

Community and locally owned renewable energy in Scotland at June 2013

A report by the Energy Saving Trust for the Scottish Government

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About the Energy Saving Trust

The Energy Saving Trust is Scotland and the UK's leading impartial organisation helping people save energy, reduce carbon emissions and use water more sustainably. We do this by directly supporting consumers to take action, helping local authorities and communities to save energy, using our expert insight and knowledge and providing quality assurance for goods and services.

This work was carried out by the Energy Saving Trust on behalf of the Scottish Government. The report draws on various sources of data from the Energy Saving Trust and other organisations working in Scotland.

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Please note: the methodology used in this report to calculate renewable capacity and output may not necessarily be in line with that required by the EU Renewable Energy Directive and as such the figures should not be used for any reporting purposes associated with this Directive.

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1. Summary of key findings

The Scottish Government has set a target of 500MW of community owned and locally owned renewable energy capacity operating in Scotland by 2020.¹ In 2011, the Energy Saving Trust was asked by the Scottish Government to produce a database of all community and locally owned renewable energy installations in Scotland, and to produce a short report on the information it contains. This database is updated annually and this is the third iteration. The database includes, as far as possible, all installations known to be operating, under construction, or in earlier stages of development as of June 2013. This database is similar to the renewable heat database which the Energy Saving Trust also maintains for the Scottish Government.²

The purpose of the database and report are to track progress towards the 500MW target. 'Community and locally owned' is defined as the installed capacity owned by: community groups; local authorities; housing associations; other Scottish public bodies; charities, including faith organisations; further and higher education establishments; local Scottish businesses; and Scottish farms and estates.

This work found that, at the end of June 2013:

- An estimated minimum of **285MW** of community and locally owned renewable energy capacity was operational in Scotland.
- This is a **40% increase** on the last report (capacity at June 2012), when the operating capacity was estimated at 204MW.
- The operating capacity results from a total of more than **8,000** individual renewable energy installations.³

This 285MW of total capacity was split between approximately 168MW of electrical capacity (MWe) and 114MW of thermal (heat) capacity (MWth).⁴ Over a year, community and locally owned renewable energy installations could be expected to produce around **740GWh** of renewable energy, consisting of approximately 390GWh of electricity and approximately 330GWh of heat.

The overall increase in the number of installations and capacity since the last report is mostly due to new installations becoming operational. However, some may also be due to an increase in the amount of data collected and being provided by the different owners, such as housing associations, leading to identification of previously unrecorded community and locally owned renewable energy.

The largest proportion of operational community and locally owned capacity is on Scottish farms and estates (119MW, or 42%). Community groups own 15% of total operational capacity (43MW) (figure 1).

A further **679MW** of community or locally owned renewable energy capacity is estimated to be in different stages of development. Of this, 74MW is under construction; 283MW has been granted planning permission but construction has not yet started ('consented not built')⁵; 101MW is waiting for a

¹ <http://www.scotland.gov.uk/Topics/Business-Industry/Energy/Energy-sources/19185/Communities>

² <http://www.energysavingtrust.org.uk/scotland/Take-action/Get-business-funding/Renewable-Heat-in-Scotland-2012>

³ This number of installations includes the total number of individual wind turbines in any multi-turbine development.

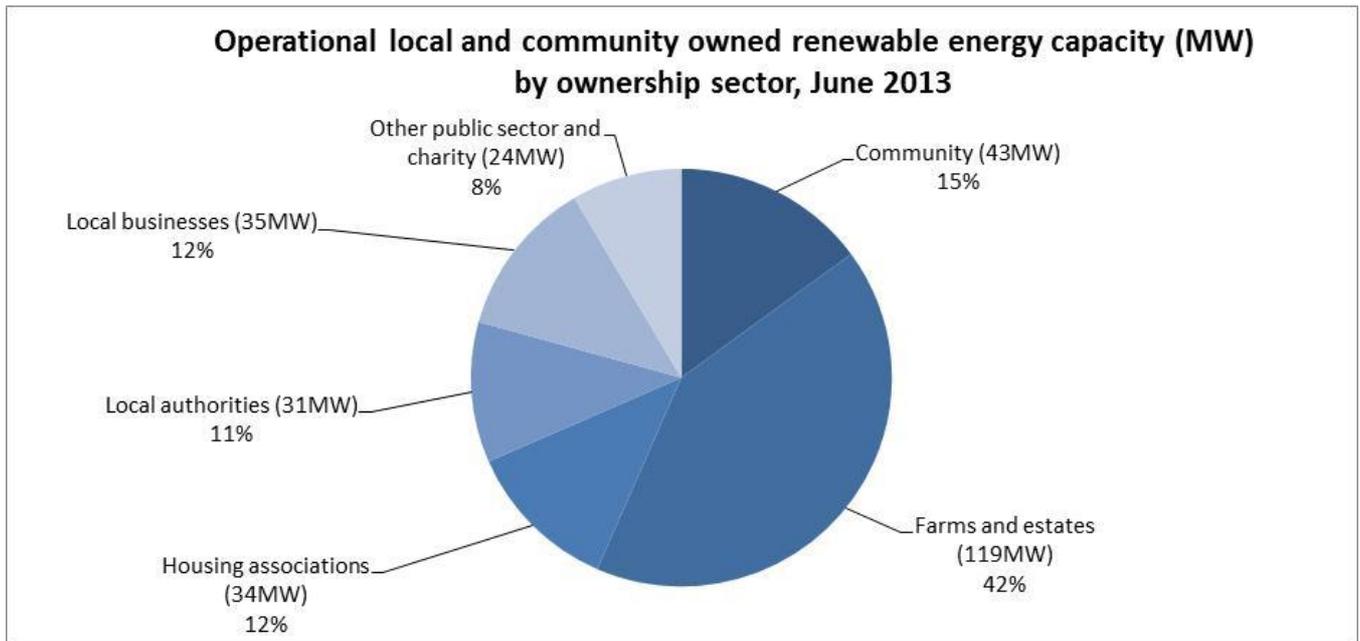
⁴ Throughout this report, totals may not equal sums due to rounding. These figures also do not include the capacity of installations recorded as being combined heat and power.

⁵ Applies only to installations which require planning permission

planning decision to be made ('in planning')⁶; 198MW is in the scoping stage; and 22MW has an unknown status (figure 2). Projects have been given an 'unknown' status when it is known they are in development, but it has not been possible to establish what stage of the process they are at.

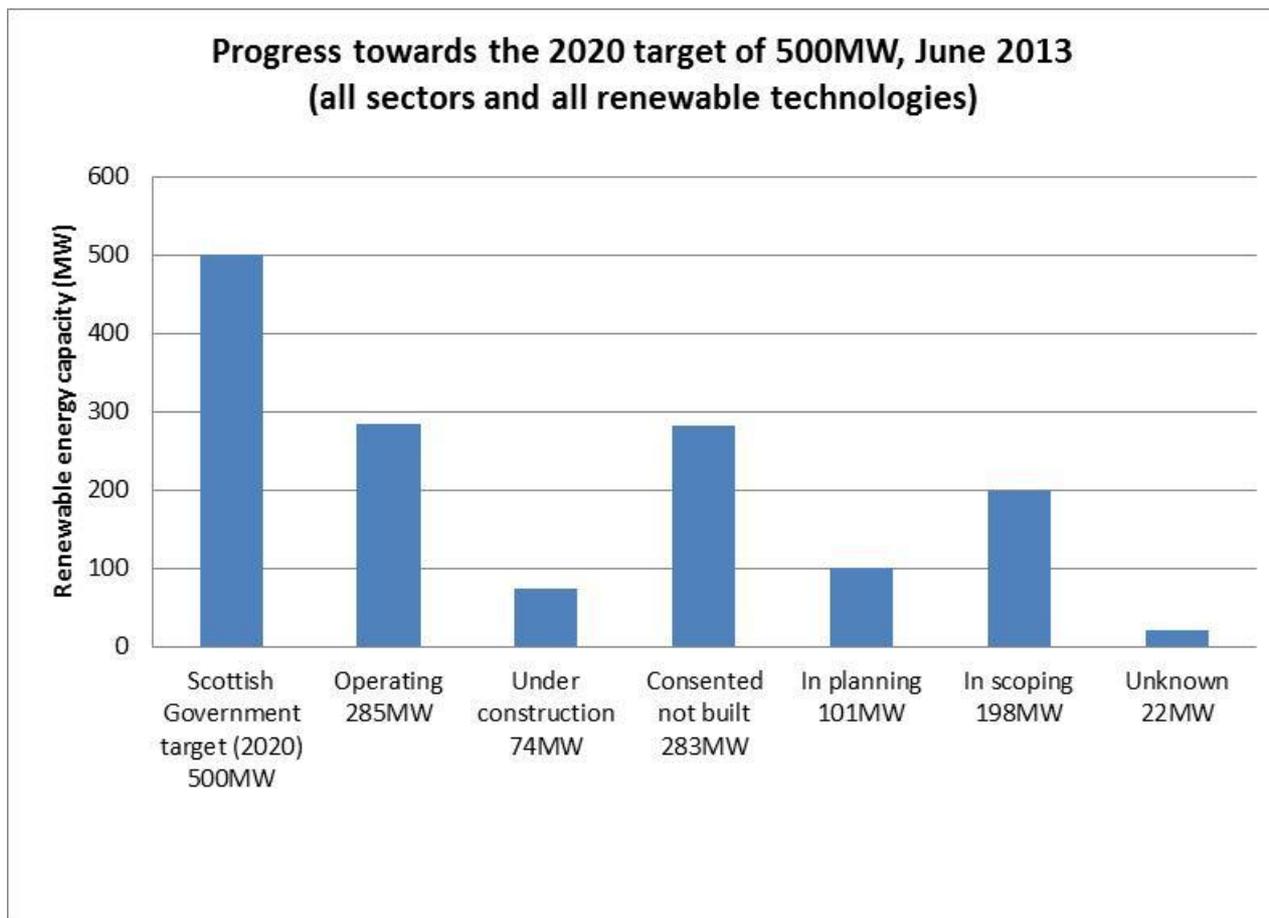
Based on 285MW of capacity in operation at the end of June 2013, and the further 679MW identified as in development, it would appear that Scotland is on track to meet its target of 500MW of community and locally owned renewable energy by 2020. However, this situation will need to be monitored with regards to the conversion rate of installations from the developmental stages to operational capacity.

Figure1. Capacity of operational installations at June 2013, by ownership category



⁶ Applies only to installations which require planning permission

Figure 2. Community and locally owned renewable energy capacity in different stages of development, June 2013



2. Methodology summary

A full methodology is provided in appendix 1. The following section provides an overview of the main points.

2.1 Definition of ‘community and locally owned’

As with previous versions of the database, the Scottish Government has requested that ‘community and locally owned renewable energy’ be defined as technologies producing heat and/or electricity from a renewable source⁷, where the owner of the installation is in one of the following categories:

⁷ A full description of each eligible technology is given in appendix 2

- A community group
- A local Scottish business⁸
- A farm or estate
- A local authority
- A housing association
- 'Other public sector and charity', including:
 - charities, including faith organisations
 - public bodies or publicly owned companies
 - further or higher education establishments such as universities and colleges
 - recipients of Scottish Community and Householder Renewables Initiative (SCHRI) grants under the community stream of the programme (but not recipients of grants under the householder stream)
 - recipients of Community and Renewable Energy Scheme (CARES) grants.

'Ownership' has not been restricted to cases where the organisation owns the entire renewable installation. It also includes cases where a community group or farmer has helped to meet part of the cost of developing and installing a renewables system in return for some benefit, such as a share in the income generated. In such cases, a percentage of the installation's capacity equal to the share owned by the community or local owner is counted towards the target.

'Ownership' does not include cases where the only benefit to the farmer or community group is a land rental payment from the owner or developer of the installation, or installations that generate community benefit payments but that are fully owned by another organisation (for example a utility company).

2.2 Renewable energy technologies included

The following renewable energy technologies are included in the database:

- Wind (including wind to heat)
- Hydro
- Wave and tidal (marine)
- Solar photovoltaics (solar PV)
- Biomass (wood) primary combustion (including for district heating)
- Biomass (wood) gasification for the production of electricity and/or heat
- Waste incineration (organic or putrescible fraction) for production of electricity and/or heat
- Heat pumps (ground source, air source and water source) including air source heat pumps (ASHP) incorporating exhaust air heat recovery (EAHR)
- Solar thermal panels
- Solar air/solar ventilation systems
- Anaerobic digestion producing electricity and/or heat⁹
- Landfill gas capture producing electricity and/or heat

Full descriptions of these technologies are provided in appendix 2.

⁸ Note that this excludes Scottish businesses whose main purpose is to develop renewable energy projects on land they do not fully own, at a site distant from their office.

⁹ Excludes the heat produced only for maintenance of the digestion process.

Some information on biogas and biofuel production plants was collected for the database. Figures on their capacity and annual energy output have not been included in this version of the report but this will be reviewed for the next update.

The following technologies were not included as they are not considered to generate heat or electricity from a renewable source (although they can be considered as 'low carbon' technologies):

- Combined heat and power (CHP), including micro-CHP, using mains gas or another fossil fuel
- Exhaust air heat recovery (unless part of an air source heat pump)
- Passive renewable heating or cooling
- District or community heating using mains gas or another fossil fuel

Descriptions of these technologies are also provided in appendix 2.

2.3 Approach taken and data sets used

The approach taken for data collection and processing for this version of the database and report was broadly in line with that for the previous reports, and is detailed in appendix 1. This year's update includes an improved survey of housing association renewables, conducted in association with the Scottish Federation of Housing Associations (SFHA).

A list of the main data sources used, and the organisations that provided them, is given in appendix 3.

2.4 Information collected

Wherever possible, the information collected for each installation included:

- Name of the project.
- Ownership (organisation and type of organisation).
- Where appropriate, the name of the subsidiary trading company owning the renewable technology on behalf of the community group/charity.
- Location, including local authority area, address and a postcode or grid reference.
- Technology type.
- Number and installed capacity of the technologies.
- Operational status as at June 2013 (operating/under construction/consented not built/in planning/in scoping).
- The date on which generation commenced (for operational projects).
- Percentage ownership by the community group etc, in cases where the organisation did not have full ownership of the installation.
- Where appropriate, the building type associated with the renewable energy installation.
- Whether public grant or loan funding was received.

3. Operational community and locally owned renewable energy in 2013

3.1 Results for June 2013: operational capacity

At the end of June 2013, an estimated minimum 285MW of community or locally owned renewable energy capacity was operational in Scotland, spread over a total of more than 8,000 individual renewable energy installations.¹⁰

A breakdown of operational capacity by ownership category is given in table 1 and illustrated in figure 3. The largest proportion of operational capacity is on Scottish farms and estates (119MW, or 42%). Community groups own 15% of total operational capacity (43MW).

The largest numbers of individual installations (more than 7,000) are in local authority and housing association ownership, together accounting for 86% (by number) of individual installations. Housing associations are the owners of the largest number of individual installations, at around 6,000, or more than 70% of all individual installations recorded.

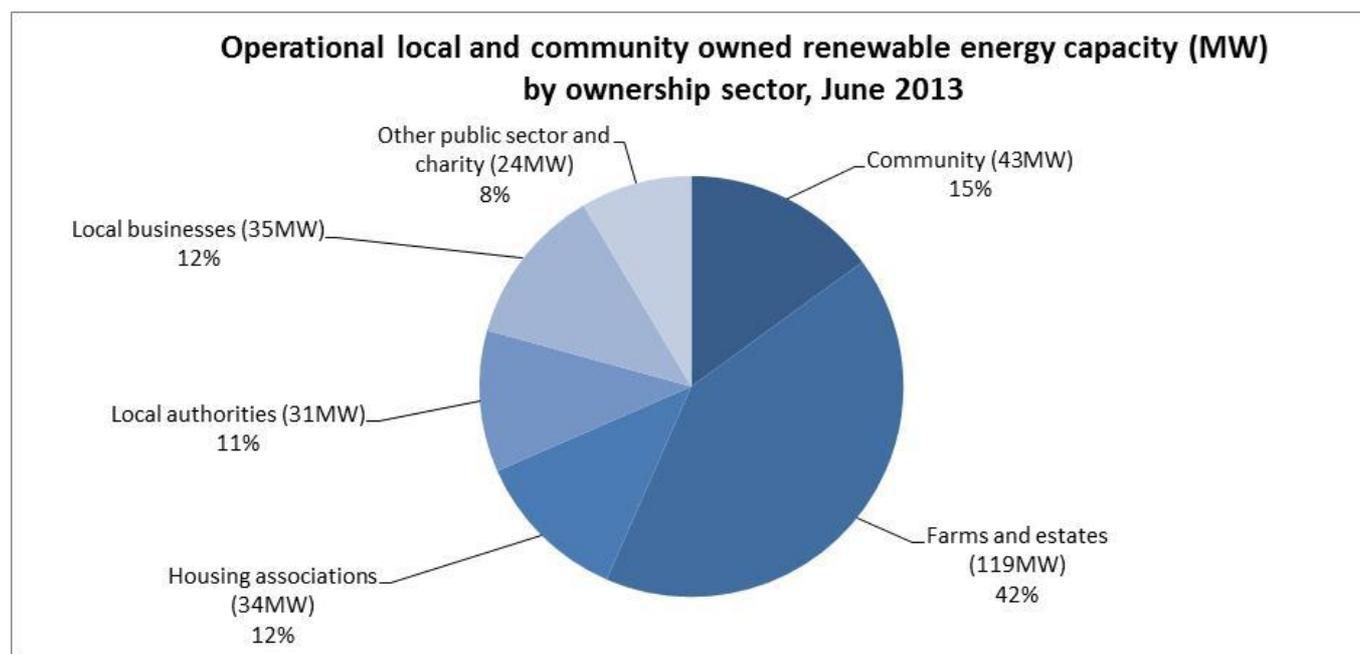
Table 1. Estimated number and capacity of operational installations as of June 2013 by ownership category

<u>Ownership category</u>	<u>Operating capacity</u>	<u>% of operating capacity</u>	<u>Number of operating installations</u> ¹¹	<u>% of operating installations</u>
Community	43MW	15%	430	5%
Farms and estates	119MW	42%	240	3%
Housing association	34MW	12%	5,990	71%
Local authority	31MW	11%	1,250	15%
Local businesses	35MW	12%	280	3%
Other public sector and charity	24MW	8%	190	2%
TOTAL	285MW	100%	8,390	100%

¹⁰ This number of installations includes the total number of individual wind turbines in any multi-turbine development.

¹¹ Rounded to the nearest 10; for wind farms, each turbine is counted as one installation.

Figure 3. Capacity of operational installations as of June 2013 by ownership



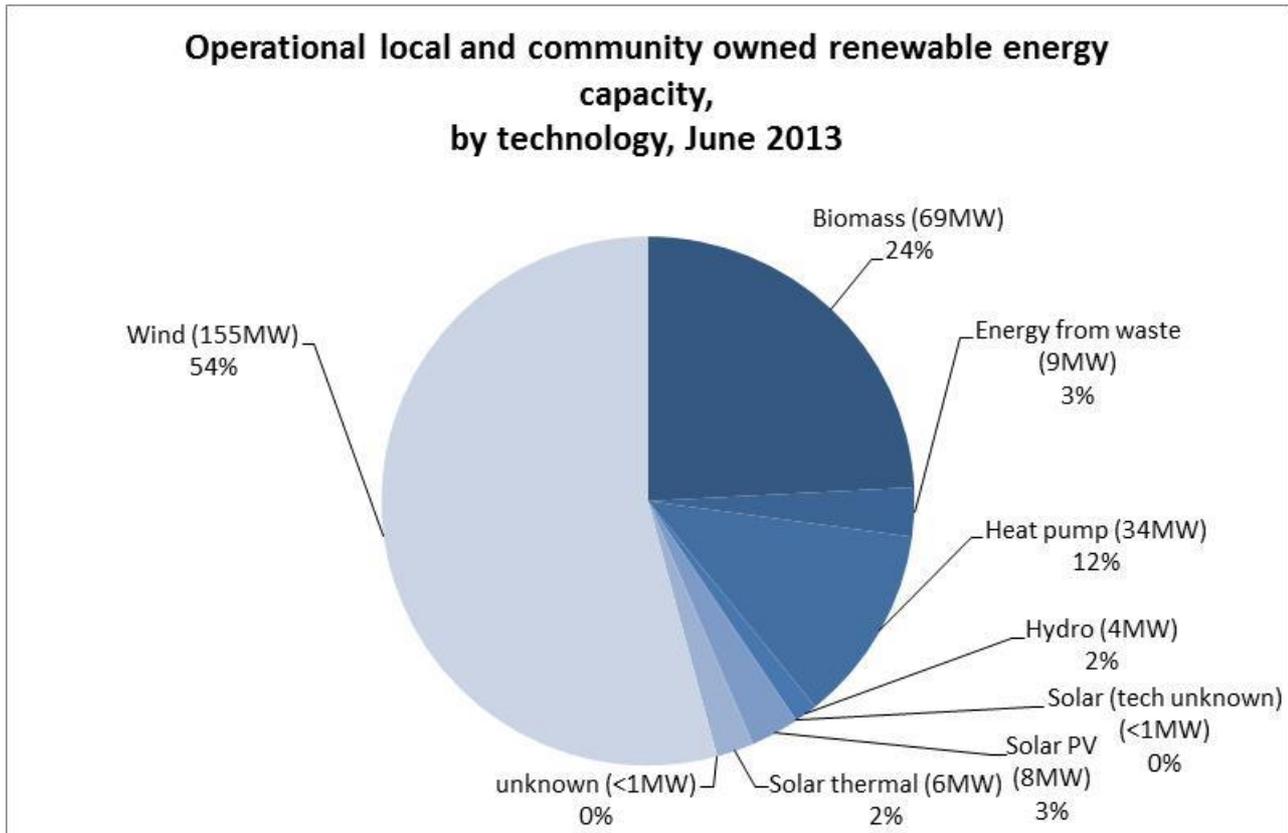
The majority of capacity in operation as of June 2013 was from wind turbines, at 155MW. The second largest category was energy from biomass (wood), at 69MW. These two technologies together account for 78% of operational capacity as of June 2013. A breakdown by technology type is given in table 2 and illustrated in figure 4.

Table 2. Number and capacity of operational installations as of June 2013, by technology

<u>Technology</u>	<u>Operating capacity</u>	<u>% of operating capacity</u>	<u>Number of operating installations</u> ¹²	<u>% of operating installations</u>
Wind	155MW	54%	470	6%
Biomass	69MW	24%	340	4%
Energy from waste	9MW	3%	10	<1%
Heat pump	34MW	12%	3,690	44%
Hydro	4MW	1%	40	1%
Solar PV	8MW	3%	1,930	23%
Solar thermal	6MW	2%	1,800	21%
Unknown	<1MW	<1%	100	1%
TOTAL	285MW	100%	8,390	100%

¹² Rounded to the nearest 10; for wind farms, each turbine is counted as one installation.

Figure 4. Capacity of operational installations as of June 2013 by technology



The difference between which organisations own the majority of installations, and which own the majority of operating capacity, stems from the mix of renewable technologies found in the different ownership categories. Housing associations own large numbers of solar thermal panels and heat pumps. However, as the majority of these are on individual domestic properties, each individual installation typically has a small capacity.¹³ Housing associations thus have a relatively small share (about 12%) of Scotland’s total operating renewable capacity, despite their large share of the number of operating installations.

For farms and estates, wind turbines and biomass (wood) boilers are the main renewable technologies owned. Installations of biomass boilers and wind turbines on farms and estates typically have very large capacities¹⁴, leading to farms and estates owning the largest share of installed operational capacity as of June 2013.

A breakdown of operational capacity by technology and by ownership category is given in table 3 and illustrated in figure 5.

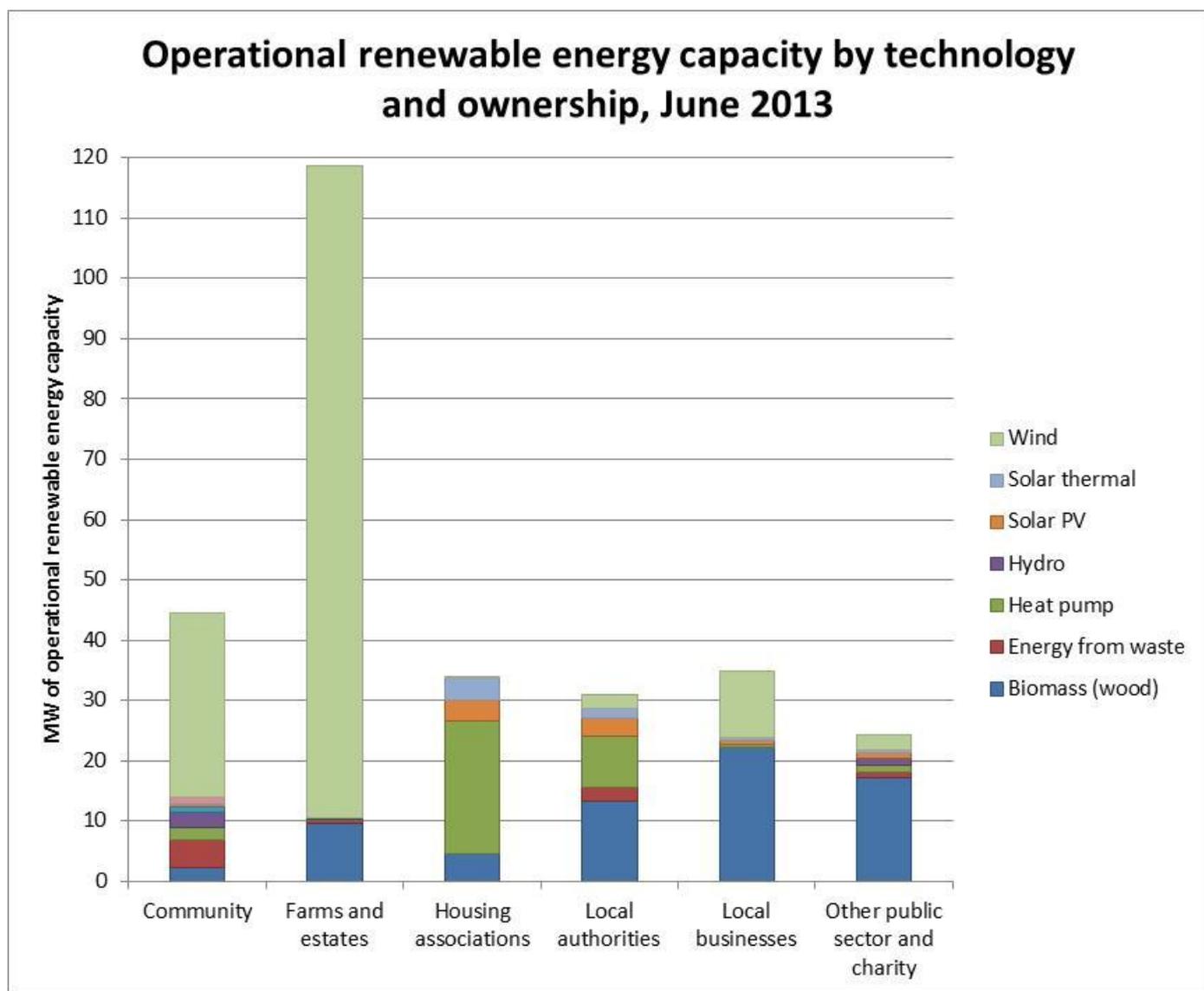
¹³ Typical domestic solar thermal panel size is around 3.4m², or about 2.3kWth (0.0023MWth). Domestic heat pumps in housing association homes are typically around 7kWth (0.007MWth), or 4.5kWth (0.0045MWth) for an ASHP with exhaust air heat recovery. See appendix 4 for more details.

¹⁴ Farm and estate biomass (wood) heating systems had a typical size of 150kWth capacity. See appendix 4 for more details. Farm and estate wind turbines varied greatly in size, from 1kWe (0.001kWe) to 2.3MWe (2,300kWe), however most were over 300kWe in size.

Table 3. Operational capacity as of June 2013, by technology and ownership category

<u>Technology</u>	<u>Community</u>	<u>Farms and estates</u>	<u>Housing associations</u>	<u>Local authorities</u>	<u>Local businesses</u>	<u>Other public sector and charity</u>
Wind	31MW	108MW	<1MW	2MW	11MW	2MW
Biomass	2MW	10MW	4MW	13MW	22MW	17MW
Energy from waste	5MW	<1MW	0MW	2MW	0MW	1MW
Heat pump	2MW	<1MW	22MW	9MW	<1MW	1MW
Hydro	3MW	<1MW	0MW	0MW	<1MW	1MW
Solar PV	<1MW	<1MW	3MW	3MW	<1MW	1MW
Solar thermal	<1MW	<1MW	4MW	1MW	<1MW	<1MW
TOTAL	43MW	119MW	34MW	31MW	35MW	24MW

Figure 5. Operational capacity as of June 2013, by technology and ownership category



3.2 Estimate of yearly energy produced with June 2013 capacity

Over a year, 285MW of community and locally owned renewable energy capacity could be expected to produce around 740GWh of renewable energy, consisting of around 390GWh of electricity and 330GWh of heat.¹⁵ A breakdown by ownership category is given in table 4. The assumptions used to calculate yearly output are specific to each technology and are detailed in appendix 1.

Table 4. Estimated capacity and annual energy output of operational installations at June 2013 by ownership category

<u>Ownership category</u>	<u>Operating capacity</u>	<u>% of operating capacity</u>	<u>Estimated yearly energy output</u>	<u>% of output</u>
Community	43MW	15%	98GWh	13%
Farms +estates	119MW	42%	290GWh	39%
Housing association	34MW	12%	71GWh	10%
Local authority	31MW	11%	75GWh	10%
Local businesses	35MW	12%	140GWh	19%
Public sector + charity	24MW	8%	61GWh	8%
TOTAL	285MW	100%	740GWh	100%

3.3 Maps of operating capacity by ownership category

The following maps (figures 6 to 11) illustrate the distribution of operational community and locally owned renewable energy capacity throughout Scotland at June 2013, by ownership.

Each circle indicates the location of a renewable energy installation, or installations if there is more than one owned by the same organisation at the same postcode or grid reference. The size of the circles indicates the capacity of the installation in MW, and the colour indicates the technology type. In cases where less than 100% of the installation is owned by a community or local owner, the size of the circle indicates the renewable capacity owned by the community or local owner, rather than the full size of the installation. Please note that these maps may not show all operational renewable energy installations held in the database, as postcodes or grid references could not be obtained for all installations.

¹⁵ These figures do not include the capacity of installations recorded as being combined heat and power.

Figure 6. Operational renewable energy installations owned by communities in Scotland as at June 2013, by technology and size category

Known operational renewable energy installations owned by Scottish community groups, as at June 2013

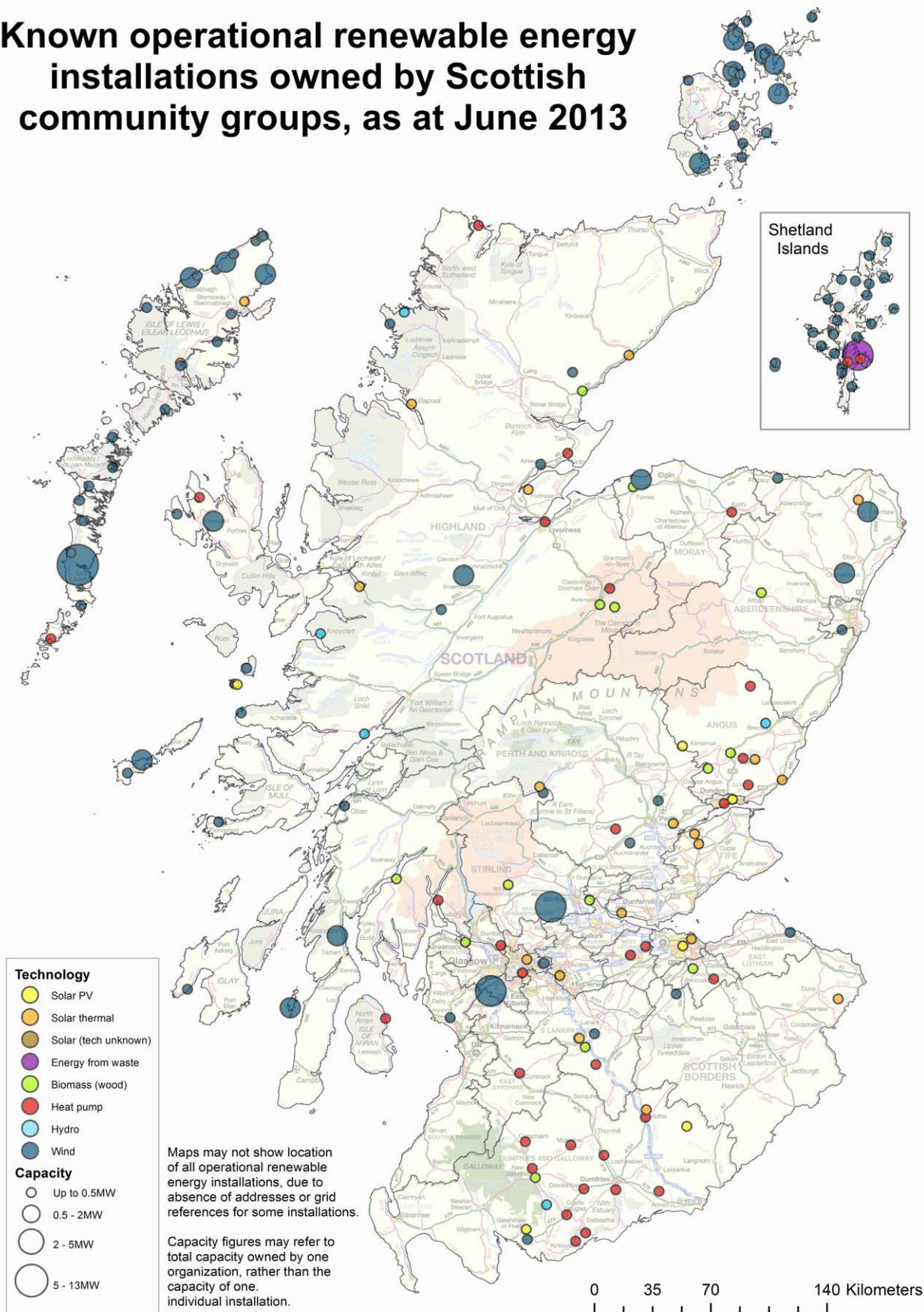


Figure 7. Operational renewable energy installations owned by farms and estates in Scotland as at June 2013, by technology and size category

Known operational renewable energy installations owned by Scottish farms and estates, as at June 2013

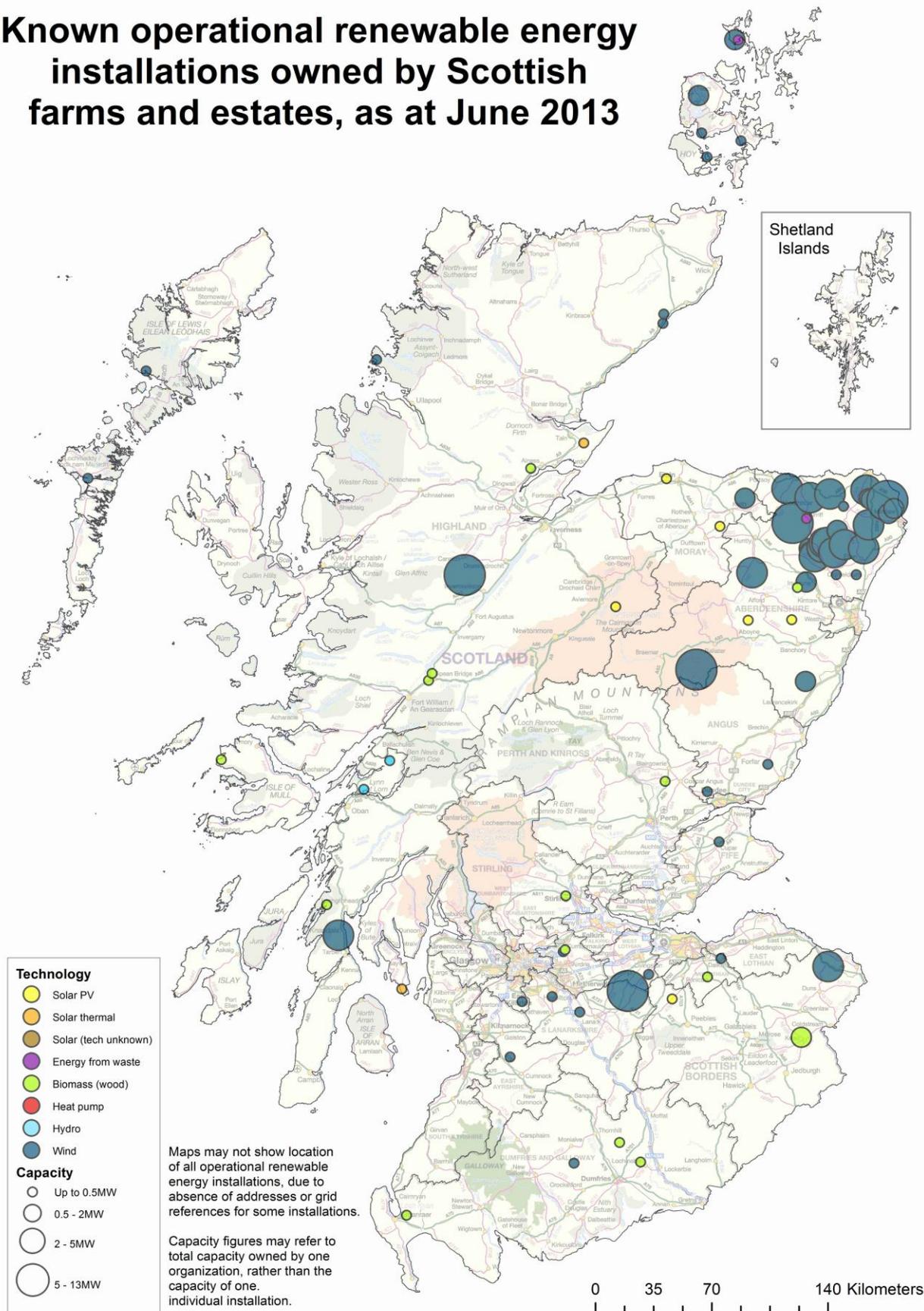


Figure 8. Operational renewable energy installations owned by housing associations in Scotland as at June 2013, by technology and size category

Known operational renewable energy installations owned by housing associations in Scotland, as at June 2013

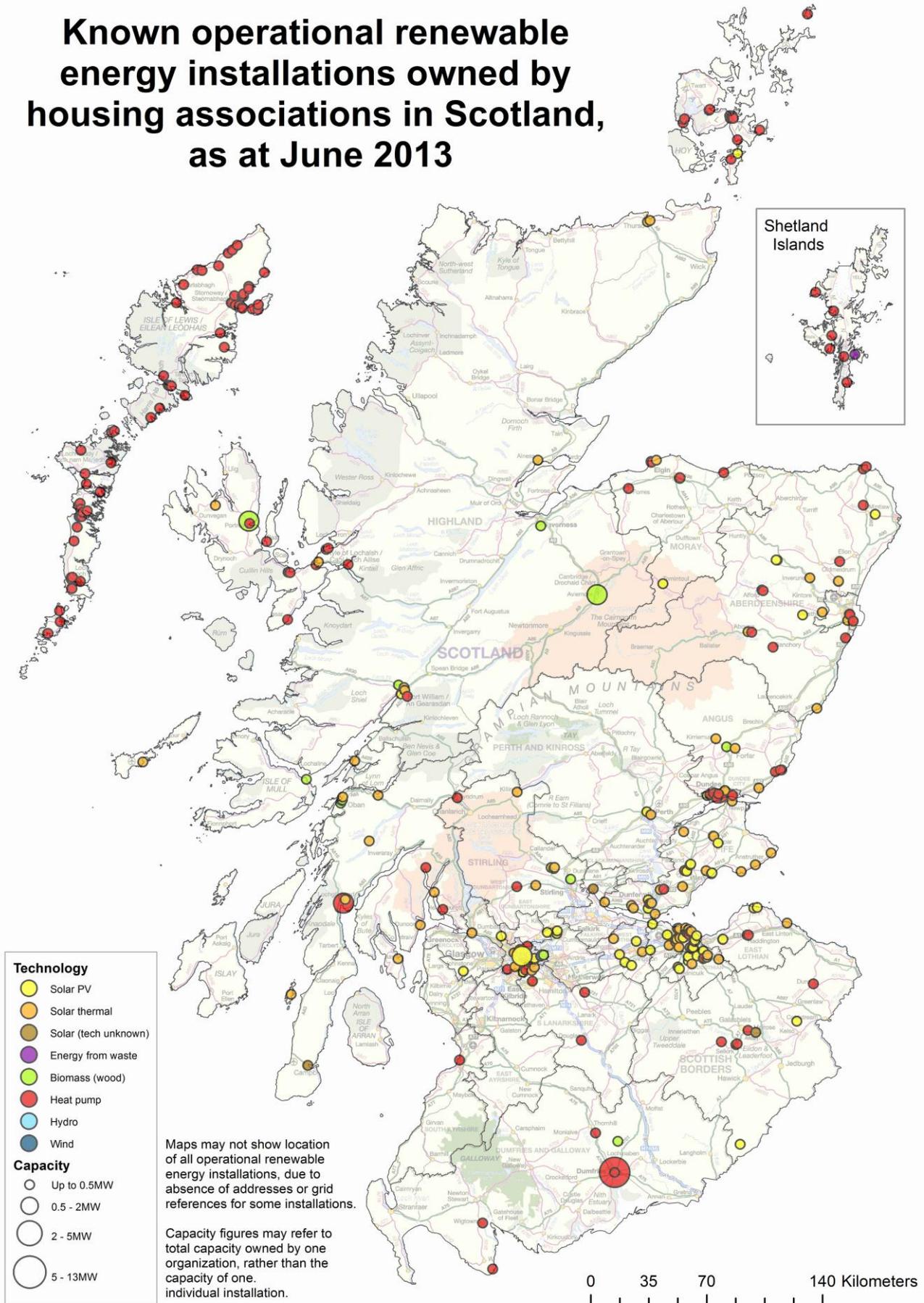


Figure 9. Operational renewable energy installations owned by local authorities in Scotland as at June 2013, by technology and size category

Known operational renewable energy installations owned by Scottish local authorities, as at June 2013

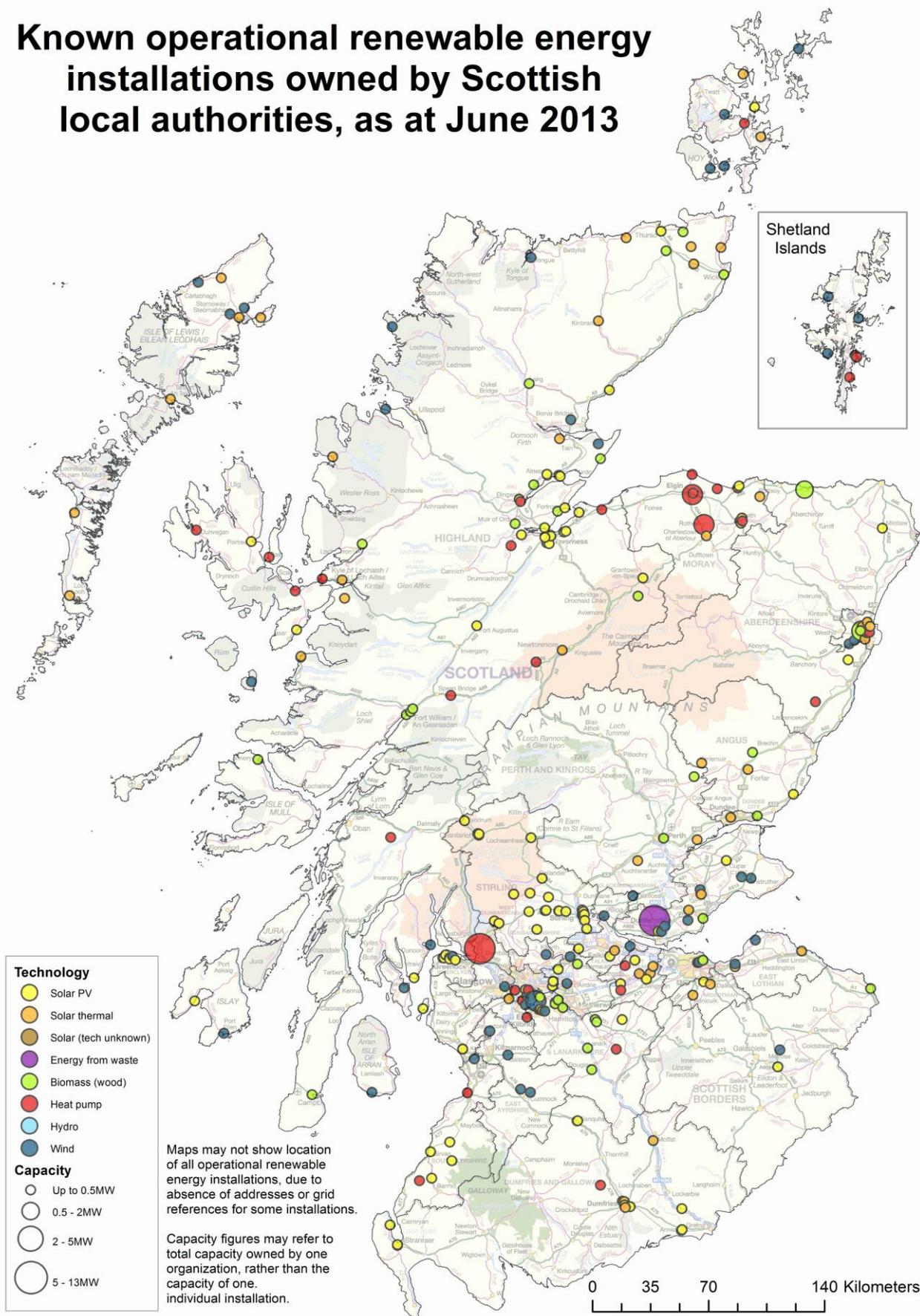


Figure 10. Operational renewable energy installations owned by local businesses in Scotland as at June 2013, by technology and size category

Known operational renewable energy installations owned by Scottish businesses, as at June 2013

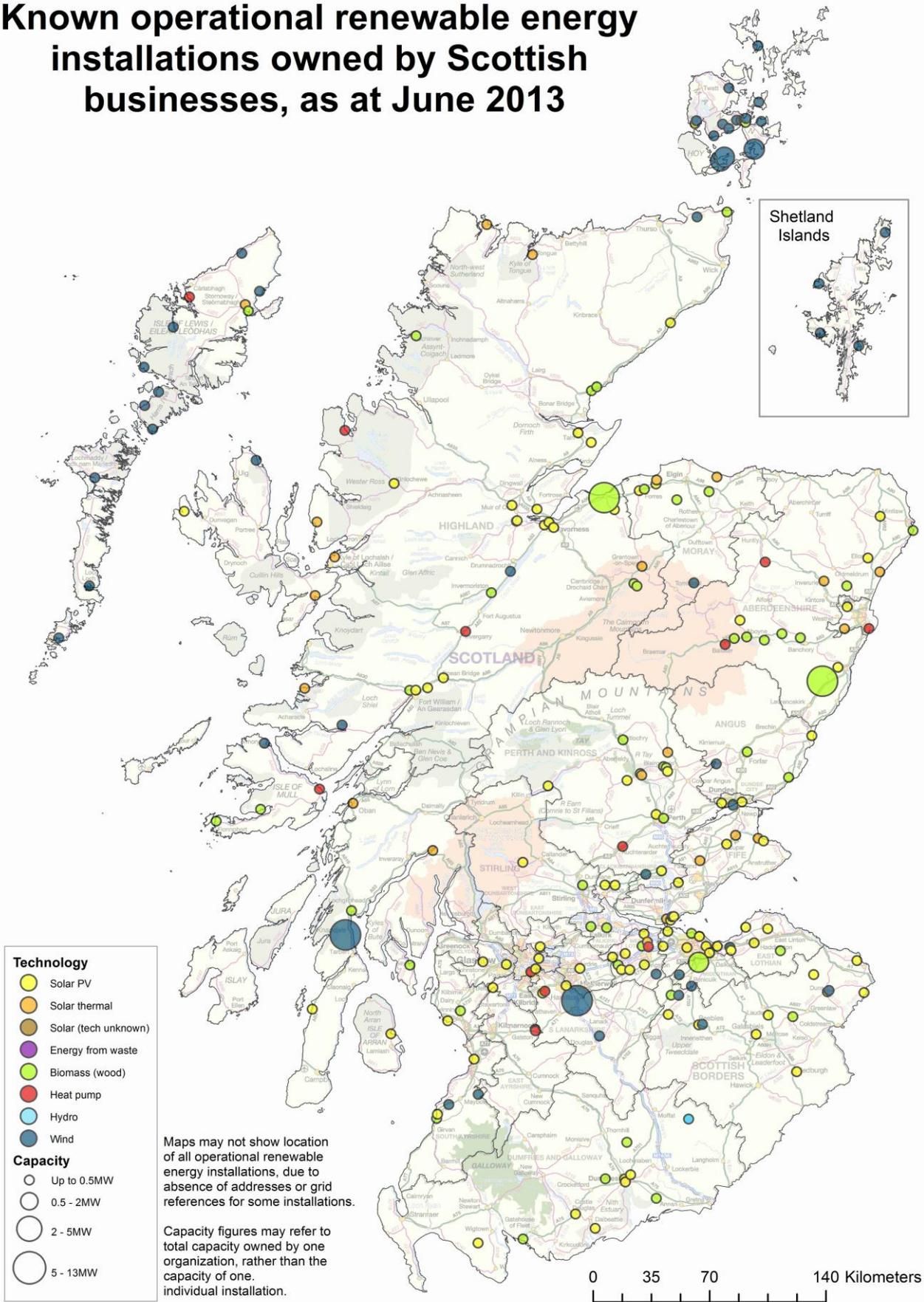
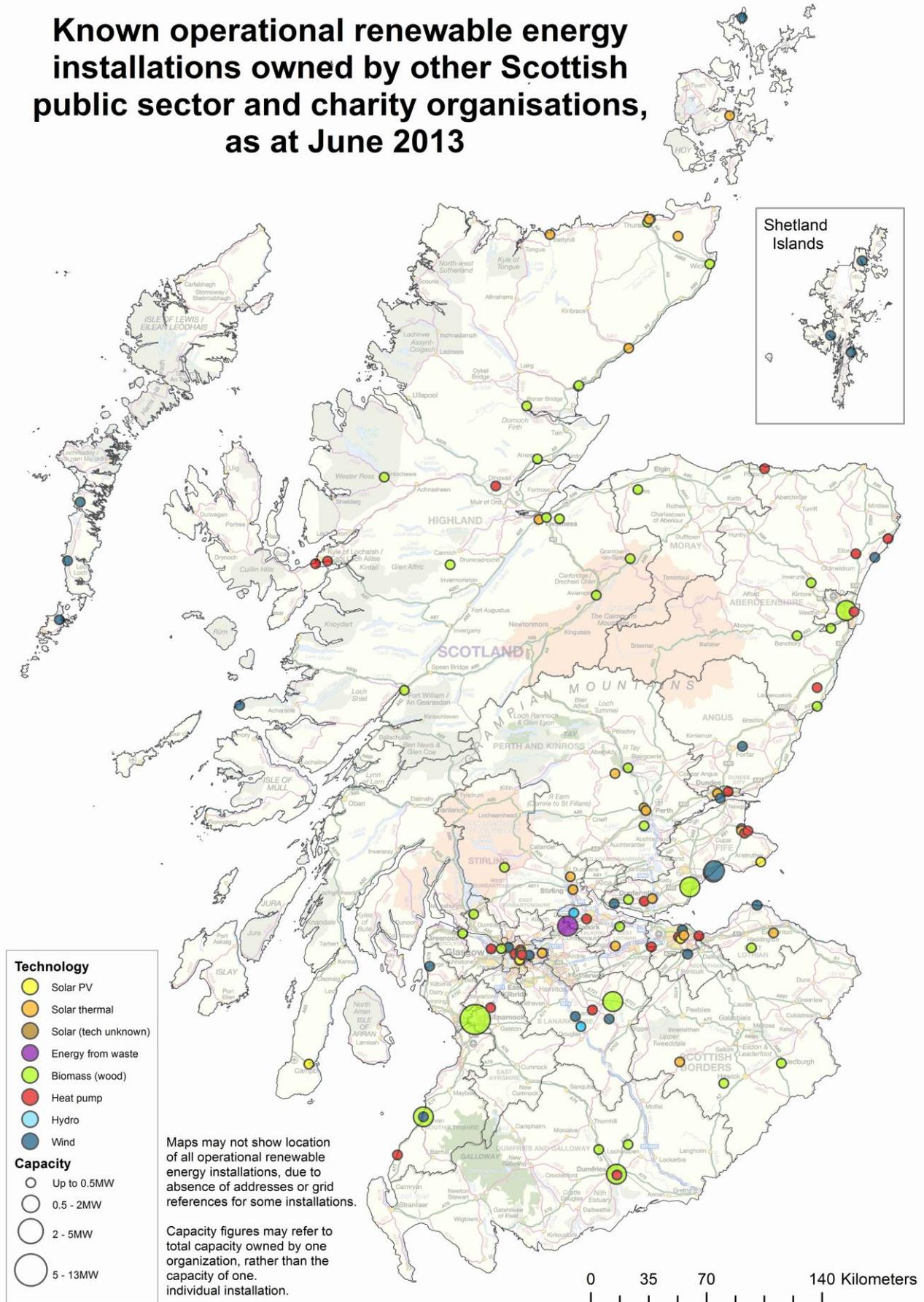


Figure 11. Operational renewable energy installations owned by other public sector and charity organisations in Scotland as at June 2013, by technology and size category

Known operational renewable energy installations owned by other Scottish public sector and charity organisations, as at June 2013



4. Further community and locally owned renewable energy capacity in development

4.1 Progress towards the 2020 target

In addition to the 285MW of community and locally owned renewable energy capacity estimated to be operational at the end of June 2013, a further 679MW of community or locally owned renewable energy capacity is estimated to be in various stages of development (under construction/consented but not built/in planning/in scoping), consisting of around 2,600 individual installations.¹⁶

Of the renewable energy capacity still in development, 74MW is under construction; 283MW¹⁷ has been granted planning permission but construction has not yet started ('consented not built')¹⁸; 101MW is in the planning system waiting for a planning decision to be made ('in planning')¹⁹; and a further 198MW is being considered, or is at the stage where preparation is being made to apply for planning permission ('in scoping'). About 22MW of capacity in the database is unclear in terms of development stage. This breakdown by is illustrated in figure 12, and a breakdown by technology type is given in table 6.

¹⁶ This number of installations includes the total number of individual wind turbines in any multi-turbine development.

¹⁷ Of the 282MW community and locally owned renewable energy capacity that had been granted planning permission but construction had not yet started as of June 2013, 167MWe is the Shetland Charitable Trust's portion of the Viking wind farm. The planning decision for this site is currently being appealed.

<http://www.vikingenergy.co.uk/>

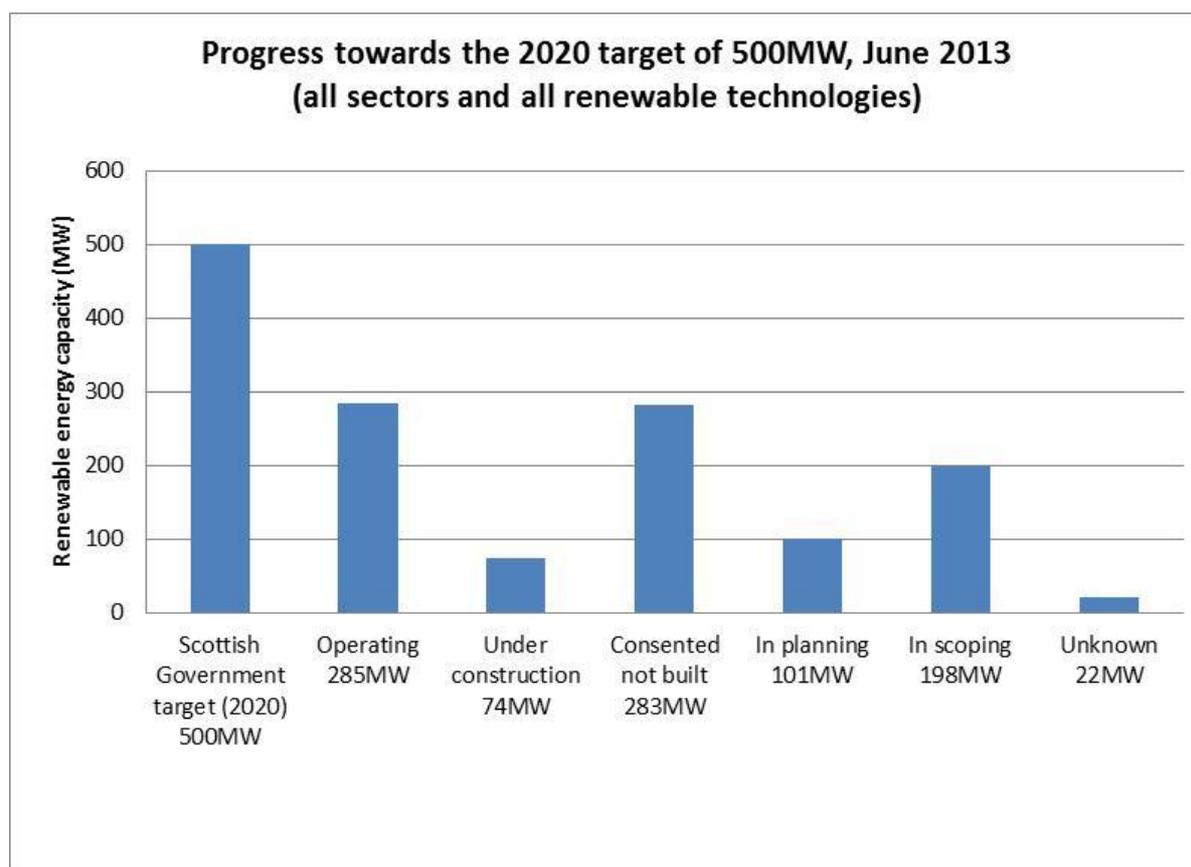
¹⁸ Applies only to installations which require planning permission

¹⁹ Applies only to installations which require planning permission

Table 5. Estimated capacity in development as of June 2013 by development stage and technology

<u>Technology</u>	<u>Under construction</u>	<u>Consented not built</u>	<u>In planning</u>	<u>In scoping</u>
Wind	66MW	268MW	88MW	158MW
Biomass	5MW	6MW	6MW	23MW
Energy from waste	0MW	<1MW	0MW	2MW
Heat pump	2MW	1MW	1MW	1MW
Hydro	<1MW	5MW	3MW	12MW
Solar PV	<1MW	3MW	2MW	1MW
Solar Thermal	1MW	1MW	<1MW	<1MW
Tidal	0MW	0MW	0MW	2MW
TOTAL	74MW	283MW	101MW	198MW

Figure 12. Community and locally owned renewable energy capacity in different stages of development, June 2013



Based on an estimated minimum of 285MW of capacity in operation at the end of June 2013, and the further 679MW identified as in development, it would appear that Scotland is on track to meet its target of 500MW of community and locally owned renewable energy by 2020. However this situation will need to be monitored with regards to the conversion rate of installations from developmental stages to operational capacity.

4.2 Recommendations for assessing future progress towards 500MW

In our report published in April 2011 we made a series of recommendations to the Scottish Government. These recommendations are still relevant and can be found in section 5 of the 2011 report. In particular, the quality of information on heat-generating installations, and on electricity-generating technologies below 10kW in size, could be improved with access to more detailed information from the Renewable Heat Incentive register and the central Feed-in Tariff register (both maintained by Ofgem on behalf of DECC).

Appendix 1: Full methodology

The actions taken and assumptions used to try to ensure minimal gaps in the information contained in the community and locally owned renewable energy database are described below.

Definition of ‘community and locally owned’

As with previous versions of the database, the Scottish Government has requested that ‘community and locally owned renewable energy’ be defined as technologies producing heat and/or electricity from a renewable source²⁰, where the owner of the installation is in one of the following categories:

- A community group
- A local Scottish business²¹
- A farm or estate
- A local authority
- A housing association
- ‘Other public sector and charity’, including:
 - charities, including faith organisations
 - public bodies or publicly owned companies
 - further or higher education establishments such as universities and colleges
 - recipients of Scottish Community and Householder Renewables Initiative (SCHRI) grants under the community stream of the programme (but not recipients of grants under the householder stream)
 - recipients of Community and Renewable Energy Scheme (CARES) grants.

‘Ownership’ has not been restricted to cases where the organisation owns the entire renewable installation. It also includes cases where, for example, a community group or farmer has helped to meet part of the cost of developing and installing a renewable system in return for some benefit, such as a share in the income generated. In such cases, a percentage of the installation’s capacity equal to the share owned by the community or local owner is counted towards the target.

‘Ownership’ does not include cases where the only benefit to the farmer or community group is a land rental payment from the owner or developer of the installation, or installations that generate community benefit payments but are owned by another organisation (for example a wind farm owner). The Scottish Government has established a register of community benefits from renewable energy projects²² in order to help communities and renewable energy developers negotiate appropriate levels of community benefit payment.

There is naturally some overlap between the different categories of owners. For example, some community groups have charitable status, as do many housing associations; and farms and estates could also be considered Scottish businesses. However, the following logic has been used to define which category an installation belongs to:

²⁰ A full description of each eligible technology is given in appendix 2

²¹ Note this excludes Scottish businesses whose purpose is to develop renewable energy projects

²² <http://www.localenergyscotland.org/view-the-register/>

- **Communities** have been defined as communities of place, i.e. based around a sense of shared location. They often have charitable status. In some instances the renewable technology and/or income from it may be owned by a trading subsidiary, which may be registered as a separate company.
- **Charities** have been defined as charitable organisations which are not also a community group, e.g. the Royal Society for the Protection of Birds (RSPB). ‘Charity’ has also been taken to include leisure trusts²³, and churches and other religious organisations.
- **Public bodies** are those listed in the National Public Bodies Directory²⁴, including NHS health boards. Other publicly-owned organisations such as the fire and rescue services and the police forces are also included in this category, although they are not strictly public bodies.
- **Further or higher education establishments** are the colleges and universities who are members of the Association of Scotland’s Colleges (ASC)²⁵ or Universities Scotland.²⁶
- **Local Scottish businesses** are small or medium-sized enterprises (SMEs) registered with Companies House²⁷ at an address in Scotland. Businesses receiving funding through the Community and Renewables Energy Scheme (CARES) or through Resource Efficient Scotland (RES) SME loans have been included. Note this definition excludes Scottish SMEs whose purpose is to develop renewable energy projects at a location significantly removed from their registered office, and where the business does not own the land where the installation will be built.²⁸
- **Farms or estates** are those organisations where the renewable technology is installed on land currently used for agricultural or other farming purposes, or on buildings that are part of a farm or estate layout; and (where the installation needs planning permission) where the person or organisation listed as the applicant in the planning application gives their address as being in Scotland. Estate ownership is often difficult to establish, but where possible publicly available information has been used to establish whether estate owners are normally resident on the estate where the installation is to be built. Farms and estates receiving funding through Local Energy Scotland have been included.
- **Local authorities** are the 32 unitary local authorities.
- **Housing associations** are providers of social housing within Scotland, other than local authorities.

²³ Leisure trusts supply sports facilities to local communities, often on behalf of unitary authorities. For example, see: <http://www.edinburghleisure.co.uk/list-116>

²⁴ <http://www.scotland.gov.uk/Topics/Government/public-bodies/about/Bodies>

²⁵ <http://www.scotlandscolleges.ac.uk/About-Us/about-us.html>

²⁶ <http://www.universities-scotland.ac.uk/>

²⁷ <http://www.companieshouse.gov.uk/>

²⁸ For example, an SME established to build and operate a renewable energy project did count as a ‘local Scottish business’ for the purposes of the target if it was registered with Companies House at an address in Scotland, and either a) owned all the land where the installation was to be built, or b) if it did not own all the land, if its registered address indicated that it was physically located close to the address of the proposed installation.

Note on the units used in the report

“Capacity” refers to the maximum instantaneous power output of a renewable energy system, in either electricity or heat. The capacity of electricity-producing technologies is usually measured in kilowatts of electricity (kWe) or megawatts of electricity (MWe), depending on the size of the installation. The capacity of heat-producing technologies is measured in kilowatts-thermal (kWth) or megawatts-thermal (MWth), again depending on the size of the installation. Where this report refers to capacity from both renewable heat and renewable electricity technologies, the figures are given simply in kW or MW. One megawatt is equal to one thousand kilowatts.

Combined heat and power units have figures for electrical capacity and heat capacity. Where such installations are referenced in this report the total capacity in MW (MWe + MWth) is reported. However, the supporting database attempts to provide both figures (electrical capacity and heat capacity).

Solar PV capacity can be referred to in kilowatt-peak, or kWp, which is interchangeable with kWe.

“Energy output” is estimated for each technology on an annual basis. Energy is reported in megawatt-hours (MWh) or gigawatt-hours (GWh). One gigawatt-hour is equal to one thousand megawatt-hours.

Approach taken and data sets used

The approach taken to collect data from each source is broadly in line with that taken to produce the previous versions of the database and report – with some updates – and is outlined below. This year’s update includes an improved survey of housing association renewables, conducted in association with the Scottish Federation of Housing Associations (SFHA).

Due to the large number of different organisations and different technologies covered by the Scottish Government’s definition of ‘community and locally owned renewable energy’, information is sought from a variety of sources. This includes organisations administering Scottish Government or other public funding streams, local authorities and planning authorities, public bodies (e.g. SEPA and Highlands and Islands Enterprise) and likely renewables owners themselves. In some cases, organisations were able to provide information about installations in more than one ownership category; and for each ownership category there were a number of different information sources used.

- **Data from funding and delivery organisations**

There have been a variety of funding sources available in recent years to promote the uptake of renewable energy generation among different groups, such as communities and farms. Therefore an important source of information for this database was information on the organisations who have received such funding, which was provided either by the funding organisation themselves (e.g. Scottish Government) or delivery organisations (e.g. Local Energy Scotland and Energy Saving Trust).

- **Data from local authorities**

A survey was sent by email from Home Energy Scotland to all 32 Scottish local authorities enquiring about renewable energy technologies fully or partly owned by local authorities. Completed surveys were received from 12 local authorities. As this survey has now been done three times for annual update of the community and locally-owned database, we now have some information on 25 of the 32 local authorities.

- **Data from housing associations**

A survey was sent by email from the Energy Saving Trust and the SFHA on behalf of the Scottish Government to all SFHA members enquiring about renewable technologies fully or partly owned by local authorities. 92 responses were received (51 including information on renewable technologies and 41 returns saying the housing association does not own any renewables in Scotland).

- **Data from the UK Renewable Energy Planning Database**

The UK Department of Energy and Climate Change (DECC) shared information from the Renewable Energy Planning Database (REPD)²⁹, which is maintained on their behalf by Ricardo-AEA. The REPD aims to track the progress through the UK planning system of all renewable electricity-generating technologies with an electrical generation capacity of 0.01MWe (10kWe) and greater, and of some heat-generating installations. However, it does not record details of ownership.

- **Data from planning authorities**

Information from DECC's REPD was used in conjunction with publicly available information from Scotland's planning authorities to determine ownership of installations.

Further information sources included:

- Publicly available information from other funding streams, for example the Renewable Heat Premium Payment (RHPP) (social landlord streams).
- Information from individual installation owners, where necessary to confirm details such as capacity or ownership in response to telephone or e-mail contact.
- Information available on Community Energy Scotland's website³⁰ and in its newsletters.
- Individual community group, charity or housing association websites.³¹

Wherever possible, the information sought included:

- Name of the project.
- Ownership (organisation and type of organisation).
- Where appropriate, the name of the subsidiary trading company owning the renewable technology on behalf of the community group/charity.
- Location, including local authority area, address, and a postcode or grid reference.
- Technology type.
- Number and installed capacity of the technologies installed.
- Operational status as at June 2013 (operating/under construction/consented not built/in planning/in scoping), including where possible the date on which generation commenced for operational projects.
- Percentage ownership by the community group etc, in cases where the organisation did not have full ownership of the installation.
- Where appropriate, the building type associated with the renewable energy installation, to aid cross-checking with other sources, help to clarify organisation type, and to estimate yearly energy output.

²⁹ <https://restats.decc.gov.uk/cms/>

³⁰ <http://www.communityenergyscotland.org.uk/>

³¹ For example: <http://neilstonwindfarm.org/ourwindfarm.html>

- Whether public grant or loan funding was received, to aid cross-checking with information received from bodies administering those funds.

Other data sources not used in this update of the database

The information sources listed below were investigated for the first version of the database and report, but they were found to contain either information captured elsewhere or insufficient detail for this project. For further details about these information sources please see section 2.3 of the first report.

- Carbon Reduction Commitment (CRC) Energy Efficiency Scheme (administered in Scotland by SEPA on behalf of DECC)
- The Feed-in Tariff (FIT) scheme (administered by Ofgem on behalf of DECC)
- The Renewable Heat Incentive (RHI) (administered by Ofgem on behalf of DECC)
- Installations registered for the Renewables Obligation (Scotland), the Climate Change Levy, and Renewable Energy Guarantees of Origin
- Scotland's Climate Change Declaration

Data quality

Not all the required information was available from all sources. Given the large number of renewables installations covered by the community and locally owned renewables database, it was not possible to contact each project individually, or to track down all missing details from other sources. Priority was given to ensuring the database contained the correct information with regards to: technology type; operational status; installed capacity; and % community or local ownership share.

In certain circumstances assumptions have been made about the operating status. If information for a project has been found in previous years but no further information has been found for the June 2013 update the following assumptions have been made: if a project has been previously recorded as 'in scoping' and no further information has been found, then the assumption has been made that it is still at the same stage of development. Projects that have had planning permission granted but where there is no further information have been assigned the status 'consented but not built'. The status of projects that were 'under construction' in June 2012 has remained the same if no evidence has been found that the project is operational. There are some projects recorded in the database that have no evidence of status; these are classed as unknown.

The quality of data that was provided varied considerably. In particular, installed capacity was often not provided, and operational status was sometimes unclear.³² Technology type was sometimes also unclear (for example 'solar', which does not indicate whether the installation is a solar PV panel generating electricity, or a solar thermal panel generating hot water).

Data received from DECC's Renewable Energy Planning Database (REPD) provided very good location data and operational status, but did not contain information on ownership, which had to be sought from other sources (mostly the planning authorities).

³² For example, grant and loan schemes frequently record the stage of the application for funding (loan offered or paid), but not the stage of the renewable technology itself e.g. under construction or operational.

Location data was often missing or incomplete. In the case of projects still in scoping, location had not always been decided at the time of data collection. As far as possible, the local authority area has been identified for each installation.

Uncertainty levels associated with the methodology

In any analysis of this kind where data are gathered from a variety of different sources, total data coverage may be incomplete. This is for a number of reasons: 1) incomplete information may be received on some installations; and 2) the number of sectors and technologies the database covers means there is a chance that some installations may have been missed altogether.

Large capacity renewables installations are typically higher profile projects, and more likely to require planning permission (and planning records are a very good source of reliable information). So issues with data collection are more likely for smaller capacity installations such as heat pumps and solar thermal panel.

The opposite problem (double-counting installations) is also a potential issue, although efforts have been made to avoid it. Due to the large number of data sources and the varying level of detail provided by different organisations there remains a risk that some double-counting of installations or their capacity may have occurred. Again, as large capacity renewables installations are typically higher profile projects, and more likely to require planning permission, double-counting is most likely for smaller capacity installations such as heat pumps and solar thermal panels.

However, some points for particular consideration in relation to data coverage and data quality are:

- **Information received from local authorities**

In the course of compiling the database, Home Energy Scotland sent an email survey to all 32 local authorities in Scotland on behalf of the Energy Saving Trust and Scottish Government, asking them to provide information on all renewable technologies fully or partly council-owned. However, due to the large numbers of different building types for which councils have responsibility (social housing, council offices, schools, waste collection facilities) and the large number of different council departments which are involved in maintaining these, we could not always guarantee a response that gave a full picture of all council-owned stock. In total, we received a reply from 12 of the 32 local authorities. As the amount of renewable capacity reported for local authority stock varied greatly, no attempt was made to scale up known capacity to account for non-respondents. As this survey has now been done three times for the community and locally-owned database, we now have some information on 25 of the 32 local authorities.

- **Information received from housing associations**

The SFHA and the Energy Saving Trust sent an email survey on behalf of the Scottish Government to all members of the SFHA. 51 of the housing associations who replied provided information on renewable capacity they had installed, and 41 replied to say they owned no renewable energy capacity. Given the range of reported installed capacity per housing association, no attempt was made to scale up known capacity to account for non-respondents.

- **Projects in scoping**

It is difficult to gain information on projects which are still in the early development stages, particularly if the applicants are not eligible for financial support from the funding organisations the Energy Saving Trust contacted while compiling this database. This will be particularly true of intentions to install farm and estate wind turbines, which typically have large capacities. Therefore the figures presented here for installations in scoping are highly likely to be an underestimate.

- **Projects in planning**

In compiling the database, information received from DECC's REPD was a source of good quality information on renewable energy installations where the owner had applied for planning permission. Many smaller capacity renewable energy installations (such as solar panels on domestic-sized properties and ground source heat pumps used for space heating in small buildings) do not require planning permission and so will not be captured by this information source. However, larger capacity renewables do require planning permission in most cases and so will have been captured from this data.

Share of capacity in community and local ownership

As noted earlier the definition of 'ownership' used in this analysis was not restricted to cases where the organisation owns the entire renewable installation. It also included cases where, for example, a community group or farmer helped to meet part of the cost of developing and installing a renewable energy technology in return for some benefit, such as a share in the income generated. In such cases, a percentage of the installation's capacity equal to the share owned by the community or local owner is counted towards the target.

Such instances are normally wind energy developments, where perhaps the best known example is the wind turbine 'owned' by Fintry Renewable Energy Enterprise, the trading subsidiary of Fintry Development Trust³³, which is part of the larger Earlsburn Wind Farm. In this case, the turbine owned by Fintry has a capacity of 2.5MWe, so Fintry Development Trust's entry in the community and locally owned database lists one turbine of 2.5MW, although the full capacity of Earlsburn wind farm is much larger (around 35MW).

There are other examples in the database, such as the Neilston Development Trust's joint venture with a commercial partner to develop a community wind farm in East Renfrewshire³⁴. In this case, the community secured loans to finance a 28% stake of the project. Therefore the 'community and locally owned renewable energy' capacity of the Neilston wind farm has been calculated in the database as 28% of the total expected installed capacity of the development.

Energy4All wind farms were a special case for consideration. Energy4All works to help establish wind energy co-operatives in the UK, and this work has included the establishment of four operational wind farm co-operatives in Scotland³⁵. Members of the local community can buy shares in the developments. In these cases, information on the percentage of community ownership was received from Energy4All, and the percentage applied to the total installed capacity of the site to estimate the MWe in community and local ownership.

Capacity estimates where values were not available

Not all required information was available for all renewable energy installations. In some cases, the installed capacity was one of the figures not available.

Every effort was made to confirm capacity with the owners of installations. However, because of the large number of installations covered in this work it was not possible to obtain this information for all installations within available resources.

³³ <http://www.fintrydt.org.uk/index.php?page=about>

³⁴ <http://www.neilstontrust.co.uk/what-we-do/go-neilston/community-windfarm.html>

³⁵ <http://www.energy4all.co.uk/scotland/>

For installations where a value for capacity was not provided, an estimate was made for likely installed capacity based on technology type, ownership category and building type (where appropriate). These were derived from similar installations where capacity was known, or using other assumptions as given below. A note of the values assumed for capacity is given in appendix 4.

For some installations, an estimate of yearly energy output was supplied instead of a value for capacity. In those cases, installed capacity was estimated using the assumptions detailed in table 7.

Information on solar thermal panels and solar PV panels was sometimes provided in area (m²) of panel. In such cases, the conversion factors used to estimate capacity are given in table 6.

Table 6: Assumptions used to estimate capacity of solar thermal and solar PV panels

<u>Technology</u>	<u>Value used</u>	<u>Units</u>	<u>Information source</u>
Solar thermal panel, average capacity per m ²	0.7	kWth/m ²	Solar Trade Association.
Solar PV panel, average capacity per m ²	0.14	kWp/m ²	Energy Saving Trust Solar Energy Calculator tool assumptions. ³⁶

Yearly energy output

The assumptions used to estimate yearly output in MWh of energy from community and locally owned renewable energy sources are given in table 7.

For solar thermal panels and solar PV panels, yearly energy output was estimated using the following method:

Total installed capacity (kW), divided by capacity per m² (kW/m²), multiplied by factor for yearly output per m² (kWh/m²/yr) = yearly energy output (kWh).

For all other technologies, the formula used was:

Total installed capacity (kW), multiplied by estimate of peak load hours per year (h) = yearly energy output (kWh).

Table 7. Assumptions used to estimate yearly energy output.

<u>Technology</u>	<u>Value used</u>	<u>Units</u>	<u>Information source</u>
Solar thermal panel, yearly energy output per m ² .	340	kWh/m ² /year	Derived from SAP 2009 calculations. ³⁷
Solar PV panel, yearly electricity output per m ² .	99	kWh/m ² /year	Energy Saving Trust Solar Energy

³⁶ Scottish average. <http://www.energysavingtrust.org.uk/Generate-your-own-energy/Solar-panels-PV/Solar-Energy-Calculator>

³⁷ http://www.bre.co.uk/filelibrary/SAP/2009/SAP-2009_9-90.pdf

			Calculator tool assumptions. ³⁸
Yearly peak load hours for small wind turbines (10kW and under).	1,664	hours/year	Energy Saving Trust field trial of domestic small-scale wind turbines. ³⁹
Yearly peak load hours for larger wind turbines (over 10kW).	2,365	hours/year	Scottish Renewables
Yearly peak load hours for hydro-electricity.	3,500	hours/year	Various ⁴⁰
Yearly peak load hours for anaerobic digestion (electricity production).	5,256	hours/year	RESTATS (Ricardo-AEA on behalf of DECC). ⁴¹
Yearly peak load hours for biomass combined heat and power (electricity production).	8,000	hours/year	(<i>Energy Saving Trust expert assumption</i>)
Yearly peak load hours for tidal electricity generation.	3,066	hours/year	Scottish Renewables
Yearly peak load hours for heat pumps or biomass providing space heating for one type of building (excluding low usage buildings e.g. community halls). Includes district heating that provides space heating to only one category of building e.g. only domestic properties.	2,500	hours/year	As used for estimating output in Renewable Heat in Scotland. ⁴²
Yearly peak load hours for heat pumps or biomass providing space heating for low usage buildings e.g. community halls and churches.	250	hours/year	As used for estimating output in Renewable Heat in Scotland. ⁴³
Yearly peak load hours for biomass providing	5,000	hours/year	As used for estimating output in Renewable

³⁸ Scottish average. <http://www.energysavingtrust.org.uk/Generate-your-own-energy/Solar-panels-PV/Solar-Energy-Calculator>

³⁹ <http://www.energysavingtrust.org.uk/Publications2/Generating-energy/Field-trial-reports/Location-location-location-domestic-small-scale-wind-field-trial-report>

⁴⁰ The following sources were used, which indicated that a reasonable assumption to use would be 3,500 peak hours per year, equivalent to a 40% load factor.

- Garrad Hassan report on renewable energy potential for Scottish Renewables
- The British Hydropower Association's mini hydro guide (2005), <http://www.british-hydro.org/mini-hydro/infopage2e19.html?infoid=370>
- Scottish Hydropower Resource Study for FREDS, Aug 2008, <http://www.british-hydro.org/UK%20Hydro%20Resource/Scottish%20Hydro%20Resource%20Study%20Aug%202008.pdfhttp://www.british-hydro.org/UK%20Hydro%20Resource/Scottish%20Hydro%20Resource%20Study%20Aug%202008.pdf>

However, estimates of output from hydro should be treated with caution because hydro output is highly site specific.

⁴¹ <https://restats.decc.gov.uk/cms/regional-renewable-statistics/#Data>

⁴² Energy Saving Trust for the Scottish Government: <http://www.energysavingtrust.org.uk/scotland/Take-action/Get-business-funding/Renewable-Heat-in-Scotland-2012>

Note that DECC uses an estimate of 1,314 peak load hours per year (equivalent to a 15% load factor) as the tier-break point between tier 1 and tier 2 prices paid for heat from small and medium non-domestic biomass under the Renewable Heat Incentive. However this is noted by DECC as being a reasonable estimate of a minimum level of usage that could be expected. Therefore 2,500 peak load hours has been used here, which is consistent with estimates of renewable heat in Scotland, as an estimate of total peak load hours for space heating in Scotland.

http://www.decc.gov.uk/en/content/cms/meeting_energy/Renewable_ener/incentive/incentive.aspx

⁴³ Energy Saving Trust for the Scottish Government. <http://www.energysavingtrust.org.uk/scotland/Take-action/Get-business-funding/Renewable-Heat-in-Scotland-2012>

heat for a commercial process (where the installation is sized between 45kW and 1MW), or providing space heating via district heating for more than one type of building.			Heat in Scotland. ⁴⁴
Yearly peak load hours for biomass providing heat for a commercial process (where the installation is sized 1MW or over).	8,000	hours/year	As used for estimating output in Renewable Heat in Scotland. ⁴⁵

(With thanks to Scottish Renewables for providing guidance on estimates of capacity factors for many of the electricity-generating technologies).

Appendix 2: Individual technology descriptions

The following renewable technologies have been included in the database:

- **Wind (including wind to heat)**

Wind turbines have blades which are turned by the wind. When the wind blows, the blades are forced round, driving a turbine which generates electricity. They may be pole-mounted or building-mounted, and may be connected to the national electricity grid, a local distribution grid, or stand-alone. Wind to heat installations ('wind to heat') where the turbines produce electricity which is used to directly charge electric storage heaters for space heating have also been included. In 'wind to heat' cases the recorded capacity is that of the turbine.

- **Hydro**

A flow of water falling from a higher level to a lower level (and not from waves or tides) is used to drive a turbine which generates electricity.

- **Wave and tidal (marine energy)**

The action of waves or tides is used to drive a turbine, which generates electricity.

- **Solar photovoltaics (PV)**

Panels or modules, normally fixed to the roofs of buildings, which produce electricity when exposed to sunlight (either direct or indirect).

- **Biomass primary combustion**

Biomass is burnt to directly produce space or water heating. Here 'biomass' has been taken to mean wood chips, pellets or logs. It is also possible (as in the Lerwick district heating scheme in Shetland) for other organic or putrescible matter, such as food waste, to be burnt to produce heat, but in these cases the installation has been classified as 'energy from waste' (EfW).

⁴⁴ Energy Saving Trust for the Scottish Government. <http://www.energysavingtrust.org.uk/scotland/Take-action/Get-business-funding/Renewable-Heat-in-Scotland-2012>

⁴⁵ Energy Saving Trust for the Scottish Government. <http://www.energysavingtrust.org.uk/scotland/Take-action/Get-business-funding/Renewable-Heat-in-Scotland-2012>

- **Biomass 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 for supplying space and/or water heating. Again, this biomass could either be wood products; or it could waste material with an organic component, such as municipal waste, but in such cases the installation would be classed as 'energy from waste'.

- **Solar thermal panels**

Panels normally fixed to the roofs of buildings, which produce hot water using the sun's heat. Occasionally these systems are designed so that the hot water produced also contributes to space heating demand (solar space heating).

- **Heat pumps**

Technologies to extract low-grade heat from the external environment (the ground, air or a body of water) and produce heat for space and/or water heating, using a compression system. 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 air source heat pumps category. Units which are purely exhaust air heat recovery (EAHR) and that do not also extract heat from the air outside have not been included.

- **Energy from waste technologies:**

- **Anaerobic digestion (AD)**

Organic matter is broken down in the absence of oxygen to produce methane gas. This is then burnt to generate heat and/or electricity. Some of the heat produced is usually used to help maintain the AD digestion process itself.

- **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 to generate electricity and heat.

- **Waste incineration**

Municipal or industrial waste can be burnt to provide heat. A proportion of the total capacity that is equal to the percentage of biodegradable matter in the waste is taken to be renewable energy capacity.

Another technology which could have been included in the database if examples had been found was:

- **Fuel cell biomass**

Fuel cells running on biomass could be used to produce electricity and useful heat. However, none were identified in Scotland for this version of the database.

Technologies which were not included in the database, as they do not produce energy from renewable sources, are:

- **Non-biomass CHP**

Combined heat and power units fuelled by gas (or other fossil fuels) to produce electricity and heat. CHP (or tri-generation) units can represent an efficient use of fuel as they achieve high efficiencies.

However, as the energy from such units is generated from fossil fuel sources, it has not been counted towards renewable energy targets in this report.

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

Systems which recover the heat from warm stale air leaving a building and use it to warm incoming air. This can help to reduce space heating requirements. However, because the heat being recovered for the building will normally have been generated by fossil fuels in the first instance, these systems do not provide renewable heat. Some heat pumps have been included which are classed as ‘exhaust air heat recovery’, but only where it was possible to ascertain that they also provided heat taken from the air outside the building (which is renewable heat) via a heat pump component.

- **Passive renewable heating or cooling**

The building design is used to ensure heating or cooling without relying on mechanical means, for example through features such as solar gain through large areas of south-facing glazing, or ‘natural ventilation’. Such design features can successfully help a building meet its heat demand, however they have not been included in this report or in the database as the heat resource is very difficult to estimate.

Appendix 3: List of main data sets used

Table 8 lists the main data sources used in this update of the community and locally-owned renewable energy database, by ownership category and data provider. Details of the data sources used for previous versions of the database can be found in the relevant reports.

Table 8. Main data sets used

<u>Organisation(s) contacted/providing data</u>	<u>Dataset(s)</u>	<u>Ownership categories</u>
<i>Local Energy Scotland</i> , on behalf of the Scottish Government	The Community and Renewable Energy Scheme (CARES).	Communities; Farms and estates; Local businesses. ⁴⁶
<i>Energy Saving Trust</i> , on behalf of the Scottish Government.	The district heating loans fund.	Local authorities; Housing associations; ⁴⁷ Communities; ⁴⁸ Farms and estates; Local businesses.
<i>Energy Saving Trust</i> , on behalf of the Scottish Government.	The Warm Homes Fund.	Local authorities; Housing associations. ⁴⁹
<i>Energy Saving Trust</i>	CESP- and ECO-funded	Local authorities;

⁴⁶ Local businesses must also be rural businesses to be eligible for CARES funding.

⁴⁷ The district heating loans fund is also open to other registered social landlords.

⁴⁸ Communities must be legally constituted community groups to apply for the district heating loans fund.

⁴⁹ The Warm Homes Fund is also open to other registered social landlords, and to energy services companies (ESCOs) set up by housing associations, local authorities or registered social landlords.

	renewable energy projects in Scotland.	Housing associations.
<i>Resource Efficient Scotland, on behalf of the Scottish Government.</i>	Resource Efficient Scotland small and medium-sized enterprises loans scheme.	Local businesses.
<i>Community Energy Scotland</i>	Operational revenue-generating community energy projects database.	Communities.
<i>Forestry Commission Scotland</i>	Wind and hydro schemes on the National Forest Estate (publicly available information).	Communities; Other public sector and charity organisations; Farms and estates; Local businesses.
<i>NHS National Services Scotland</i>	Operational renewable energy installations on the NHS Scotland estate.	Other public sector and charity organisations.
Individual local authorities, via <i>Home Energy Scotland</i>	Responses to an Energy Saving Trust e-mail survey of all local authorities, using contacts from the Home Energy Scotland advice network.	Local authorities.
Individual housing associations, via the <i>Scottish Federation of Housing Associations (SFHA)</i>	Responses to an SFHA and Energy Saving Trust e-mail survey of all SFHA housing association members in Scotland.	Housing associations.
<i>Ricardo-AEA, on behalf of the UK government's Department for Energy and Climate Change</i>	Extract from the Renewable Energy Planning Database.	Local authorities; Housing associations; Communities; Other public sector and charity organisations; Local businesses; Farms and estates.
<i>The UK Government's Department for Energy and Climate Change</i>	Renewable Heat Premium Payment (publicly available information).	Local authorities; Housing associations.

Appendix 4: Capacities assumed for individual installations where information was not available

Table 9 shows the assumed capacities that were used in the community and locally owned renewable energy database where information on capacity was not available.

Table 9. Assumptions for capacity by technology and building type (where other information was not available).

<u>Ownership category</u>	<u>Building type</u>	<u>Technology</u>	<u>Estimate of likely installed capacity</u>	<u>Derived from</u>
Community	Community buildings	Solar PV	8kWe	Average of other community PV installations recorded in the database.
	Community buildings	Solar thermal	6kWth	Average of other community solar thermal installations recorded in the database.
	Community buildings	Wind (including wind to heat) – grant funded	6kWe	Average of other community wind installations recorded in the database. ⁵⁰
	Community buildings	Heat pumps (ASHP and GSHP)	16kWth	Average of other heat pumps in public sector, LA non-domestic and community buildings, recorded in the database.
	All	Biomass	45kWth	Average of other community biomass installations recorded in the database.
	All	Biomass district heating	250kWth	Average of other community biomass district heating installations recorded in the database.
Other public sector and charity	All	Solar thermal	13kWth	Average of other public sector and charity solar thermal installations recorded in the database.
	All	Wind – grant funded	6kWe	Average of other public sector and charity wind

⁵⁰ This average excludes large-scale wind developments, and was used as the assumed capacity for wind turbines installed under SCHRI or CARES grant schemes (where this information was not provided), and in cases where other information provided indicated that the turbine was associated with a community hall or other small building, rather than being part of a larger development. Revenue-generating wind projects (which are typically not grant funded) are more variable in size. However as these tend to be large in size (typically 800kW and over), effort has been made to determine the exact size of each installation for non-grant funded community wind projects.

				installations recorded in the database. ⁵¹
	All	Heat pumps (ASHP and GSHP)	16kWth	Average of other heat pumps in public sector, LA non-domestic and community buildings recorded in the database.
	All except hospitals	Biomass	150kWth	Average of other public sector and charity biomass installations, excluding hospital installations, recorded in the database.
	Hospitals	Biomass	1.7MWth (1,700kWth)	Average of other hospital biomass installations recorded in the database.
Farms and Estates	All	Biomass	150kWth	Average of other farm and estate biomass installations recorded in the database.
	All	Biomass district heating	150kWth	Average of other farm and estate biomass district heating installations recorded in the database.
	All - Scotland Rural Development Programme (SRDP) grant recipients only	Hydro	9kWe	Average of other farm and estate hydro installations recorded in the database. ⁵²
Local businesses	All	ASHP	16kWth	Average of other local business ASHP's recorded in the database.
	All	GSHP	30kWth	Average of other local business GSHP's

⁵¹ This average excludes large-scale wind developments, and was used as the assumed capacity for wind turbines installed under SCHRI or CARES grant schemes (where this information was not provided), and in cases where other information provided indicated that the turbine was associated with a small building, rather than being part of a larger development. Revenue-generating wind projects (which are typically not grant funded) are more variable in size. However as these tend to be large in size (typically 800kW and over), effort has been made to determine the exact size of each installation for non-grant funded wind projects.

⁵² Based on information received on size of hydro capacity installed under SRDP, therefore only used for other SRDP hydro installations where capacity was not known. Revenue-generating hydro projects (which are typically not grant funded) are more variable in size. However as these tend to be large in size (typically 100kW and over), effort has been made to determine the exact size of each installation for non-grant funded hydro projects.

				recorded in the database.
	All	Biomass	200kWth	Average of other local business biomass recorded in the database.
	All	Biomass district heating	150kWth	Average of other local business biomass district heating recorded in the database.
Local authority	Domestic properties	Solar thermal	3.4m ²	Analysis of Energy Saving Scotland home renewables grants. ⁵³
	Domestic properties	Solar PV – installed in 2011 or 2012	2.8kWe	Analysis of installations registered for FITs in Scotland. ⁵⁴
	Domestic properties	Solar PV – installed in 2013	3.6kWe	Analysis of installations registered for FITs in Scotland. ⁵⁵
	Domestic properties	Heat pumps (ASHP and GSHP)	7kWth	Average of other LA- and HA-owned heat pumps in domestic properties recorded in the database.
	Schools	Solar thermal	7kWth	Average of other school solar thermal installations recorded in the database.
	Schools	Solar PV	8kWe	Average of other school solar PV installations recorded in the database.
	Schools	Wind – grant funded	6kWe	Average of other school wind installations recorded in the database.
	Schools	ASHP	10kWth	Average of school ASHP installations recorded in the database.
	Schools	Biomass	200kWth	Average of other school biomass boiler installations recorded in the database.

⁵³ Energy Saving Scotland home renewables grants (no longer available) were grants for domestic renewables, administered by the Energy Saving Trust on behalf of the Scottish Government.

⁵⁴ Central FIT's register, Ofgem. <http://www.ofgem.gov.uk/Sustainability/Environment/fits/Pages/fits.aspx>

⁵⁵ Central FIT's register, Ofgem. <http://www.ofgem.gov.uk/Sustainability/Environment/fits/Pages/fits.aspx>

	Other buildings	Heat pumps (ASHP and GSHP)	16kWth	Average of other heat pumps in public sector, LA and community buildings, recorded in the database.
Housing Association	Domestic properties	Solar thermal	3.4m ²	Analysis of Energy Saving Scotland home renewables grants. ⁵⁶
	Domestic properties	Solar PV – installed in 2011 or 2012	2.8kWe	Analysis of installations registered for FITs in Scotland. ⁵⁷
	Domestic properties	Solar PV – installed in 2013	3.6kWe	Analysis of installations registered for FITs in Scotland. ⁵⁸
	Domestic properties	Heat pumps (ASHP and GSHP)	7kWth	Average of other LA- and HA-owned heat pumps in domestic properties, recorded in the database.
	Domestic properties	ASHP - EAHR ⁵⁹	4.5kWth	Average of other LA- and HA-owned ASHP-EAHRs in domestic properties, recorded in the database.

⁵⁶ Energy Saving Scotland home renewables grants (no longer available) were grants for domestic renewables, administered by the Energy Saving Trust on behalf of the Scottish Government.

⁵⁷ Central FIT's register, Ofgem. <http://www.ofgem.gov.uk/Sustainability/Environment/fits/Pages/fits.aspx>

⁵⁸ Central FIT's register, Ofgem. <http://www.ofgem.gov.uk/Sustainability/Environment/fits/Pages/fits.aspx>

⁵⁹ ASHP - EAHR = air source heat pump with exhaust air heat recovery. Such heat pumps draw heat from both air outside a building, and heat from stale air leaving the building or extracted from rooms such as kitchens and bathrooms within the building, to provide space and water heating.

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