Renewable Heat in Scotland, 2018 Appendices

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Prepared by the Energy Saving Trust

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These appendices were created for use with and in reference to the Renewable heat in Scotland 2018 report published by the Energy Saving Trust (EST) on behalf of Scottish Government.

All information contained within this document relates only to the 2018 iteration of the Renewable Heat Report. Many of the calculations, sources and assumptions used in the analysis are reviewed and updated on an annual basis.

Prior to the 2018 report, the appendices have been included within the main body of the report but for ease of use we have now separated them.

For any questions or comments relating to the Renewable Heat Database or accompanying analysis and report please contact RenewableReporting@est.org.uk.

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Appendix 1. Full revised figures for December 2017 report

A1.1 Summary of revisions

Due to improvements in the quality of the data captured and as part of the annual data cleansing process, the following figures for December 2017 have been revised. The revisions were made utilising the latest RHI extracts, matched by EST to the Renewable Heat Database, to backdate heat output to 2017. This figure is an estimate as there is no guarantee that some accreditations have not been cancelled between 2017 and July 2019 (the date when the extract was received). However, the revised figures for December 2017 below will still be more accurate than the estimates made at the time of initial publication.

The headline changes to the 2017 report are as follows:

- The known total of operational capacity was reduced from 2 GW to 1.94 GW and the increase in capacity from 2016 to 2017 fell from 17% to 13% accordingly.
- The total yearly output in GWh for 2017 fell from 4,800 to 4,569. The corresponding increase in output from 2016 to 2017 changed from 28% to 22% as a result.

Revisions to 2017 capacity and output broken down by installation size and technology can be found in Tables A and B of section A1.2 below**.**

A1.2 Revised 2017 results by size of installation and technology

The values for the previously reported December 2017 figures presented in the following tables do not add up to the operational capacity and heat output totals as published in the 2017 report. This is because an up to date extract from the non-domestic RHI dataset containing installations missing from the Renewable Heat Database was unavailable at the time of publication and the 2016 results were used instead considering that no other comparable data sources were available.

Table A. Previously reported and revised figures for December 2017, by size of installation[1]

Size category	Previously reported figures for December 2017			Revised figures for December 2017		
	Renewable heat capacity (GW)	Annual output (GWh)	Number of installations	Renewable heat capacity (GW)	Annual output (GWh)	Number of installations
Large (>1 MW)	0.776	2,793	80	0.778	2,188	90
Small to medium (>45 kW – <1 MW)	0.697	1,055	5,180	0.835	1,221	3,620
Micro (≤45 kW)	0.341	640	23,350	0.322	584	19,290
Biomethane (no stated capacity)	N/A	100	10	N/A	566	10
Unknown	<0.01	10	10	<0.1	10	10
Total	1.819	4,598	28,620	1.938	4,569	23,010

Table B. Previously reported and revised figures for December 2017, by technology

Technology	Previously reported figures for December 2017			Revised figures for December 2017		
	Renewable heat capacity (GW)	Annual output (GWh)	Number of installations	Renewable heat capacity (GW)	Annual output (GWh)	Number of installations
Biomass	1.112	3,128	Not published	1.232	2,677	8,180
Biomass CHP	0.366	629	Not published	0.395	685	30
Energy from waste	0.125	449	Not published	0.115	904	150
Heat pump	0.179	374	Not published	0.159	284	11,310
Solar thermal	0.037	19	Not published	0.036	17	3,340
Total	1.819	4,598	Not published	1.938	4,569	23,010

[1] Number of installations are rounded to the nearest 10 in all cases.

Appendix 2. Technical terms used

A2.1 References to 'heat output'

The following terms have been used in the report when talking about heat output from heat generating installations:

- **Heat output**

Where used in this report 'heat output' refers to the heat output from a site. This may be potential, actual or useful heat output.

- **Useful heat output**

Heat delivered to an end user or process, taking into account losses.

- **Actual heat output**

The predicted amount of heat produced by a site, accounting for losses and efficiency. Actual heat output includes heat that is *not* delivered to an end user or process and is often estimated using assumed values such as the running hours stated in Table D or capacities in Table E.

- **Potential heat output**

The total amount of heat that could potentially be generated by the site if it operated all year round.

- **Renewable heat output**

Refers to the renewable heat output from a site. This term is used for clarity where it may not be clear if the heat output being discussed is renewable, for example with energy from waste sites.

A2.2 Renewable energy technologies

The following technologies are considered to produce heat from renewable sources, and are included in the database:

- **Biomass (wood) primary combustion**

Wood is burnt to directly produce heat for space or water heating, or to provide heat for an industrial process. The woodfuel may be chips, pellets or logs, or waste wood, sawdust or offcuts. In some installations the woodfuel may be supplemented by, or be a supplement to, other non-renewable fuels such as coal. These cases are referred to as 'co-firing', and the renewable heat capacity and renewable heat output of installations when co-firing occurs are estimated to be a proportion of the total capacity and heat, based on the mix of different renewable and non-renewable fuels used.

- **Biomass (wood) combined heat and power (CHP)**

Biomass is burnt in order to generate electricity. Heat is produced as a by-product, which can then be used for process heat, or supplying space or water heating.

- **Solar thermal panels**

Panels which produce hot water using the sun's heat. The systems can be designed so that the hot water produced also contributes to space heating demand ('solar space heating') but it is more commonly used to provide only hot water.

- **Heat pumps: water source, air source and ground source**

Technologies to extract low-grade heat from the external environment (the ground, air or a water body) and through a compression system produce heat for space or water heating or both. Although heat pumps rely on electricity to operate, their high co-efficient of performance (COP) means they extract more heat energy from the environment than they use in electricity. 'Exhaust air heat pumps' (which, in addition to extracting heat from the external air, also draw warmth from warm stale air leaving a building) have been included within the category air source heat pumps. However, units which are purely exhaust air heat recovery, without also extracting heat from the air outside, have not. Cooling provided by heat pumps has not been included in the database.

- **Energy from waste (EfW)**

Heat energy produced from the treatment of organic biodegradable waste other than wood. This category includes the following technologies:

- **Anaerobic digestion (AD):**

Organic matter is broken down in the absence of oxygen to produce methane gas. The methane is then burnt to produce heat, or burnt in a combined heat and power unit to generate both heat and electricity. In some cases, it can be upgraded to biomethane gas and injected into a gas grid. In some applications, the heat produced is used solely to maintain the anaerobic digestion process, which requires some heat input. Useful renewable heat has been classed as heat produced (and used) beyond that fed back into the anaerobic digestion process to maintain it, which is sometimes called the parasitic heat load.

- **Landfill gas capture:**

Landfill gas (methane from rotting organic matter in landfill) is captured and burnt to produce heat or used in a combined heat and power unit.

- **Biomass primary combustion:**

This category covers installations where materials other than wood, such as municipal solid waste and animal carcasses, are burnt directly to produce heat. For installations burning municipal solid waste, a proportion of the heat capacity and output is estimated to be renewable, based on the biodegradable proportion of the waste burnt.

- **Advanced thermal treatment (ATT), using pyrolysis or gasification or both**

Treatment of waste at high temperatures either in the complete absence of oxygen (pyrolysis) or a limited amount of oxygen (gasification) to produce gases which can be burnt to generate heat or heat and electricity.

- **Biomethane injection to the gas grid (BtG)**

This is the same technology as anaerobic digestion up to the point of having a biomethane (biogas) product. The resultant biomethane is not combusted on site but is 'upgraded'[2] to allow it to be injected into the gas grid, whilst ensuring it has similar properties to fossil natural gas. This technology will therefore allow the biomethane to displace fossil natural gas in the grid.

- **Deep geothermal**

Heat from deep underground is extracted by pumping water into a deep well, allowing it to heat up using the heat of the rocks, then abstracting the water via another well.

Had examples been found, fuel cell biomass could also have been included:

- **Fuel cell biomass**

Fuel cells running on biomass could be used to produce useful heat.

Technologies which are not included in the database, as they do not produce renewable heat, are:

- **Non-biomass combined heat and power (CHP)**

Combined heat and power units running on gas (or other fossil fuels) to produce electricity and heat. Because the heat from such units comes from fossil fuel sources, it has not been counted towards 'renewable heat' targets in this report.

- **Exhaust air heat recovery (EAHR)**

Systems for recovering the heat from warm stale air leaving a building, which is used to warm incoming air. This can help to reduce space heating requirements. However, because the heat being recovered for the building will normally have come from fossil fuels in the first instance, rather than being drawn from a renewable source, these systems have not been included as providing renewable heat.

- **Energy from waste: installations where the only fuel is hospital waste**

DUKES[3] considers hospital waste as non-biodegradable, so installations burning only hospital waste are not counted as producing renewable heat. However, installations which burn other wastes that are considered biodegradable such as municipal waste, in addition to hospital waste, have been included in the database**.**

[2] 'Upgrading' consists of: removing carbon dioxide and other impurities and adding propane to ensure similar energy content to natural gas already in the gas network. The gas is then odorised and compressed before being injected into the gas grid.
[3] Renewable Energy Statistics: Data Sources and Methodologies, Department for Business, Energy and Industrial Strategy: https://www.gov.uk/government/collections/renewables-statistics

The following renewable heat technologies are not included in the Renewable Heat Database:

- **Passive renewable heating**

This is where building design is used to ensure buildings benefit from features such as solar gain through large areas of south-facing glazing. Such design features can help a building meet its heat demand; however, they have not been included in this report or database, as the heat resource provided is very hard to assess.

- **Wind or hydro to heat (electricity)**

Wind to heat installations (where wind turbines produce electricity which is used to directly charge electric storage heaters for space heating) can be an important source of low-carbon heating in remote rural locations in Scotland. However, the electricity produced by these systems is already counted towards renewable electricity targets for Scotland, so estimates of heat from these systems have not been included in the renewable heat figures reported here.

Appendix 3. Renewable Heat Database assumptions

A3.1 Biomass efficiency assumption

Table C below lists the efficiencies used for calculating heat output of biomass boiler from known amount of woodfuel combusted.

Table C. Boiler efficiencies assumed for converting oven-dried tonnes of wood burnt to heat output

Installation size	Assumed boiler efficiency	MWh heat output per ODT burnt
Large installations (>1 MW, or >10,000 ODT)	80%	3.94
Small to medium installations (>45 kW – <1 MW, or <10,000 ODT) providing process heat	80%	3.94
Small to medium installations (>45 kW – <1 MW, or <10,000 ODT) providing space heating	75%	3.69
Micro installations (≤45 kW) (not MCS)	70%	3.44

A3.2 Running hour assumptions

Table D below shows the running hours of different technologies by sector and installation size that are used to calculate capacity of installation where output is available and to calculate output where only capacity for the installation is available.

Table D. Peak running hours assumed by technology, size and heat use

Sector and size of installation	Peak running hours/year
Large (>1 MW) biomass providing process heat	8,000
Energy from waste installations providing process heat.	8,000
Anaerobic digestion (<1 MW)	5,203
Commercial small to medium (45 kW – 1 MW) biomass.	5,000
Combined heat and power, all sizes	3,603
Space heating biomass, all sizes (including district heating).	2,500
Heat pumps providing space heating.	2,500
Heat pumps or biomass providing space heating for community buildings.	250

A3.3 Capacity assumptions

Table E below shows the assumed capacities that were used in the Renewable Heat Database where information on capacity was not available.

Table E. Assumptions used for capacity where not known, 2018[4]

Technology	Build type	Estimate of likely installed capacity (kWth)	Derived from
ASHP	Schools	6	Average of other school ASHP installations recorded within the database
ASHP	Domestic properties	7	Average of other ASHP in domestic properties recorded in the database
ASHP	Commercial properties	12	Average of other local business ASHP installations recorded in the database
ASHP/GSHP	Community Buildings	7	Average of other community heat pump installations recorded in the database
ASHP/GSHP	Other non-domestic buildings	7	Average of other local authority and housing association heat pumps in non-domestic properties recorded in the database
ASHP/GSHP	Public sector properties	7	Average of other public sector heat pump installations recorded in the database
Biomass	Community buildings	60	Average of other community biomass installations recorded in the database
Biomass	Public sector properties	110	Average of other public sector biomass installations recorded in the database
Biomass	Commercial properties	140	Average of other biomass installations recorded in the database
Biomass	NHS hospitals (small)	200	Average of other small to medium hospital biomass installations recorded in the database
Biomass	Schools	200	Average of other school biomass installations recorded in the database
Biomass	NHS hospitals (large)	1400	Average of other large hospital biomass installations recorded in the database
Biomass district heating	Other district heating	140	Average of other biomass district heating installations recorded in the database

[4] Energy Saving Scotland home renewable loans are loans for domestic renewables, administered by the Energy Saving Trust on behalf of the Scottish Government, and have been used to estimate average capacities for domestic solar thermal installs.

Biomass district heating	Community district heating	175	Average of other community biomass district heating installations recorded in the database
Exhaust ASHP	Domestic properties	7	Average of other ASHP - EAHR in domestic properties in the database
GSHP	Domestic properties	7	Average of other GSHP in domestic properties recorded in the database
GSHP	Commercial properties	30	Average of other local business GSHP installations recorded in the database
Solar Thermal	Community Buildings	6	Average of other community solar thermal installations recorded in the database
Solar Thermal	Schools	7	Average of other school solar thermal installations recorded in the database
Solar Thermal	Public sector properties	13	Average of other public sector solar thermal installations recorded in the database
Solar Thermal (installed 2011-14)	Domestic properties	2.38	Analysis of Energy Saving Scotland home renewables loans
Solar Thermal (installed 2014-18)	Domestic properties	2.8	Analysis of Energy Saving Scotland home renewables loans

Appendix 4. Merging the Renewable Heat Database with the non-domestic RHI database

A4.1 Background

The non-domestic Renewable Heat Incentive (RHI) is a renewable heat incentive scheme that opened to applicants in November 2011 (with scope for legacy applicants to apply for accreditation). The non-domestic scheme is designed to incentivise uptake of renewable heat technologies in mainly non-domestic applications but does include district heating for residential schemes[5]. The RHI is administered by Ofgem on behalf of BEIS.

In previous years, no site-level detail on the installations accredited (or awaiting accreditation) under the scheme has been shared with the Scottish Government or the Energy Saving Trust. However, for the first time this year the Scottish Government and EST were able to access the complete dataset comprising all active and terminated RHI accreditations for the 2018 calendar year. Under strict conditions of access to the RHI dataset EST conducted analysis on the RHI dataset, comparing it with EST's Renewable Heat Database (RHD).

For all systems on the RHI database where no match was found in the Renewable Heat Database, the capacity and 'heat paid for' were aggregated and provided for the calendar year 2018.

The variables provided by BEIS were:

- Number of full applications by technology and tariff band.
- Operational capacity by technology and tariff band.
- 'Heat paid for' under the RHI scheme, by technology and tariff band. It should be noted that this will not be an exact match for 'heat produced' but is the closest proxy available. As the RHI only pays for heat that is used for an eligible purpose[6], it can be directly translated into 'useful renewable heat output' for the purposes of this report.

Since many of the systems accredited under the RHI were already known about by the Energy Saving Trust from other data sources such as the Scottish Forestry's woodfuel surveys, checks were required to ensure, as much as possible, that the risk of double counting projects be kept to a minimum. The methodology to do so, and any limitations thereof, is described in detail in the following section.

[5] Communal and district heating include systems that link more than one property to the heat network. These may still be domestic applications but they are not eligible for support under the Domestic RHI scheme.
[6] Please see the RHI guidance for further details: https://www.ofgem.gov.uk/environmental-programmes/non-domestic-renewable-heat-incentive-rhi/eligibility-non-domestic-rhi

A4.2 RHI matching methodology

The analysis undertaken by EST was done using an extract of the Renewable Heat Database as of 31st July 2019. As per the work carried out by BEIS in previous years, all sites with a capacity of 0.5 MW (500 kW) or higher were manually cross-referenced with the Renewable Heat Database to ensure accurate matching of the sites with the largest capacity. The remaining data was then matched using formulae in excel to compare key pieces of information which could successfully identify a site occurring in both datasets.

The key identifiers used were:

- Exact match on the name of the project/install.
- Exact match on concatenation of the postcode, technology and capacity.
- Exact match on concatenation of the postcode and technology.

Any project which was automatically matched by the identifiers above was then checked manually to confirm the match was successful. In most cases, the automated checks matched successfully.

Where the matches were least successful, this seemed to occur due to the postcode or capacity not exactly matching between the two datasets. As a result, the checks were widened to include an exact match on the concatenation of postcode sector, technology and capacity; in effect widening the search area around the individual postcodes. Matched records from this check were not confirmed manually, instead the aggregated capacity and output of these records was removed from the RHI totals to minimise the risk of duplication.

Other checks were performed using exact matches on the full owning organisation name and concatenations of the local authority, technology and capacity. However, these checks proved to have a very low match rate owing to repeating organisations which own more than one accredited installation and local authority being too large a catchment area to be reliable.

A4.3 Uncertainties and duplication

In previous years, when this process was undertaken by BEIS on EST and the Scottish Government's behalf, potential duplicates were removed from the RHI totals using the logic set out in Table F below. Only projects deemed of 'medium' or 'high' risk were removed.

Table F. RHI Risk indicators no longer assigned to Renewable Heat Database records

Risk	Descriptor
Very low	• The record is for a microgeneration system (capacity ≤45 kW). All microgeneration systems were removed from the RHI data after merging to avoid double counting. Or • The record has a capacity of 0.5 MW or more. These records were all checked manually for a match. Or • The site is accredited under the Renewables Obligation (RO) scheme and claims the Combined Heat and Power uplift under that scheme[7]. These sites cannot claim support under the RHI as well.
Low	• The record was sent to BEIS for merging with the Renewable Heat Database and has good location information in the Renewable Heat Database. Or • The Renewable Heat Database records that the system was commissioned before November 2009, which would mean that the site is too old to claim RHI support. • The technology is unlikely to be supported by the RHI, as there are very few technologies in the RHI database (i.e. for CHP systems). • The system is not yet operational
Medium	• The record was sent to BEIS but has no, or poor, location information in the Renewable Heat Database. Or • The record was not sent to BEIS, is not a micro technology and was commissioned between 2009 late 2011. These systems may be double counted as they will not have been included in the analysis carried out by BEIS. They are not, however 'High' risk as they may not have taken advantage of applying to the RHI as a legacy applicant.
High	• The record was not sent to BEIS, is not a micro technology and commissioned late 2011 and is an RHI-eligible technology. These systems will not have been included in BEIS analysis but are more likely to have applied for RHI support following the launch of the scheme.

However, as we had access to all RHI accreditations at the site level, the logic followed previously was no longer applicable. Instead, as discussed under methodology section above, more manual checks were performed and only those which matched on postcode sector, technology and capacity, and which were also not manually confirmed, were removed from the RHI aggregated totals.

[7] For details please see https://www.ofgem.gov.uk/system/files/docs/2019/01/guidance_volume_1_oct_2018.pdf

This resulted in an approximate reduction of 20 MW of capacity and 26 GWh of heat output to the RHI totals for 2018. Provided EST are in a position to conduct the matching process again for the 2019 reporting year, this method will be further tested to ensure as little duplication of project counting occurs as possible.

Appendix 5. Reducing the risk of duplicate projects between Renewable Heat Database and MCS installs

As part of the annual data cleansing process, it was realised that there is likely duplication of capacity and output between installs that are known to be or are likely to be in a domestic setting and the installs received from MCS. In order to establish the potential impact of such risks, the following logic rules in Table G were applied to the database in order to split records into the associated risk categories.

Table G. MCS Risk indicators assigned to Renewable Heat Database records

Risk	Descriptor
Very low	• The record is not for a microgeneration system (capacity ≤45 kW) because the vast majority of installs reported by MCS are less than 45 kW in size. Or • The record is for a microgeneration system (capacity ≤45 kW) but the install was commissioned prior to 2010 which is before the start of the MCS.
Low	• The record is for a microgeneration system (capacity ≤45 kW) AND The installation build type is known to be non-domestic. MCS have confirmed that they have very few non-domestic installations in their MID database.
Medium	• The record is for a microgeneration system (capacity ≤45 kW) AND The installation build type is unknown, but the owner is not a local authority or housing association. The vast majority of domestic records within the Renewable Heat Database are sourced from local authorities or housing associations. Other organisation types are therefore deemed less risky.
High	• The record is for a microgeneration system (capacity ≤45 kW) AND the installation build type is likely to include some domestic installations For example, 'accommodation' or 'guest house' build types are more likely to be considered domestic than other non-mixed build types. These records are therefore deemed riskier, regardless of which organisation owns the installation.
Very High	• The record is for a microgeneration system (capacity ≤45 kW) AND The installation build type is known to be domestic OR • The record is for a microgeneration system (capacity ≤45 kW) AND The owner is a local authority or housing association AND The build type is unknown. Records provided by local authorities or housing associations are deemed high risk as the vast majority of known domestic installations are owned by such organisations.

Only records which were deemed ‘high’ or ‘very high’ risk were removed from the analysis. This resulted in around 45 MW of capacity and 100 GWh of output being removed from this year’s report. Part of the revising process for the 2017 published figures also included applying the same MCS duplicate risk logic; this resulted in a drop of around 30 MW of capacity and 75 GWh from last year’s analysis.

We will continue to evaluate the risk of duplication occurring throughout the next reporting year and make any amendments to the logic used as required.

Appendix 6. Combining Renewable Heat Database with CHP dataset

A6.1 Background

The CHPQA programme is a government initiative which aims to provide a practical, determinate method for assessing all types and sizes of combined heat and power schemes throughout the UK. The voluntary scheme, which is implemented by Ricardo-AEA, requires the submission of annual or monthly energy figures for electricity generated, fuel consumed, and heat utilised.

No site-level detail on the installations which are CHP certified under the CHPQA scheme has been shared with the Scottish Government or the Energy Saving Trust to date. It is, however, likely that the majority of CHP systems certified under the scheme are already known to EST from other data sources, including the FCS woodfuel survey, and the REPD.

At the time of collating data for this report, Ricardo-AEA were unable to share full site-level information on CHPQA certified installations but did undertake some analysis on the two datasets in order to estimate:

- Operational renewable heat capacity
- Useful renewable heat output

A6.2 Methodology

An extract of the CHP installations held in the Renewable Heat Database as of 12th July 2019 was sent to Ricardo-AEA[8]. Sites were matched with the CHP database using key variables, including site names, organisation names and address data.

For all renewable energy generating systems in the CHP dataset where no match was found in the Renewable Heat Database, the annual renewable capacity and useful heat output were aggregated and provided for the calendar year of 2018.

A6.3 Uncertainties and duplication

As there are only a small number of CHP installations recorded in the Renewable Heat Database and all installations have good address level data, the risk of double counting or missing sites during the matching process has been deemed to be relatively low. However, if the matching process is repeated in future years, the risk of double counting would need to be reassessed.

The only risk as of yet identified is that in order to get access to the non-domestic RHI CHP tariff, the installation needs to also be accredited under CHPQA. In light of this, we have not

[8] Any personal data was removed from the EST extract in compliance with GDPR/DPA 2018; any data provided to EST as otherwise confidential was also removed from the database before sharing with BEIS.

included the capacity or output figures provided by Ricardo-AEA for the solid biomass CHP technology type. We will continue to review the methodology and logic used in order to ensure the risk of potential duplication is as minimal as possible.

As the CHPQA programme is a volunteer scheme, it is possible that there are operational CHP systems operational in Scotland that have not been captured by the Renewable Heat Database, or by the CHP dataset.

Appendix 7. Measurement of heat demand in Scotland

This Appendix sets out:

- How the Scottish Government derived the original 11% renewable heat target
- How until the 2012 report (monitoring progress to 2011) the Scottish Government monitored progress on renewable heat as a percentage of projected 2020 heat demand.
- An explanation of how improved data and an updated methodology is being used to monitor renewable heat as a percentage of annual non-electrical heat demand in Scotland.

A7.1 Background

Heat has been estimated to account for more than half of Scotland's total energy use[9]. Switching from fossil fuel to renewable heat sources has the potential to reduce greenhouse gas emissions and make a significant contribution to Scotland's overall renewable energy target. The 2009 Renewable Heat Action Plan[10] sets a target of delivering 11% of Scotland's projected 2020 (non-electrical)[11] heat demand from renewable sources.

In 2006, the Scottish Energy Study[12] described Scotland's current energy supply, energy consumption and energy-related CO_2 emissions during 2002. This was the first major study of energy supply and demand to be conducted in Scotland for more than a decade. At that time, the discrete study provided the most robust data source available for estimates of energy consumption in Scotland. This study produced estimates for 2002 and subsequently a figure for 2020 heat demand was derived from these estimates. This heat demand figure was subsequently used to derive the 11% heat target (detailed in section A7.2). Due to improved availability of heat demand data for Scotland (detailed in section 11.3), the heat demand figure derived in 2006 is no longer used to monitor progress towards the 2020 target.

A7.2 Derivation of the 11% heat target

The target figure of 11% for renewable heat by 2020 was derived using the estimated contributions that renewable electricity and renewable transport would make to the overall 2020 renewable energy target. Based on the requirements of total non-electrical heat demand in Scotland at the time, it was estimated that renewable heat must contribute 6,420 GWh of

[9] Energy Statistics Database, September 2019, Scottish Government, https://www2.gov.scot/Topics/Statistics/Browse/Business/Energy/Database
[10] Renewable Heat Action Plan (2009). http://www.scotland.gov.uk/Publications/2009/11/04154534/0
[11] To avoid double counting we measure the non-electrical heat component against the heat target, acknowledging that the demand for heating delivered by electricity will be included as part of the renewable electricity target. The Scottish House Condition Survey (2016) estimates that around 11% of households in Scotland use electricity as their primary heating fuel.
[12] Scottish Energy Study, Vol 1 (2006). http://www.scotland.gov.uk/Publications/2006/01/19092748/0

output in order for Scotland to meet its 2020 Renewable Energy Target. Total heat energy demand in Scotland in 2020 was estimated to be 60,089 GWh using data from the 2006 Scottish Energy Study. Therefore, the target was set at 11% (See Table H).

Table H. Description of the derivation of the renewable heat target (estimated 2020 figures)

Step	Step description	Output (GWh)
1	Total energy demand	160,307
2	Renewable energy target (20%)	32,061
3	Estimated renewable electricity contribution (50% target[13])	22,244
4	Estimated renewable transport contribution (10% target)	3,397
5	**Renewable heat output required (remainder)**	**6,420**
6	Total energy consumed within domestic, industrial and service sectors	95,276
7	Less: electricity consumption in these sectors	35,187
8	**Derived heat energy demand**	**60,089**
9	**Therefore, renewable heat required**	**c. 11%**

A7.3 Improving data on heat demand in Scotland

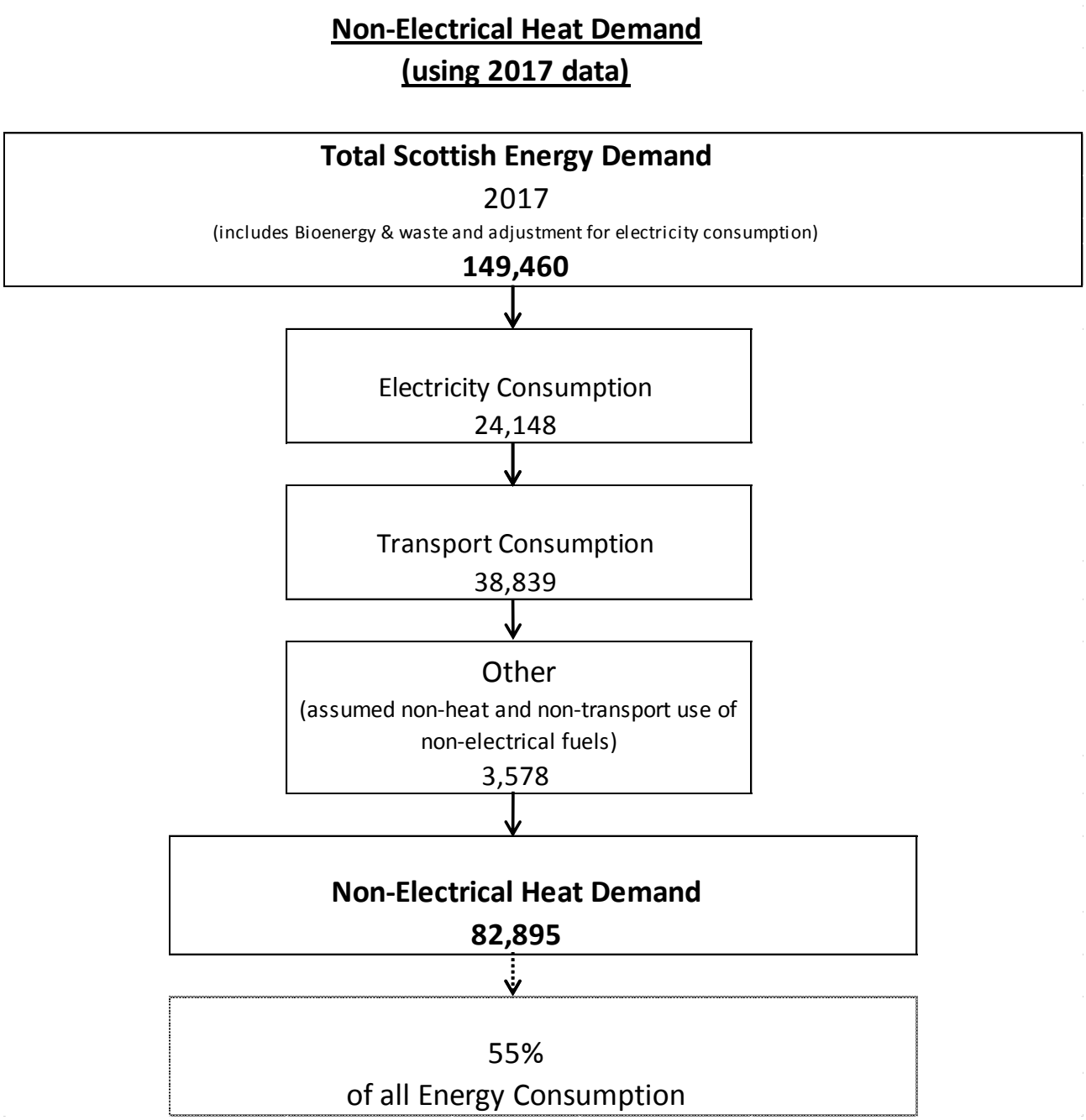
In the years following the publication of the Scottish Energy Study, BEIS began publishing more detailed sub-UK estimates of energy consumption[14] which has enabled the development of a systematic and robust method of monitoring (non-electrical) heat demand in Scotland on an annual basis. The Scottish Government has worked with colleagues in BEIS to derive a heat demand methodology for Scotland which will allow more accurate annual measurement of progress towards the renewable heat target.

BEIS data shows a breakdown of final energy consumption by end use for Scotland down to local authority level. By subtracting electricity and transport consumption from the final energy consumption figure, this results in an estimate for non-electrical heat demand in Scotland (see the flow chart in Figure A below for more detail).

[13] The heat target was derived at a time when the renewable electricity target in Scotland was set at 50%. http://www.scotland.gov.uk/News/Releases/2007/11/27095600

[14] Total final energy consumption at sub-national level, BEIS. https://www.gov.uk/government/collections/total-final-energy-consumption-at-sub-national-level

Figure A. Heat demand methodology



The methodological differences between the 2006 Scottish Energy Study and BEIS's annual estimates of final energy consumption have implications for the monitoring of the renewable heat target. Table I presents a time series using both sources, demonstrating the impact this annual heat demand estimate has made on measuring progress towards the 11% renewable heat target.

It is important to note that BEIS's estimates of final energy consumption (from 2005 onwards) are subject to annual revision. This can impact on the Scottish Government's time series of non-electrical heat demand, and hence the renewable heat target progress figures.

In 2019 BEIS adjusted their methodology to calculate sub-national energy consumption; it now includes petroleum use in the public sector and agriculture which it didn't before. In September 2019, BEIS published a revised time series back to 2005. Previously heat demand was assumed to be all gas and residual fuels not used for transport, but end use of these fuels is not definitely known from the sub-national statistics. BEIS's Energy Consumption in the UK (ECUK) publication breaks down end use for heat by sector and fuel, but this data applies to Great Britain as a whole. To estimate use for heat in Scotland, the proportion used for heat for each fuel and sector was applied to the Scottish consumption figures to calculate a more realistic representation of Scottish heat demand. The ECUK data shows that approximately 96% of non-transport consumption from coal, petroleum, manufactured fuels and bioenergy and wastes is used for heat.

Table I. Renewable heat and renewable heat as a percentage of heat demand

	2008/9	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Total renewable heat output (GWh)	863	Not estimated	1,363	1,690	2,045	2,266	3,071	4,205	3,752	4,569	5,230
% of total non-electrical heat demand	**0.9%**	**1.2%**	**1.5%**	**2.0%**	**2.4%**	**2.7%**	**3.9%**	**5.3%**	**4.7%**	**5.5%**	**6.3%**
Heat demand (GWh)	94,380	87,058	89,461	86,609	85,540	83,422	79,670	78,694	79,695	82,895	82,895

Note: The percentage of non-electrical heat demand met by renewable sources for 2008/9 uses the heat demand value for the 2008 calendar year and the resulting percentage is therefore an approximate indication.

As renewable heat output was not estimated for 2009, the percentage of non-electrical heat demand to be met by renewables for that year has been interpolated from the 2008/9 and 2010 values.

A7.4 Summary of the changes as a result of the new methodology

Advantages

- The target can now be measured annually against the heat demand in a particular year, allowing more accurate monitoring of target progress.
- Improves the comparability and consistency with other energy target measures.

Issues

- There is a lag in the availability of BEIS sub-UK consumption data – 2018 data will not be available until September 2020.
- An adjustment is made to the electricity consumption data to account for discrepancies within BEIS datasets.
- The adjustment of figures for heat end use is based on the proportion used for heat in GB as a whole. There may be reasons to believe that Scotland's proportion used for heat may be different. A greater proportion of buildings being off the gas grid in Scotland and higher heating demand may be reasons why Scotland might be different to the rest of GB.

Further improvements

- An update to the 2018 Renewable Heat Report will be published in early 2020 which will blend the 2018 gas demand data with the 2017 heat demand figure from residual fuels, both datasets provided by BEIS, to generate a more representative estimate of non-electrical heat demand in Scotland.

To ensure transparency the Scottish Government has published both measures in parallel, for a transitional period, as the evidence base regarding heat use in Scotland is continuously being improved.

For any queries or feedback on the new measure, or on the measurement of heat demand in Scotland in general, please contact energystatistics@scotland.gsi.gov.uk.