of fuel poverty that specifically refers to income. Furthermore, there may be households living in fuel poverty who currently do not qualify for WHS and their inclusion may increase the number of households able to access support.

It is also accepted that households in remote and rural areas that are off the gas grid have higher fuel costs than those on the gas grid and/or in urban areas and are consequently more likely to be in fuel poverty. It would therefore be expected that take up of WHS would be greater in off gas areas. Figure 5 shows a map of WHS installations in the period of the review whilst alongside, Figure 6 shows maps of postcodes with a gas supply, the 6-fold urban/rural classification, and levels of fuel poverty.

**Recommendation 1** – This review recommends that a workshop on WHS eligibility is held in the near future to further investigate the current criteria to ensure all fuel poor households are able to access WHS.

Figure 5 – Warmworks installations map

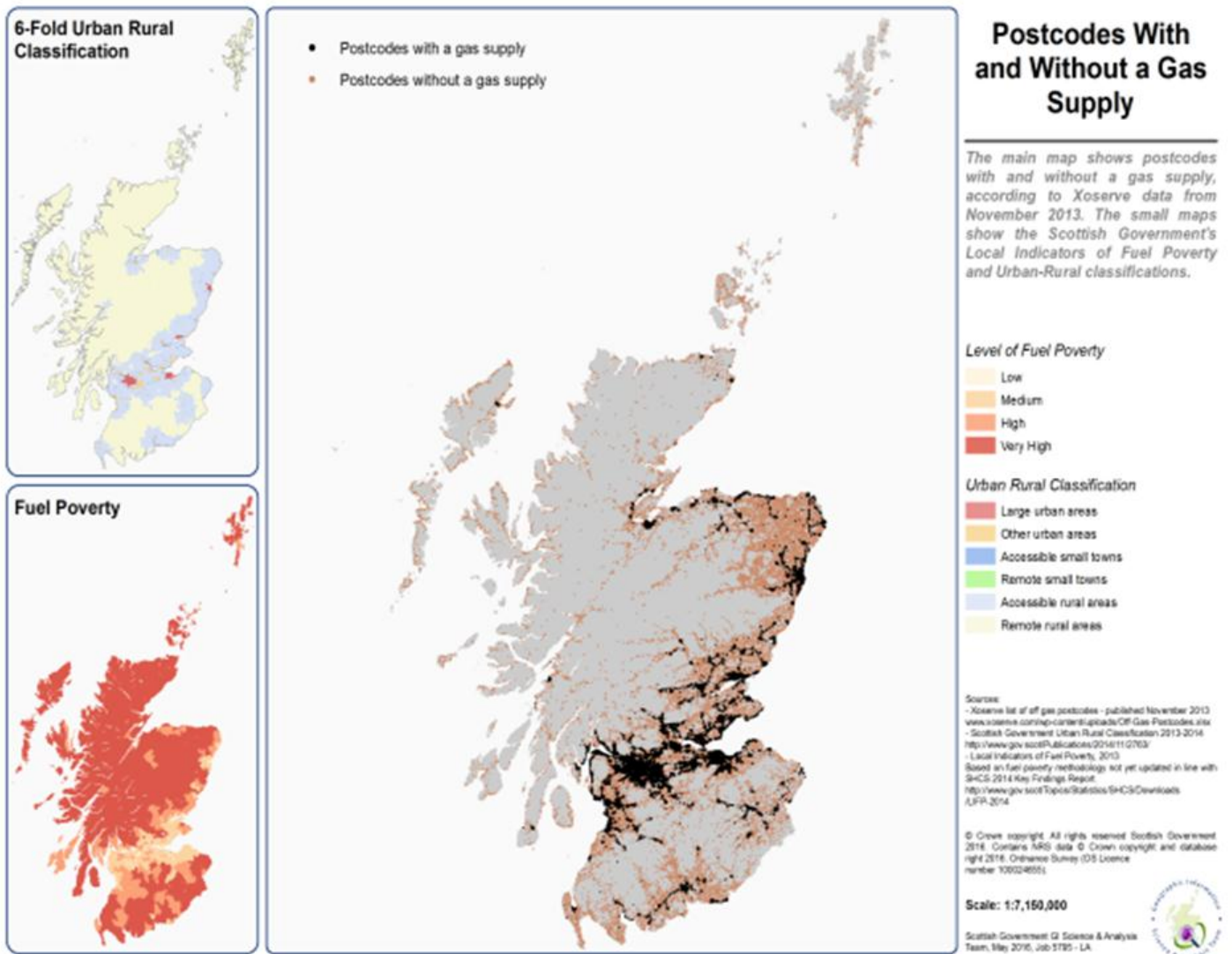


At first glance, it appears that WHS take up is greater in on gas areas. However, Table 3 suggests that when the current eligible group is considered as a proportion



of the total population, take up in off gas areas has been significantly higher<sup>3</sup>. Given the above recommendation though, this would need to be reconsidered in light of any changes made to the eligible group.

**Figure 6 - Maps of postcodes with a gas supply, the 6-fold urban/rural classification, and levels of fuel poverty**



Any consideration of eligibility will need to take into account the reports and recommendations from the Rural Fuel Poverty Task Force and the Fuel Poverty Strategic Working Group. Both are due to report by the end of October.

<sup>3</sup> <http://www.gov.scot/Topics/Statistics/About/Methodology/UrbanRuralClassification>



## ii. Awareness

One of the key issues that might prevent WHS from meeting its objectives is that fuel poor households may simply be unaware that it exists.

If they are unaware that support exists, they may be less likely to contact Home Energy Scotland to take up WHS support.

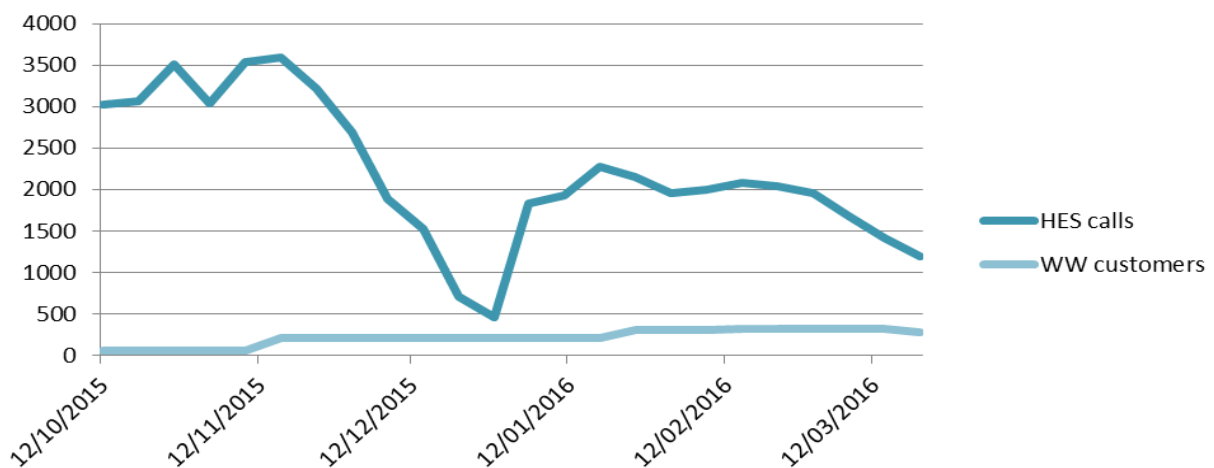
This review therefore sought to determine whether or not customer awareness had impacted on WHS uptake during the first seven months of operation.

During the mobilisation period, Scottish Government did not undertake any marketing activity on the Greener Scotland portfolio as the previous national fuel poverty scheme had closed to new referrals on 31 March 2015. Home Energy Scotland continued to take calls from customers at this time and recorded details of anyone who may potentially be eligible for WHS. This meant that when the scheme launched on 1 September 2015, there was a small pool of pre-screened customers who were very quickly able to be referred.

The official launch of WHS by the First Minister on 14 September 2015 also generated some interest although it is difficult to separate this from the launch of the Greener Scotland marketing campaign on the same day. However, Figure 7 shows a subsequent track of calls to Home Energy Scotland from 14 September 2015 to 31 March 2016 against referrals to WHS.

Figure 7 shows that calls to HES increased from September to late November, dropped sharply over the Christmas period (as would be expected) but did not return to pre-Christmas levels despite a further marketing campaign in January.

**Figure 7**—Calls to HES vs. referrals



**Table 3** – WHS eligible group as a proportion of the population

	Scottish Government 6-fold Urban-Rural classification	Number of households that received measures	Households that received measures per 1000 dwellings
Large Urban Areas	>=125,000 people	403	<b>0.46</b>
Other Urban Areas	10,000-124,999 people	472	<b>0.56</b>
Accessible Small Towns	3,000-9,999 people, and accessible	138	<b>0.64</b>
Remote Small Towns	3,000-9,999 people, and remote	62	<b>0.73</b>
Accessible Rural Areas	<3,000 people, and accessible	187	<b>0.66</b>
Remote Rural Areas	<3,000 people, and remote	110	<b>0.69</b>
<b>TOTAL</b>		<b>1,372</b>	

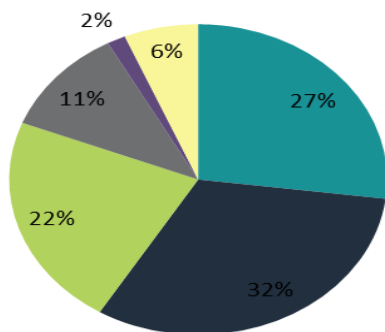
Over the same period, referrals to WHS did not begin to rise until November 2015, remained steady, then increased slightly again in January. This data therefore does not show a strong correlation between Scottish Government marketing activity and referrals to WHS.

As part of the survey undertaken with HES advisers, they were asked what they believe drives people to contact Home Energy Scotland and also whether or not customers calling HES were specifically asking about Warmworks and Warmer Homes Scotland. The results are shown in Figures 8 and 9.

**Recommendation 2** – This review recommends that further pro-active promotional work is undertaken in a way that will most effectively reach vulnerable and fuel poor households, particularly those groups identified who have not engaged with WHS. This should be in line with the Scottish Government’s policies on Above the Line marketing and cold calling activities.

**Figure 8—Reasons people contact HES according to advisers**

- Measures (new, or problems with existing)
- Fuel bills
- Grants or funding
- Advice
- SG marketing
- Word of mouth

**Figure 9— HES customers asking for WHS**

**3/10** CUSTOMERS  
ASK FOR WHS  
WHEN THEY CALL HES

These responses also mirror comments made by the supply chain. Of the six who were interviewed, four noted that their customers generally did not know who Warmworks are or confused WHS with other schemes such as the Green Deal.

Considering the breakdown of benefit receipt and age of Warmer Homes Scotland customers, it appears that those in receipt of Carer's Allowance, Industrial Injuries Disablement Benefit, War Disablement Pension and Armed Forces Independence Payment have the lowest uptake of the scheme. This is also true for those under the age of 30 (see Figure 4).

This evidence suggests that there is a lack of awareness amongst some fuel poor households of the existence of WHS and Warmworks and that this may be negatively impacting take up of the scheme.

### iii. Attractiveness

The third element of accessibility of WHS is attractiveness and this can be further broken down into two strands:

- a. Encouraging a customer to take up a referral to Warmworks; and
- b. Ensuring that once referred, they want to remain in the process

Once a customer has contacted HES, gone through the initial screening process and is deemed to be eligible for WHS, they can be referred to Warmworks and have a survey booked. Whilst most customers are happy to be referred, HES advisers reported that there are some customers who choose for a variety of reasons not to be referred. Figure 10 details the reasons given to HES advisers and also the

frequency with which these reasons were reported out of 52 responses to this question.

The HES advisers were also asked if they thought Warmer Homes Scotland was a positive intervention and if it had achieved its aim of being customer focussed. Of the 52 responses to this question, 98% think that WHS is a positive intervention and 81% think that it is customer focussed.

These figures suggest that HES advisers want to refer customers to WHS when they can and that with the right information and assistance may be able to encourage more customers to take up the support that is on offer.

**Recommendation 3–** This review recommends that Scottish Government work with HES and Warmworks to improve the information shared with customers and make case studies available to HES and the public to encourage uptake of WHS amongst eligible customers.

Once a customer has been referred, Warmworks take over the management of the end-to-end customer journey (see Figure 11).

During the period of the review, Warmworks reported that a total of 894 customers cancelled their application. As shown by Table 4, the majority of these customers cancelled because of the measures they were offered and this is considered in more detail in the Technical Review.

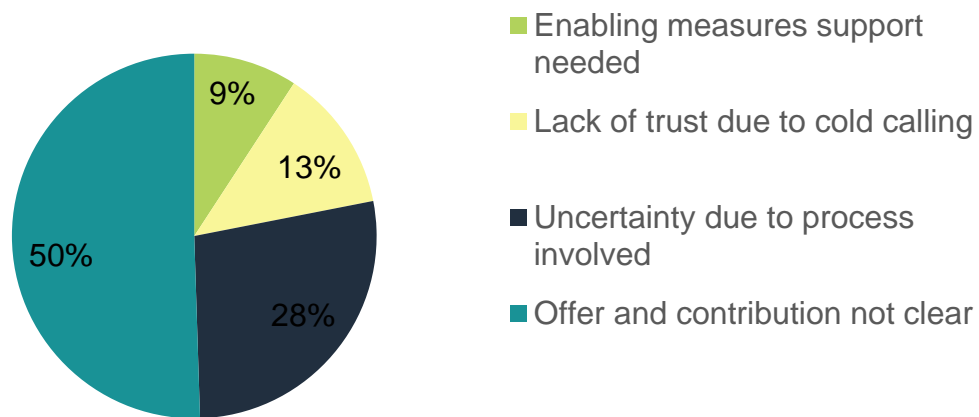
**Table 4 –** Reasons customers cancelled their WHS application

Cancellation reason	No.
Contribution	37
Customer moving house	20
Customer not able to proceed at that time	72
Upheaval/preparation works required	130
Customer deceased	12
Customer illness	35
No longer interested (fuel /measure choice)	151
Customer outwith timescales	67
Private install	41
Asbestos	6
Duplication	65
Health & Safety	7
Landlord refused or did not respond	24
No access (survey)	16
Unable to contact	133
Unknown	78
<b>Total</b>	<b>894</b>

The Technical Review, which includes data from September 2015 to June 2016, provides a breakdown per measure of the reasons customers cancelled their application. It outlines that for many customers, the perceived upheaval of an installation and the choice of measure they were offered are the primary causes of cancellation. The Technical Review also shows that the regions with the highest rates of cancellations per installation were Highland and Islands. We are therefore considering additional measures that could be offered by the scheme that will address these issues.

Whilst customer contributions were a cause of relatively few cancellations (4% in Table 4 and 5.7% in the Technical Review) these customers did qualify and were deemed to be living in or at risk of fuel poverty but were unable to proceed.

**Figure 10** – Reasons people choose not to be referred

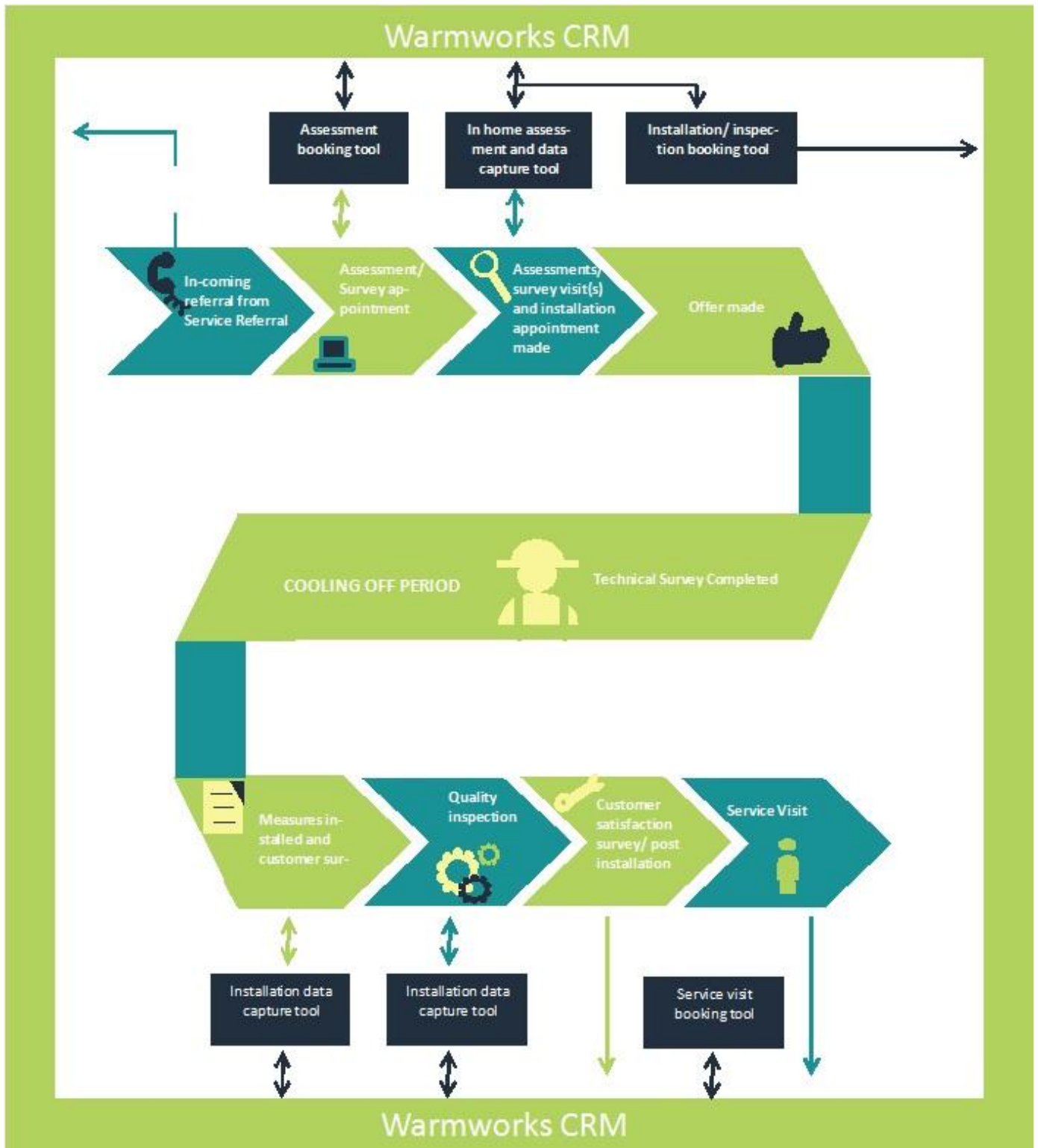


There should therefore be a further investigation to determine whether or not the grant levels and loan support that are offered are adequate for the scheme

**Recommendation 4**—A further review of the grant levels and loan support should be carried out to determine whether or not they are adequate for a fuel poverty scheme.

Beyond that, most customer cancellations were due to a lack of enabling support such as loft clearance and customers not responding to Warmworks contact attempts.

Figure 11 – Warmworks customer journey



Warmworks have already taken steps to address the upheaval to customers by engaging with a number of organisations that offer enabling support to WHS customers including Scottish and Southern Energy and other local community organisations. Customers cancellations in this category should therefore be examined again in the 2016/17 WHS review to determine the impact of this work.

A review of the Referral to Completion (RTC) contractual KPI has also been undertaken and a number of additional categories for allowed Pause Periods have been agreed which is intended to reduce the number of customers cancelled because they are outwith the RTC timescale. This is taking place on a trial basis to assess impact; this will then be reviewed and adopted if successful.

**Recommendation 5** – Customers who have cancelled their application due to lack of enabling measures should be examined again in the 2016/17 WHS review to determine the impact of the work.

In terms of the contact attempts, Warmworks is required to attempt customer contact three times at different times of the day and using different contact methods before an application can be cancelled. This is audited on a monthly basis by Pennington Choices who have confirmed that this process is being followed. With no further information, it is difficult to speculate why customers have not responded or to make any useful recommendations on how to overcome this issue.

**Recommendation 6**– The review recommends that a further investigation is undertaken into why customers do not respond to Warmworks repeated contact attempts.

Those customers who remain in the process are receiving a very high level of customer service as shown by Table 5 which shows Warmworks' customer satisfaction scores against volume of survey returns over the period of the review. This is backed up by anecdotal evidence from Pennington Choices and by the low volume of complaints escalated to Scottish Government over the period (four in total, none upheld).

The evidence presented suggests that Warmer Homes Scotland is an attractive option for fuel poor customers but that more should be done to ensure eligible customers take up the offer of support.

Table 5 – Customer satisfaction scores

Month	Score	Volume
October 2015	100%	95%
November 2015	100%	24%
December 2015	100%	85%
January 2016	99%	69%
February 2016	100%	68%
March 2016	100%	71%



## Objective 2 - Climate Change

It is widely accepted that the most cost effective way to reduce carbon emissions and therefore tackle climate change is by reducing demand for energy. Currently, heating accounts for over 55% of the energy used domestically and WHS is therefore ideally placed to make a significant impact on the reduction of energy use from Scottish homes. This objective influenced many of the policy decisions that were taken in the development of WHS including the emphasis on “fabric first” measures included within the contract and the restrictions on certain fuel types.

This review sought to answer the following questions to determine whether or not WHS was succeeding in reducing domestic energy demand and therefore meeting this objective.

- Are we reaching our carbon emission reduction target?
- Do we offer the most suitable measures to respond to climate change challenges?

Whilst the carbon and fuel bill savings reporting structure was not in place during the period of the review, these metrics can be inferred from the analysis based on modelling of measures installed. Table 6 gives a breakdown of the total number of heating and insulation measures installed from September 2015 to March 2016 and from that, Figure 13 demonstrates the key findings.

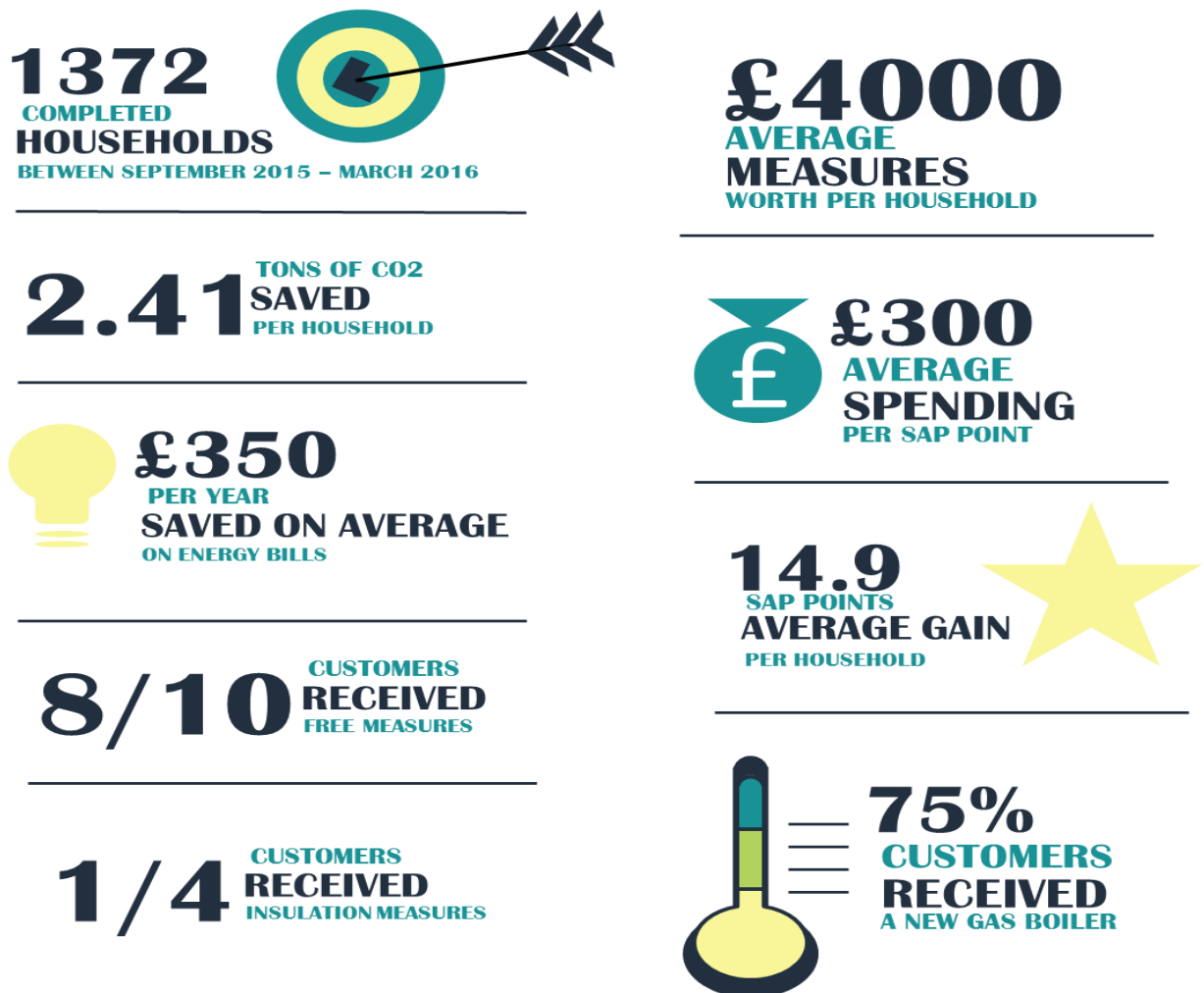
The average annual fuel bill saving per customer and estimated average SAP points gained suggest that WHS is reducing domestic energy demand and associated carbon emissions. However, this cannot be concluded with certainty based on modelled data. With the reporting structure in place, more accurate data is expected to be available from April 2016.

**Recommendation 7**—Carbon and fuel bills savings and the associated impact on energy demand & carbon emission reduction should be a key focus of the 2016/17 WHS review

Table 6 - Breakdown of the total heating and insulation measures installed in the first 6 months

Measure	Qty
Cavity wall insulation	50
Pitched roof insulation	1
Draught proofing	104
Energy efficient glazing/doors	2
External wall insulation	23
Flat roof insulation	1
Floor insulation	30
Internal wall insulation	4
Loft insulation - virgin loft to lay 270mm	103
Gas fired condensing boilers 22kw	1070
Gas boiler LPG combi 22kw	50
Oil fired condensing boilers 18kw	67
Heating system insulation	17
Heating secondary system	913
Electric storage heater	99

Figure 13 – Climate change related findings



## Objective 3 - Housing Stock

The Warmer Homes Scotland scheme aims to achieve this objective by ensuring the installation of measures that are appropriate to the property and will benefit current and future inhabitants. This is reflected in one of the scheme's guiding principles that its impacts should be sustainable and long term.

This review sought to answer the following questions to determine whether or not WHS is meeting this objective.

- How many people have dropped out because an appropriate measure was not available?
- Where the emphasis is placed when making recommendations to customers i.e. are surveyors taking a “fabric first” approach?
- Are non specified measures e.g. wind turbines being offered where appropriate?
- Are mandatory measures being installed where recommended?
- Are measures not included in the EPC/GDAR being recommended?
- Are there other measures that should be included? E.g. enabling. ?
- Are solutions being proposed within grant limits where possible?

Whilst it is difficult to determine the long term impact of WHS from the first seven months of operation, there are steps that can be taken to ensure that only appropriate measures are installed and that they are done so properly and in accordance with the standards that are set out in the contract. These steps are outlined in the customer journey at Figure 11.

### Survey

Firstly, it is important that the initial survey undertaken by Warmworks is thorough and takes account of the property type and location as well as the measures that would be most suitable. The survey is based on rdSAP software but also relies on the skills and knowledge of the surveyors to determine the most appropriate solution for each property including recommending measures specified by the WHS contract that are not included within the rdSAP software.

As part of the field research, the Scottish Government review team attended 4 surveys in the South East, Islands, and Strathclyde & Central. The observations of the team were that the surveys were thorough, detailed, and that time was taken to engage with customers.

A 5% sample of surveys is also audited on a monthly basis by Pennington Choices who assess each survey against set criteria. The results of the pre-installation audits are summarised at Table 7 and show that the majority of WHS surveys pass the audit requirements and there was only one failed survey in the very early days of the scheme. This suggests that the surveys are being carried out in line with the contractual requirements and are recommending appropriate measures

**Table 7** – Results of Pennington audit of WHS surveys

Month	Vol.	Pass	Pass	Fail
			Advisory	
October	19	15	3	1
November	69	65	4	0
December	47	42	5	0
January	83	83	0	0
February	145	121	24	0
March	130	130	0	0

However, the Technical Review carried out by Pennington Choices has highlighted a number of measures that were not offered to customers at all during the period of the review. This will require further investigation to determine why these measures have not been taken up.

**Recommendation 8** – A further investigation is required to determine why some measures specified by the scheme have not been offered to customers

## Installation & Inspection

All WHS installations are subcontracted by Warmworks to a supply chain of 34 companies (correct over the period of the review) operating across Scotland, including Everwarm who can undertake up to 50% of the installation work. All installers must have or be working towards PAS 2030 certification and must meet the other measure-specific standards set out in the contract e.g. MCS, Oftec, Gas Safe. Post-installation, all works are inspected by a Warmworks inspector.

Given the nature of the work being undertaken and the WHS customer base, it is vitally important that installations are carried out in line with the technical, health & safety and customer care standards required by the contract

As part of the field research, the Scottish Government review team met with six of Warmworks' subcontracted installers and attended four inspections. The installers all concurred that WHS standards for health & safety and customer care are higher than industry norms. This was backed up by the team's discussions with the Warmworks inspectors who also noted that the inspection regime developed by

Warmworks is more robust than that required for other energy efficiency schemes e.g. the Energy Companies Obligation.

A sample of work in progress (WIP) and post-installation inspections are also carried out by Pennington Choices and a summary of their overall onsite findings (including survey, WIP, and post-install) for the period of the review is at Table 8.

Whilst there were no jobs found to be At Risk and failed inspections were very low, a further breakdown of the WIP and post-installation inspections shows that some level of remedial work was required in around half of the jobs inspected by Pennington Choices as shown in Table 9.

**Table 8** - Overall results of Pennington onsite inspections

Inspection outcome	Overall result from October 2015 to March 2016
Pass	67%
Pass Advisory	16%
Pass Remedial	13%
Fail	4%
At Risk	0%

**Table 9** - Rate of remedial work in WIP and Post-Install jobs

Inspection category	Total no. of inspections	Total no. requiring remedial work	% requiring remedial work
WIP	69	34	49%
Post-installation	492	253	51%

The most common remedial works included:

- Absence of risk, PAT, and ladder registers
- Missing product labels
- Technical survey documents missing
- Use of 220v tools
- Boiler filling loops connected

Warmworks has already taken a number of steps to address these common

remedial works including providing customer folders for paperwork and launching an installer portal to improve communications with the supply chain.

From July 2016, Warmworks introduced a performance management system for installers, which ranks them according to their own KPI performance. The impact of these actions should be examined in the 2016/17 WHS review.

**Recommendation 9**—The levels of remedial work should be examined in the 2016/2017 review to compare with 2015/2016 levels

This review has also considered what impact the operational delivery and the behaviours that drives subcontractors has on the contractual KPIs, particularly Right First Time and a KPI workshop was held with the Warmer Homes Scotland Strategic Board. This workshop found that whilst the robust inspections put in place by Warmworks were pushing up standards, they were also hampering Warmworks' ability to meet their Right First Time (RFT) KPI target in areas with low volumes and that in these areas, a 98% RFT target unintentionally became a 100% target. It has therefore been agreed that Warmworks will trial an adjustment to this KPI for three months. This adjustment will allow one failed job in areas with low volumes (under 25 jobs per month) and will be reviewed in December 2016.

## Measures

The Technical Review covered all questions from the scope that related to the measures available under the scheme, and makes recommendations on whether or not those measures should remain part of the scheme and which new measures should be included. The full report is at Annex 1.

In terms of key findings however, the Technical Review found that:

- The most common measure installed in the period of September 2015 to June 2016 was a gas fired condensing boiler
- Loft insulation was the most common fabric measure installed
- WHS is compliant with current standards and regulations
- An enabling fund for asbestos removal would be beneficial within the scheme.

## Objective 4 - Value for Money

In order to achieve this objective, Warmer Homes Scotland is expected to leverage funding from sources other than the core Scottish Government budget in order to increase the number of households that could benefit from the scheme.

A key source of this additional leveraged funding is the Energy Companies Obligation and as part of Warmworks' delivery model, they manage this centrally on behalf of their supply chain.

In addition, Warmworks has sought to work more closely with Local Authorities in the Islands region to ensure that Warmer Homes Scotland compliments HEEPS Area Based Scheme activities in these areas. Over the period of the review, these partnerships were being negotiated but no outcomes had been reported. Similarly, Warmworks had begun to develop other national partnerships in 2015/16 including with energy suppliers to access enabling funds, providers of free or low cost gas connections, and suppliers of fuel tanks in off gas areas. As formal reporting structures were not yet in place to record the monetary value of these partnerships, they should be considered in the 2016/17 review of WHS.

**Recommendation 10** – The national and local partnerships developed by Warmworks and their associated value to the Warmer Homes Scotland scheme should be considered a key part of the 2016/17 review of the scheme.



## Objective 5 - Community Benefits

In order to achieve this objective, Warmer Homes Scotland is expected to provide benefits to the wider community through vocational training and employment opportunities and Warmworks has committed to an Employment and Skills Plan (ESP) which set targets to be achieved over the term of the contract. Table 10 shows the ESP targets against the commitments Warmworks and its supply chain have made to exceed these targets.

Figure 14 – HES Customer advisors opinions of the scheme



Warmworks is also required to:

- Ensure that it operates the contract in line with the Scottish Government's Environmental Policy;
- Consider the use of social enterprises in the delivery of the contract;
- Consider engaging with Community-Based Activities that local people can engage with on a region by region basis, that are centred around alleviating the effects of living in poverty; including social isolation and poor health;
- Optimise opportunities for SME involvement; and
- Take a similarly positive approach to workforce-related matters as part of a fair and equitable employment and reward package as the Scottish

Government (this also applies to Warmworks’ subcontractors).

Anecdotally, the Scottish Government review team is aware that many of these have been achieved but formal reporting structures were not yet in place for the period of the review so Community Benefits should be considered a key element of the 2016/17 review of Warmer Homes Scotland. From 2016/17, Pennington Choices will audit Community Benefits reporting on a monthly and quarterly basis.

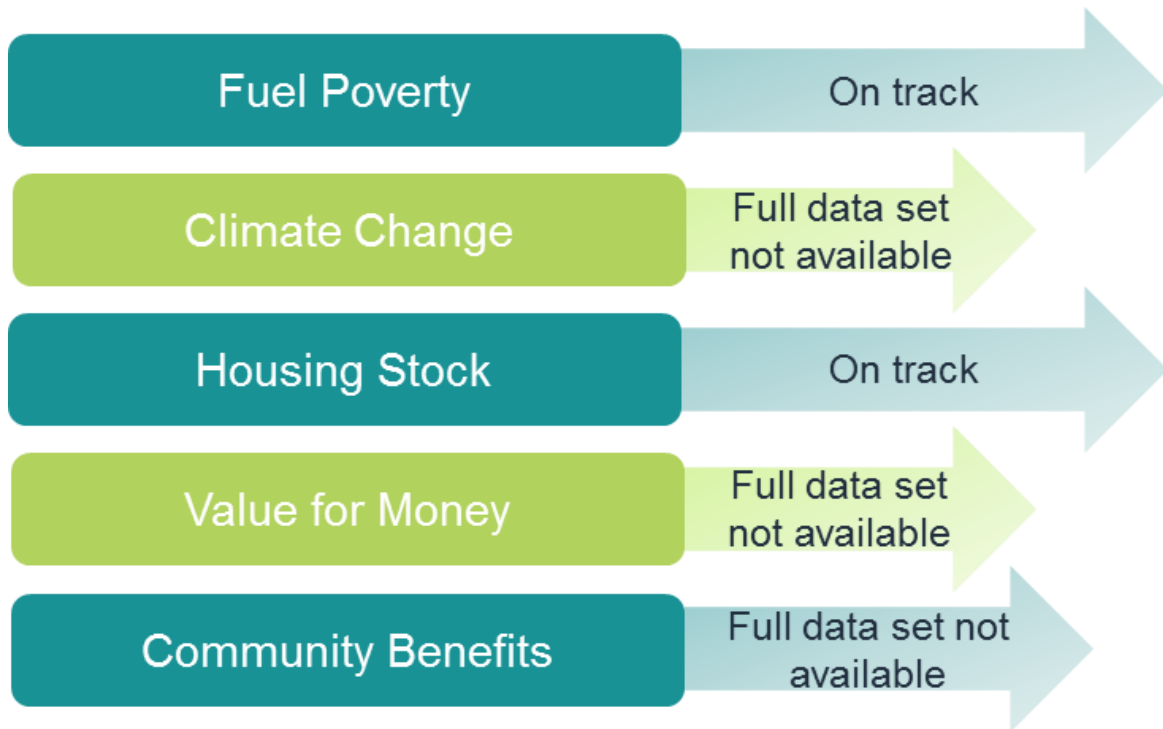
**Table 10** – ESP targets and Warmworks commitments

Deliverable	ESP target	Warmworks commitment
Work Placement or Work Shadowing (14-16 years) – persons securing	20	68
Work Placement or Work Shadowing (16 plus years) – persons	20	60
Skills For Work: Construction Crafts	40	44
Renewable Energy Skills Framework for Action	50	67
Pre Apprenticeship Electrical Installation and Renewables	40	37
Graduates – persons benefitting from graduate positions	10	17
Apprentice (Including Modern Apprentices) Starts – new person registered on schemes	18	48
Existing apprentices – persons registered on existing schemes	8	70
Apprentice (Including Modern Apprentices) Completions – persons completing apprenticeships	18	60
Jobs created in the core PAS 2030 work areas including office / support – number of new jobs created in this area of work	15	47
S/NVQ Starts for Subcontractors – persons gaining award	20	41
S/NVQ Completions for Subcontractors – persons gaining award	20	32
Training Plans for Subcontractors – number of plans to be completed	6	11
Supervisor Training for Subcontractors – persons to be trained	10	16
Leadership and Management Training for Subcontractors – persons to be trained	10	18
Advanced Health and Safety Training for Subcontractors – persons to be trained	15	25

**Recommendation 11**– Community Benefits reporting should be a key focus of the 2016/17 review of Warmer Homes Scotland.

## Conclusions

The following matrix shows whether or not Warmer Homes Scotland is on track to meet its stated objectives



- It is clear from the evidence presented that Warmer Homes Scotland is on track to meet at least two of its stated objectives and that a full data set was not available to make a conclusive determination on the other three.
- However, the evidence that has been provided on Climate Change, Value for Money and Community Benefits shows that a positive start has been made.
- It can also be concluded that the Warmworks Scotland delivery model aligns with the scheme's guiding principles.
- Warmworks have established a service that is customer focussed and have set high standards in terms of quality, health & safety and customer care.
- Priorities going forward should be to maintain that level of customer service, monitor subcontractor performance on remedial work, and put in place remaining reporting structures so that a full set of data can be considered in future years.
- Warmer Homes Scotland could be made more accessible to potential customers by increasing awareness of the scheme and sharing information that will encourage uptake.

## Recommendations Summary

Fuel Poverty	<ul style="list-style-type: none"> <li>· <b>Recommendation 1</b> – This review recommends that a workshop on WHS eligibility is held in the near future to further investigate the current criteria to ensure all fuel poor households are able to access WHS. This workshop will need to take into account the relevant recommendations of the Rural Fuel Poverty Task Force and the Fuel Poverty Strategic Working Group.</li> </ul>
	<ul style="list-style-type: none"> <li>· <b>Recommendation 2</b> – This review recommends that further proactive promotional work is undertaken in a way that will most effectively reach vulnerable and fuel poor households, particularly those groups identified who have not engaged with WHS. This should be in line with the Scottish Government’s policies on Above the Line marketing and cold calling activities.</li> </ul>
	<ul style="list-style-type: none"> <li>· <b>Recommendation 3</b>– This review recommends that Scottish Government work with HES and Warmworks to improve the information shared with customers and make case studies available to HES and the public to encourage uptake of WHS amongst eligible customers.</li> </ul>
	<ul style="list-style-type: none"> <li>· <b>Recommendation 4</b>—A further review of the grant levels and loan support should be carried out to determine whether or not they are adequate for a fuel poverty scheme.</li> </ul>
	<ul style="list-style-type: none"> <li>· <b>Recommendation 5</b>—Customers who have cancelled their application due to lack of enabling measures should be examined again in the 2016/17 WHS review to determine the impact of this work.</li> </ul>
	<ul style="list-style-type: none"> <li>· <b>Recommendation 6</b>– The review recommends that a further investigation is undertaken into why customers do not respond to Warmworks repeated contact attempts.</li> </ul>
Climate Change	<ul style="list-style-type: none"> <li>· <b>Recommendation 7</b>—Carbon and fuel bills savings and the associated impact on energy demand &amp; carbon emission reduction should be a key focus of the 2016/17 WHS review</li> </ul>
Housing Stock	<ul style="list-style-type: none"> <li>· <b>Recommendation 8</b> – A further investigation is required to determine why some measures specified by the scheme have not been offered to customers</li> </ul>
	<ul style="list-style-type: none"> <li>· <b>Recommendation 9</b>—The levels of remedial work should be examined in the 2016/2017 review to compare with 2015/2016 levels</li> </ul>
Value for Money	<ul style="list-style-type: none"> <li>· <b>Recommendation 10</b> – The national and local partnerships developed by Warmworks and their associated value to the Warmer Homes Scotland scheme should be considered a key part of the 2016/17 review of the scheme.</li> </ul>
Community Benefits	<ul style="list-style-type: none"> <li>· <b>Recommendation 11</b>– Community Benefits reporting should be a key focus of the 2016/17 review of Warmer Homes Scotland.</li> </ul>

## Acknowledgements

The review team would like to thank the following for their assistance with the review:

- Ross Armstrong, Nicola McLeod and the team at Warmworks
- Laura McGadie, David Campbell and the team at EST
- Home Energy Scotland
- Matt Corry, Shirley Quinn, Lewis Duff and Ben Davidson at Pennington Choices
- David Reay, Scottish Government Internal Audit
- Supply chain members: Devine, LMPH, Omega Electrical, Everwarm, Richard Irvine, South East Heating
- Warmworks surveyors and inspectors
- Warmer Homes Scotland customers whose homes we visited

## References

### **SG Strategic Objectives -**

<http://www.gov.scot/About/Performance/scotPerforms/objectives>

**Customer eligibility criteria –** <http://www.greenerscotland.org/home-energy/advice-and-grants/warmer-homes-scotland>

### **6-fold urban/rural classification –**

<http://www.gov.scot/Topics/Statistics/About/Methodology/UrbanRuralClassification>

## Photo references

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## Annex 1—Technical Review



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## Scottish Government

### Warmworks Scotland LLP – Measure Specification Audit Final Report

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Our mission: Supporting Property People

Our vision: Exceptional • Trusted • Expert

We **L**ive **O**ur **V**alues **E**veryday at Pennington Choices Ltd; they serve as a compass for our actions and describe our behaviours.

<b>Innovative</b>	<p>Innovation and creativity – We are passionate about developing new ideas and approaches to meet demand.</p> <p>Continuous learning and improvement – We encourage and inspire others to learn and grow.</p>
<b>Sincere</b>	<p>Equality and diversity – We respect everyone’s individual differences, values and beliefs.</p> <p>Honesty, integrity and being ethical – We create and open, positive and inspiring working environment.</p>
<b>Trusted</b>	<p>Professionalism – Our ambition is to be the best at what we do.</p> <p>Respect – We treat others as we would like to be treated ourselves.</p>
<b>Supportive</b>	<p>Quality focused – We have a ‘right first time’ culture.</p> <p>Competence – We have the right people, doing the right things.</p>
<b>Collaborative</b>	<p>Responsive – We are flexible and proactive to meet objectives.</p> <p>Effective communication – We collaborate and build lasting relationships.</p>

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# Preface

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Pennington Choices Ltd is a multi-disciplinary organisation providing a range of property-related professional services nationally to the public and private sectors. Our main aim is to help clients meet and exceed their strategic objectives. We add real value to organisations and projects, and in turn build lasting professional relationships. Our services are categorised into the following key topics areas:

- Building and Quantity Surveying Services
- Project Management
- Asbestos Surveying, Monitoring and Laboratory Analysis
- Gas, Electrical and Legionella Compliance Auditing
- Asset and Facilities Management
- ECO, Energy Performance and Green Deal Assessments
- Regeneration and Development
- Procurement
- Housing & Finance Consultancy
- Training

We pride ourselves on using our core business values to drive quality and to enhance to lives of both clients and internal staff. First and foremost our mission is to 'support property people' and to do it an ethical and enjoyable way.

## Prepared By

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Matthew Corry,  
Shirley Quinn and  
Ben Davidson.

## Version Control

Version	Date modified	Modified by	Reason for Modification
Draft	03/08/2016	MC	N/A
Draft	06/09/2016	MC	Internal Review

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## 1.0 Introduction

### 1.1 Our brief

The Scottish Government has commissioned Pennington Choices Ltd (PCL) to undertake a measure specification audit on the Scottish Government's new national fuel poverty scheme (Warmer Homes Scotland). Since its inception a number of technical challenges have arisen that have affected the implementation of the scheme. It has at times been difficult for Warmworks to identify appropriate measures for some households. These have generally been off-gas rural properties. In addition, regulation changes to oil tanks have resulted in some installs not proceeding as customers were unable to replace tanks before installs could take place for various reasons.

The overarching purpose of the audit is to determine whether or not the Warmer Homes Scotland scheme contains the most appropriate suite of measures to achieve its key objectives of reducing fuel poverty and carbon emissions; and improving the housing stock. The audit will also determine whether the technical specification of each measure is still appropriate. PCL will make recommendations for any amendments, additions or discontinuation of measures offered that would be beneficial.

The audit is to focus on the following key areas:

- Measure suitability and mix
- Non-specified measures
- The regulatory environment

The review was commissioned in July 2016, with an expected completion date set for September 2016.

### 1.2 Methodology & Scope

The initial audit has been undertaken by the following individuals:

Staff member	Position
Matt Corry (MC)	Head of Survey Services
Shirley Quinn (SQ)	Project Manager
Ben Davidson (BD)	Building Surveyor

The audit included onsite reviews, live data interrogation and additional desktop analysis where required.

The scope of service is provided below in more detail:

1. Measure suitability and mix – A review of the suitability of each measure currently available through the scheme in terms of the energy efficiency savings delivered, their carbon footprint and their price, and make recommendations for any clarifications, improvements, amendments or discontinuation of part or all of a measure as deemed to be appropriate. This assessment will also identify any additional potential energy efficiency measures that would cost less than £25,000 that could practically be offered through the scheme. The assessment of these will be presented using the same analytical approach to the assessment of the current measures to aid comparisons.
2. Non-specified measures – When the scheme opened, a number of measures within the contract had not yet been specified. A draft specification has been produced by the Scottish Government’s previous technical support. Our assessment will review these specifications and suggest refinements where deemed beneficial in terms of clarity or technical competence.
3. The regulatory environment – This part of the assessment will look at any changes to the regulatory environment that the scheme operates within since its initial development in 2015; and identify any changes to the scheme that are recommended as a result. Specifically, we will confirm whether all regulatory requirements are fully accounted for and make recommendations for any current/future requirements that should be accommodated. As part of the review we will consider regulations around oil tanks and the likely implications of the proposed VAT changes consulted on by DECC in late 2015/ early 2016.

The key members of Warmworks staff that we have been able to work with in relation to the initial audit are as follows:

Staff member	Position
Ross Armstrong (RA)	Contracts Director
Nicola McLeod (NM)	Operations and Supply Chain Mana
Simon Dawe (SD)	Financial Controller

### 1.3 Report structure

The outcome of the assessment will be reported firstly to the Scottish Government’s identified contract manager. The report will then be shared with the HEEPS Delivery Board and Warmer Homes Scotland Strategic Board.

### 1.4 Project oversight

The review has been overseen by a group of senior Scottish Government staff, consisting of:

Staff member	Position
Fiona Quinn (FQ)	Head of HEEPS National Schemes
Joanne Wright (JW)	Project Manager

The group was involved in developing and agreeing the brief and providing supporting information relating to the original technical specification for the scheme.

## 2.0 Completed and cancelled measures

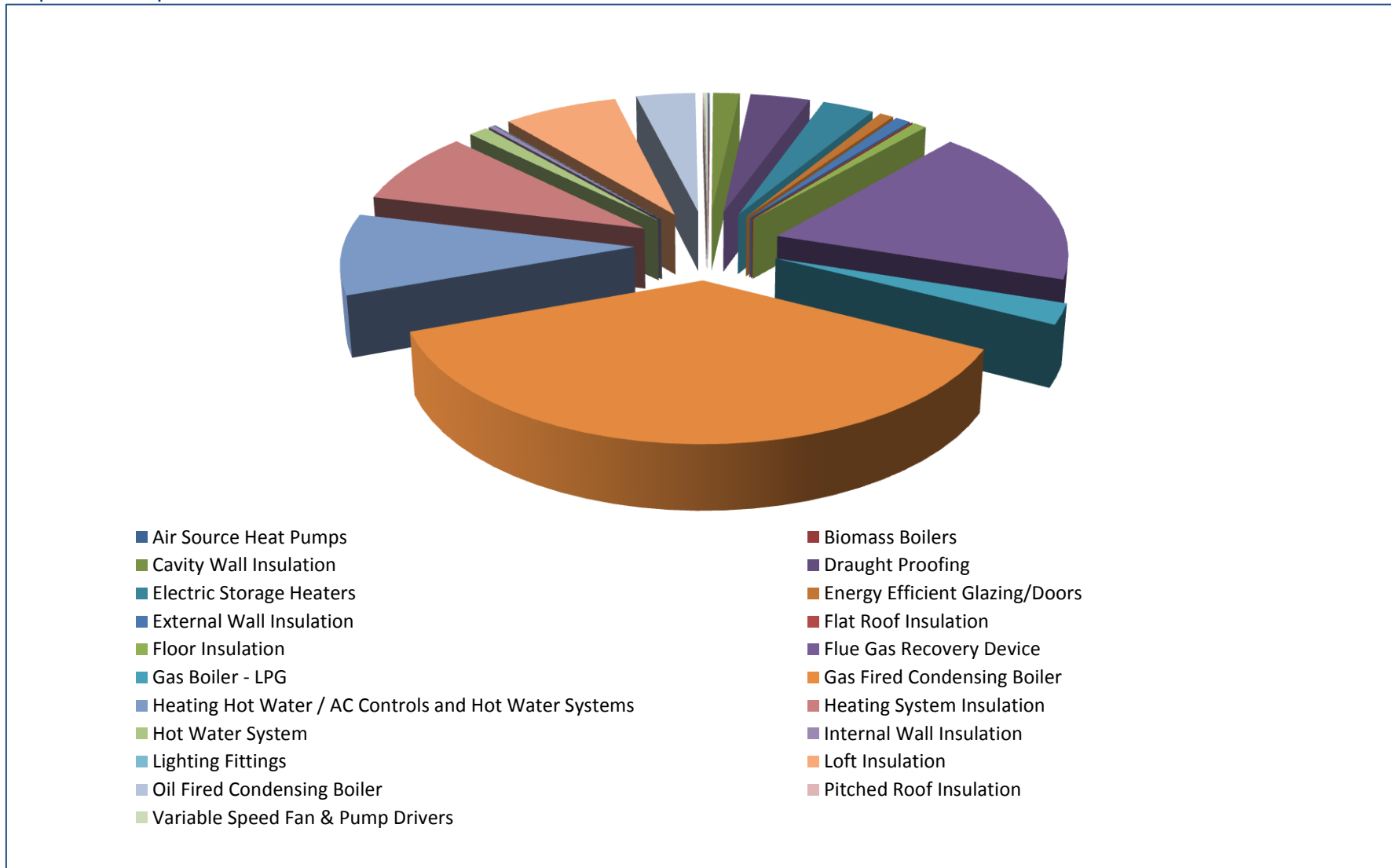
### 2.1 Summary of Completed Installations

The following data was provided to Pennington Choices in August 2016 by Warmworks Scotland. The table below is a summary of all the completed measures between September 2015 and June 2016. Between these dates there have been a total of 5183 measures installed across 2615 properties. The breakdown of measure installs is shown in table 2.1a and graph 2.1b below.

Table 2.1a – Summary of Installations

Measure	No. of Installs
Air Source Heat Pumps	5
Biomass Boilers	1
Cavity Wall Insulation	86
Draught Proofing	194
Electric Storage Heaters	169
Energy Efficient Glazing/Doors	46
External Wall Insulation	50
Flat Roof Insulation	3
Floor Insulation	45
Flue Gas Recovery Device	956
Gas Boiler - LPG	125
Gas Fired Condensing Boiler	1922
Heating Hot Water / AC Controls and Hot Water Systems	484
Heating System Insulation	437
Hot Water System	63
Internal Wall Insulation	20
Lighting Fittings	2
Loft Insulation	372
Oil Fired Condensing Boiler	191
Pitched Roof Insulation	4
Variable Speed Fan & Pump Drivers	8
<b>TOTAL</b>	<b>5183</b>

Graph 2.1b – Spread of Installations





The data identifies that from the 5183 measures installed a total 26507 SAP points have been gained. The total cost of all measure installs was £8,145,746.10. The average cost per SAP point gain currently stands at £307.30.

It is important to note that the above analysis has been calculated on a per property basis and not a per measure basis.

## 2.2 Summary of Cancelled Installations

A total of 261 customers have cancelled installs between September 2015 and June 2016.

Table 2.2a – Summary of Cancelled Measures Types

Upheaval	61	23.4%
Contribution	15	5.7%
DNQ Various	60	23%
Measures offered	13	5%
Timescale	19	7.3%
No contact Customer/LLP	93	35.6%

Graph 2.2b – Spread of Cancelled Measures Types

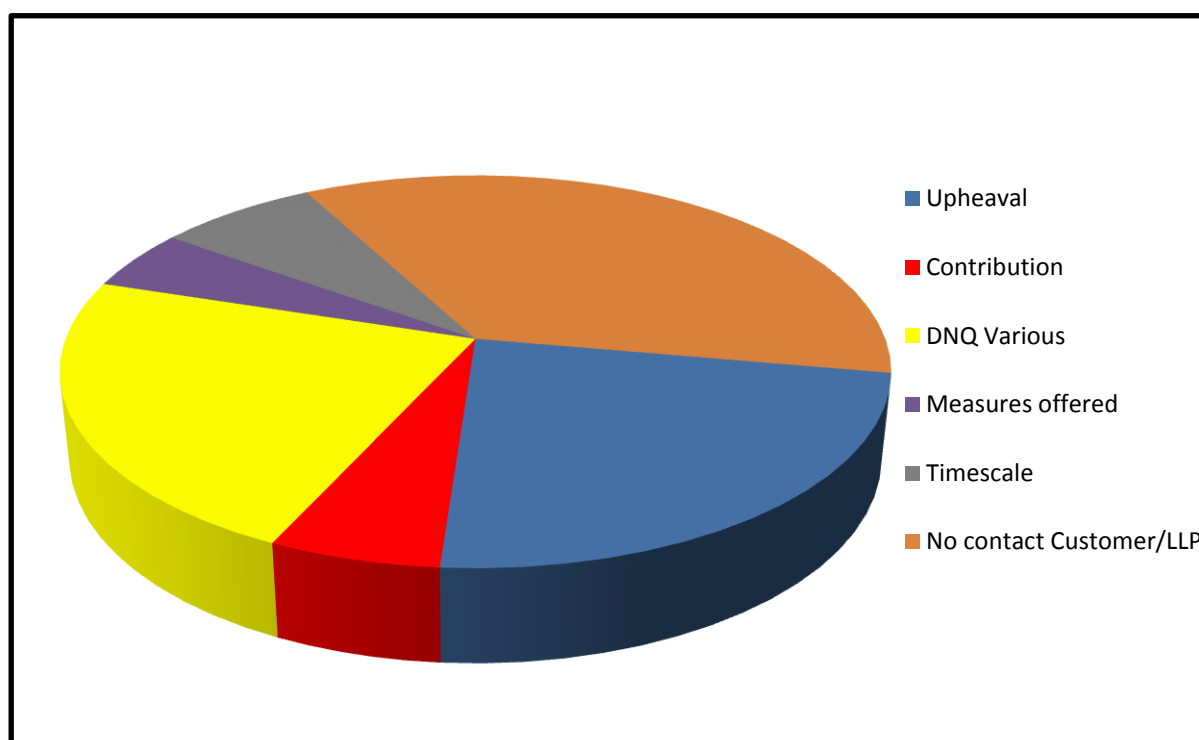
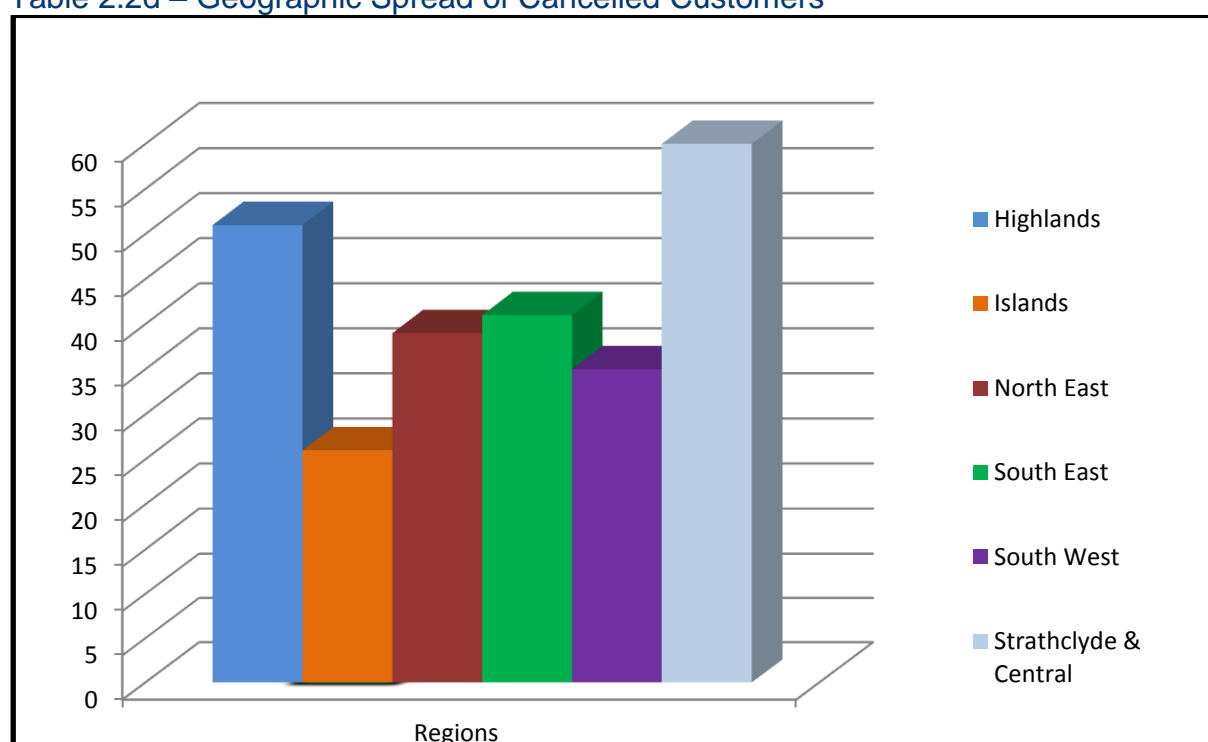


Table 2.2c – Geographic Summary of Cancelled Customers

Geographical Area	No. of Properties with Installs	No. of Cancelled Installs	Percentage of Cancelled
Highlands	249	51	20.5%
Islands	98	26	26.5%
North East	478	39	8.2%
South East	467	41	8.7%
South West	338	35	10.4%
Strathclyde & Central	985	69	7%
TOTAL	2615	261	~

Table 2.2d – Geographic Spread of Cancelled Customers



## 2.3 Air Source Heat Pumps

Measure	Completed	Cancelled
Air Source Heat Pumps	5	1

Air Source heat pumps are a recommended measure and there has been a limited number of installs. The main reason for the low volume is the property types, as a large amount of space is required for an install. It is recommended that air source heat pumps remain as an available option. The one air source heat pump cancellation was due to the customer not wanting to go through the upheaval of an install.

## 2.4 Biomass Boilers

Measure	Completed	Cancelled
Biomass Boilers	1	5

Biomass boilers have been recommended on a number of occasions, however there has only been one install to date. There have been repairs to existing systems and there is a robust supply chain in place for this measure which will hopefully allow for an increased volume of installs should there be a boost in demand. It is recommended that biomass boilers remain as an available option. There were five cancelled biomass boilers. All of these were for rural cottages, of which 80% were in the Highlands. Four were cancelled due to no contact from the customer and one cancellation was due to the customer moving house.

## 2.5 Cavity Wall Insulation

Measure	Completed	Cancelled
Cavity Wall Insulation	86	19

Cavity wall insulation is a highly utilised measure, and there has been a high number of installs. It is recommended that cavity wall insulation remains as an available option. From the nineteen cavity wall insulation cancellations 69% were in the Highlands and Islands. These were cancelled for a variety of reasons ranging from the customer not qualifying to the customer not making contact within the required timescale. The remaining 31% of cancellations were across the other five regions and were mainly cancelled due to the customer not wishing to progress with the application as a whole because other measures would cause too much upheaval.

## 2.6 Draught Proofing

Measure	Completed	Cancelled
Draught Proofing	194	27

This measure has been re-introduced into the scheme and there has been a high number of installs. It is recommended that draught proofing remains as an available option. Draught proofing has been cancelled in conjunction with other recommended measures and has not been offered in any of the twenty seven cancellations as a standalone measure.

## 2.7 Electric Storage Heaters

Measure	Completed	Cancelled
Electric Storage Heaters	169	19

Electric storage heaters are commonly recommended to properties without gas connections. Due to there being a high volume of properties across Scotland without a gas connection it is recommended that electric storage heaters remain as an available option. One of the nineteen cancellations was due to the proposed fuel choice. The other eighteen cancellations varied - 69% of the customers did not make contact and 2% of the customers cancelled due to the cost and upheaval involved in having the asbestos removed.

\* The completed install figures are based on a lower Spec. electric storage heater; this model is a cheaper measure however the instalment of this range expires in the near future. There will then be a higher Spec. model being used which may decrease the uptake of this measure.

## 2.8 Energy Efficiency Windows and Doors

Measure	Completed	Cancelled
Energy Efficiency Windows & Doors	46	7

These two separate measures are identified within the specification as one measure. Secondary glazing is offered not double glazing as planning constraints can impact and delay the installs. Door replacements are UPVC installs. These measures could be installed as stand alone measures, therefore we recommend that these measures be separated and offered as individual measures [Action]. The seven cancelled applications were mainly due to the properties not being inefficient and one customer requiring double not secondary glazing.

## 2.9 External Wall Insulation

Measure	Completed	Cancelled
External Wall Insulation	50	22

External wall insulation is a commonly recommended measure and there has been reasonable demand for external wall insulation installations. There is a customer contribution required as part of the installation and for that reason there have been a number of cancellations. There are no key issues with this measure and therefore recommend that it remains an available measure. 50% of the external wall applications were cancelled due to the customer having to pay a contribution and/or the property not being eligible for the measure. The remaining 50% ranged from the customer not wanting the upheaval of all the measures they were offered to them or not making contact in the required timescales.

## 2.10 Flat Roof Insulation

Measure	Completed	Cancelled
Flat Roof Insulation	3	1

This is a recommended measure where applicable however, the demand has been relatively low. Despite the small number of installations we recommend that flat roof insulation remains as an available measure. The one customer that cancelled did not want the upheaval and they were also surveyed for an oil system.

## 2.11 Floor Insulation

Measure	Completed	Cancelled
Floor Insulation	45	16

Floor insulation is a commonly recommended measure following the initial survey, however due to the nature of the works there have been 16 cancellations. The cancellations were mainly due to the customer's property having too high a SAP rating (not qualifying), customers not wanting the upheaval of lifting floors and customers not making contact in the required timescale. We recommend that floor insulation remains on the scheme as an available measure.

## 2.12 Flue Gas Heat Recovery Device

Measure	Completed	Cancelled
Flue Gas Heat Recovery Device	956	71

This measure is currently installed as part of a new gas boiler installation which is a separate measure, due to this there have been a large amount of installs. There are current discussions taking place between Warmworks and the Scottish Government to determine the future status of this measure. The conclusion of the discussions will establish if a flue gas heat recovery device is kept as an individual measure. The cancelled flue gas heat recovery devices were being fit as part of a gas fired condensing boiler install.

## 2.13 Gas Boiler LPG

Measure	Completed	Cancelled
Gas Boiler LPG	125	37

There have been a number of gas boiler LPG recommendations and installs. Gas boiler LPG should be kept within the scheme as an available measure for the benefit

of properties that use LPG tanks. 30% of the cancelled applications were due to the customer falling out of the required timescale as this installation required customers making arrangements for new LPG tanks to be fitted. 8% of the customers cancelled due to fuel choice as they were looking to have other measures installed. The remainder of the cancelled customers did not make contact or they were having private installations carried out.

## 2.14 Gas Fired Condensing Boiler

Measure	Completed	Cancelled
Gas Fired Condensing Boiler	1922	92

This measure has had the highest number of installs across the programme. Boiler upgrades are in high demand and we recommend that they are kept on the scheme as an available measure. From the ninety two cancellations 28% of the customers and their properties did not qualify and 43% made no contact within the required timescales. The remaining 29% did not want the upheaval of the system being installed or could not afford to pay the contribution required.

## 2.15 Heating, Hot Water and A/C Controls

Measure	Completed	Cancelled
Heating, Hot Water & A/C Controls	484	12

This measure is included as part of a boiler install, due to this there has been a high percentage of uptakes. The twelve cancelled were offered this measure along with a fuel measure.

## 2.16 Heating System Insulation

Measure	Completed	Cancelled
Heating System Insulation	437	5

As above in section 2.15, heating system insulation is a measure applied as part of a boiler installation. The five cancelled were offered this measure along with a fuel measure.

## 2.17 Hot Water System

Measure	Completed	Cancelled
Hot Water System	63	3

As above in sections 2.15 and 2.16, heating system insulation is a measure applied as part of a boiler installation. The three cancelled were offered this measure along with a fuel measure.

## 2.18 Internal Wall Insulation

Measure	Completed	Cancelled
Internal Wall Insulation	20	13

This is a recommended measure however the installation can be fairly disruptive which could be impacting on the number of installs. If external wall insulation cannot be recommended for any reason then internal wall insulation is recommended during the survey, and for this reason we recommend the measure remains available on the scheme. The thirteen cancelled applications were due to customers and landlords not qualifying or agreeing to the measures due to either the perceived upheaval or unable/unwilling to make the required financial contribution.

## 2.19 Light Fittings

Measure	Completed	Cancelled
Light Fittings	2	0

A strongly recommended measure however light bulbs are not supplied as part of the retrofit. It is recommended that the specification is amended to include light bulbs as part of the install to increase the number of instalments. [Action]

## 2.20 Loft Insulation

Measure	Completed	Cancelled
Loft Insulation	372	60

Loft insulation is in high demand and there are no obvious issues with the measure or the instalment, we therefore recommended that it remains as an available measure on the scheme. The sixty cancelled applications that included loft insulation as a measure were applications that also had a fuel measure and cancelled for a variety of reasons from the customers not qualifying, not making contact within the required timescale or not wanting the perceived upheaval within their properties.

## 2.21 Oil Fired Condensing Boiler

Measure	Completed	Cancelled
Oil Fired Condensing Boiler	191	73



This is another commonly installed and recommended measure following the initial survey. However, there has been some ambiguity surrounding oil tank legislation which has impacted and delayed potential installs (see section 5.4 for further details). We recommend that oil fired condensing boilers remain as an available measure. 52% of the cancelled applications were due to the applicant or the property not qualifying, the customer not making contact within the required timescale. 27% of customers cancelled due to the contribution required and four out of the seventy three cancellations were due to the customers considering alternative measures.

## 2.22 Pitched Roof Insulation

Measure	Completed	Cancelled
Pitched Roof Insulation	4	1

This measure is recommended when there is a room-in-the-roof present at a property. The instalment includes the use of 'Kingspan' thermo-boards, which are readily available and applicable. We recommended that pitched roof insulation remains as an available measure. The one cancelled pitched roof insulation measure was due to the customer not willing or able to pay the required financial contribution.

## 2.23 Variable Speed Fan and Pump Drive

Measure	Completed	Cancelled
Variable Speed Fan & Pump Drive	8	0

There have only been a small number of variable speed fan and pump drive installs as this measure is typically fitted with other measures (dependent on the heat source present at the property). However we recommend that it remains as an available measure on the scheme.



## 2.24 Measures not recommended to date

The following measures have not been installed at any property to date –

Measure	Notes	Recommendation
Hybrid Wall Insulation	This measure is recommended for properties with multiple wall construction types. This measure has been cancelled on 5 occasions. The five hybrid wall insulation measures have been offered with other measures and cancelled for reasons applying to the whole application.	We recommend that this measure remains available within the scheme.
Solar Blinds Shutters and Shades	This measure is more suited to commercial properties. To date there have not been any recommendations for this measure. There are also no SAP points available for this measure.	To increase the uptake of this measure we recommend that the Scottish Government look into a possible contribution towards the instalment of this measure and/or if the loans scheme covers this measure. We would also recommend that Warmworks investigate the software they use on site allows for the recommendation of this measure and that surveyors are trained to recognise where this measure might be best suited as a recommendation.

Flexible Thermal Linings	As above, this measure is more suited to commercial properties. To date there have been no recommendations for this measure and there are no SAP point advantages when installing this measure.	To increase the uptake of this measure we recommend that the Scottish Government look into a possible contribution towards the instalment of this measure and/or if the loans scheme covers this measure. We would also recommend that Warmworks investigate the software they use on site allows for the recommendation of this measure and that surveyors are trained to recognise where this measure might be best suited as a recommendation.
Mechanical Ventilation and Heat Recovery	This measure has not yet been recommended and is rarely applicable to properties within fuel poverty.	To increase the uptake of this measure we recommend that the Scottish Government look into a possible contribution towards the instalment of this measure and/or if the loans scheme covers this measure. We would also recommend that Warmworks investigate the software they use on site allows for the recommendation of this measure and that surveyors are trained to recognise where this measure might be best suited as a recommendation.
Underfloor heating	This measure has not yet been recommended and is rarely applicable to properties within fuel poverty.	To increase the uptake of this measure we recommend that the Scottish Government look into a possible contribution towards the instalment of this measure and/or if the loans scheme covers this measure. We would also recommend that Warmworks investigate the software they use on site allows for the recommendation of this measure and that surveyors are trained to recognise where this measure might be best suited as a recommendation.

Warm air heating systems	There have been some recommendations for this measure however no instalments have gone ahead due to asbestos being present at the properties.	We recommend that the specification is amended to make an allowance for asbestos removal.
Water efficient taps and shower	There are no concerns with this measure as a recommendation however there have been no installs to date.	We recommend that this measure remains available within the scheme.
Solar Thermal	There have been a limited number of recommendations but no installs have taken place to date.	We recommend that this measure remains available within the scheme.
Solar PV	This measure is recommended however there have been no instalments as customers are unable to claim the feed in tariff.	We recommend that this measure remains available within the scheme.
Wind Turbines	There have been no recommendations and this measure does not suit the target properties.	To increase the uptake of this measure we recommend that the Scottish Government look into a possible contribution towards the instalment of this measure and/or if the loans scheme covers this measure. We would also recommend that Warmworks investigate the software they use on site allows for the recommendation of this measure and that surveyors are trained to recognise where this measure might be best suited as a
Ground Source Heat Pumps	Ground source heat pumps and air source heat pumps are classified as the same measure. There have been no recommendations for ground source heat pumps.	We recommend this measure be separated from air source heat pumps. See Section 4 for specific recommendation for ground source heat pumps.
Micro Hydro Systems	There have been no recommendations for this measure to date.	See Section 4 for recommendations

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Micro Combined Heat and Power	There have been no recommendations for this measure to date.	See Section 4 for recommendations
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## 3.0 Potential measures

### 3.1 Overview

As part of our brief we were asked to recommend any further potential measures that could be recommended for the scheme. Following our analysis in section 2, there are a number of measures that have not yet been recommended due to the reasons explained. On this basis it has been a complex process to identify further new measures that can be included in the scheme. Below are some additional recommendations that could be included into the scheme to assist with the uptake of measures, including minor amendments to current measures that could also be considered.

### 3.2 Measure 1 – Biomass Stove

Biomass stoves differ from biomass boilers as stoves are used to heat a single room and are not connected to a central heating and hot water system that can provide heating and hot water for the whole of the property.

Stoves can be installed with a back boiler which can provide water heating for the property, but this depends on the customers' heating demands as well as the current heating fuel source used by the property. This is because they are generally fitted in conjunction with a full heating system within the property. It is necessary that a chimney or a flue is present in the room that the stove is being installed. Stoves operate at a higher efficiency to boilers as they spread the heat produced through convection rather than the traditional method of radiation, this means that the room is heated more evenly and efficiently using a fan attached to the stove. The average cost of an automated stove ranging from 5-7kW output varies from £2,000-£4,000, plus the price of fuel.

This measure is a different and cheaper option from the biomass boiler as there are different variations available as well as the possibility of a back boiler being fitted alongside the stove and the cost implications are not as high as a biomass boiler.

### 3.3 Measure 2 – Enabling fund for Asbestos Removal

During our discussions and research with Warmworks it was discovered that a number of recommended measures were being cancelled due to asbestos being present at the property. The cost implications of removing the asbestos to allow the measure to be installed are currently too high therefore the measures are being cancelled.

It was discussed that if an enabling fund was made available for asbestos removal then there would be a higher uptake of measures. The implications with asbestos removal are quite significant to the customers as in some cases it requires floors being totally stripped and lofts emptied so customers are cancelling on these grounds. The actual cost of asbestos removal itself is quite high; the cost of removal is implemented by the amount that is present at the property.

We feel it would be beneficial to the scheme if an enabling fund for asbestos removal was introduced. This may then increase the uptake of recommended measures, as funding will assist with the removal of any asbestos in a property and allow the recommended measure to be installed.

### 3.4 Measure 3 – Energy Efficient Bulbs

During our time with Warmworks it was made clear that the measure available for energy efficient lighting did not include the supply of energy efficient light bulbs. Warmworks will only fit and supply the correct fittings that will accommodate energy efficient light bulbs, but then it is down to the customer to purchase the bulbs. We feel it necessary to include the supply of bulbs along with the fittings with this measure.

This measure is a common recommendation following an EPC survey so there will be a high uptake of this measure as it not intrusive to have light fittings installed and a supply of energy efficient bulbs. In some cases energy efficient lighting systems are installed which may include further works that are more disruptive to the customer however the install will be completed if bulbs are being supplied at the end of the works.

### 3.5 Measure 4 – Ground Source Heat Pumps (GSHP)

Ground Source Heat Pumps are a recommended measure currently on the scheme; however they are grouped as part of the air source heat pump measure recommendation.

There are greater benefits to a ground source heat pump than an air source heat pump as they are buried in the ground and are not visible like an air source heat pump that is installed to the outside of the property. Air source heat pumps are reliant on air flow to work to a high efficiency whereas ground source heat pumps extract heat from the ground. Typically the instalment of a system will cost between £13,000-20,000, running costs depend on the size and type of property the system is serving as well as how well the property is insulated.

This measure is a good alternative to recommend separately aside from air source heat pumps. This system also works excellently with under floor heating systems, which are a current recommended measure on the programme. They are also a good replacement for properties that have old electric or coal heating systems that require replacement.

### 3.6 Measure 5 – Oil Tanks & Connections

There are a large number of properties targeted in this scheme that use LPG & Oil tanks. Gas connections, tanks and bases can be quite a significant cost to customers. From our meeting with Warmworks it was discussed that the current supply chain for oil tanks and bases has significant cost implications and has caused an increase in the number of cancelled installs. We recommend that Warmworks review the current supply chain for oil tanks, bases, LPG tanks and gas connections

further to see if there are any additional offers that may benefit the customers and potentially increase the number of installs. We also recommend that the Scottish Government explore a possible contribution and/or enabling fund to allow there to be more installs of these types of measures. This is due to the current cost of installations and in the case of LPG tanks, Warmworks stated that the gas tank provider would offer a free tank to the customer on the provision that they signed up to an 18 month contract with them.

## 4.0 Specification review

### 4.1 Overview

As part of our brief we have been asked to review a number of measures that were not fully specified when the new scheme opened. A draft specification (See Appendix 1) has been produced by the Scottish Government's previous technical support on the following measures –

- Bio-Mass Stove No Central Heating
- Ground Source Heat Pumps
- Micro Hydro Systems
- Micro Wind Systems
- Micro Combined Heat and Power

Our assessment will review these specifications and suggest refinements where deemed beneficial in terms of clarity or technical competence.

### 4.2 Specification Review

We have carried out the requested review of the current specifications set out for the proposed measures. These measures specified have been approved by the Micro-generation Certificate Scheme (MCS), the measures are; Biomass Stove, Micro Combined Heat & Power, Micro Hydro, Micro Wind and Ground Source Heat Pumps. These measures are subject to the stated industry standards in terms of materials, equipment and competent installers. We cross referenced the specification provided by the Scottish Government to the up to date version of the specifications which are available on the official MCS website. We have provided a table breakdown showing the current specification used and the updated version, detailing any amendments made in updated versions in Appendix 3.

### 4.3 Considerations

The addition of the above measures in our opinion should be subject to a further 'demand review'. Whilst we acknowledge the importance of offering a diverse range of measures across the scheme it would be prudent to reality test the demand for such measures. It is expected that the measures identified would be subject to a significant contribution from respective homeowners. The Warmer Homes Scotland scheme is aimed at households living in fuel poverty and measures that require a significant contribution from the household may not in reality, be practical.



The 'demand review' may identify specific regions where the measures could be marketed and delivered successfully.

It is also recommended that in conjunction with the 'demand review' the Scottish Government also task Warmworks to carry out a 'supply chain review' to again determine the availability of materials, equipment and competent installers across all regions.

## 5.0 Compliance review

### 5.1 Overview

We have reviewed the latest version of the PAS2030 document to determine whether there have been any changes to regulations for specified measures currently listed within the document, since the specification for the scheme was introduced. This was to ensure that all installations remained compliant and to the current standards.

### 5.2 Summary of Findings

Having reviewed the specification produced at the beginning of the programme, the version of PAS 2030 used and quoted in the specification was PAS2030: 2014 Edition 1. From this, Pennington then researched and reviewed the latest version of PAS2030 and found it to be same edition.

In the specification under each section for all measures, the Scottish Government have cited the key features directly from PAS2030, this includes information in relation to installation requirements, pre-installation requirements, surveyor and operative competence and any provision of information at the time of handover.

Within these statements there are variance guidance tables referenced which are shown on the PAS2030 document however these are not shown in the specification. These tables provide key guidance and knowledge in relation to the particular measure being used. From our recommendations section in Appendix 2, Pennington have recommended that the tables be made available so that the clauses and tables referenced in the specification can be viewed and understood. There is also reference to clauses 4 to 7 of PAS2030 made in every measure installation requirements section, these are then, however not shown in the specification. It is a further recommendation by Pennington to make these clauses available as part of the project specification so that these can be read and understood by the relevant personnel. Clauses 4 to 7 detail information and guidance in relation to the installation process, installation process management, service provision and claims of conformity.

As shown in Appendix 2 the process of making the clauses and guidance tables refers to all measures in Annex's B, C and D.

In terms of the 7 micro-generation measures that are available in the programme there have been updates to the standard documents since the specification was

introduced. There have only been minor amendments to the text with most versions updating definitions and correcting cross referencing issues. A full breakdown of the amendments is shown in Appendix 2.

Overall there have been a limited number of changes in legislation and documentation to PAS2030 that will affect the programme of works or specification. Any minor amendments have been referenced in Appendix 2 however it is the view of Pennington that no action needs to be taken from these as they concern only slight changes to the structure of the document as opposed to actual legislative changes. It is recommended that the clauses and guidance tables referenced in the specification are made available so that these can be understood in conjunction with the specification.

### 5.3 Proposed VAT Considerations

On 9<sup>th</sup> December 2015 HMRC issued a consultation paper in relation to proposed changes to the reduced rate of VAT for energy saving materials. The consultation set out when the reduced rate of VAT will and will not continue to apply. Subject to the changes to the list of installed goods included within the relief the reduced rate will continue to apply as it does now to supplies made to people living in dwellings who have a social need ('qualifying persons'), to supplies made to 'relevant housing associations' and to installations in all buildings used solely for a relevant residential purpose.

For 'qualifying person', the consultation cross references to the definition in Note 6 of Group 3 of Schedule 7A VATA (reduced rate for grant funded installations of certain goods) which relies on the same EU vices. This defines a qualifying person as someone who:-

- a) is aged 60 or over;
- b) Is in receipt of one or more of the following benefits
  - i. council tax benefit;
  - ii. disability living allowance;
  - iii. any element of child tax credit except the family element, working tax credit, housing benefit or income support;
  - iv. income based job-seekers allowance;
  - v. disablement pension;
  - vi. war disablement pension;
  - vii. personal independence payment;
  - viii. armed forces independence payment;
  - ix. universal credit.

We recommend that the Scottish Government cross reference the list with that of the eligible criteria for the Warmer Homes Scotland scheme. It is anticipated that the criteria for a 'qualifying person' under the VAT regulations and an 'eligible person' on the Warmer Homes scheme will be similar; however there may be small variances with the eligibility criteria. There may be circumstances where a customer eligible for the scheme is not a 'qualifying person' under the VAT rules. It is recommended that the Scottish Government review the impact this may have on the delivery of the

scheme and develop a contingency plan in relation to grant funding levels to ensure the number of installs does not drop as result of the new legislation.

## 5.4 Oil Tank Regulation Considerations

As part of our brief we have reviewed the agreement between Warmworks and OFTEC in relation to replacing oil storage tanks when installing a new boiler. The agreed process is as follows –

If a tank is not to current standards but is not immediately unsafe then an installation can still proceed and the customer will be issued with an OFTEC approved advisory note. This has resulted in fewer installations being delayed because of issues in relation to tanks and or bases.

It is important to note that, where a customer's tank and/or base are immediately unsafe, Warmworks postpone the installation of the boiler until the customer has fixed the tank and/or base, using their own money as there is no support from the scheme. Feedback from Warmworks suggests that in most cases the customers are on low incomes and/or vulnerable which typically means that they are unable to replace the unsafe tank and/or base themselves and subsequently cancel their application.

## 6.0 Overall conclusions & recommendations

- We suggest that a range of enabling measures are made available to assist customers such as asbestos removal and house/loft clearances for vulnerable groups [Action]
- Further support needs to be considered for those in fuel poverty. 5.7% of customers cancelled applications as they could not afford the contributions however they were classified as being in fuel poverty and qualified for the scheme [Action]
- We recommend that secondary glazing and doors are separated and offered as individual measures [Action]
- We recommend that light bulbs are included within the specification for energy efficient light fittings [Action]
- We recommend that Solar Blinds Shutters and Shades, Flexible Thermal Linings, Mechanical Ventilation and Heat Recovery and Wind Turbines are reviewed from a contribution perspective i.e., loans option. We also recommend that Warmworks investigate the software they use on site allows for the recommendation of these measures and that surveyors are trained to recognise where this measure might be best suited as a recommendation [Action]
- We recommend that the Scottish Government and Warmworks carry out a thorough 'demand' and 'supply chain' review on the following measures; Bio-

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Mass Stove No Central Heating; Ground Source Heat Pumps; Micro Hydro Systems; Micro Wind Systems and Micro Combined Heat and Power [Action]

- We recommend that the Scottish Government cross reference the VAT qualifying person list with that of the eligible criteria for the Warmer Homes Scotland scheme and then develop a contingency plan in relation to grant funding levels to ensure the number of installs does not drop as result of the new legislation [Action]
- We recommend that the Scottish Government apply updates to all specifications and compliance documents to ensure that the most up to date versions of legislation and specifications of the measures are being utilised in the scheme, as discussed in sections 4.2 and 5.0. [Action]

# Appendix

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## Appendix 1

### Draft Specifications

## Bio-Mass Stove without Central or Water Heating

### **Biomass boilers - Microgeneration Installation Standard: MIS 3004 - Issue 4.0**

The sole purpose and intention of this supplement to Scheme Measure MIS:3004 is to create an opportunity for the installation, off gas-grid of a bio-mass boiler as a room heater only. This occasion will normally be merited and substantiated, by the Surveyor to create a workable carbon efficient and fuel poverty alleviating option for a specific customer

There is no direct provision for this within PAS 2030 hence the inclusion of the main MIS 3004 contractual narrative that is essential to ensure that what is created is a safe working installation that simply has no active water or central heating pipework connected at the time of installation and commissioning.

Therefore, this Measure seeks to set out the contractual requirement for contractors undertaking the supply, design, installation, set to work, commissioning and handover of solid bio-fuel room heaters ONLY.

### **Scope**

The details of this Standard specify the requirements of MCS for the approval and listing of Contractors undertaking the supply, design, installation, set to work, commissioning and handover of microgeneration solid biofuel heating systems, and their fuel supply systems and heating systems supplying permanent buildings. The MCS Biomass Working Group is currently reviewing the requirements for the installation of dry biomass systems. Until this is completed and it is necessary to install a dry biomass system, the MCS Installation Company shall contact MCS.

Any reference to wet system design installation of performance are purely coincidental.

Multiple MCS certified solid biofuel heating products may be used in a single installation, but the individual output for a single product shall not exceed 45 kWth as defined by the MCS Product Certification Scheme document MCS 008. All products must meet the requirements of MCS 008. For a summary of product categories see MCS 008.

The Scope of this MCS Installation Standard is limited to installations with a design heat load requirement of up to 70 kWth as determined in accordance with Section 4.5.1 of this Standard.

Solid biofuel as defined in the “BS EN 14961 Solid biofuels — Fuel specifications and classes. Terminology, definitions and descriptions” and excluded from the Waste Incineration Directive.

### **Design and Installation**

The formulation of a written plan and drawings, substantiated by the relevant dimensioning and system performance calculations of this Standard (see 4.5), as well as a specific list of products and fixings to form a completed system for a defined microgeneration technology within a particular building; including extensions and alterations to existing heating systems.

The design (see 2.6) of the bio-mass heating stove, chimney flashings and integral system, shall contain a statement confirming its purpose.

This shall confirm as a minimum that it has been designed and installed to provide space heating for indoor use.

Solid biofuel heating systems and fuel storage systems shall be installed in accordance with the guidance given in Building Standards (Scotland) Regulations Scotland and Health and Safety Executive (HSE) guidance. Where the legal requirement is more stringent than the product guidance, the legal requirement shall take precedence. Where the product manufacturer's requirements exceed the Building Regulations then these shall be adhered to.

Where the product manufacturer's requirements give additional guidance to the building regulations then these should be followed. Where manufacturer's instructions conflict with the requirement of this Standard, the MCS Contractor shall conform to this Standard unless it can be proven that conformance to the manufacturer's instructions will facilitate a system that is more efficient than if the requirements of this Standard were met.

The competence of staff includes their ability to design and / or install (also see Section 5 for Subcontracting). Many factors such as fuel storage design are site specific at the design stage. Note: Wood stores installed in Scotland need to meet Scottish Building Regulations.

- If the product is to be installed in a Smoke Control Area, that it is a "recorded exempt product";
- If the product is to be installed in a Smoke Control Area, under Section 21 of the Clean Air Act 1993, it must be a recorded exempt appliance, showing that it meets the limits agreed by DEFRA for operation of solid fuel appliances in a Smoke Control Area. See <http://smokecontrol.defra.gov.uk/>

Biofuel appliances used in installations shall be listed under the MCS. Note: see [www.microgenerationcertification.org](http://www.microgenerationcertification.org) to view product list.

Biofuel appliances and ancillary equipment shall be fit for purpose of the intended installation.

All Microgeneration solid biofuel boilers that are installed within the European Union must be CE marked in compliance with the relevant European Directives.

### **Specific Relevant Legislation and Guidance**

- Scheme documents (available from [www.microgenerationcertification.org](http://www.microgenerationcertification.org))



- MCS 001 - Installer Certification Scheme Requirements
- MCS 008 - Product Certification Scheme Requirements – Biomass
- The MCS Solid Biofuel Wet Heating System Calculator (currently in development and will be available prior to the date of implementation of this Standard)
- The Compliance Certificate for solid biofuel wet heating systems available from <http://www.microgenerationcertification.org>
- Domestic Building Services Compliance Guide for Scotland (applicable for building regulations purposes from 1 October 2015) (available from: [www.scotland.gov.uk/bsd](http://www.scotland.gov.uk/bsd))
- BS EN 14961 Solid Biofuels — Fuel Specifications and Classes (available from: [www.bsi-global.com/en/Standards-and-Publications/](http://www.bsi-global.com/en/Standards-and-Publications/))
- The Government’s Standard Assessment Procedure for Energy Rating of Dwellings (available from: [www.bre.co.uk](http://www.bre.co.uk))
- Domestic Heating Design Guide - The Chartered Institution of Building Services Engineers (CIBSE) (available from: [www.cibse.org](http://www.cibse.org))
- BS EN 12831 Heating systems in buildings. Method for calculation of the design heat load
- HETAS Advice Leaflet (1) Using Wood Fuels For A Sustainable Future
- BFCMA – British Flue & Chimney Manufacturers Association – General Guidance on the selection and installation of flues and chimneys for wood burning and multi fuel appliance in residential properties.

## **Operational Scheme Notes**

The introduction states obvious issues around “active ..... at the time of commissioning” these are set out so that with Warmworks detailed Quality Assurance process photographic records should be included to show that the stove, on final completion and certification was simply being used as a room heater. Why? These units may have closed off or un-used tappings for hot water heat exchangers that are built into a unit but are not used.

The reason for stating this is not to prevent customers or Warmworks future proofing installations but to avoid serious health and safety issues later if a room heating installation is either changed or adapted by a customer and problems, fires or explosions occur due to poor or erroneous works.

## **Off Gas Grid, Highland and Island Fuel Types**

The use of local or nationally available none wood fuels will be an issue in Island and Highland locations. The main peat option will be prepared fully dried and retail packs of extruded peat briquettes: these should be viewed as available fuel source but the sustainable certification of this product may not be readily available.

The use of croft or community generated cut peat, locally dried stacked and ready for use are a local natural resource but carbon sustainable

Notes:

Some world resources suggest that peat may be considered as a CO neutral fuel yet others note the peat has the notable disadvantage of being highly carbon intensive emitting 1.23 times more CO per tonne than coal.

This aspect may require added clarification as an essential scheme query from the Energy Saving Trust or similar organisation.

The International Peatland Society (IPS) Peat as an Energy Resource

Source: 2001 WEC Survey of Energy Resources published by the World Energy Council

Although environmental aspects nowadays play a central role in social and commercial decision-making processes, they are only a part of the totality, which includes many other aspects. In the White Book on "An Energy Policy for the European Union" the Commission emphasises that in the energy policy of the European Community market integration, sustainable economic growth, job creation and prosperity for its citizens have to be taken into account. An especially important principle of the EU's energy policy is security of supply, as well as social and economic cohesion.

Peat as a local "biomass" fuel meets most of the demands the Commission has set for the energy policy of the European Community. Peat is produced mostly in remote areas where there is a chronic lack of industrial jobs. Powerful tractors typical in peat harvesting can be used outside the production season in agriculture, road maintenance and in wood transportation.

There are three main forms in which peat is used as a fuel:

Sod peat - slabs of peat, cut by hand or by machine, and dried in the air; mostly used as a household fuel;

Milled peat - granulated peat, produced on a large scale by special machines; used either as a power station fuel or as raw material for briquettes;

Peat briquettes - small blocks of dried, highly compressed peat; used mainly as a household fuel.

### **PAS 2030 Reference Criteria**

Please refer to the appended relevant measure reference criteria that should be included within the Warmworks pricing of these items to establish the two-fold delivery and installation tender process.

Smoke and Heat Detectors and a CO Detector should be installed in accordance with the Project Technical Specification

## **Ground – Source Heat Pump**

### **Microgeneration Installation Standard: MIS 3005 - Issue 4.0**

Requirements for contractors undertaking the supply, design, installation, set to work, commissioning and handover of microgeneration heat pump systems

The more common developments in the use of Air Source Heat Pumps and the 2016 review of Permitted Development Rights, relaxing the planning application process by a significant extent that will offer clear financial impetus to see more ASHP units installed by virtue of the added volume and reduced unit prices.

This improvement will percolate slower but progressively to the ground, sea water and inland water loch systems in addition to more recent systems that are utilising old mine shafts and the like.

The core design principles apply to all Heat Pumps and hence there is little difference here for specific ground source units.

The key distinction is that the Ground Source design may be either extensive in its use of land or intensive.

#### **Extensive Method**

The first uses coils of pipe work buried some 1.5 metres deep in an open area of land that shall absorb the sun's heat, the ground need not necessarily be left undeveloped, it can be used as car-parking or access road etc. The incidence of these options may offer a possibility in a fuel poverty situation where other supporting community funded improvements may create a new roadway or similar landscaping works.

In an off gas-grid remote area or island setting the ground or sea or freshwater Heat Pump installation may offer a practical option in specific situations.

#### **Intensive Method**

This option can be easily retro-fitted around existing properties as it relies upon deep drilled well pipes that contain a flow and return pipe-in-pipe circuit that draws the heat of the ground via a coolant material such as glycol (car anti-freeze).

This option is at its cost of drilling in unlikely to benefit a fuel poverty scheme but may offer a design option where in remote areas a redundant deep well as do exist in some post-war old wind driven windmill-head water pumps that are today redundant due to new water supplies but offer the potential deep shaft capital that might be given a new use.

#### **Scope**

This Standard specifies the requirements of the MCS for the approval and listing of Contractors undertaking the supply, design, installation, set to work, commissioning and

handover of micro-generation heat pump systems supplying permanent buildings and either linked to the building's space heating and/or hot water system.

Microgeneration heat pump systems utilise different primary heat sources (ground, air, and water sources), each of which requires different design and installation considerations. This MCS Installation Standard includes the requirements for both compression and thermally activated heat pumps, as well as heat pump systems for heating or for heating and cooling. Cooling only systems and direct expansion (DX) ground-loop systems are excluded from this Standard.

For the purposes of this MCS Installation Standard, microgeneration heat pump systems are defined as those having a design output that does not exceed 45 kW thermal. Multiple MCS certified heat pumps may be used in a single installation, but the individual output for a single heat pump shall not exceed 45 kWth, as defined by the MCS Product Certification scheme document MCS 007. The scope of this MCS Installation Standard is limited to installations with a design heat load requirement of up to 70 kWth, as determined in accordance with BS EN 12831

The Contractor shall be assessed under one or more of the following four categories of heat pump installation work:

- Ground source heat pump (GSHP) systems;
- Exhaust air heat pump systems;
- Gas absorption and adsorption heat pump systems.

The Certification Body must identify the scope of works that the Contractor wishes to be registered for and undertake the assessment in accordance with this Standard using the clauses relevant to the category of heat pump installation work.

NOTE: It can be deemed that installers successfully assessed on GSHP systems can also undertake work on ASHP systems.

## **Design and Installation**

All applicable regulations and directives must be met in full. Certificated Contractors shall ensure they are working to the most recent documents and have a system to identify all applicable regulations and changes to them.

All work, and working practices, must be in compliance with all relevant health and safety regulations and where required a risk assessment shall be conducted before any work on site is commenced.

All Contractors shall make their customers aware of all permissions and approvals required for the installation. The Contractor shall assess the building using a competent professional experienced in heat pump systems to ensure that the site is suitable for the installation, and that the building will meet the requirements of the building regulations (in particular those

relating to energy efficiency) and other regulations applicable to their work during and following installation.

Where required, planning permission shall be obtained before work is commenced. Where work is undertaken that is notifiable under the building regulations, it shall be made clear to the customer who shall be responsible for this notification.

The MCS Contractor shall ensure that this notification has been completed prior to handing over the installation.

The following principles shall be met when designing, specifying and installing heat pump systems. Note: Appendix E provides a summary of heat pump design definitions and calculations.

### **Heat Pump Sizing**

The following procedure shall be followed for the correct sizing and selection of a heat pump and related components for each installation:

- A heat loss calculation should be performed on the building using a method that complies with BS EN 12831, taking into account any requirements for an uplift factor or allowance for intermittent heating in accordance with the heating system control strategy.
- Heat loss calculations shall be based on the internal and external temperatures specified in BS EN 12831 UK National Annex adjusted for height and local conditions. Any supplementary in-built electric heater shall be designed to not operate above the external temperatures in Table 2 at the internal temperatures specified in Table 1.
- When calculating the heat loss through a solid floor in contact with the ground, the temperature difference to be used is the internal design room temperature (Table 1) minus the local annual average external air temperature (Appendix B).
- When calculating the heat loss through a suspended floor, the temperature difference to be used is the internal design room temperature (Table 1) minus the design external air temperature (Table 2).
- Table 1 is reproduced from the UK National Annex to BS EN 12831. Customers should be consulted to establish whether they have any special requirements and the internal design temperatures increased if required.

c) Table 1 is reproduced from the UK National Annex to BS EN 12831. Clients should be consulted to establish whether they have any special requirements and the internal design temperatures increased if required.

Room	Internal design temperatures (/°C) from the UK national annex to BS EN 12831
Living room	21
Dining room	21
Bedsitting room	21
Bedroom	18
Hall and landing	18
Kitchen	18
Bathroom	22
Toilet	18

*Table 1: Internal design temperatures from the UK annex to BS EN 12831. CIBSE Guide A should be consulted for data for other applications. CIBSE Guide A also contains information on how to adapt this data for non-typical levels of clothing and activity.*

- A heat pump shall be selected that will provide at least 100% of the calculated design space heating power requirement at the selected internal and external temperatures in Tables 1 and 2, the selection being made after taking into consideration the flow temperature at the heat pump when it is doing space heating. Performance data from both the heat pump manufacturer and the emitter system designer should be provided to support the heat pump selection. Heat pump thermal power output for the purposes of this selection shall not include any heat supplied by a supplementary electric heater. Where clauses 4.2.1d and/or 4.2.1e cannot be met, then clause 4.2.1f shall apply.
- When selecting an air source heat pump, the heat pump shall provide 100% of the calculated design space heating power requirement at the selected ambient temperature and emitter temperature, after the inclusion of any energy required for defrost cycles. Where clause 4.2.1d and/or 4.2.1e cannot be met, then clause 4.2.1f shall apply.
- For installations where other heat sources are available to the same building, the heat sources shall be fully and correctly integrated into a single control system. A heat pump shall be selected such that the combined system will provide at least 100% of the calculated design space heating requirement at the selected internal and external temperatures, the selection being made after taking into consideration the space heating flow temperature assumed in the heat emitter circuit and any variation in heat pump performance that may result. Heat pump thermal power output for the purposes of this section shall not include any heat supplied by a supplementary electric heater within the design temperature range.

For installations where other heat sources are available to the same building, it shall be clearly stated by the Contractor what proportion of the building’s space heating and domestic hot water has been designed to be provided by the heat pump. The figures stated (i.e. the proportion of the annual energy provided by the heat pump) shall be based only on the energy supplied by the heat pump and shall not include any heat supplied by a supplementary electric heater.



## Domestic Hot Water Services Design Considerations

Domestic hot water services design should be based on an accurate assessment of the number and types of points of use and anticipated consumption within the property, making appropriate adjustments for the intended domestic hot water storage temperature and domestic hot water cylinder recovery rate.

The reheat time shall be estimated, and then discussed and agreed with the customer. Additional information for assessing hot water use is available: in EN 8558 Guide to the design, installation, testing and maintenance of services supplying water for domestic use within buildings and their curtilages. Complementary guidance to EN 806; EN 806 Specifications for installations inside buildings conveying water for human consumption; and studies conducted by the Energy Saving Trust (EST) and Department of Energy and Climate Change (DECC), for example “Measurement of domestic hot water consumption in dwellings (Energy Monitoring Company) March 2008”.

For domestic hot water cylinder heat exchanger specification, installers shall follow the heat pump manufacturers’ and/or cylinder manufacturers’/suppliers’ recommendations. Domestic hot water heat exchangers for heat pump systems tend to require a much greater heat exchanger performance as compared to traditional combustion-based heat sources (i.e. boilers). For coil-type heat exchangers, this usually requires a significantly greater heat exchanger area.

Domestic hot water systems shall incorporate a means to prevent bacterial growth (including Legionella bacteria). NOTE: Further guidance can be found within the Health and Safety Executive Approved Code of Practice L8 document (HSE ACoP L8).

### Specific Relevant Legislation and Guidance

- BS EN 12831: Heating systems in buildings
- CIBSE Domestic Heating Design Guide. A CIBSE publication
- Closed-loop Vertical Borehole – Design, Installation & Materials Standard Issue 2011 [www.gshp.org.uk](http://www.gshp.org.uk)
- “Design of low-temperature domestic heating systems – a guide for system designers and installers”, 2013, BRE Trust publication FB59, [www.brebookshop.com](http://www.brebookshop.com)
- EN 806: Specifications for installations inside buildings conveying water for human consumption
- EN ISO 13790: Energy performance of buildings- Calculation of energy use for space heating and cooling
- EN 8558: Guide to the design, installation, testing and maintenance of services supplying water for domestic use within buildings and their curtilages. Complementary guidance to BS EN 806”



- Environmental good practice guide for ground source heating and cooling. GEHO0311BTPA-E-E. Published by Environment Agency 2011 [www.environment-agency.gov.uk](http://www.environment-agency.gov.uk)
- Guide A: Environmental Design. A CIBSE publication
- HSE Approved code of practice (ACOP) L8 - The control of legionella bacteria in water systems approved code of practice and guidance
- MCS 001- MCS – Installer certification scheme document. Available from: [www.microgenerationcertification.org](http://www.microgenerationcertification.org)
- MCS 022 – Ground heat exchanger look-up tables. Supplementary Material to MIS 3005. Available from: [www.microgenerationcertification.org](http://www.microgenerationcertification.org)
- MCS 021 - Heat Emitter Guide. Available from: [www.microgenerationcertification.org](http://www.microgenerationcertification.org)
- MCS 020 – Planning Standards. Available from: [www.microgenerationcertification.org](http://www.microgenerationcertification.org)
- “Report for DECC: Measurement of domestic hot water consumption in dwellings”, Energy Monitoring Company, March 2008. Available from [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/48188/3147-measure-domestic-hot-water-consump.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/48188/3147-measure-domestic-hot-water-consump.pdf)
- The Compliance Certificate for heat pump systems. Available from: <http://www.microgenerationcertification.org/mcs-standards/installer-standards>

### **Operational Scheme Notes**

The operation of ground source heat pump will require a modestly well insulated dwelling that requires a new low or very low consumption energy source and therefore very carbon efficient system.

### **PAS 2030 Reference Criteria**

Please refer to the appended relevant measure reference criteria that should be included within the Warmworks pricing of these items to establish the two-fold delivery and installation tender process.

Use should be made by Warmworks of the EST (Energy Saving Trust) open public access Green Homes Network which sets out established schemes that have installed working, viable and proven technology that can be visited by interested parties in a series of Mini-Lessons Learned and Case Study Works.

This was one EST resource used to assess the technical viability and practicability of the outline ITT Tender and Procurement process.

## Micro-Hydro System

### Micro-hydro systems - Microgeneration Installation Standard: MIS 3006 - Issue 2.2a

Requirements for contractors undertaking the supply, design, installation, set to work commissioning and handover of micro-hydropower systems.

#### Scope

This standard specifies the requirements of the MCS for Contractors undertaking the supply, design, installation, set to work, commissioning and handover of micro hydropower systems. For the purposes of this MCS Installation Standard micro- hydropower systems are defined as those having a design output that does not exceed 50kW electrical and are based on-shore.

Recent developments in small scale hydro-schemes do offer the opportunity to use existing piped or contained water flows including some private water supplies which offer adequate volume of flow and or head of pressure. There is also an inherent misconception that high or significant vertical changes of height is the main or only determinant for a viable scheme. Modern small scale inline turbine units can derive suitable and viable opportunities with very long travel distances with modest low changes in height.

#### Design and Installation

All applicable regulations and directives must be met in full. It should be noted that regulations that must be applied may be different in England and Wales, Scotland and Northern Ireland. Some guidance on applicable regulations is given in the guidance document MCS 002. This guidance is not necessarily exhaustive and may change from time to time. Certificated contractors must ensure they have a system to identify all applicable regulations and changes to them:

- All work, and working practices, shall be in compliance with all relevant Health and Safety regulations and a risk assessment shall be conducted before any work on site is commenced to safeguard against pressures exceeding the pressure rating of the weakest component.
- To comply with the provisions of the Reservoirs Act 1975 when a reservoir (>25,000<sup>m3</sup>) is utilised.

Systems shall be designed and installed in accordance with but not exclusive to:

- the manufacturer's instructions.
- provision for safe de-commissioning.
- the current issue of Environment Agency Hydropower Guidelines; or Guidelines for Low-Head Hydropower Installations;

- or SEPA Hydro Power Guidelines and,
- the British Hydropower Association Mini Hydro Development Guide.
- the relevant provisions of BS:EN61116.

The maximum hydro turbine flow rate should be related to the long-term annual mean flow available at the site, and the relationship should be demonstrated. A calculation, or series of calculations, should be clearly presented to explain how the maximum hydro turbine flow rate was determined from the flow data.

The source of the flow data shall be stated and justified in the calculations for the site. This should include a clear statement of the percentage of an 'average flow' year that the hydro turbine would be operating at its maximum flow rate, the percentage it would be operating at a part flow rate, and the percentage of the year the hydro turbine would be shut down due to insufficient flow.

Any assumed Scottish Environment Protection Agency (SEPA) compensation flows should be clearly stated. The design (rated) flow rate shall be stated to the customer and shall be appropriate for the water course.

Installers shall provide an estimate of average energy performance based on the system design and specification, the flow duration curve and head duration curve of the watercourse.

Installers must list all known SEPA constrictions of system usage on the specific watercourse and include restrictions in the overall performance estimation.

It is incumbent on the installer to explain to the customer that the performance of a Hydropower System in any one year is impossible to predict with certainty due to the variability in the amount of rainfall for location-to-location and year-to-year.

## **Site Planning**

The following issues should be addressed in the design of hydropower systems

- The EA, SEPA or the NIEA must be consulted at the initial design stage of the development.
- The system shall be designed in accordance with the current issue of Environment Agency Hydropower Guidelines or SEPA Hydro Power Guidelines and the British Hydropower Association Mini Hydro Development Guide.
- Depending on the sensitivity of the site and size of the development SEPA may issue:
  - Land drainage consent
  - Impoundment licence
  - Abstraction licence
  - Controlled Activity Regulations (CAR) Licence
  - Consent for affecting the watercourse and/or flood defences.

- Engineering Works licence

### **Planning Permission may be required from the Local Authority**

The Contractor shall survey the site using a suitably qualified person and/or a professional experienced in Hydropower Systems to ensure that the site is suitable for the installation and that the civil works will meet the requirements of the building regulations and other applicable regulations during and following installation.

All Contractors shall make their customers aware of all permissions approvals and licences required for the installation. Where required the contractor shall ensure that these permissions approvals or licences have been obtained before work is commenced.

The Contractor shall ensure the customer is aware from the outset that metering will be required if the customer wishes to access certain financial incentive schemes. The contractor will ensure the customer has the opportunity to take account of this when awarding the contract.

Note: for guidance on metering requirements please follow MCS Metering Guidance v1.0, available from the Standards section of <http://www.microgenerationcertification.org/>

Hydropower Systems shall be listed under the MCS or equivalent.

Equipment shall be suitable for its application and equipment shall have a manufacturer's declaration of conformity for the appropriate standard.

All equipment comprising the hydropower system must be in compliance with the applicable European Directives.

'As new' hydro equipment, which is certificated to the 'As new' hydro product standard may be used.

### **Specific Relevant Legislation and Guidance**

The following list implies the latest edition and amendments:

- MCS 001 – Microgeneration Certification Scheme - Installer certification scheme document. Available from [www.microgenerationcertification.org](http://www.microgenerationcertification.org)
- MCS 002 – Guidance on regulations and directives for microgeneration installations. Available from [www.microgenerationcertification.org](http://www.microgenerationcertification.org)
- G83/1 – Recommendations for the connection of small-scale embedded generators (up to 16A per phase) in parallel with public low voltage distribution networks.
- G59/1 – Recommendations for the connection of embedded generating plant to the public Electricity Suppliers distribution systems.
- BS:EN 61116 – Electromechanical equipment guide for small hydro installations
- Health and Safety at Work etc. Act 1974
- Electricity at Work Regulations
- Environment Agency Hydropower Guidelines

- SEPA Hydro Power Guidelines
- British Hydropower Association Mini Hydro Development Guide
- MCS Metering Guidance

## **Operational Scheme Notes**

The main options that may apply to a single customer are more likely to arise where the customer's property benefits from an existing redundant feature such as weir of a mill laid, old water supply take-off pipe work, or dam outfall pipe where the dam was previously used for public water supplies but has been returned to the landowner.

The overall scheme design will require significant upfront invested costs to undertake:

- The SEPA compliance design audit process that in two stages may take three months or 15 months.
- The required statutory consents can only be applied for on completion of the above audit stages.
- The need to appoint a design team, usually on a "design and install" basis, this will be developed into the full installation and commissioning process,
- All the above before that any electrical generation benefits the customer's property.

Scheme Scope may be developed to expand the opportunity to develop a mini-district generation scheme that could create a viable solution in an island or remote area scheme.

The option to derive "true off-grid" electrical voltages at say 12 or 24 volts, which with LED lighting technology and an element of battery storage and the use of selected inverter unit use – the electrical transformer that does the reverse of a battery charger: it transfers 12 volts to 220 volts but has a restriction on the volume of power it can generate. On the basis the in these situations the customer may already make use of a diesel generator to supply higher value power outputs for short duration use to heat kettles, runs ovens or cookers.

## **PAS 2030 Reference Criteria**

Please refer to the appended relevant measure reference criteria that should be included within the Warmworks pricing of these items to establish the two-fold delivery and installation tender process.

Use should be made by Warmworks of the EST (Energy Saving Trust) open public access Green Homes Network which sets out established schemes that have installed working, viable and proven technology that can be visited by interested parties in a series of Mini-Lessons Learned and Case Study Works.

This was one EST resource used to assess the technical viability and practicability of the outline ITT Tender and Procurement process.

## Micro-Wind System

### Wind turbines - Microgeneration Installation Standard: MIS 3003 - Issue 3.3

Requirements for contractors / Service Provider undertaking the supply, design, installation, set to work commissioning and handover of micro and small wind turbine systems

The MCS guidance suggests that a pre-design period of around 1-year is preferred before a design is commissioned; unless given the size, location and design output can be reliably and justifiably determined by modelling.

Retention of this installation category in a fuel poverty scheme is seen as being inclusive in nature and may in specific circumstances justify support within scheme parameters.

### Scope

This standard specifies the requirements the Microgeneration Certification Scheme (MCS) for Contractors undertaking the supply, design, installation, set to work, commissioning and handover of micro and small wind turbine systems located on dedicated free-standing / guyed towers or building-mounted; supplying permanent buildings; and either linked to the electricity distribution grid or off-grid battery charging systems.

For the purposes of this standard, Micro and Small Wind Turbine systems are defined as those having an electrical output up to 50kW (measured at a wind speed of 11.0 metres per second as defined in BWEA etc).

### Design and Installation

Wind Turbine systems shall be designed and installed in accordance with the Energy Saving Trust publication CE72 – ‘Installing small wind-powered electricity generating systems’, with the following exception and the additional requirements specified in this standard. The scope of CE72 is defined as wind turbines with power outputs ranging from 500W to 25kW. For the purposes of this standard this range is extended to between 0W and 50kW (measured at a wind speed of 11.0 m s<sup>-1</sup>).

### Document detailing and system performance

#### Annual Energy Production Estimate

An estimate of annual energy production shall be calculated using the standardised procedure detailed below. This standardised procedure is a simple method using freely available wind speed data (NOABL) and simple tabulated correction factors for the local terrain, obstructions and turbine height, and hence has a relatively high degree of uncertainty. However, it gives useful information, especially where full wind monitoring of the site is not considered financially viable.



As indicated below it is permissible to give estimates of annual energy production based on other procedures in addition to the standardised estimate. However, an estimate based on the standardised procedure shall be given in all cases to give preliminary information about the suitability of the site, to allow comparisons between different systems, and to provide a reality check for any other estimates that may be provided.

For a greater level of certainty, it is recommended that on-site wind speed monitoring is undertaken ideally for at least a year. Note: it may be useful to monitor for shorter periods, especially if the acquired data is then correlated with other sources in order to estimate an annual mean wind speed.” In addition to the above standard estimate of annual energy performance, additional estimates may be provided using alternative methodologies or additional adjustment factors in the standard methodology. Any such estimates must clearly describe and justify the approach taken and factors used, must not be given greater prominence than the standard estimate and must have an associated warning that they should be treated with caution if they are significantly greater than the result given by the standard method.

The details of the standardised and any additional estimates of the annual energy performance shall be recorded and retained in the project file.

### **Electrical connections**

The wind turbine system shall be installed in accordance with the latest version of BS7671 Requirements for Electrical Installations and CE72. Note: it is acceptable that BS7671 overrides CE72 in that it does not require the installation of a dedicated circuit to a dedicated fuse way or circuit breaker in some circumstances.

### **Commissioning**

The wind turbine system shall be commissioned according to a documented procedure to ensure that the system is safe, has been installed in accordance with the requirements of this standard and the manufacturers' requirements, and is operating correctly in accordance with the system design. A record of completion of the commissioning procedure for each installation shall be retained in the customer file containing any items recommended by the turbine manufacturer, or in the absence of any such recommendations it shall cover the items in Clause 5 of the Energy Saving Trust publication CE72.

### **Equipment**

Wind turbine systems used in installations shall be listed under the MCS. Equipment shall be suitable for its application and have a manufacturer's declaration of conformity for the appropriate standards & directives.



## Handover requirements

At the point at which the micro and small wind turbine system is handed over to the client or as soon as practicable after installation (within at least 10 working days of the commissioning date), the documentation detailed below should be provided and explained:

- A documentation pack in accordance with CE72;
- The maintenance requirements and maintenance services available;
- A certificate signed by the contractor containing at least the following:
  - a statement confirming that the installed wind turbine system meets the requirements of this standard (being MIS 3003);
  - client name and address;
  - site address (if different);
  - contractors name, address etc.;
  - list of key components installed;
  - estimation of system performance, calculated according to 4.3.1;
- The generic fixing system for the wind turbine and type of construction of the building; structural engineer's report for a building mounted wind turbine or for the
- Advice to the customer that the customer should advise their insurer(s) of the installation of a wind turbine.

## Specific Relevant Legislation and Guidance

In the following list reference to undated publications implies the latest edition and amendments unless a specific date or edition is indicated:

- British Wind Energy Association Small Wind Turbine Safety & Performance Standard (revision 29 February 2008).
- CE 72 – Installing small wind-powered electricity generating systems (November 2004)  
Available from: [www.est.org.uk/download.cfm?p=1&pid=336](http://www.est.org.uk/download.cfm?p=1&pid=336)
- BS7671:2008 Requirements for Electrical Installations (IEE Wiring Regulations Seventeenth Edition). Available from British Standards Institution (BSI): [www.bsi-global.com](http://www.bsi-global.com) or The Institution of Engineering and Technology (IET): [www.theiet.org/publications/](http://www.theiet.org/publications/)
- EN 61400-2: 2006 Wind Turbines – Part 2: Design requirements for small wind turbines. Available from British Standards Institution (BSI): [www.bsi-global.com](http://www.bsi-global.com)
- G59: Recommendations for the connection of embedded generating plant to the public electricity suppliers' distribution systems. Available from The Energy Networks Association: [www.energynetworks.org](http://www.energynetworks.org)
- G83: Recommendations for the connection of small scale embedded generators (up to 16 A per phase) in parallel with public low voltage distribution networks. Available from The Energy Networks Association: [www.energynetworks.org](http://www.energynetworks.org)
- MCS 001 –Microgeneration Certification Installer Certification Scheme. Available from [www.microgenerationcertification.org](http://www.microgenerationcertification.org)

- MCS 020 – Planning Standard. Available from [www.microgenerationcertification.org](http://www.microgenerationcertification.org)
- NOABL (Numerical Objective Analysis of Boundary Layer) database. The national database of approximate wind speeds published by the UK government (referred to as NOABL <http://www.microgenerationcertification.org/mcs-standards/external-links>)

### **Operational Scheme Notes**

The main options that may apply to a single customer are more likely to arise where the customer's property benefits from an elevated position that offers a clean regular and relatively consistent wind.

Scheme Scope may be developed to expand the opportunity to develop a mini-district generation scheme that could create a viable solution in an island or remote area scheme.

The option to derive "true off-grid" electrical voltages at say 12 or 24 volts, which with LED lighting technology and an element of battery storage and the use of selected inverter unit use – the electrical transformer that does the reverse of a battery charger: it transfers 12 volts to 220 volts but has a restriction on the volume of power it can generate. On the basis the in these situations the customer may already make use of a diesel generator to supply higher value power outputs for short duration use to heat kettles, runs ovens or cookers.

### **PAS 2030 Reference Criteria**

Please refer to the appended relevant measure reference criteria that should be included within the Warmworks pricing of these items to establish the two-fold delivery and installation tender process.

Use should be made by Warmworks of the EST (Energy Saving Trust) open public access Green Homes Network which sets out established schemes that have installed working, viable and proven technology that can be visited by interested parties in a series of Mini-Lessons Learned and Case Study Works.

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## Micro-Combined Heat and Power Units

### Microgeneration Installation Standard: MIS 3007 - Issue 3.1

Requirements for contractors undertaking the design, supply, installation, set to work, commissioning and handover of a heating system containing a micro-cogeneration package

#### Scope

This standard specifies the requirements of the Microgeneration Certification Scheme (MCS) for the approval and listing of Contractors undertaking the design, supply, installation, set to work, commissioning and handover of a heating system containing a micro-cogeneration package. The micro-cogeneration packages covered by this standard are those described in the MCS Product Certification Scheme requirements MCS 014 (see Ref. [7.2])

Domestic micro-CHP systems are currently powered by mains gas or LPG with models powered by oil or bio-liquids possible too. Although gas and LPG are fossil fuels rather than renewable energy sources, the technology is still considered to be a 'low carbon technology' because it can be more efficient than just burning a fossil fuel for heat and getting electricity from the national grid.

Micro-CHP systems are similar in size and shape to ordinary, domestic boilers and like them can be wall hung or floor standing. The only difference to a standard boiler is that they are able to generate electricity while they are heating water.

The Energy Saving Trust, having undertaken detailed research indicate that there are three main micro-CHP technologies that deliver the way in which they generate electricity

- Stirling engine micro-CHP – This technology is new to the market, although the principal of the Stirling engine is well established. The electrical output is small relative to the heat output (about 6:1) but this is not necessarily a problem for micro-CHP.
- Internal combustion engine CHP – This is the most proven technology. These are essentially, and sometimes literally, truck diesel engines modified to run on natural gas or heating oil, connected directly to an electrical generator. Heat is then taken from the engine's cooling water and exhaust manifold. The engines can have a higher electrical efficiency than a Stirling engine but are larger and are not currently available for the normal domestic market.
- Fuel cell CHP technology – This is also new to the market in the UK and globally. Fuel cells work by taking energy from fuel at a chemical level rather than burning it. The technology is still at developmental stage and not widely available to consumers.

As with some of these more specialised technologies these may only become viable where in a remote or island situation more than one customer can combine their requirements to create a viable demand volume for the micro-CHP's output and aggregate grant contributions.

## Design and Installation

All applicable regulations and directives must be met in full. It should be noted that regulations that must be applied may be different in England and Wales, Scotland and Northern Ireland. Some guidance on applicable regulations is given in the guidance document MCS 002 (see Ref. [7.5]).

This guidance is not necessarily exhaustive and may change from time to time. Certificated contractors shall ensure they have a system to identify all applicable regulations and changes to them. All work, and working practices, must be in compliance with all relevant health and safety regulations and a risk assessment shall be conducted before any work on site is commenced.

The areas of competence relevant to the design and installation of heat-led micro-cogeneration package systems in dwellings are included in Clause 5. The following principles shall be met when selecting, designing, specifying and installing such systems.

- The environmental performance of the micro-cogeneration package shall be equal or better than would be achieved by a boiler using the same fuel. This shall be determined by the method set out in Appendix B.
- The design of the heating system shall ensure that it complies with the following fundamental assumptions:
  - The micro-cogeneration package is the primary heating system for the dwelling (i.e., it will produce at least 50% of the annual heating and hot water demand);
  - It is acting as a boiler substitute;
  - Water heating service throughout the year is included, unless the package is declared unsuitable for water heating;
  - The package is controlled by heat demand (i.e. it is “heat-led”);
  - Heat is never wasted; and
  - Electricity is never wasted, and any that is not used in the dwelling is always exported to the grid.
- The design of the micro-cogeneration package system shall be in compliance with the micro-cogeneration package manufacturer’s specification and shall be clearly documented so that such compliance may be demonstrated.
- The micro-cogeneration package system shall be installed such that all the manufacturer’s instructions are followed.
- The micro-cogeneration package shall be connected to the domestic electrical installation (in parallel with the mains supply) by following the appropriate guidance contained in the Guide prepared by the Electrical Safety Council “Connecting a microgeneration system to a domestic or similar electrical installation (in parallel with the mains supply)” (see Ref. [7.9]).
- For new build the Contractor shall provide evidence of consultation and compliance with the requirements of the designers and installers of the building’s heat distribution system (and hot water system if applicable) regarding specification and performance to ensure

the correct and efficient operation of the system as a whole. This shall cover the selection of a micro-cogeneration package of appropriate output for the building, and the design of heat distribution systems and controls compatible with efficient operation.

- When replacing an existing heating system, the Contractor shall provide evidence that the micro-cogeneration package selected is of appropriate output for the building, (and hot water system if applicable), and that the design of the heat distribution systems and controls is compatible with efficient operation of the package.
- The Contractor shall ensure the customer is aware from the outset that metering will be required if the customer wishes to access certain financial incentive schemes. The contractor will ensure the customer has the opportunity to take account of this when awarding the contract.

Note: for guidance on metering requirements please follow the MCS Metering Guidance v1.0, available from the Standards section of <http://www.microgenerationcertification.org/>

### **Specific Relevant Legislation and Guidance**

In the following list reference to undated publications implies the latest edition and amendments:

- [MCS 001- Microgeneration Certification Scheme – Installer certification scheme document - Available from [www.microgenerationcertification.org](http://www.microgenerationcertification.org)
- MCS 014 – Microgeneration Certification Scheme - Product certification scheme requirements Heat-led micro-cogeneration packages in dwellings - Available from [www.microgenerationcertification.org](http://www.microgenerationcertification.org)
- PAS 67: 2008, or the latest available version thereof – Publicly Available Specification 67 – Laboratory tests to determine the heating and electrical performance of heat-led micro-cogeneration packages primarily intended for heating dwellings – Available from BSI Customer Services Tel: +44 (0)20 8996 9001.
- REAL Assurance Scheme Consumer Code – <http://www.realassurance.org.uk/about-the-code>
- MCS 002 – Guidance on regulations and directives for Microgeneration installations - Available from [www.microgenerationcertification.org](http://www.microgenerationcertification.org)
- The Product Characteristics Database – see [www.sedbuk.com](http://www.sedbuk.com)
- Method to evaluate the annual energy performance of micro-cogeneration heating systems in dwellings, 9 October 2008. Prepared for Sustainable Energy Policy Division, Defra, by John Hayton and Bruce Young, BRE. Available from: <http://projects.bre.co.uk/SAP2005/supporting-technical-documents.html>
- SAP - The Government’s Standard Assessment Procedure for Energy Rating of Dwellings” – 2009 Edition (or latest available version thereof) – see: [http://www.bre.co.uk/filelibrary/SAP/2009/SAP-2009\\_9-90.pdf](http://www.bre.co.uk/filelibrary/SAP/2009/SAP-2009_9-90.pdf)

- “Connecting a microgeneration system to a domestic or similar electrical installation (in parallel with the mains supply) – Best Practice Guide produced by the Electrical Safety Council – see [http://rexel.tamba.co.uk/client\\_files/File/NE/BestPracticeGuide3.pdf](http://rexel.tamba.co.uk/client_files/File/NE/BestPracticeGuide3.pdf)
- IGE/UP/3 Edition 2 Gas fuelled spark ignition and dual fuel engines – see <http://www.igem.org.uk/technical/publications.asp?mci=4>
- ACS Module CGFE1 (Commercial Gas Fired Engines)
- Domestic Heating Design Guide published by CIBSE
- MCS Metering Guidance v1.0.
- Augmented Technical Measures as at 22-6-2014

### **Operational Scheme Notes**

The operation of this scheme measure will require a degree of fresh thinking to bring the cost profile of the scheme to a workable and viable fuel poverty solution.

### **PAS 2030 Reference Criteria**

Please refer to the appended relevant measure reference criteria that should be included within the Warmworks pricing of these items to establish the two-fold delivery and installation tender process.

Use should be made by Warmworks of the EST (Energy Saving Trust) open public access Green Homes Network which sets out established schemes that have installed working, viable and proven technology that can be visited by interested parties in a series of Mini-Lessons Learned and Case Study Works.

This was one EST resource used to assess the technical viability and practicability of the outline ITT Tender and Procurement process.

## Appendix 2

# Regulation Review



Regulations - 2015 (Review Specification)	Current Regulations (Desktop Review)	Amendments	Recommendations
MIS 3001: Solar Heating Standard - Version 4.1	MIS 3001: Solar Heating Standard Version 4.2	<p>Updated definitions</p> <p>Clause 4.3 minorly modified which relates to the requirements in MIS 3001 regarding design and installation</p> <p>Clause 8 was added to provide further documents for requirements relating to Solar Thermal</p>	<p>All up to date versions of the current regulations are available from <a href="http://www.microgenerationcertification.org">www.microgenerationcertification.org</a>. When selecting the desired measure here the website displays all the relevant regulations and documentation and what version of the document is available and the date of the latest version.</p>
MIS 3002: Solar PV Standard -Version 3.2	MIS 3002: Solar PV Standard Version 3.3	Version 3.3 included an update of definitions	<p>All up to date versions of the current regulations are available from <a href="http://www.microgenerationcertification.org">www.microgenerationcertification.org</a>. When selecting the desired measure here the website displays all the relevant regulations and documentation and what version of the document is available and the date of the latest version.</p>
MIS 3003: Wind Tubines - Version 3.3	MIS 3003: Wind Tubines - Version 3.4	Version 3.4 included an update of definitions	<p>All up to date versions of the current regulations are available from <a href="http://www.microgenerationcertification.org">www.microgenerationcertification.org</a>. When selecting the desired measure here the website displays all the relevant regulations and documentation and what version of the document is available and the date of the latest version.</p>
MIS 3004: Biomass Boilers - Version 4.0	MIS 3004: Biomass Boilers - Version 4.2	<p>Version 4.1 included a minor update on definitions</p> <p>Version 4.2 Including minor corrections to cross referencing</p>	<p>All up to date versions of the current regulations are available from <a href="http://www.microgenerationcertification.org">www.microgenerationcertification.org</a>. When selecting the desired measure here the website displays all the relevant regulations and documentation and what version of the document is available and the date of the latest version.</p>
MIS 3005: Heat Pump Standard - Version 4.0	MIS 3005: Heat Pump Standard - Version 4.3	<p>Version 4.1 was the addition of the requirements for VHTHPs, HWHPs and SAHPs.</p> <p>Version 4.2 included updated definitions and updates to ErP requirements.</p> <p>Version 4.3 included minor corrections to cross referencing</p>	<p>Very High Temperature Heat Pumps (VHTHPs) should be avoided as an installation. The Seasonal Performance Factor (SPF) shows the efficiency for Solar Assisted Heat Pumps (SAHPs) and Hot Water Heat Pumps (HWHPs), these are determined in test results taken as part of the heat pump product certification scheme.</p> <p>ErP updates related to calculating the Seasonal Performance Factor (SPF)</p>
MIS 3006: Micro Hydro Standard - Version 2.2a	MIS 3006: Micro Hydro Standard - Version 2.2a	N/A	N/A
MIS 3007: Micro Combined heat and power - Version 3.1	MIS 3007: Micro Combined heat and power - Version 3.2	Version 3.2 updated definitions and clause numbering	<p>All up to date versions of the current regulations are available from <a href="http://www.microgenerationcertification.org">www.microgenerationcertification.org</a>. When selecting the desired measure here the website displays all the relevant regulations and documentation and what version of the document is available and the date of the latest version.</p>

Regulations - 2015 (Review Specification)	Current Regulations (Desktop Review)	Amendments	Recommendations
MIS 3001: Solar Heating Standard - Version 4.1	MIS 3001: Solar Heating Standard Version 4.2	<p>Updated definitions</p> <p>Clause 4.3 minorly modified which relates to the requirements in MIS 3001 regarding design and installation</p> <p>Clause 8 was added to provide further documents for requirements relating to Solar Thermal</p>	All up to date versions of the current regulations are available from <a href="http://www.microgenerationcertification.org">www.microgenerationcertification.org</a> . When selecting the desired measure here the website displays all the relevant regulations and documentation and what version of the document is available and the date of the latest version.
MIS 3002: Solar PV Standard -Version 3.2	MIS 3002: Solar PV Standard Version 3.3	Version 3.3 included an update of definitions	All up to date versions of the current regulations are available from <a href="http://www.microgenerationcertification.org">www.microgenerationcertification.org</a> . When selecting the desired measure here the website displays all the relevant regulations and documentation and what version of the document is available and the date of the latest version.
MIS 3003: Wind Tubines - Version 3.3	MIS 3003: Wind Tubines - Version 3.4	Version 3.4 included an update of definitions	All up to date versions of the current regulations are available from <a href="http://www.microgenerationcertification.org">www.microgenerationcertification.org</a> . When selecting the desired measure here the website displays all the relevant regulations and documentation and what version of the document is available and the date of the latest version.
MIS 3004: Biomass Boilers - Version 4.0	MIS 3004: Biomass Boilers - Version 4.2	<p>Version 4.1 included a minor update on definitions</p> <p>Version 4.2 Including minor corrections to cross referencing</p>	All up to date versions of the current regulations are available from <a href="http://www.microgenerationcertification.org">www.microgenerationcertification.org</a> . When selecting the desired measure here the website displays all the relevant regulations and documentation and what version of the document is available and the date of the latest version.
MIS 3005: Heat Pump Standard - Version 4.0	MIS 3005: Heat Pump Standard - Version 4.3	<p>Version 4.1 was the addition of the requirements for VHTHPs, HWHPs and SAHPs.</p> <p>Version 4.2 included updated definitions and updates to ErP requirements.</p> <p>Version 4.3 included minor corrections to cross referencing</p>	<p>Very High Temperature Heat Pumps (VHTHPs) should be avoided as an installation. The Seasonal Performance Factor (SPF) shows the efficiency for Solar Assisted Heat Pumps (SAHPs) and Hot Water Heat Pumps (HWHPs), these are determined in test results taken as part of the heat pump product certification scheme.</p> <p>ErP updates related to calculating the Seasonal Performance Factor (SPF)</p>
MIS 3006: Micro Hydro Standard - Version 2.2a	MIS 3006: Micro Hydro Standard - Version 2.2a	N/A	N/A
MIS 3007: Micro Combined heat and power - Version 3.1	MIS 3007: Micro Combined heat and power - Version 3.2	Version 3.2 updated definitions and clause numbering	All up to date versions of the current regulations are available from <a href="http://www.microgenerationcertification.org">www.microgenerationcertification.org</a> . When selecting the desired measure here the website displays all the relevant regulations and documentation and what version of the document is available and the date of the latest version.

# Appendix 3

## Specification Review

Warmer Homes Scotland				
MCS 023	Scottish Government Specification	Current Regulations (Desktop Review)	Amendments	Recommendations
<b>Biomass boilers</b>	Installer Standards - MIS 3004: Biomass Boilers - Version 4.0	Installer Standards - MIS 3004: Biomass Boilers - Version 4.2	Version 4.1 included a minor update on definitions  Version 4.2 Includes minor corrections to cross referencing	All up to date versions of the current regulations are available from <a href="http://www.microgenerationcertification.org">www.microgenerationcertification.org</a> . When selecting the desired measure here the website displays all the relevant regulations and documentation and what version of the document is available and the date of the latest version.
<b>Biomass boilers</b>	Product Standards - MCS 008 -Product Ceretification Scheme Requirements - Biomass Version 2.2	Product Standards - MCS 008 -Product Ceretification Scheme Requirements - Biomass Version 2.2	N/A	N/A
<b>Ground Source Heat Pumps</b>	Installer Standards - MIS 3005: Heat Pump Standard - Version 4.0	Installer Standards - MIS 3005: Heat Pump Standard - Version 4.3	Version 4.1 was the addition of the requirements for VHTHPs, HWHPs and SAHPs.  Version 4.2 included updated definitions and updates to ErP requirements.  Version 4.3 includes minor corrections to cross referencing	Very High Temperature Heat Pumps (VHTHPS) should be avoided as an installation. The Seasonal Performance Factor (SPF) shows the efficiency for Solar Assisted Heat Pumps (SAHPs) and Hot Water Heat Pumps (HWHPs), these are determined in test results taken as part of the heat pump product certification scheme.  ErP updates related to calculating the Seasonal Performance Factor (SPF)
<b>Ground Source Heat Pumps</b>	Product Standards -MCS 007 - Product Certification Scheme Requirements - Heat Pumps - Version	Product Standards -MCS 007 - Product Certification Scheme Requirements - Heat Pumps - Version 5.0	N/A	N/A
<b>Micro-hydro systems</b>	Installer Standards - MIS 3006: Micro Hydro Standard - Version 2.2a	MIS 3006: Micro Hydro Standard - Version 2.2a	N/A	N/A
<b>Micro-Wind systems</b>	Installer Standards - MIS 3003: Micro-Wind Turbines - Version 3.3	Installer Standards - MIS 3003: Micro-Wind Turbines - Version 3.4	Version 3.4 Includes updated definitions	Ensure latest version of document is stated on the specification.
<b>Micro-Wind systems</b>	Product Standards - MCS 006 - Product Certification Scheme Requirments - Micro Wind Turbines - Version 2.1	Product Standards - MCS 006 - Product Certification Scheme Requirments - Micro Wind Turbines - Version 2.1	N/A	N/A
<b>Micro Combined Heat and Power</b>	Installer Standards - MIS 3007: Micro Combined heat and power - Version 3.1	Installer Standards - MIS 3007: Micro Combined heat and power - Version 3.2	Version 3.2 updated definitions and clause numbering	All up to date versions of the current regulations are available from <a href="http://www.microgenerationcertification.org">www.microgenerationcertification.org</a> . When selecting the desired measure here the website displays all the relevant regulations and documentation and what version of the document is available and the date of the latest version.
<b>Micro Combined Heat and Power</b>	Product Standards - MCS 014 - Product Certification Scheme Requirments - CHP - Heat Led - Version 1.3	Product Standards - MCS 014 - Product Certification Scheme Requirments - CHP - Heat Led - Version 1.3	N/A	N/A
<b>Micro Combined Heat and Power</b>	Product Standards - MCS 015 - Product Certification Scheme Requirments - CHP - Electricity Led	Product Standards - MCS 015 - Product Certification Scheme Requirments - CHP - Electricity Led - Version 1.2	~	This document is referenced on the MCS website hwoever it does not form part of the Scottish Government's specification on MCHP. Ensure it is referenced to and included in the specification if electric led MCHP systems are used in the scheme.



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