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Renewable Heat in Scotland

2020 report

Report produced for the Scottish Government by Energy Saving Trust

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Contents

1. Introduction

1.1. Changes to the report

Version two of this report corrects an error with the estimated heat output at some large biomass sites.

For 2020, biomass output was reduced from 3,578GWh to 3,512GWh; total output was reduced from 5,074GWh to 5,008GWh and the Scottish Government's progress towards their target remains unchanged at 6.4% due to rounding and is now an increase, rather than a decrease, compared to the corrected 2019 values.

For 2019, biomass output was reduced from 3,816GWh to 3,531GWh; total output was reduced from 5,209GWh to 4,925GWh and progress towards the target was reduced from 6.6% to 6.2%. This change results in an increase to overall progress against the target between 2019 and 2020, rather than the decrease previously reported.

For 2018, biomass output was reduced from 3,878GWh to 3,663GWh; total output was reduced from 5,028GWh to 4,813GWh and progress towards the target was reduced from 6.2% to 6.0%.

Some percentages contained in the local authority analysis section of this report have also been changed as a result of corrections in the overall contribution of different technology classes.

The corrected figures have been used throughout this report. **Previously published figures are no longer applicable.**

1.2. Background

The Scottish Government has set a target for 11% of non-electrical heat demand in Scotland to be met from renewable sources, such as biomass or heat pumps, by 2020.[1] Non-electrical heat demand is defined as any fuel used for space heating, hot water or process heat except for any heat used solely to generate electricity. Please note that we use 'non-electrical heat demand' throughout this report as a shorthand for energy content of fuel consumed for non-electrical heat demand for ease of reading. All figures presented throughout this report are taken from a revised time series for Renewable Heat in Scotland spanning from 2010 to 2020; thus the figures may differ from those in previous publications and are intended to replace any historically published figures.

In order to measure progress against this target, two values are required:

[1] Renewable Heat Action Plan for Scotland, the Scottish Government, November 2009: https://www.gov.scot/publications/renewable-heat-action-plan/
Replaced by The Heat Policy Statement in June 2015: https://www.gov.scot/publications/heat-policy-statement-towards-decarbonising-heat-maximising-opportunities-scotland/

- An estimate of the energy content of the fuel consumed for non-electrical heat demand. This figure is derived from sub-national fuel consumption data produced by the UK Government department for Business, Energy and Industrial Strategy (BEIS).
- An estimate of renewable heat output which is compiled from a number of datasets:
    - The Renewable Heat Database maintained by Energy Saving Trust on behalf of the Scottish Government. This dataset contains capacity and yearly heat output for all known renewable heat projects in operation or in development and is updated annually.
    - Unpublished data covering Scottish accreditations under the domestic and non-domestic Renewable Heat Incentive (RHI) schemes, provided by BEIS.
    - Unpublished data covering accreditations under the Microgeneration Certification Scheme (MCS) provided by MCS.

This report tracks progress towards the Scottish Government's renewable heat target. It also provides commentary on accreditations under the domestic and non-domestic RHI schemes between December 2020 and August 2021, as an indicator of the growth in renewable heat into the next reporting year.

The report begins with a summary of the key findings followed by an outline of the methodology (with a more detailed methodology included in the appendices). We continue with an in-depth examination of the Scottish Government's renewable heat target and the factors affecting progress towards it between 2010 and 2020. We then discuss renewable heat development between 2010 and 2020 in regard to the number of installations and capacity of different technologies including an estimate of renewable heat growth for the 2021 reporting year so far. In addition, we have included case studies for four local authority groups detailing the growth in renewable heat in their respective areas. The report concludes with recommendations to improve the analysis of renewable heat in Scotland.

Where any reference is made in this report to an appendix, please see the separate Renewable Heat in Scotland Report 2020 appendices file which can be accessed from the Energy Saving Trust website. Only the 2020 report appendices are applicable to this report because many of the calculations, sources and assumptions used in the analysis are reviewed and updated on an annual basis.

2. Summary

The key findings of the Renewable Heat in Scotland, 2020 report are:

- In 2020,[2] 6.4% of non-electrical heat demand was met by renewable technologies; a little over half-way towards the target of 11% by 2020. This represents an increase of 4.5 percentage points (up from 1.9%) since 2010 and an increase of 0.2 percentage points from 2019. See Figure 1.[3]
- An estimated 5,008GWh of useful heat output was generated by renewable technologies in 2020, an increase of 2% (83GWh) from 4,925GWh in 2019 and more than triple the output generated in 2010 (1,667GWh).[3]
- The increase in output between 2019 and 2020 was primarily from heat pumps (83GWh), medium sized biomass installations (32GWh) and biogas (19GWh). Overall growth has been limited by a 52GWh output reduction from large biomass sites due to changes in operation at a small number of these sites.
- Between 2010 and 2020, the annual change in renewable heat output in Scotland has been driven by new biomass installations or changes in operation at large biomass installations. However, since 2014 the share of total heat output provided by biomass has steadily declined from 91% to 70% in 2020. This has occurred as the uptake of biomass has slowed since 2014 and the rate of uptake of other technologies has increased.
- In 2020, less than half (42%) of the reported renewable heat output is from large sized (>1MW) installations whereas it was 86% in 2010. For comparison, the share of renewable heat output from medium sized installations rose from 1% in 2010 to 21% in 2020. For biomethane producing sites, the share of total output rose from 0% in 2010 to 14% in 2020.
- Scotland's non-electrical heat demand was estimated at 78,844GWh in 2019, slightly lower than the 80,864GWh consumed in 2018 and lower than the 88,180GWh consumed in 2010.[4] This downward trend is assumed to be due to improving energy efficiency, improving heating system efficiencies, and increasing average annual temperatures.
- 2.14GW of renewable heat capacity was operational in Scotland by the end of 2020, up from 2.06GW in 2019 and from 0.44GW in 2010.
- The total reported heat output and capacity comes from 38,920 operational renewable energy installations, up from 35,730 in 2019.
- Heat pumps were the technology class to increase by the greatest number of installations between 2019 and 2020, with 3,020 additional installations reported.

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[2] All annual results are reported by calendar year from 1 January to 31 December.
[3] The 2018, 2019 and 2020 overall output values and the progress towards the target in each year have been revised due to a correction to output from some large biomass installations. See Section 1.1 "Changes to this report" for more information. These corrections have been applied throughout the report.
[4] The 2019 value has been rolled over to 2020 because the final sub-national fuel estimates for a given calendar year are not available until the publication of the subsequent Renewable Heat in Scotland report.

This was also the greatest annual increase in heat pump numbers seen between 2010 and 2020. Since 2010 the number of heat pump installations has risen from 2,850 to 20,680 in 2020.

- Approximately 59% of the total reported heat output is accredited under both RHI schemes, 54% under the non-domestic RHI scheme and 6% under the domestic RHI scheme.

Figure 1 shows the change over time in the percentage of non-electrical heat demand met by renewables with the 2020 target marked for reference.[5]

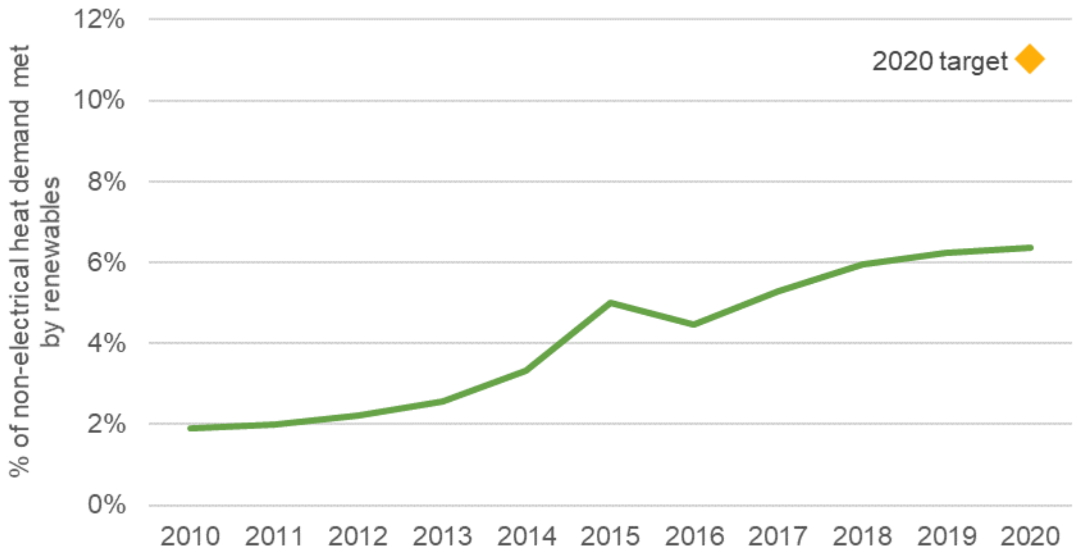

Figure 1. Renewable heat target and the percentage of non-electrical heat demand met by renewables in Scotland, 2010 to 2020

[5] Reduction in 2016 primarily due to changes in operation at a small number of very large capacity biomass sites.

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3. Methodology

Energy Saving Trust has maintained and updated the Renewable Heat Database for the Scottish Government on an annual basis since 2011. The heat output estimate for 2020 contained in this report has been generated by a further update of the information held in the database alongside cross-analysis with other externally provided datasets.

3.1. Rounding conventions and units used

Throughout this report all output values are shown in gigawatt hours (GWh)[6] and capacities are shown in gigawatts (GW).[7] For ease of reading, the report utilises the following rounding conventions:

- All output values have been rounding to the nearest whole number except those which are less than 1GWh which are shown as <1.
- All capacity values have been rounded to two decimal places except those which are less than 0.01GW which are shown as <0.01.
- All number of installation figures have been rounded to the nearest ten except those which are less than ten which are shown as <10.

Due to rounding, some figures may not be precisely consistent with summed totals or percentage changes.

3.2. Data sources used

Listed in Table 1 are the main data sources used and the organisations which supplied them. In addition, other organisations and individuals connected with specific installations were contacted and also provided information.

[6] 1GWh = 1,000MWh = 1,000,000kWh.
[7] 1GW = 1,000MW = 1,000,000kW.

Table 1. Main datasets used and the timeframe covered[8]

Organisation	Dataset	Timeframe
Department for Business, Energy and Industrial Strategy (BEIS)	Extract of Scottish installations accredited under the domestic Renewable Heat Incentive schemes	2009-2020
Department for Business, Energy and Industrial Strategy (BEIS)	Extract of Scottish installations accredited under the non-domestic Renewable Heat Incentive schemes	2011-2020
MCS	Extract of Scottish installations accredited under the microgeneration certification scheme (MCS)	2010-2020
Scottish Forestry (survey carried out by EST on their behalf)	Annual woodfuel survey of large capacity (>1MW) wood fuelled biomass installations in Scotland	2010-2020
Eunomia, on behalf of BEIS	The Renewable Energy Planning Database (REPD)	2011-2020
Energy Saving Trust, on behalf of the Scottish Government	Renewable heat installations funded by Resource Efficient Scotland's Small and Medium Enterprise (SME) Loan Scheme	2014-2020
Energy Saving Trust, on behalf of the Scottish Government	Data from the District Heating Loan Fund and the community and locally owned renewable energy database	2011-2020

3.3. Technologies included

The following list is of the technology classes which produce heat from renewable sources and are currently held within the Renewable Heat Database, as well as the specific technologies which can be found within those classes.[9] More detailed descriptions of these technologies can be found in Appendix 2.

[8] Some of the timeframes covered by the datasets listed are longer than the duration of the schemes to date. This is because some datasets include heat output values for legacy installations which were in operation prior to the start of the scheme that they were later accredited under.

[9] Some of the technology classes used in this report have changed from the previous report to better align our reporting with other UK and Scottish Government statistics. In particular, biomass heat-only and biomass CHP installations now share one 'Biomass' class, and the previous 'Energy from Waste' class has now been split into 'biogas', 'bioliquid', 'biomethane' and 'waste combustion' classes.

- Biogas combustion
  - Biogas produced by anaerobic digestion
  - Biogas produced by landfill
  - Biogas produced by pyrolysis or other advanced conversion methods
- Biomass combustion
  - Biomass heat-only installations
  - Biomass combined heat and power (CHP) installations
- Biomethane
  - Biomethane injection to gas grid
- Heat pumps
  - Air source heat pumps
  - Ground source heat pumps
  - Water source heat pumps
- Solar thermal panels
- Waste combustion
  - Combustion of solid municipal waste[10] or refuse derived fuel of which a percentage is assumed to be renewable[11]

3.4. Installation size categories

Individual installations are classified into five size categories; four based on the installation capacity and a fifth specific to biomethane installations which do not have a capacity. The installation size categories are described in kilowatts (kW) or megawatts (MW) rather than gigawatts and are as follows:

- Large (≥1MW)
- Medium (>200kW – <1MW)
- Small (>45kW - ≤200kW)
- Micro (≤45kW)
- Biomethane

[10] Waste installations where the only fuel is clinical (hospital) waste are not included.
[11] The percentage of municipal waste assumed to be renewable is 50% in line with the latest BEIS RESTATS methodology. https://www.gov.uk/government/collections/renewables-statistics

3.5. Estimating non-electrical heat demand

The fuel consumed for non-electrical heat demand values are derived from the sub-national final energy consumption data published by BEIS on an annual basis. The full methodology for deriving the non-electrical heat demand figures for Scotland are discussed in Appendix 6.

It is important to note that the energy content of the fuels used for non-electrical heat demand do not take into account the efficiencies or losses of the systems consuming said fuels. The renewable heat output figures do consider system efficiencies and other losses, either via using metered datasets or by applying adjustments through the Renewable Heat Database assumptions and calculations. By comparing the two, we are therefore underestimating the percentage of fuel consumed for non-electrical heat demand being met by renewables by an unknown amount. However, this is the best possible estimate of the progress towards the 2020 target with the datasets and information currently available for reporting purposes.

4. Results

4.1. Progress towards the 2020 target

At the end of 2020, the percentage of non-electrical heat demand to be met by renewables was estimated to be 6.4%, meaning that the Scottish Government had progressed slightly more than half-way (58%) towards their 2020 target of 11%. This progress was made by 5,008GWh of renewable heat output produced from an installed capacity of 2.14GW spread across 38,920 installations. Figure 2 shows the progress towards the 2020 target between 2010 and 2020.

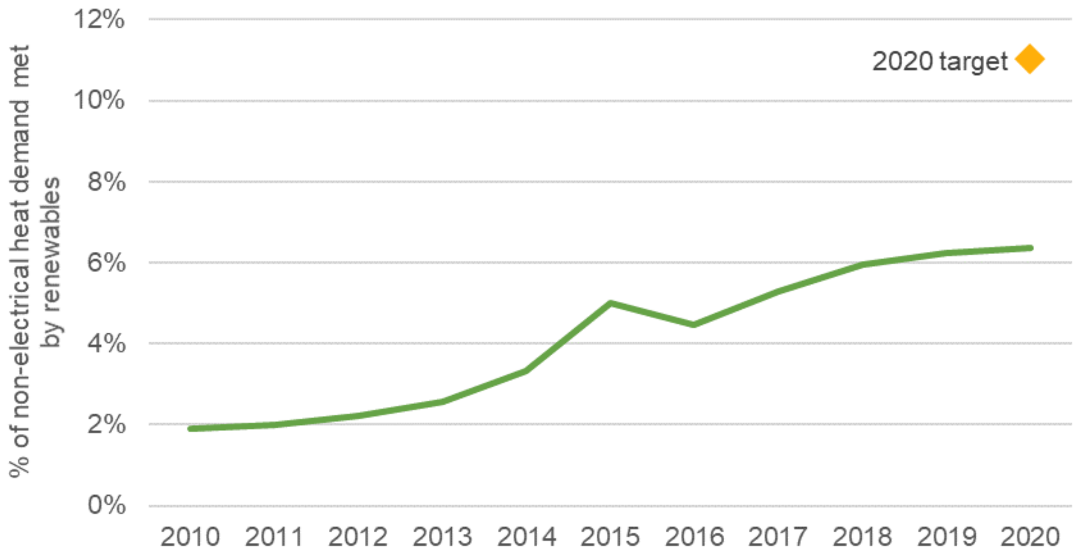

Figure 2. Renewable heat target and the percentage of non-electrical heat demand met by renewables in Scotland, 2010 to 2020

Although there has been progress towards the 11% target since 2010, in most years the rate of progress has not been great enough to achieve said target by the end of 2020. In an example scenario where growth in heat output occurred evenly each year, 701GWh of additional heat output would have been required each year to meet the target.

Figure 3 shows the average annual change in renewable heat output alongside the average annual required growth. In only two years, 2015 and 2017, was the required level of growth met or exceeded, when renewable heat output increased by 1,245GWh and 804GWh respectively. In contrast, there was a reduction in heat output in 2016 by 364GWh, largely because of changes in operation at a small number of large biomass sites. In the remaining seven years, there was some growth in renewable heat output but below the average level required to meet the target.

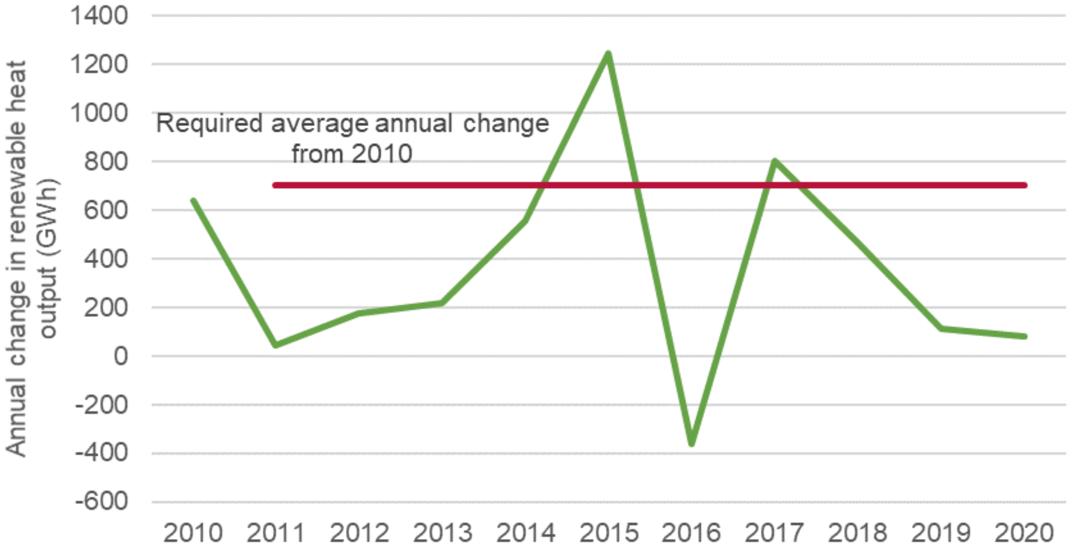

Figure 3. Annual change in renewable output (GWh) in Scotland, 2010 to 2020

To explain why progress towards the target, or lack thereof, has occurred in a given year, we must examine in more detail the two variables that influence progress: non-electrical heat demand and renewable heat output. Figure 4 shows the change over time for non-electrical heat demand and renewable heat output between 2010 and 2020.

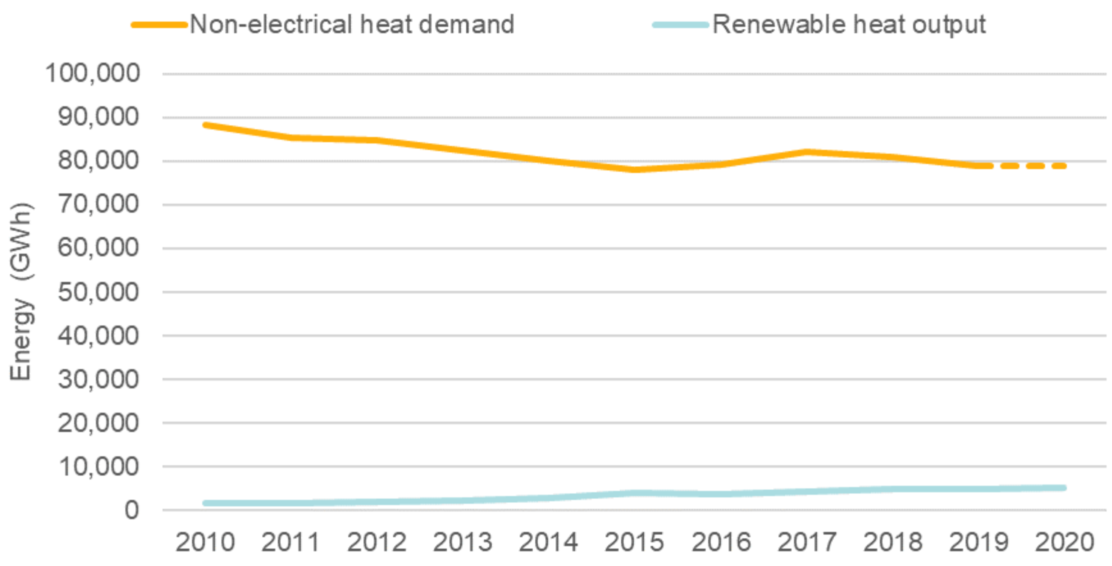

Figure 4. Estimated non-electrical heat demand vs renewable heat output in Scotland, 2010 to 2020[12]

[12] Non-electrical heat demand for 2020 has been estimated by holding the 2019 value constant. See the Scottish Government's Scottish Energy Statistics Hub later on in 2021 for an updated figure for 2020. https://scotland.shinyapps.io/Energy/

Non-electrical heat demand has fallen by 11% (9,335GWh) between 2010 and 2020 due to a combination of factors assumed to include improved energy efficiency of properties or processes using heat, improved efficiency of heating technologies providing heat and less demand for heat as a result of increasing average annual temperatures. This means that the amount of renewable heat output required to meet the 11% target has also decreased in line with overall non-electrical heat demand, making the target easier to reach over time. However, whilst non-electrical heat demand has generally been trending downwards, it did rise in 2016 by 1.6% (1,250GWh) and again in 2017 by 3.4% (2,715GWh).

Turning then to examine the change in renewable heat output over time, Figure 5 shows the total renewable heat output, total biomass renewable heat output as well as the output for each biomass installation size category and the total renewable heat output of all other (non-biomass) technologies. It is clear that the total output follows a very similar pattern to biomass for the majority of the time series and in particular the large sized biomass installations. The significant drop in percentage of non-electrical heat demand met by renewables seen in 2016 corresponds to a sharp drop in large biomass output for that year of 970GWh due to changes in operation at a small number of these sites.

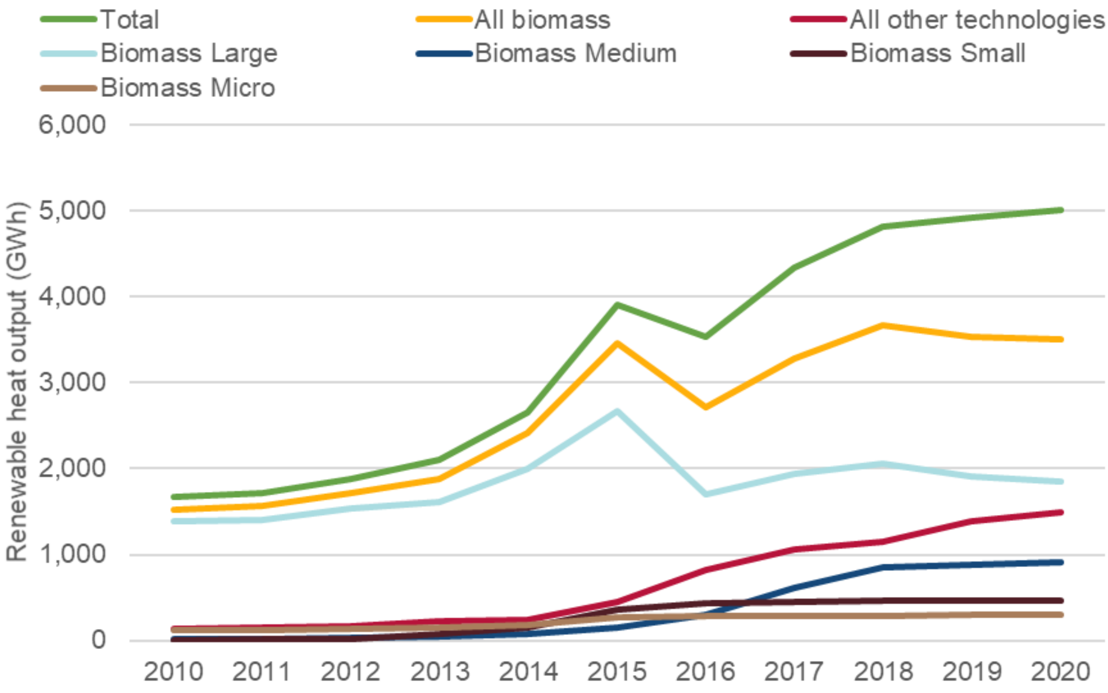

Figure 5. Total renewable heat output and renewable heat output for all biomass, biomass by installation size category and all other (non-biomass) technologies, 2010 to 2020

From 2017 onwards biomass continued to play a pivotal role in determining the progress towards the 2020 target. The growth in total output slows considerably when reductions to large biomass output occur in 2019 and 2020, despite steady growth in all other non-biomass technologies. It can also be seen that from 2017 onwards the trend in total output has become more influenced by a wider range of technologies and installation size categories. In 2010, biomass contributed 92% of total output compared to 70% in 2020.

The increased growth in output from non-biomass technologies was greater than the reduction in large biomass output occurring in 2019 and 2020. Figure 6 shows the change in output from non-biomass technologies between 2010 and 2020.

Other than large biomass, biomethane has also resulted in some noticeable step changes. Before 2014 there were no known biomethane installations producing fuel for injection into the gas grid but since then the output (which for biomethane is the calorific value of the gas injected into the gas grid) has risen by 716GWh despite there being relatively few biomethane producing sites in Scotland (around 20). Heat pumps have contributed to the total output figures throughout the time series with a slight ramping up in output growth from 2017 onwards. Biogas has shown relatively consistent growth between 2010 and 2020 and based on the data we have available, which is assumed to be mostly biogas produced by anaerobic digestion. The outputs from bioliquid, solar thermal and waste combusting installations have not changed considerably over the time series.

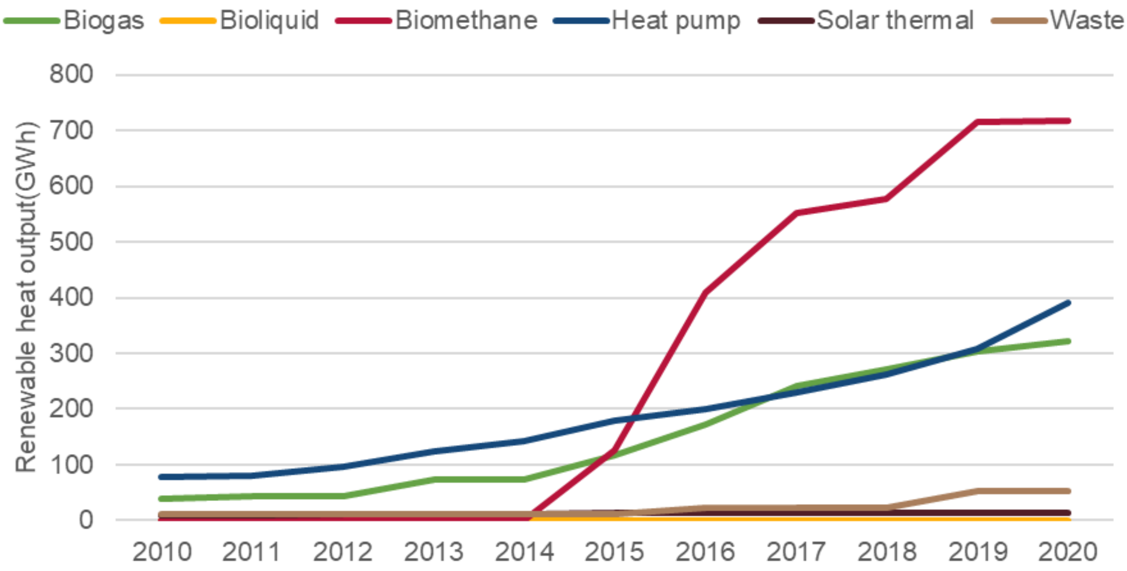

Figure 6. Renewable heat output for non-biomass technologies, 2010 to 2020

4.2. Renewable heat developments between 2010 and 2020

We have already examined the output of various technologies in relation to total renewable heat output and progress towards the 2020 target, however, output by itself does not indicate various developments across the renewable heat sector. This is because output is influenced not just by new installations, but also changes in operation at existing installations. This means that a rise or fall in heat output, particularly at the large sized installations which are pivotal to the overall heat output trends, may mask some of the developments occurring in other installation size categories or technologies. This section focuses on the number of installations and total renewable heat capacity by technology and installation size category to give a more detailed picture of when and what new installations have been installed.

Figures 7 and 8 show renewable heat capacity and number of installations by technology class between 2010 and 2020. Bioliquid, biomethane and solar thermal lines are not clearly visible but are behind the waste line.

Figures 7 and 8 show that large sized biomass installations have provided the greatest proportion of renewable heat capacity despite being responsible for relatively few installations. Biomass installations tend to have a higher installed capacity compared to other renewable heating technologies because they are often used in non-domestic settings. This could be to provide process heat, generate electricity with some heat exported to other end uses or users, meet very high space heating and hot water demands such as in hospitals or provide heat to heat networks.

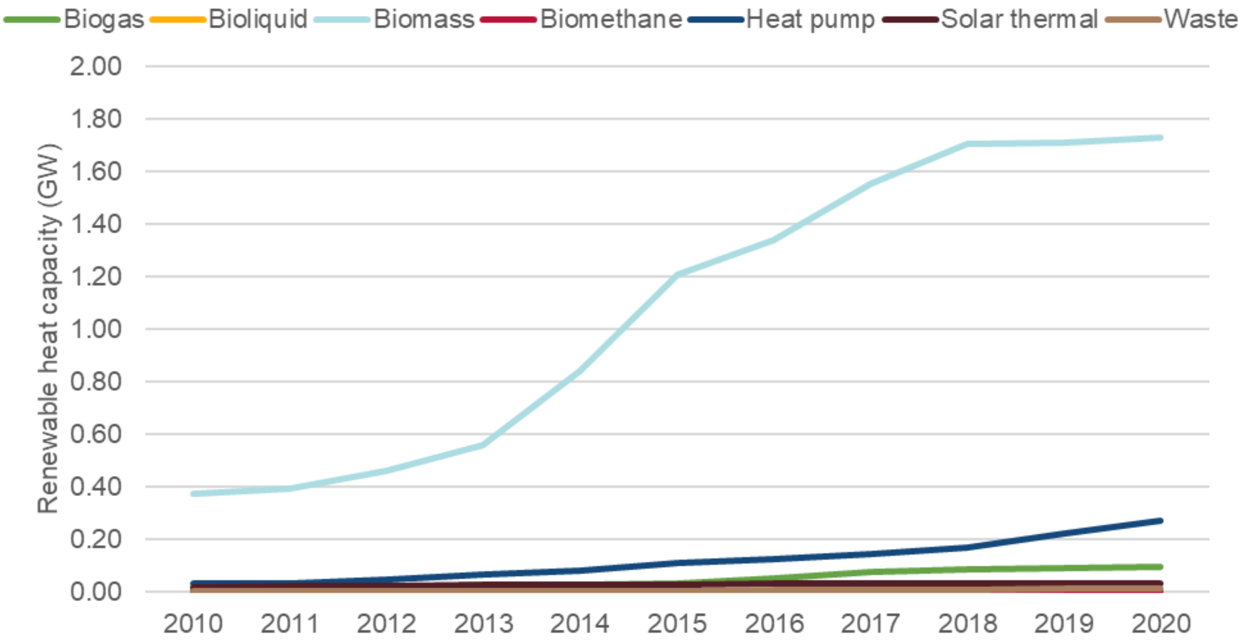

Figure 7. Renewable heat capacity (GW) by technology class, 2010 to 2020

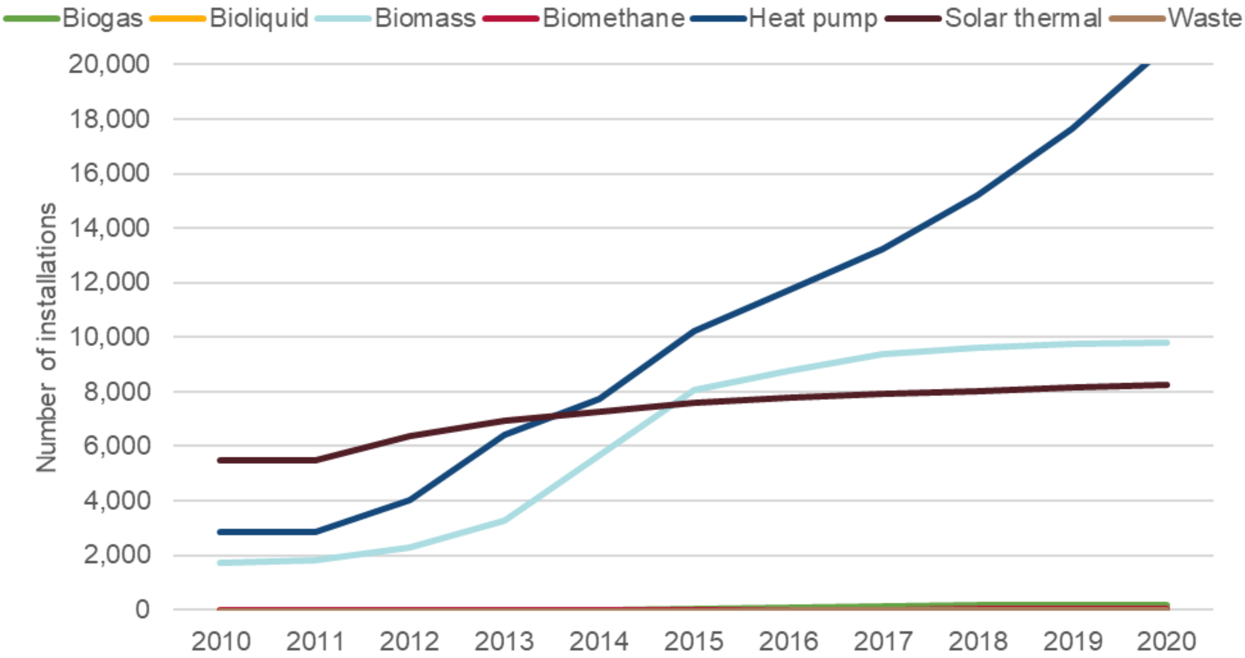

Figure 8. Number of renewable heat installations by technology class, 2010 to 2020

Unlike the output trend in Figure 5, where there is a large drop in 2016, the capacity and number of installs for biomass have not decreased. Biomass capacity and number of installs rapidly increased until 2016 when uptake started to slow before plateauing in 2018 onwards. This trend culminated in 100 or fewer new biomass installations reported in both 2019 (100) and 2020 (90). This means that the main reason for the drop in total biomass heat output in 2019 and 2020 is the change in operation at some large biomass sites which has masked the growth in output from the relatively small number of new biomass installations from all other biomass installation size categories. The higher uptake of biomass before 2016 is considered to be driven by higher RHI tariff rates which have reduced over time as part of the RHI schemes' degression mechanism where tariff rates are lowered as budget caps for technologies are met as the technologies are deployed.

The heat pump technology class consistently has the largest number of installations throughout 2010 to 2020, and Figures 9 and 10 further detail this by heat pump source. Micro sized heat pumps make up 72% of installed heat pump capacity and 99% of the number of heat pump installations. By number, the majority (85%) are assumed to be in domestic settings because they are either accredited through MCS, which is predominantly used to accredit domestic installations, or are known to be in domestic settings because they are accredited under the domestic RHI. This domestic percentage is also likely to be an underestimate because it does not include installations from schemes predating the domestic RHI scheme, such as the Scottish Government's SCHRI scheme, because the data we have for those programmes is anonymised and contains both domestic and non-domestic installations. By 2020 the number of heat pump installations is greater than the number of all other technology classes combined. In 2010 heat pumps made up 28% of all renewable heat installations, rising to 53% in 2020.

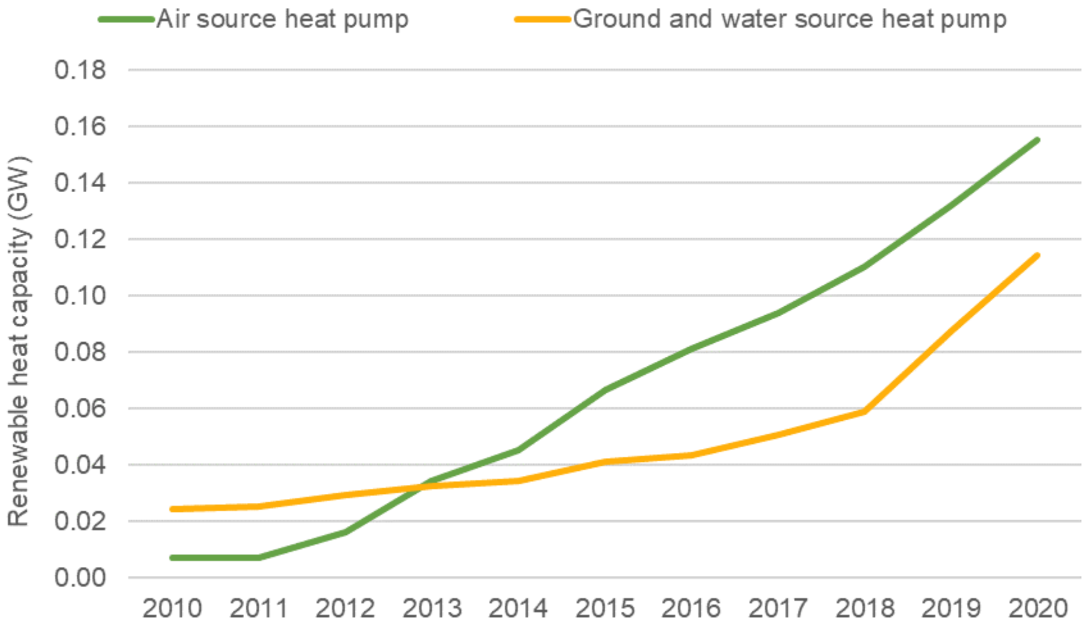

Figure 9. Renewable heat capacity of heat pump technologies, 2010 to 2020

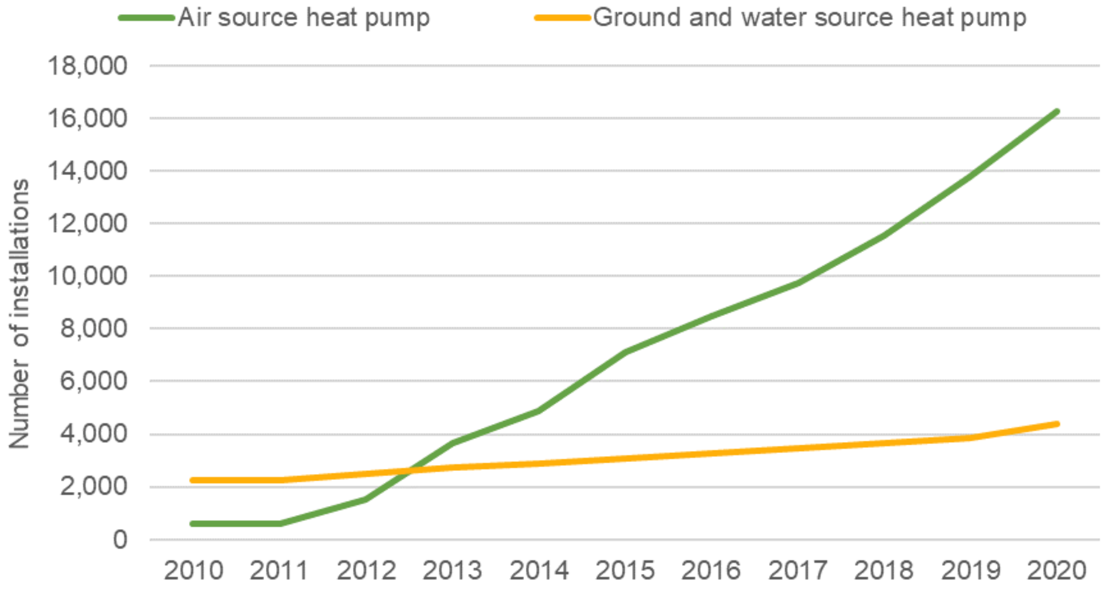

Figure 10. Number of installations of heat pump technologies, 2010 to 2020

The trend in the number of installations is quite similar to the trend in capacity except for ground and water source heat pumps between 2018 and 2020 when capacity has risen at a greater pace relative to the increase in number of installations.[13] In 2020, ground and water source heat pumps accounted for 17% of new heat pump installations and were responsible for 54% of new heat pump capacity.

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[13] Not all of the data sources used to produce this report distinguish between ground and water source heat pumps and we have therefore kept them grouped here.

The reported biogas and biomethane output and capacity have come from relatively few installations. In 2020, there were 160 biogas and 20 biomethane installations.

The capacity and number of installs from bioliquid, solar thermal and waste installations have remained relatively static compared to the other technology classes between 2010 and 2020.

There is only one known bioliquid installation, the values for which have remained unchanged since 2010. Our count of bioliquid installations is likely to be an underestimate because information on bioliquid use for heating in Scotland is very limited as the technology is not accredited through MCS and not supported by the RHI scheme. As bioliquid combustion is a fairly niche technology likely to only be installed to meet a small number of viable use cases, the impact of any under counting is considered minimal on the reported total heat output, capacity and number of installation figures.

There are less than ten waste installations reported and these sites have generally not changed since they were first reported, leading to much of the output and capacity remaining static. Again, one issue with monitoring waste combusting sites is that very few data sources contain information on them. Waste combustion is not an eligible technology under the RHI schemes.

The number of solar thermal installations has increased year on year but at a much slower rate of uptake than that seen for heat pumps. As a result, the share of the total number of installations that solar thermal makes up has decreased from 55% in 2010 to 21% in 2020. As the vast majority of solar thermal installations are in the micro size category and are typically installed in domestic settings to provide hot water rather than space heating, the contribution of solar thermal to the total renewable heat output is very small, less than 1% throughout the entire time series.

4.3. Breakdown of 2020 data

Figures 11, 12 and 13 show the breakdown of renewable heat output, capacity and number of installations by installation size category and technology class for both 2019 and 2020. Biomass has been excluded from the figures because the very large output and capacity totals obscure the changes in other technologies at that scale. Bioliquid has also been excluded because all associated renewable heat values are not visible at this scale and have not changed between 2010 and 2020.

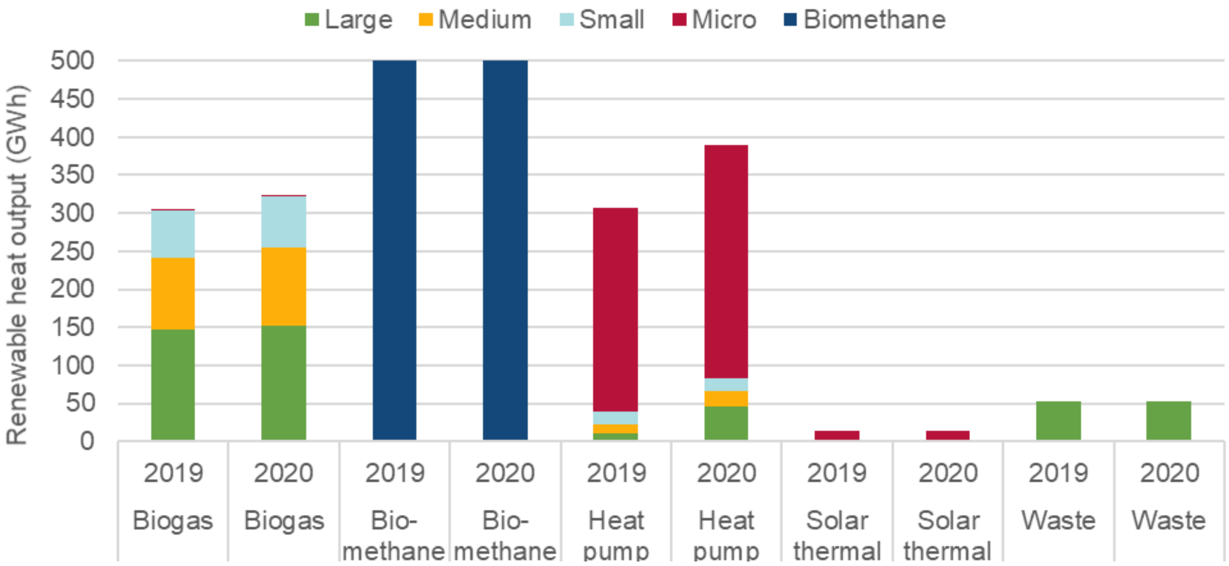

Figure 11. Renewable heat output (GWh) by technology class (excluding bioliquid and biomass) and installation size category, 2019 and 2020

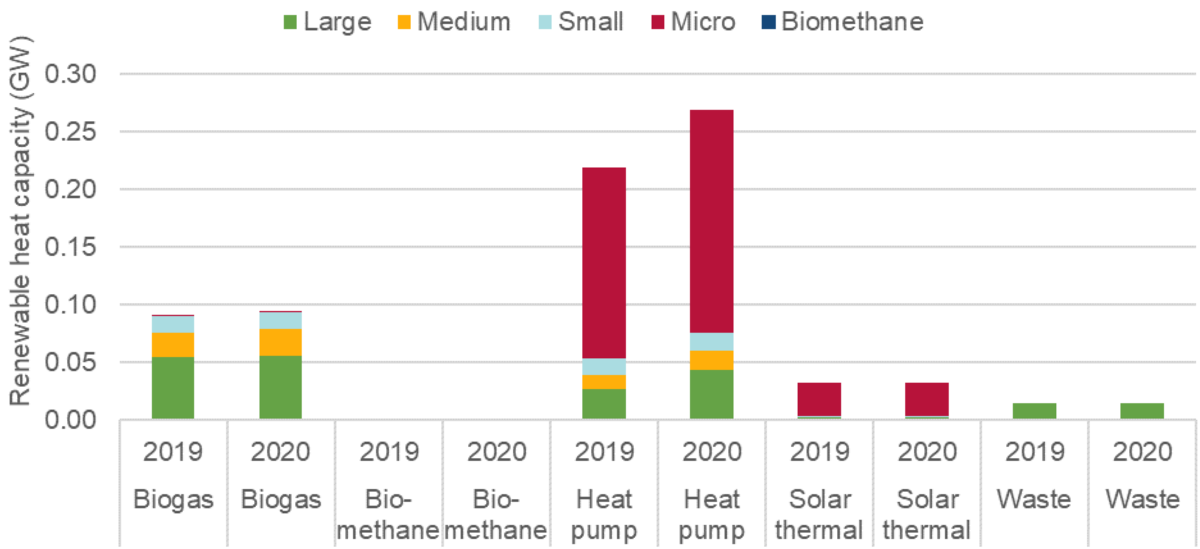

Figure 12. Renewable heat capacity (GW) by technology class (excluding bioliquid and biomass) and installation size category, 2019 and 2020

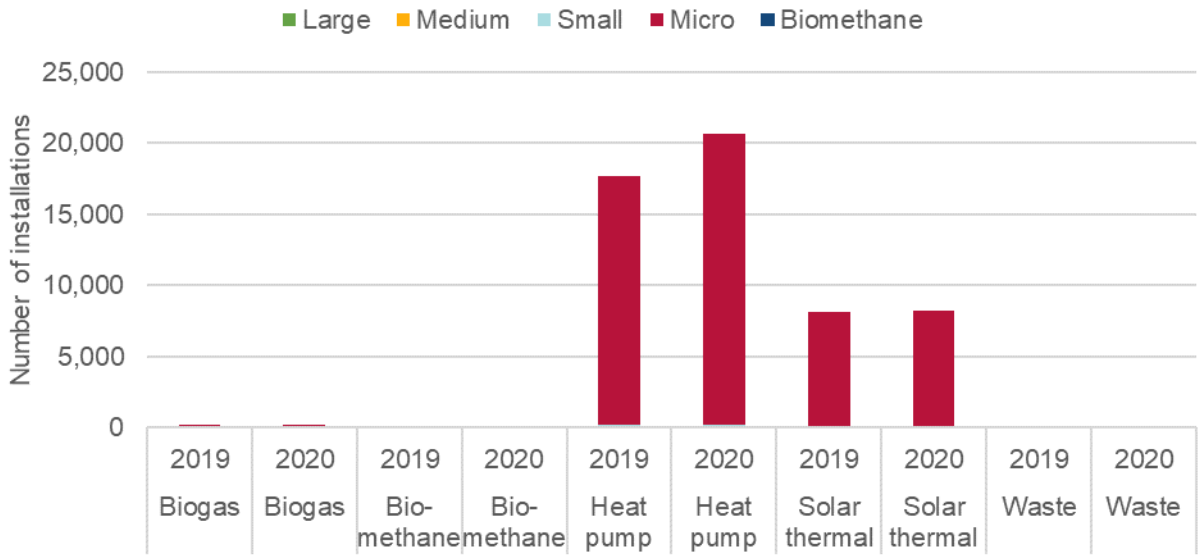

Figure 13. Number of installations by technology class (excluding bioliquid and biomass) and installation size category, 2019 and 2020

Referring to Figure 5, biomass output fell by 19GWh between 2019 and 2020 largely due to changes in operation at a small number of large installation size category sites in the non-domestic sector. The decrease in output from these few sites has masked the output gain from the 90 additional biomass installations which were reported in 2020. More than half of the output of biomass (53%) is from the large size category, with 26% coming from medium sized installations, 13% from small sized installations and 8% from micro sized installations.

The largest contribution to growth in renewable heat output reported in 2020 was from the heat pump technology class which had a 27% (83GWh) increase compared to the 2019 figure. This gain in output was split between the micro installation size category (46%) and the large installation size category (43%). There were 3,020 new heat pump installations in 2020, of which 99% (2,990) were in the micro installation size category. This continues the trend of seeing the greatest uptake of new installations amongst micro sized heat pumps which are typically installed to provide space and hot water heating, particularly in domestic settings. The 10 new large sized installations are ground or water source heat pumps for non-domestic usage.

Biogas has shown a modest increase in output (19GWh) and there were a few new installations (<10) reported in 2020. The output, capacity, and number of installation values for the waste and bioliquid technology classes has remained static because there were no new reported installations nor any known changes in operation at the existing installations affecting the reported output.

There were 80 new solar thermal installations recorded in 2020, all but one of which were in the micro size category. Due to the scale of these systems, coupled with the fact that solar thermal installations are typically installed in domestic settings to only meet hot water demand and none of the space heating demand, the gain in output and capacity for solar thermal between 2019 and 2020 is less than 1%.

In 2020, a significant proportion of renewable heat output (42%) and capacity (40%) in Scotland continues to come from large sized installations despite them contributing less than 1% of the total number of installations. This is because, aside from the scale of the installations themselves, larger installations often provide process heat all year round compared to smaller installations which generally have more seasonal demands such as providing space and water heating.

The large installation size category saw a 1% reduction in output (11GWh) since 2019 due to changes in operation at a small number of large biomass sites. A significant proportion of the output from biomass (53%), biogas (47%) and waste (100%) facilities fall into the large size category. Large size heat pumps and solar thermal installations make up 12% of heat pump output and 4% of solar thermal output.

Both the micro and medium installation size categories reported a substantial growth in output. The gain in micro sized installation output (40GWh) was predominantly from new heat pump installations whereas the growth in medium sized installation output (48GWh) was split between biomass (32GWh), biogas (9GWh) and heat pumps (8GWh).

4.4. Renewable heat by local authority area

The distribution of renewable heat output and capacity by local authority area is shown in Figures 14 and 15. The renewable heat output, capacity and number of installations are shown in Table 2 for the five local authority areas with the greatest amount of renewable heat output.

The key findings from the local authority analysis are:

- The Highland local authority area accounted for 17% of Scotland's total renewable heat output and 17% of the overall operational capacity in 2020.
- Five local authority areas (Highland, Stirling, South Ayrshire, Aberdeenshire and Moray) accounted for around 52% of the total heat output and collectively contributed 2,619GWh of renewable heat in 2020. These five council areas had a combined capacity of 0.84GW, or 39% of the renewable capacity in Scotland.
- The highland local authority also had the greatest number of installations with 5,530 or 14% of the total for Scotland.

Table 2. Renewable heat output (GWh), capacity (GW) and number of installations for the five local authority areas with the greatest renewable heat outputs in Scotland, 2020

Local authority area	Output (GWh)	Output (%)	Capacity (GW)	Capacity (%)	Installations (#)	Installations (%)
Highland	849	17%	0.37	17%	5,530	14%
Stirling	556	11%	0.10	5%	660	2%
South Ayrshire	499	10%	0.07	3%	490	1%
Aberdeenshire	381	8%	0.21	10%	2,360	6%
Moray	334	7%	0.09	4%	900	2%

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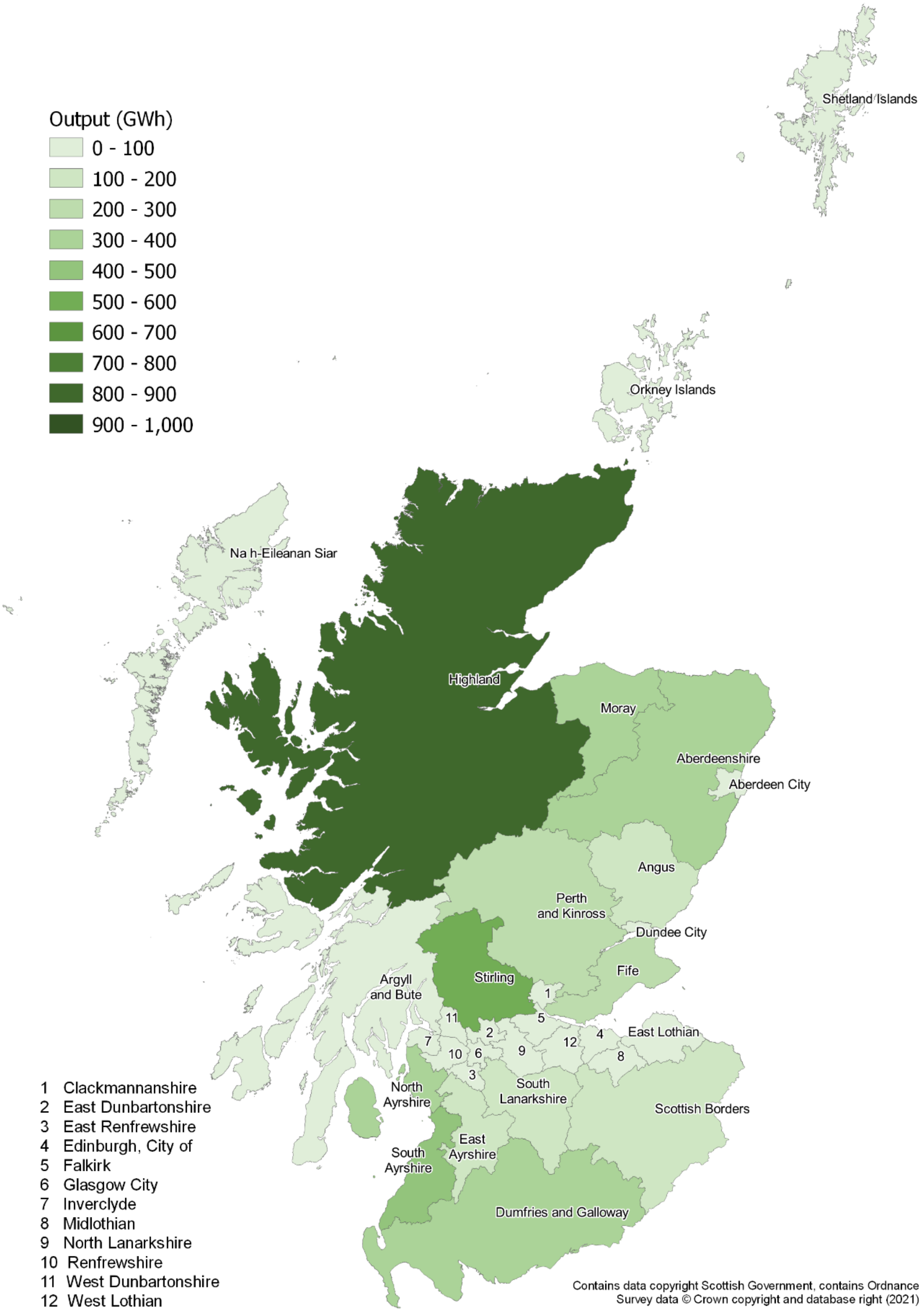

Figure 14. Map of operational renewable heat output by local authority area in Scotland, 2020

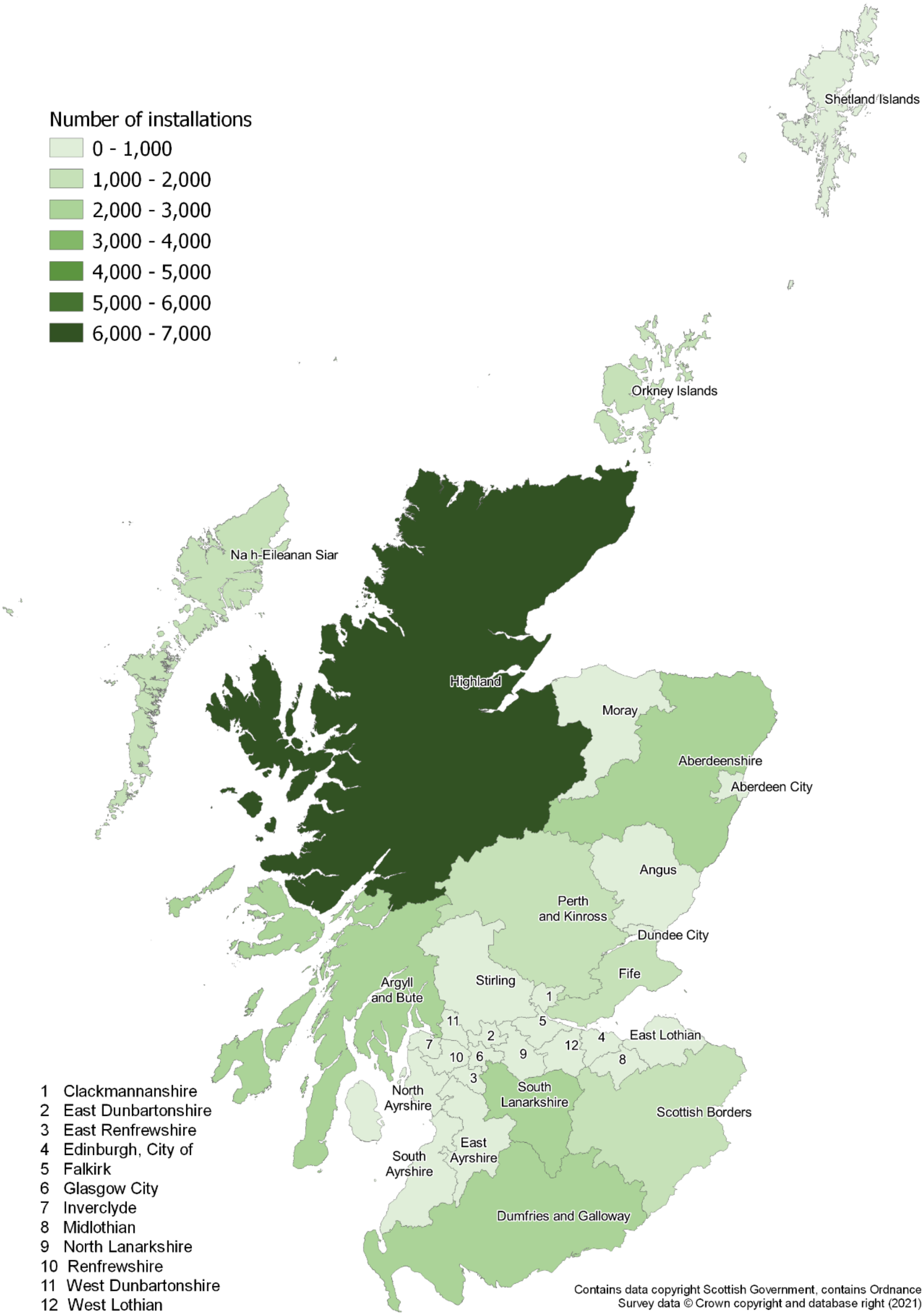

Figure 15. Map of number of renewable heat installations by local authority area in Scotland, 2020

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4.5. Local authority trends

To further investigate the development of renewable heat across Scotland, we have identified four groups of local authorities which show similar trends between 2010 and 2020 and which also share similar population densities and levels of rurality or urbanity. The four groups are defined as:

- Mainland local authorities that are predominantly rural
- Island local authorities
- Local authorities which are predominantly dense urban areas
- Mixed urban-rural local authorities in the central belt of Scotland

Table 3 lists the local authorities included within each group.

Table 3. List of local authorities within each of the identified analysis groups

Mainland rural	Island	Urban	Mixed Central Belt
Aberdeenshire	Na h-Eileanan Siar	Aberdeen City	Clackmannanshire
Angus	Orkney Islands	City of Edinburgh	East Dunbartonshire
Argyll and Bute	Shetland Islands	Dundee City	East Renfrewshire
Dumfries and Galloway		Glasgow City	Falkirk
East Ayrshire			Inverclyde
East Lothian			Midlothian
Fife			North Lanarkshire
Highland			Renfrewshire
Moray			South Lanarkshire
North Ayrshire			West Dunbartonshire
Perth and Kinross			West Lothian
Scottish Borders			
South Ayrshire			
Stirling			

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Mainland local authorities that are predominantly rural

Mainland rural local authorities consistently show the greatest renewable heat outputs with the 14 local authorities included in this group making up 86% of the total renewable heat output of Scotland in 2020. This output is largely from biomass installations. Some of the local authorities within this group contain very large biomass installations, where the changes in operation at these sites can have significant effects upon the renewable heat output totals for Scotland as a whole.

Between 2010 and 2020, mainland rural local authorities have shown the greatest absolute growth in output, again, largely due to new biomass installations of all installation size categories. However, as the installation rate of other technologies has increased, the share of mainland rural local authority output from biomass has fallen from 97% in 2010 to 68% in 2020. The technology with the second greatest share of local authority output in 2020 in this group is biomethane (15%) followed by heat pumps (7%) and biogas (7%).

The mainland rural local authorities have very high installation counts, most of which are in domestic settings. However, only 6% of the total output in these areas is accredited under the domestic RHI in comparison to 55% under the non-domestic RHI. The non-domestic installations in the mainland rural local authorities are producing considerably more heat than the domestic installations due to their inherent larger capacity or longer operating hours to provide process heat or to meet higher space heating and hot water demands.

On a pro-rata basis per every 1,000 dwellings,[14] mainland rural local authorities have the greatest output and the greatest output accredited under both RHI schemes. These trends can be attributed in part to the high prevalence of renewable installations in off-gas grid areas in mainland rural parts of Scotland, particularly seen under the RHI schemes. For example, 89% of Scottish installations accredited under the domestic RHI scheme are in off-gas grid postcode areas.

Island local authorities

The island local authorities, defined as those which have no area of land on the mainland at all, have lower than average total renewable heat outputs compared to the rest of Scotland. However, this is not to be unexpected due to the relatively low population density of these island regions. In contrast, the island local authorities have greater total heat outputs per every 1,000 dwellings than most other local authorities in Scotland.

Unlike the mainland rural local authorities, the greatest heat outputs are not from biomass but are from heat pumps. Between 2010 and 2020, the proportion of total renewable heat generated in these local authorities by heat pumps increased from 50% in 2010 to 58% in

[14] The number of dwellings in each local authority from each year are taken from Scottish Government statistics: https://statistics.gov.scot/resource?uri=http%3A%2F%2Fstatistics.gov.scot%2Fdata%2Fhousehold-estimates

2020. The next largest contributors to renewable heat in 2020 in these areas are biomass (23%) and waste (17%).

By number, 85% of installations in island local authorities are heat pumps. The vast majority of island local authority installations are in domestic properties; 98% of island installations are either known to be in domestic properties because they are accredited under the domestic RHI or assumed to be in domestic properties because they are MCS accredited and the vast majority of MCS accredited installations are in domestic properties. The rate of 98% of island installations being in domestic properties is much higher than that seen in the other three local authority groups: 83% in urban local authorities, 79% in mainland rural local authorities and 78% in mixed central belt local authorities. Overall, island local authorities comprise 10% of the total number of accreditations under the domestic RHI in Scotland and 7% of the heat output despite only making up 1% of the total number of dwellings in Scotland.

Urban local authorities

The total renewable heat output from the urban local authorities is typically lower than those seen in other areas of Scotland. On a pro-rata basis, the urban local authorities make up 29% of all dwellings in Scotland but only 2% of renewable heat output. One of the main factors likely to influence the uptake of renewable heat in an area is how much of the region is connected to the gas grid. It is assumed that the relatively low uptake of renewable heat in these local authorities is due to mains gas connections being an available, and often the pre-existing, form of heat with mains gas traditionally the most affordable fossil fuel.

Biomass contributes a significant proportion of the total heat output from urban local authorities (50%) with heat pumps (28%) and biogas (21%) making up most of the remainder. Very little of this output is coming from domestic properties, just 7% of urban local authority renewable heat output is accredited under the domestic RHI compared to 62% under the non-domestic RHI scheme.

Mixed urban/rural local authorities in the central belt of Scotland

The remaining eleven local authorities, all of which are in the central belt of Scotland, show a mixture of population density and spread between urban and rural settings. They typically have population densities greater than the rural local authorities but far below those of the urban local authorities. On a pro-rata basis per every 1,000 dwellings, the mixed spread local authorities show total renewable heat outputs greater than the urban but lower than the rural local authorities. Again, this is assumed to be due to a higher prevalence of mains gas in these local authorities relative to more rural areas but lower than the urban local authorities.

By technology class, 61% of the total output in these areas in 2020 is from biomass, 21% from heat pumps, 9% from biogas and 8% from biomethane.

Factors influencing accreditation under the RHI schemes

A number of factors influence uptake of RHI in each local authority area including the proportion of homes that do not have access to mains gas. The domestic RHI was designed to be targeted at, but not limited to, off-gas grid households. The vast majority of micro-sized systems accredited under the domestic RHI are located off the gas grid (see Table 4). As of December 2019, 89% of heat pumps and 89% of biomass systems were installed in off-gas grid areas, compared with approximately 14% of Scottish properties located in off-gas grid postcodes. A smaller proportion of solar thermal systems (65%) are located in off-gas grid areas.

The higher incidence of solar thermal installations in on-gas grid postcodes compared to other renewable heating technologies may be because solar thermal installations are most often used alongside a main heating system and can work well with certain gas central heating systems. On the other hand, heat pumps and biomass boilers are typically installed to provide space heating and hot water and will most often replace any existing main heating system.

Table 4. Number of installations accredited in Scotland under the domestic RHI in on and off-gas grid postcode areas, by technology

Technology Class	Number of installations in on gas grid areas	% installations in on gas grid areas	Number of installations in off gas grid areas	% installations in off gas grid areas
Biomass	417	11%	3,331	89%
Heat pump	1,278	11%	10,130	89%
Solar thermal	432	34%	823	66%
Total	**2,127**	**13%**	**14,284**	**87%**

The number of accreditations under the domestic RHI has continued to increase across all eligible technologies since December 2020. Please refer to section 5.1 for further commentary on the trends seen in both the domestic and non-domestic RHI schemes between December 2020 and August 2021.

5. Further renewable heat in development

5.1. Trends seen in the RHI monthly statistics

While there is a large degree of uncertainty around the projects recorded as 'in development' in the Renewable Heat Database, the monthly RHI statistics published by BEIS give an indication of renewable heat capacity in the pipeline during 2021. The latest figures from BEIS show that by August 2021 there was an increase in the number of accreditations under both the domestic and non-domestic RHI schemes.

Overall, the non-domestic RHI data currently available for 2021 suggests the continuation of a downward trend for new biomass applications being made under the scheme, and a rise in the number of applications for heat pumps. This mirrors the growing rate of uptake of heat pumps seen under the domestic RHI scheme.

These figures demonstrate the continued impact both the non-domestic and domestic RHI schemes, alongside supporting Scottish Government schemes, have on renewable heat in Scotland.

Trends in the non-domestic RHI scheme:

- There was a 3.8% increase in the number of accreditations in Scotland across the eight months from December 2020 to August 2021, from 3,926 accreditations as of 31 December 2020 to 4,074 as of 31 August 2021. This corresponds to a 2.5% (0.026GW) increase in capacity from 1.055GW to 1.088GW.
- There was a 3% increase in annual accreditations in Scotland in the twelve months of 2020, which remains consistent with the relatively low growth rates of 4% seen in 2018 and 3% in 2019. In comparison, the historical rates of accreditation under the scheme have been higher but following a downwards trend, in 2015 it was 32%, in 2016 it was 16% and in 2017 it was 14%.
- The general trend across Great Britain was that the largest absolute growth in number of accreditations between December 2020 and August 2021 was in small water or ground source heat pumps, which increased in number from 1,287 in December 2020 to 1,705 in August 2021 (an increase of 32%). Meanwhile, the largest proportional growth in number of accreditations was from biomethane, increasing 46% from 95 to 139. Biomethane installations can provide considerable renewable heat output, but it is not yet known to us how many, if any, of these accreditations are in Scotland.
- Across Great Britain, medium solid biomass boilers saw the largest absolute growth in capacity of accreditations, increasing by 0.039GW (5.4%) from December 2020 to August 2021. However, the largest proportional growth in capacity of accreditation was from small water or ground source heat pumps, increasing 31% from 0.037GW to 0.049GW.

- As of August 2021, systems in Scotland accounted for 19% of the total number of accredited full applications (4,074 out of 21,457) and 20% of the total installed capacity (1.13GW out of 5.6GW) under the non-domestic RHI scheme.
- The rates of accreditation under the scheme in 2020 and to date in 2021 are broadly consistent with that of 2019. However, with no other data to judge from, we cannot determine what impacts if any there have been on the rate of accreditation under the scheme as a result of Covid-19 health emergency.

Trends in the domestic RHI scheme in Scotland:

- There was a 7% increase in the number of accreditations in the eight months from December 2020 to August 2021. This is an increase of 1,151, from 16,411 as of 31 December 2020 to 17,562 as of 31 August 2021.
- There was an 11% increase in annual accreditations in the twelve months of 2020. Following the highest historical rate of growth under the domestic RHI of 201% in 2015, the growth rate decreased to 20% in 2016. Since then, the growth rate has remained below 20%, with a rate of 10% in 2017, 7% in 2018, 14% in 2019 and now 11% in 2020.
- The technology with the largest increase in the number of accreditations under the domestic RHI was air source heat pumps, with an increase of 1,091, from 9,888 as of December 2020 to 10,979 as of August 2021 (an increase of 11%).
- The number of domestic ground source heat pumps accredited under the domestic RHI from December 2020 to August 2021 has grown by 5.7%, from 1,520 to 1,575 systems.
- The number of solar thermal technology accreditations decreased by one between December 2020 and August 2021 (from 1,255 to 1,245).
- The number of biomass accreditations has decreased by 0.67% (from 3,748 to 3,723) between December 2020 and June 2021.
- As of August 2021, systems in Scotland accounted for 19% (17,562 installations) of the total number of accredited systems across Great Britain under the domestic RHI scheme (92,733 installations), consistent with the 19% share held in December 2020.
- On a monthly basis, the number of new accreditations between April 2020 and February 2021 are on average considerably lower than the same months of 2019-20. As this downturn coincides with the timings of lockdowns relating to the Covid-19 health emergency, it is likely that the pandemic has had some impact on slowing the rate of accreditation. However, we do not have the data to speculate in more detail on this nor on any other potential causes which may be contributing.
- Since March 2021, the number of new accreditations seen each month has been higher than the same months in both 2020 and 2019. This may be attributable to a bounce back in installation activity following the relatively few accreditations happening between April 2020 and February 2021. It may also be influenced by changes to the domestic RHI scheme to relax the stipulation that all renewable heat installations need to apply for accreditation within twelve months of the installation

date. This change was brought in as a response to the Covid-19 health emergency to allow householders more time to apply for accreditation and as a result, the accreditation rate seen in 2021 may also be higher because it covers a wider installation timeframe.

5.2. Emerging technologies and innovative projects in the pipeline

Sites converting biogas from anaerobic digestion (AD) to biomethane for gas grid injection (BtG) are increasingly becoming a more prominent technology in Scotland. These sites will not add to Scotland's overall heat capacity; as these sites start to inject gas, the contribution will only be noticeable in the figures for heat output. This is because there is no associated capacity with this kind of technology as you do not have a dedicated facility built to output a fixed capacity of biomethane; instead you have a varying volume of biomethane (generated from various amounts of agricultural or waste material) that you inject into the gas grid for use. Although there will be some low conversion losses, gas to grid injection should avoid higher heat losses from combusting gas on site (or flaring the excess gas and wasting the energy) and should make a contribution to decarbonisation of the gas grid.

There has already been a considerable increase in the amount of heat generated by biomethane to grid sites in Scotland during 2017, 2018 and 2019 but there has been no additional biomethane output reported for 2020. The number of biomethane installations in Scotland is very low (around 20) but the biomethane producing sites are capable of causing significant step changes in the amount of renewable heat output whenever a new site becomes operational or changes in operation at existing sites occurs. It remains to be seen then whether the trend of rapidly increasing output from biomethane sites will continue.

The majority of the biomethane derived output presented in this report was sourced from the non-domestic RHI dataset, supplemented by data from SGN. It is not always clear whether sites export some or all of the biogas captured from AD (or other processes) for conversion to biomethane, or whether all consumption takes place on the site alone. There are similar issues in identifying whether an AD fed biogas site is burning biogas solely to generate electricity or if they are using some or all of the resulting heat output as well.

In May 2019, the Scottish Government published a review of domestically available bioenergy resources. This report suggested that there could be up to 2,700GWh of feedstock available for processes such as AD by 2030. The Scottish Government has commissioned further research to better understand the scale of AD opportunity and the barriers to deployment.

5.3. Renewable energy funding streams

There are a wide range of innovative projects being funded through various funding schemes. Together, these projects aim to show how different renewable technologies can be used and to reduce heat demand through the installation of energy efficiency measures and behavioural change. Many of the projects are not yet at a stage where heat capacity and estimated output can be included in the figures presented in this report. A summary of some of the relevant funding programmes is given below:

District Heating Loan Fund

The Scottish Government's District Heating Loan Fund has funded or co-funded a significant number of district heating schemes in Scotland and continues to provide an important funding stream to help deliver both low carbon and renewable district heating projects. Since 2011, the Scottish Government has provided almost £20 million to 53 different projects across Scotland.

Local Energy Scotland funding

Local Energy Scotland delivers the Scottish Government's Community and Renewable Energy Scheme (CARES), which offers free independent advice and funding options to support community groups, public sector organisations and rural SMES in exploring their options around developing renewable energy projects.

The current contract for CARES (1 April 2021 – 31 March 2025) focuses on:

- Giving priority to decarbonisation as the driver for community-led action, providing new opportunities for communities arising from the shift towards more localised energy solutions.
- Supporting of the delivery of our 2030 2GW community and locally owned energy target.
- Enhancing and building on shared ownership aims.
- Focusing support on the transition towards local energy systems, which more directly benefit local economies as well as the consumers within those communities.
- Providing more influence and choice, and thus improving Decarbonisation and Decentralisation.

CARES support is flexible and will adapt to meet the changing environment, which we have seen in terms of the reduction/removal of renewable subsidies, with a focus now on decarbonisation for community activity.

CARES has supported the delivery of the Scottish Government targets for 1GW of community and locally owned renewable energy by 2020 - with half of all newly consented renewable energy developments to have an element of shared ownership by 2020 - and continues to support the 2030 target of 2GW.

The Scottish Government has at December 2020 achieved progress of 85.3% towards their 2020 target of 1GW, and has achieved 42.6% towards their 2030 target of 2GW. This is equivalent to 170.6% of the original 2020 target of 0.5GW, which was exceeded in 2015.

Low Carbon Infrastructure Transition Programme

The Low Carbon Infrastructure Transition Programme (LCITP) is a collaborative partnership led by the Scottish Government working with Scottish Enterprise, Highlands and Islands Enterprise, Scottish Futures Trust and Resource Efficient Scotland. The programme is co-funded by the European Regional Development Fund and focuses on supporting the acceleration of low carbon infrastructure projects, including district heating, across the public, private and community sectors to develop investment grade business cases to help projects secure public and private capital finance.

Since its launch in 2015, the LCITP has awarded over £66 million of grant funding to 34 demonstrator projects supporting low carbon energy generation and supported the co-development of over 30 proof of concept and development proposals.

A successor programme for the LCITP is currently being developed. The new programme will run for the next five years to support the deployment of large scale low and zero carbon heat projects using established technologies, as well as continuing to facilitate demonstration of innovative low and zero heat technologies.

Area Based Schemes and Warmer Homes Scotland

Since 2013 the Scottish Government has invested over £373 million in their Area Based Schemes (ABS), providing energy efficiency and zero emissions heating measures to over 100,000 households across Scotland. Local schemes are designed and delivered by councils, in conjunction with energy companies and local delivery partners, providing improvements to households in or at risk of fuel poverty. ABS projects prioritise help for ‘harder to treat properties’ requiring solid wall or complex cavity wall insulation. ABS funding also helps leverage Energy Company Obligation (ECO) finance and private investment to maximise reductions in CO_2 emissions and cost savings for households.

The Scottish Government has invested more than £150 million in the Warmer Homes Scotland Scheme since its launch in September 2015 helping more than 24,000 households throughout Scotland. Warmer Homes Scotland is the Scottish Government’s flagship fuel poverty scheme which offers each eligible household a bespoke package of measures that takes account of both the needs of the property and the needs of the household. Warmer Homes Scotland makes available low and zero emissions heating systems and new insulation measures particularly beneficial to rural and remote communities not served by the gas grid.

Since Warmer Homes Scotland commenced in September 2015 there has been a steady increase in the number of zero emissions heating systems installed. Changes have recently been made to the scheme to further incentivise zero emissions heating measures to help meet Scotland’s climate change targets. The Warmer Homes Scotland contract is due to end in September 2022.

Loan and cashback schemes

The Scottish Government makes loans and cashback grants available to homeowners and SMEs. Through Home Energy Scotland, owner occupiers can receive cashback of up to 75% (capped at £7,500) towards the installation of renewable heating systems, with a similar offer available to SMEs through the Energy Efficiency Business Support Service (which will change to Business Energy Scotland in April 2022). Loans and cashback are also available for energy efficiency measures. These schemes, or a grant replacement, will continue to run until at least 2023.

Heat in Buildings Strategy

On 7 October 2021, the Scottish Government published its Heat in Buildings Strategy in response to the draft consultation published in February 2021. The Strategy provides an update to the 2018 Energy Efficient Scotland Route Map and the 2015 Heat Policy Statement, bringing together the Scottish Government's ambitions on energy efficiency and heat decarbonisation into a single framework. The Strategy builds on the Shared Policy Programme,[15] through which the Scottish Government boosted its ambitions and commitments to transitioning to zero emissions heat, going faster and mobilising more resources to make Scotland's homes easier and greener to heat.

The Scottish Government will kick start this transition with at least £1.8 billion of capital funding during the next five years, allowing the acceleration of energy efficiency upgrades and renewable heating deployment, creating new jobs and supply chain opportunities across Scotland.

The Strategy outlines several key points, including commitments:

- Setting out how Scottish Government investment will kick-start growth in the market as well as supporting those least able to pay. This includes investing £400 million over the next five years in large-scale heat decarbonisation infrastructure, increasing investment in the Social Housing Net Zero Fund to £200 million, and investing at least £200 million in zero emissions heat and energy efficiency across the Scottish public sector estate.
- New guiding principles to ensure Scottish Government action to decarbonise heat is aligned with its fuel poverty objectives
- To introduce new mandatory legal standards for zero emissions heating and energy efficiency, where it is within the Scottish Government's legal competence, to underpin investment and provide long-term certainty to the sector and home owners, landlords, owners of non-domestic premises and the public sector.
- Establishing a Green Heat Finance Taskforce to recommend ways the Scottish Government and private sector can collaborate to scale up investment.
- Establishing a new National Public Energy Agency with a remit to accelerate transformational change, aid public understanding and awareness, and coordinate delivery of infrastructure.

[15] Scottish Government and Scottish Green Party – Shared Policy Programme, 2021, https://www.gov.scot/publications/scottish-government-scottish-green-party-shared-policy-programme/

- Co-producing with industry a new ‘Heat in Buildings Supply Chain Delivery Plan’ focussed on the strengthening of supply chains needed to deliver at the pace and scale we need.

The Heat in Buildings Strategy makes clear that, to meet Scotland’s emissions reduction targets will require over a million homes and the equivalent of 50,000 non-domestic buildings to convert to zero emissions heating systems. Gathering and reporting data on renewable heat deployment will continue as an important component of progress monitoring.[16]

[16] The Heat in Buildings Strategy sets out a provisional renewable heat target of 22% of non-electrical heat in buildings by 2030. However, this is a provisional target that will be reviewed next year to take a whole-systems view in the Energy Strategy and Just Transition Plan.

6. Uncertainty levels and recommendations for future updates

In any analysis of this kind where incomplete data are gathered from a variety of sources, certain assumptions have to be made to fill in gaps in the data. Assumptions made for particular technologies or sectors are discussed in this section.

Of the figures reported, 83% of renewable heat output is known, 17% is estimated and less than 1% has an unknown status; 90% of renewable heat capacity is known, 10% is estimated and less than 1% is of unknown status.

We also offer the following general advice on the robustness of the presented figures:

- As in previous years there is a chance that installations could have been either missed or double counted.
- Realised heat output from installations may not match the predictions of output based on installed capacity and peak running hours.
- Some heat projects, particularly CHP installations, propose to export heat to nearby heat users; however, the heat networks necessary to transport this heat have yet to be constructed and in some cases there is not yet a heat user located nearby. Use of the renewable heat will therefore depend firstly upon a suitable heat user being identified or established nearby and secondly how much heat that user requires, either for process heat or space heating. This heat is therefore not included in our reported totals and will not be until the heat is used for an eligible purpose (i.e. space heating, hot water or process heat other than for generating electricity).

6.1. Recommendations for future updates

Recommendation 1 – energy from waste data

Given the estimated current and potential contribution of energy from waste to renewable heat output, the database would benefit from greater information sharing between organisations involved in the development of energy from waste projects and, as far as is possible, within the limits of commercial confidentiality. Any on site information from operational projects regarding biodegradable content and the quantity of waste used for heat generation (or as feedstock for conversion to biofuels via AD, BtG, gasification or pyrolysis processes) as well as metered heat output data would help to ensure greater certainty in the calculations used to estimate the useful heat output figures included in this report.

In addition, improved data about changes to the fraction of biodegradable material within the municipal waste stream over time would improve the evidence base of the contribution made by installations producing heat from burning municipal solid waste. Access to such data would also provide the information needed to more accurately estimate the potential contribution to the Scottish Government’s heat targets of pipeline projects.

Recommendation 2 – Assessing decommissioning rates

With the Renewable Heat Database now being 10 years old and containing some installations of an age older still, it is expected that a number of renewable heat installations will become decommissioned in future reporting years as the systems reach the end of their life expectancy. In some cases, installations may also be decommissioned before the expected end of their life expectancy due to maintenance issues or user choice. Assessing decommissioning rates will therefore become more important over time to identify when renewable heat output needs to be removed from the Renewable Heat Database.

Some work was carried out to compare the domestic RHI and MCS datasets against an extract of EPCs from the Scottish domestic EPC register to help identify properties which previously had a renewable system installed but where the latest EPC suggests the system has been replaced. The initial results were not promising because there is a large variation in the quality and consistency of EPCs for properties which are known to have a renewable technology installed. Energy Saving Trust will continue to expand upon this work to assess whether estimating the amount of renewable heat output lost from decommissioned systems in any reporting year is possible with the datasets currently available.

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7. Further Information

For further information, please see the corresponding appendices file which accompanies this report and has been referenced throughout. The contents of the appendices file are:

- Appendix 1. Data tables for Renewable Heat in Scotland, 2020 report
- Appendix 2. Extended methodology
- Appendix 3. Renewable Heat Database assumptions
- Appendix 4. Analysing the RHI dataset
- Appendix 5. Analysing the MCS dataset
- Appendix 6. Measurement of heat demand in Scotland