

elementenergy

Numbers of
microgeneration units
installed in England,
Wales, Scotland, and
Northern Ireland

Final Report

For

BERR

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Element Energy Limited is a low carbon consultancy providing a full suite of services from strategic advice to engineering consultancy in the low carbon energy sector. Element Energy's strengths include techno-economic forecasting and delivering strategic advice to public and private sector clients on all opportunities connected to the low carbon economy. Element Energy has experience in the design of strategies for the coordinated deployment of low carbon infrastructure.

CAVEAT

While the authors consider that the data and opinions contained in this report are sound, all parties must rely upon their own skill and judgement when using it. The authors do not make any representation or warranty, expressed or implied, as to the accuracy or completeness of the report. Please note that there is considerable uncertainty concerning historic microgeneration deployment. This research and analysis was conducted over a relatively short period, providing little opportunity to verify, independently, third party data. Energy and CO₂ estimates are provided for illustration purposes only. The authors assume no liability for any loss or damage arising from decisions made on the basis of this report. The views and judgements expressed here are the opinions of the authors and do not reflect those of BERR.

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www.berr.gov.uk/energy/microgenerationresearch

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1 INTRODUCTION

The recently published report “The growth potential of microgeneration in England, Wales and Scotland”, led by Element Energy and funded by a consortium including BERR, provided estimates of the total installed numbers of the range of different microgeneration technologies within the UK¹. These estimates were based on a number of sources and it was recognised that there had been a limited amount of transparent efforts at data collection in the past. The report also proposed new methodologies for data collection in the future, to make the microgeneration statistics more reliable.

The Secretary of State is required, under the Climate Change and Sustainable Energy Act 2006, to use estimates of the numbers of microgeneration installations in England, Wales, and Scotland, to make a decision about whether to set a microgeneration target. Under the Act, Microgeneration is defined as up to 50 kW_e for electricity generating technologies and up to 45 kW_{th} for heat generating technologies.

This document is intended to provide up-to-date estimates of numbers installed in England, Wales, Scotland, and Northern Ireland. Where newer or additional data has become available since Element Energy’s previous work, this data is used or noted as necessary. In some cases, approximate energy generated and CO₂ savings are provided for illustration purposes.

2 DATA RECEIVED

Data sources used for this study include (in ascending order of transparency and reliability):

- estimates from single manufacturers or installers,
- estimates from technology-specific trade associations and magazines,
- estimates from large independent or technology-neutral trade associations, and
- publicly-funded programmes (such as grant programmes).

A summary of the most useful sources of data for each technology is provided in Table 1. Not all trade associations were able to feed additional data during the period of the study.

Table 1 Summary of most useful sources of overall UK data for numbers of microgeneration technologies.

Technology	Most useful sources of data
Solar PV	ENA, EST (Major PV demo), Clear Skies, EST (LCBP 1), BRE (LCBP 2), Photon magazine, The Energy Saving Trust, IEA, IT Power
Micro-CHP	ENA
Wind	ENA, BWEA, EST (SCHRI), EST (LCBP 1), BRE (LCBP 2), The Energy Saving Trust
Micro-Hydro	ENA, BHA, OFGEM
Solar thermal	HHIC, STA, ESTIF, Clear Skies, EST (LCBP 1), BRE (LCBP 2), OFGEM (EEC2), DETINI (RECONNECT, NIHE, EREF), EST (SCHRI)
Biomass (stoves and boilers)	HETAS, RES Ltd, Clear Skies, EST (LCBP 1), BRE (LCBP 2), The Energy Saving Trust, EST (SCHRI)
Ground source heat pump	OFGEM (EEC2), Clear Skies, EST (LCBP 1), BRE (LCBP 2), Earth Energy, EST (Scottish Fuel Poverty Pilot)
Air source heat pump	OFGEM (EEC2), Clear Skies, EST (LCBP 1), BRE (LCBP 2), EST (Scottish Fuel Poverty Pilot), FETA/HPA

¹ This study is available at www.berr.gov.uk/energy/microgenerationresearch

A mixture of different reporting dates and methodologies complicates comparison between data and technologies. The most recent available data is used where possible. Greater response from public bodies and industry has led to some revisions to estimates in Element Energy's [Growth Potential for Microgeneration in England, Wales and Scotland](#) report.

3 METHODOLOGY FOR REGIONAL/NATIONAL ESTIMATES

With the exception of micro-hydro, there is little publicly available information to allow precise bottom-up estimates of the numbers of microgeneration installations into separate numbers for England, Wales, Scotland and Northern Ireland, other than that recorded by grant schemes. Where possible, grant databases have been used directly, but it should be noted the databases provided were often unverified, incomplete or inconsistently prepared. In some cases, e.g. EEC, no national breakdown is available. Comparison between programmes is particularly challenging due to different reporting dates and methodologies. Readers should be mindful of the limited accuracy of these results in this context². Where data has been rounded for presentation purposes, this may introduce slight inconsistencies between tables.

For solar thermal and micro-CHP, where grants are less relevant, the installation of some microgeneration technologies will be influenced by access to roof-space and mains gas connection.

Table 2 Methods to estimate numbers installed in England, Wales, Scotland and Northern Ireland, starting with UK estimates.

Technology	Regional estimation
Solar PV	Use grant-funded installation database directly, and check against the ratio of houses in each region.
Micro-CHP	Assume these correspond to gas-fired CHP. Pro-rate between regions based on the ratio of households with mains gas connection.
Wind	Pro-rate BWEA estimates between regions based on known relative micro-wind and small wind uptake figures from major grant programmes.
Micro-Hydro	Use BHA and Ofgem data indicating location of micro-hydro sites.
Solar thermal	Adjust national estimates based on regional ratios of houses (i.e. with own roofs) and properties without mains gas connection.
Biomass (stoves and boilers)	Use information from public grant databases directly.
Ground source heat pump	Use information from public grant databases directly. Where no data is available, assume these are largely in off-gas houses, then pro-rate based on ratios of house: flat and mains gas: off-gas properties between regions.
Air source heat pump	Use information from public grant databases directly.

² An accuracy of $\pm 25\%$ on number of installations (and derived factors such as kW, MWh and t CO₂) would seem realistic but is challenging to confirm. For systems purchased mostly without grants, e.g. air source heat pumps, errors may be higher.

Throughout this report, an average intensity of grid electricity of 0.43 t CO₂/MWh is assumed, and 0.19 t CO₂/MWh for natural gas³. Projected MWh and CO₂ savings are shown for illustration only – actual savings will be highly site and device dependent.

Note that it was not possible within the constraints of this report to cross-check numbers comprehensively with individual manufacturers and installers.

³ DEFRA (2007)

4 RESULTS

4.1 Electricity-generating microgeneration technologies, by nation⁴

Table 3 Solar PV installations (up to 50 kWe)

Solar PV	England	Wales	Scotland	Northern Ireland	UK
Units installed (end 2007)	2,511	155	95	232	2,993
kWe (end 2007)	8,527	550	414	863	10,354
Approximate MWh /year (end 2007)	7,248	468	352	734	8,801
Approximate t CO ₂ saved/year (end 2007)	3,117	201	151	315	3,784

Notes:

- Number of units estimated by summing all available databases (see Appendix)
- kWe estimated by summing available databases. In the case of PV installed in Northern Ireland, an average size of 3.5 kWe was used.
- A performance of 850 kWh/kWp/year was used to estimate energy produced. In reality, performance is likely to vary between locations.

Table 4 Micro-CHP installations (up to 50 kWe)

Micro-CHP	England	Wales	Scotland	Northern Ireland	UK
Units installed (end 2006)	174-869	10-48	16-81	1-3	200-1000
kWe (end 2006)	6,016	332	561	21	7,000

Notes:

- There is little up-to-date and publicly available data on micro-CHP installations. Data are drawn largely from 2006 ENA data.
- Installations are distributed according to the distribution of homes with mains gas connections.
- 87 micro-CHP units installed under the Carbon Trust field trial are not explicitly included as they may be included in ENA data, leading to double counting.
- Up to 43 CHP units have been installed in Northern Ireland by NIHE by August 2008 and up to 9 CHP units under EEC2, however no capacity details, or overlap with other schemes, are available, and these are not shown in the table. Some of these may be included in the ENA data, or some may be more than 45 kWe (installed with district heating).
- The CHP Association has indicated a more up-to-date estimate of numbers of micro-CHP units installed may be available in the near future, but was unable to provide any recent sales figures at the time of this study.

⁴ Where required, an assumption of 0.43 t CO₂/MWh has been used to estimate CO₂ savings, DEFRA (2007).

Table 5 Wind installations (up to 50 kWe)

Wind	England	Wales	Scotland	Northern Ireland	UK
BWEA grid-connected estimates (pro-rated)	1,297	142	410	473	2,323
kWe using BWEA estimates	2,438	267	771	889	4,367
MWh/year (assuming 10% load factor)	2,136	234	676	779	3,825
t CO ₂ saved/year	918	101	291	335	1,645

Notes:

- Numbers of off-grid installations are pro-rated between nations based on the known relative uptake of grants.
- BWEA estimates of kWe generating capacity are used (pro-rated from the number of grid-connected units and between nations as above)⁵
- A load factor of 876 kWh/kWp/year is assumed for all installations. In reality, performance is likely to be highly location-dependent.

Table 6 Micro-hydro installations (up to 50kWe), calculated from BHA and OFGEM data.

Micro-Hydro	England	Wales	Scotland	Northern Ireland	UK
Units installed	32	18	21	2	73
Capacity/kWp	382	207	262	70	921
Energy/MWh/year	1,671	907	1,148	307	4,033
tCO ₂ saving/year	719	390	494	132	1,734

Notes:

- Numbers of installations and kW capacity are determined directly from postcodes of known installations, as identified by OFGEM and BHA.
- Where capacity information is not clear, an assumption of 10 kW appears to have been used by OFGEM.
- An average load factor of 50% is assumed for all installations. Monitoring data would be needed to provide greater site-specific capacity factors if required.

⁵ Wind estimates in this report are higher than estimated in Element Energy's [Growth Potential For Microgeneration in England Scotland and Wales](#) (June 2008) report as that report used primarily 2006 ENA grid-connection data, whereas the current report uses BWEA data from manufacturers up to end of 2007.

4.2 Heat only-generating microgeneration technologies, by nation⁶

Table 7 Solar thermal installations (up to 45 kWth)

Solar Thermal	England	Wales	Scotland	Northern Ireland	UK
Units installed	66,800 - 69,600	5,590 - 5,830	10,700 - 11,100	14,400-15,000	97,500 - 102,000
kW _{th}	140,000-146,000	11,700-12,200	22,400-23,400	30,300-31,600	205,000-213,000
MWh heat/year	90,200-94,000	7,500 – 7,870	14,400 - 15,000	19,500 – 20,300	132,000-137,000

Notes:

- A range is shown – using data provided by HHIC and ESTIF/STA. The data provided by HHIC provides a lower limit on sales, whereas data from ESTIF may include some double counting between manufacturers and installers and is likely to represent an upper limit.
- Where necessary, an assumption of 2.1 kW or 3m²/installation has been used, with a load factor of 643 kWh/kWp/year.
- Data has been rounded to three significant figures for presentational purposes.

Table 8 Biomass boilers and pellet stoves (up to 45 kWth)

Biomass boilers and pellet stoves	England	Wales	Scotland	Northern Ireland	UK
Units installed	203	63	196	938	1,400
kW _{th}	4,060	1,260	3,920	18,800	28,000
MWh heat/year	3,474	1,080	3,360	16,050	23,961

Notes:

- Numbers of units are estimated by counting numbers installed under different grant programmes (see appendix).
- An assumption of 20 kW_{th} is used per installation.
- An average semi-detached house space heating and hot water energy demand of 17,115 kWh/year is used to calculate total energy demand.
- HETAS is hoping to obtain more reliable estimates for biomass boilers in the future.

⁶ For heat-generating technologies, calculations of CO₂ savings are highly sensitive to assumptions about offset heating system (if any), and are therefore not presented.

Table 9 GSHP installations (up to 45 kWth)

GSHP	England	Wales	Scotland	Northern Ireland	UK
Units installed	1,620	155	1,057	583	3,415
kW _{th}	10,530	1,008	6,871	3,790	22,198
MWh/year	27,726	2,653	18,091	9,978	58,448

Notes:

- Data are combined from publicly-funded initiatives. Where devolved nation data is not available, installations have been pro-rated according to the relative distribution of houses and off-gas properties between nations.
- Where no information on capacity is available, an average size of 6.5 kW_{th}/installation is assumed – this is an average value reported from grant schemes.
- An average semi-detached house space heating and hot water energy demand of 17,115 kWh/year is used to calculate total delivered heat energy. No correction is made for electricity used.
- No data on non-publicly funded installations is included.
- HHIC is planning to record heat pump sales in the future.

Table 10 Domestic ASHP installations (up to 45 kWth)

ASHP	England	Wales	Scotland	Northern Ireland	UK
Units installed	N/A	N/A	96	73	169
kW _{th}	N/A	N/A	416	555	1,146
MWh/year	N/A	N/A	1,643	1249	2,892

Notes:

- FETA estimates an upper limit of 2500 domestic ASHP installed in the UK since 2004, however there has been no formal data collection, and no supporting evidence was available.
- Data are combined from publicly-funded initiatives in Scotland and Northern Ireland. ASHP has not been installed under several major UK microgeneration programmes and no other data emerged on ASHP installations in England and Wales (N/A = Not available – hence assumed as zero).
- For Scotland, capacity is taken from grant databases. Where no capacity information is recorded, e.g. for Northern Ireland, an average size of 7.5 kW_{th}/installation is assumed (based on the mean average kW capacity for Scotland).
- An average semi-detached house space heating and hot water energy demand of 17,115 kWh/year is used to calculate total delivered heat energy. No correction is made for electricity used.
- No data on non-publicly funded installations or commercial installations was obtained during the course of this study.
- HHIC is planning to record heat pump sales in the future.

4.3 Installations in each nation, by technology

Table 11 Installations in UK, by technology

Technology	Number	Capacity / kWp	Energy/ MWh/year	Reference Date (Approx)
Solar PV	2,993	10,354	8,801	Aug 2008
Micro-CHP	200-1,000	7,000	N/A	Dec 2006
Wind	2,323	4,367	3,825	Dec 2007
Micro-Hydro	73	921	4,033	Aug 2008
Solar Thermal	97,500-102,000	205,000-213,000	132,000-137,000	July 2008
Biomass	1,400	28,000	23,961	Aug 2008
GSHP	3,415	22,198	58,448	Aug 2008
ASHP	169	1,146	2,892	Aug 2008

Table 12 Installations in England, by technology

Technology	Number	Capacity / kWp	Energy/ MWh/year	Reference Date (Approx)
Solar PV	2,511	8,527	7,248	Aug 2008
Micro-CHP	174-869	6,016	N/A	Dec 2006
Wind	1,297	2,438	2,136	Dec 2007
Micro-Hydro	32	382	1,671	Aug 2008
Solar Thermal	66,800-69,600	140,000-146,000	90,200-94,000	July 2008
Biomass	203	4060	3,474	Aug 2008
GSHP	1,620	10,530	27,726	Aug 2008
ASHP	N/A	N/A	N/A	Aug 2008

Table 13 Installations in Wales, by technology

Technology	Number	Capacity / kWp	Energy/ MWh/year	Reference Date (Approx)
Solar PV	155	550	468	Aug 2008
Micro-CHP	10-48	332	N/A	Dec 2006
Wind	142	267	234	Dec 2007
Micro-Hydro	18	207	907	Aug 2008
Solar Thermal	5,590-5,830	11,700-12,200	7,500-7,870	July 2008
Biomass	63	1,260	3,920	Aug 2008
GSHP	155	1,008	2,653	Aug 2008
ASHP	N/A	N/A	N/A	Aug 2008

Table 14 Installations in Scotland, by technology

Technology	Number	Capacity / kWp	Energy/ MWh/year	Reference Date (Approx)
Solar PV	95	414	352	Aug 2008
Micro-CHP	16-81	561	N/A	Dec 2006
Wind	410	771	676	Dec 2007
Micro-Hydro	21	262	1,148	Aug 2008
Solar Thermal	10,700-11,100	22,400-23,400	14,400-15,000	July 2008
Biomass	196	3,920	3,360	Aug 2008
GSHP	1,057	6,871	18,091	Aug 2008
ASHP	96	416	1,643	Aug 2008

Table 15 Installations in Northern Ireland, by technology

Technology	Number	Capacity / kWp	Energy/ MWh/year	Reference Date (Approx)
Solar PV	232	863	734	Aug 2008
Micro-CHP	1-3	21	N/A	Dec 2006
Wind	473	889	779	Dec 2007
Micro-Hydro	2	70	307	Aug 2008
Solar Thermal	14,400-15,000	30,300-31,600	19,500-20,300	July 2008
Biomass	938	18,800	16,050	Aug 2008
GSHP	583	3,790	9,978	Aug 2008
ASHP	73	555	1,249	Aug 2008

4.4 Conclusions on number of installations by nation

Table 16 Approximate cumulative number of installations by nation (N.B. Underlying data captured at different dates)⁷.

England	Wales	Scotland	Northern Ireland	UK
72,600-76,100	6,130-6,410	12,590-13,100	16,700-17,300	108,000 – 113,000

⁷ Data rounded to three significant figures.

5 APPENDIX 1: SOURCES OF DATA

This section provides a summary of information provided to this study from major schemes, trade associations and other sources, based on data provided to Element Energy before or during August 2008. The information from the following sources are presented in more detail below:

- Major PV Demo
- IEA (via IT Power)
- Clear Skies
- The Low Carbon Buildings Programme
- EEC2
- SCHRI
- Scottish Renewable Energy/Fuel Poverty Pilot
- RECONNECT
- NIHE
- EREF
- BWEA
- HHIC
- STA
- ENA
- FETA

It should be noted that the gathering of information on numbers and capacity is rarely a priority of these sources, and there is little coordination in data gathering. Specifically the scope, accuracy, timing, capacity definitions vary considerably between programmes, making it difficult to add the results of different programmes. The underlying databases may have been incorrectly filled in, and the organisations supplying data have requested that all data be considered tentative. Readers should assume an accuracy no better than $\pm 25\%$ (errors may be even higher for biomass, air source heat pumps, ground source heat pumps and micro-CHP)

Importantly, a few installations may have received funding from multiple sources. Adding data from different sources leads to a high risk of double counting.

5.1 Major PV Demonstration Programme

The Major PV Demo data below includes both grid-connected and isolated units.

Table 17 Approximate statistics for Stream 1 of the Major PV Demonstration Programme

Major PV Demo Stream 1	England	Wales	Scotland	Northern Ireland	UK
Units	1,399	95	53	114	1,661
kWe	3,334	242	116	370	4,063
MWh/year	2,483	181	87	278	3,030
t CO ₂ saved/year	1,066	78	37	119	1,301

Table 18 Approximate statistics for Stream 2 of the Major PV Demonstration Programme

Major PV Demo Stream 2	Banding	England	Wales	Scotland	Northern Ireland	UK
Units installed	<=50kWp	114	11	12	4	141
	>50 kWp	25	2	0	0	27
	Grand Total	139	13	12	4	168
kWe	<=50kWp	2,136	169	211	91	2,609
	>50 kWp	2,053	122	0	0	2,174
	Total	4,189	291	212	91	4,783
MWh/year	<=50kWp	1,648	124	153	67	1,992
	>50 kWp	1,590	100	0	0	1,690
	Grand Total	3,237	225	153	67	3,682
t CO ₂ /year	<=50kWp	707	54	56	31	848
	>50 kWp	669	43	0	0	712
	Grand Total	1,377	97	56	31	1,560

Table 19 Combined Major PV Demo results for installations below 50 kWe

Major PV Demo Units, < 50 kWe only	England	Wales	Scotland	Northern Ireland	UK
Units	1,513	106	65	118	1,802
kWe	5,470	411	327	461	6,669 ⁸
MWh/year	4,131	305	240	345	5,022
t CO ₂ saved/year	1,773	132	93	150	1,301

5.2 IEA estimates of UK PV installations by end of 2007

Table 20 IEA estimates of PV capacity in the UK⁹.

Category	kWp installed
Cumulative off-grid domestic PV capacity / kW	420
Cumulative off-grid non-domestic PV capacity	1,050
Cumulative grid-connected distributed PV capacity / kW	16,620
Cumulative grid-connected centralised PV capacity / kW	0
Cumulative installed PV capacity / kW	18,090

Through IT Power, the IEA have produced a thorough study of PV uptake in the UK, which reaches a conclusion that a total of 18 MW was installed by the end of 2007. Note that IEA figures include installations above 50 kWe, which are beyond the scope of the present study. The IEA PV accounting methodology involves discussions with manufacturers, and may therefore also include PV not purchased through public schemes, or for which public funding is not complete and therefore recorded in the grant databases. There may be some double counting of manufacturers sales data with the grant database information, and the IEA report does not explicitly make clear how this effect was addressed. The present report takes a conservative approach by drawing solely on grant database information.

⁸ These data are broadly consistent with ENA estimates of 8.5 MWe installed (<60kWp) by end of 2006. Data on grid-connected vs. non-grid connected PV is currently incomplete within the Major PV Demo database.

⁹ IEA (August 2008) Trends in Photovoltaic Applications – Survey report of selected IEA countries between 1992 and 2007.

5.3 Clear Skies

Table 21 Numbers of installations under Clear Skies programme.

Region	England	Wales	Scotland	Northern Ireland	UK
Solar thermal	5,209	387	0	203	5,799
GSHP	325	32	0	116	473
Wind	132	20	0	54	206
Hydro	13	2	0	0	15
Biomass boilers	41	15	0	34	90
Pellet Stoves	17	7	0	26	50
Total	5737	463	0	433	6,633

Table 23 Estimates of numbers of microgeneration units purchased under LCBP Phase 1 – Householder stream, including units above and below 45 kW_{th}.

Technology/ units installed	England	Wales	Scotland	Northern Ireland	UK
Biomass Room Heater/Stove (Automated Wood Pellet Feed)	6	2		1	9
Ground Source Heat Pump	254	36	1	11	302
Small Scale Hydro	3	1			4
Solar Photovoltaic	786	36	21	4	847
Solar Thermal Hot Water	2,894	279	3	8	3,184
Wind Turbine	438	54	49	14	555
Wood Fuelled Boiler System	142	39	1	2	184
Grand Total	4,523	447	75	40	5,085

For consistency in adding installations funded through different sources, only microgeneration that meets the limit of <45 kW_{th} and < 50 kW_e are included in the final tables.

Table 24 Estimated kW capacity installed under LCBP Phase 1 – Householder stream

Technology capacity / kW	England	Wales	Scotland	Northern Ireland	UK
Biomass Room Heater/Stove (Automated Wood Pellet Feed)	153	11		5	169
<i>< 45 kW heat</i>	<i>42</i>	<i>11</i>		<i>5</i>	<i>58</i>
<i>> 45 kW heat</i>	<i>111</i>				<i>111</i>
Ground Source Heat Pump	3,366	437	8	130	3,941
<i>< 45 kW heat</i>	<i>2,916</i>	<i>437</i>	<i>8</i>	<i>130</i>	<i>3,491</i>
<i>> 45 kW heat</i>	<i>450</i>				<i>450</i>
Small Scale Hydro	30	3			33
<i>< 50 kWe</i>	<i>30</i>	<i>3</i>			<i>33</i>
Solar Photovoltaic	1886	94	43	11	2,034
<i>< 50 kWe</i>					<i>2034</i>
Solar Thermal Hot Water	6,078	586	6	17	6,687
<i>< 45 kW heat</i>	<i>6,078</i>	<i>586</i>	<i>6</i>	<i>17</i>	<i>6,687</i>
Wind Turbine	1,340	169	457	265	2,231
<i>< 50 kWe</i>	<i>1,340</i>	<i>169</i>	<i>457</i>	<i>265</i>	<i>2,231</i>
Wood Fuelled Boiler System	3,820	921	25	63	4,828
<i>< 45 kW heat</i>	<i>3,237</i>	<i>831</i>	<i>25</i>	<i>63</i>	<i>4,155</i>
<i>> 45 kW heat</i>	<i>583</i>	<i>90</i>			<i>673</i>
Grand Total	22,901	3,779	539	491	27,710

5.4.2 LCBP Phase I – Communities stream

Table 25 Numbers of Microgeneration systems installed under the Communities Stream of LCBP Phase 1.

Units installed (< 45 kWth and < 50 kWe)	England	Wales	Scotland	Northern Ireland	UK
Biomass boiler (chips or pellets)	1				1
Biomass boiler (logs)	1				1
GSHP	2				2
PV	15			2	17
Solar thermal	10	2		2	14
Wind turbine	9				9
Wood stove (pellets)	1				1
Grand Total	39	2		4	45

Table 26 Capacity of microgeneration systems installed under the Communities Stream of LCBP Phase 1.

Capacity / kW	England	Wales	Scotland	Northern Ireland	UK
Biomass boiler (chips or pellets)	32				32
Biomass boiler (logs)	25				25
GSHP	42				42
PV	57			6	63
Solar thermal	166	1		3	170
Wind turbine	53				53
Wood stove (pellets)	15				15
Grand Total	390	1		9	399

5.4.3 LCBP Phase I –Stream 2A (mainly larger installations)

Data for LCBP Phase I – Stream 2a was provided by the Energy Saving Trust in August 2008. This stream is primarily aimed at larger scale systems. As above, the data below may not be representative of the scheme when pending applications are completed.

Table 27 Approximate number of microgeneration units installed under Stream 2A of the LCBP Phase 1

Units installed	Range	England	Wales	Scotland	Northern Ireland	UK
Biomass boiler	< 45 kW heat	4	1			5
	> 45 kW heat	13			1	14
Biomass boiler Total	< 100 kW heat	17	1		1	19
Heat pump	< 45 kW heat	3				3
Pellet stove	> 45 kW heat	1				1
PV	< 50 kW _e	11				11
Solar thermal	< 45 kW heat	13	2		1	16
Wind turbine	< 50 kW _e	5				5
Grand Total		50	3		2	55

Table 28 Approximate installed capacity of microgeneration installed under Stream 2A of LCBP Phase 1

Capacity installed /kW	England	Wales	Scotland	Northern Ireland	UK
Biomass boiler (kW _{th})	742	20		48	810
Heat pump (kW _{th})	78				78
Pellet stove (kW _{th})	76				76
PV (kW _e)	37				37
Solar thermal (kW _{th})	92	9.8		4.9	107
Wind turbine (kW _e)	40				40

5.4.4 LCBP Phase 2

Draft LCBP Phase 2 data was provided by BRE in August 2008.

Table 29 Approximate number of units installed in LCBP Phase 2

	England	Wales	Scotland	Northern Ireland	UK
Solar PV	186	13	9	4	212
Wind	7	0	0	0	7
Micro-Hydro	0	0	0	0	0
Solar thermal	31	5	0	0	36
Biomass (stoves and boilers)	1	0	0	0	1
Ground source heat pump	14	1	0	0	15

Table 30 kW capacity installed under LCBP Phase 2

	England	Wales	Scotland	Northern Ireland	UK
Solar PV	1077	45	44	21	1187
Wind	32	0	0	0	32
Micro-Hydro	0	0	0	0	0
Solar thermal	274	136	0	0	410
Biomass (stoves and boilers)	45	0	0	0	45
Ground source heat pump	278	44	0	0	322

Table 31 Predicted kWh/year from equipment installed under LCBP Phase 2 (as stated)

	England	Wales	Scotland	Northern Ireland	UK
Solar PV	852,339	33,757	23,973	16,658	926,727
Wind	44,287	0	0	0	44,287
Micro-Hydro	0	0	0	0	0
Solar thermal	175,925	85,699	0	0	261,624
Biomass (stoves and boilers)	88,200	0	0	0	88,200
Ground source heat pump	412,767	136,500	0	0	549,267

5.5 EEC2

EEC2 data has been estimated by OFGEM, working with DEFRA. No regional data is available. Data was supplied in August 2008 and is expected to provide a reasonable picture for EEC2 installations up to April 2008.

Table 32 Microgeneration devices installed under EEC2.

Technology	Number installed in UK
GSHP	1,500
Solar Thermal	1,200
CHP	Up to 9

Some EEC-funded CHP installations may exceed 50 kWe, however details are not available.

5.6 Scottish Communities and Householders Renewables Initiative (Scotland only)

EST Scotland administers SCHRI, which is divided into householder and community streams. A database snapshot was taken in August 2008. The database has yet to be verified by EST Scotland, and the numbers below should be considered as draft and liable to revision.

Table 33 Number of microgeneration units installed under householder stream.

Technology	Household 2004-5	Household 2005-6	Household 2006-7	Household 2007-8	Cumulative end 2007/2008
Solar thermal	109	152	469	396	1,126
GSHP	79	148	351	271	849
Wind turbine	16	12	89	65	182
Biomass	11	46	65	52	174
Micro-hydro	1	0	4	4	9
Air source heat pumps	0	0	10	31	41
Total	216	358	988	819	2,381

Table 34 Numbers of microgeneration units installed under community stream.

Technology	Community 2004-5	Community 2005-6	Community 2006-7	Cumulative end 2006/2007
Solar thermal	3	1	9	13
GSHP	6	2	7	15
Wind turbine	4	2	11	17
Biomass	9	3	5	17
Micro-hydro	0	1	0	1
Air source heat pumps	0	0	0	0
Total	22	9	32	63

5.7 Scottish Renewable Heating Pilot (usually known as the Fuel Poverty Pilot)

A database snapshot was taken in August 2008 and provided to Element Energy by EST Scotland. The database has yet to be verified by The Energy Saving Trust, and the numbers below should be considered as draft.

Table 35 Estimated numbers of units and capacity installed under Scottish Renewable Heating Pilot.

Technology	Number of units installed	kWth capacity
Solar thermal	13	26
Biomass (stoves and boilers)	4	98
Ground source heat pump	28	184
Air source heat pump	55	416

5.8 RECONNECT (Northern Ireland only)

DETINI provided draft information on installations through RECONNECT up to August 2008¹⁰.

Table 36 Approximate numbers of units installed under RECONNECT

Technology	Numbers installed
Solar PV	67
Micro-CHP	
Wind	152
Micro-Hydro	0
Solar thermal	1422
Biomass (stoves and boilers)	864 comprising 830 boilers and 34 pellet stoves
Ground source heat pump	233
Air source heat pump	73
Water source heat pump	4

5.9 Northern Ireland Housing Executive (Northern Ireland only)

DETINI provided draft estimates on installations through NIHE up to August 2008.¹⁰

Table 37 Approximate number of microgeneration units installed by NIHE

Technology	Numbers installed
Solar thermal	2032 (of which 2027 were EREF-funded)
Solar PV	37
Micro-CHP	42
Wood pellet boilers	7
Ground source heat pump	1
Micro-wind	1

The size of CHP units was not specified.

5.10 Additional EREF-linked installations draft estimates in Northern Ireland

DETINI provided draft estimates on installations through NIHE up to August 2008.¹⁰

Table 38 Approximate numbers of microgeneration units installed in N. Ireland that are EREF-part funded.

Technology	Number installed in Northern Ireland
Solar thermal	2
Biomass boilers	4 (2 funded only by EREF)
Small wind	3
Gas CHP	1

¹⁰ Northern Ireland has operated separately funded grant programmes, in addition to those available elsewhere in the UK.

5.11 Draft cumulative micro-wind and small wind installations (supplied by BWEA¹¹)

Table 39 Cumulative installation numbers estimated by BWEA.

BWEA Annual SWT Market Report	2005	2006	2007
Cumulative number of deployed units (calendar year end)			
Type			
0-1.5 kW	862	2,496	5,246
1.5-10kW	155	426	1,103
10-20kW	13	26	44
20-50kW	3	4	18
Total	1,033	2,952	6,411
Of which			
Ongrid	165	700	2,323
Offgrid	868	2,252	4,088
Buildings mounted	2	225	1,106
Free standing	1,031	2,727	5,305

Table 40 Cumulative UK installed capacity of micro and small wind (MWe), including off-grid devices, estimated by BWEA.

Nominal Capacity	Assumed unit capacity	2005	2006	2007
0-1.5kW	1 kW	0.862	2.496	5.246
1.5-10kW	5 kW	0.775	2.13	5.515
10-20kW	15 kW	0.195	0.39	0.66
20-50kW	35 kW	0.105	0.14	0.63
Total MWe		1.9	5.2	12.1

Table 41 Approximate energy generated from micro and small wind in the UK (MWh/year), including off-grid devices, estimated by BWEA.

Nominal Capacity	BWEA Assumed utilisation factor	2005	2006	2007
0-1.5kW	10%	755	2,186	4,595
1.5-10kW	17%	1,154	3,172	8,213
10-20kW	17%	290	581	983
20-50kW	17%	156	208	938
Total MWh/year		2,356	6,148	14,730

¹¹ BWEA SWS UK Market Report 2008

5.12 Draft solar thermal data supplied by HHIC

HHIC collects panel area sales data from twelve of the larger solar manufacturers. No data is collected from smaller suppliers, therefore HHIC estimates should be regarded as a lower limit for current sales.

Table 42 Solar thermal sales data obtained from HHIC.

Annual sales	July 2006 – June 2007	Jul 2007 – June 2008
Aperture area (m ²)	16,048	24,975
Capacity (kW _{th})	11,234	17,483

To allow HHIC data to be combined with data from a previous Energy Saving Trust study, a simplifying assumption is made that 2005 sales are assumed to be similar to those in 2006. CO₂ savings are highly dependent on assumptions on what fuel is offset – no reliable UK-wide data on offset fuel are available.

Table 43 Calculations based on HHIC sales data

Property	Estimate
Assumed typical installation size	3 m ² , corresponding to 2.1 kWp
Inferred number of new installations in 2006/7 and 2007/8 from HHIC	13,674
Energy Saving Trust estimate of installations up to end of 2004/2005 ¹²	78,470 ¹³
Assumption on number installed in 2005/6	5,350 (assume same as 2006)
Combined number of installations (up to June 2008)	97,495
Typical load factor	643 kWh/kWp/year (i.e. 7% capacity factor)
Inferred energy generated	131,646 MWh heat/year
t CO ₂ /MWh assumption used	0.31 – based on mean average of natural gas (0.19) and electricity (0.43).
Inferred CO ₂ savings	40,810 t CO ₂ /year

¹² (2005) DTI: Potential for Microgeneration: Study and Analysis.

¹³ This may include some installations installed during the 1980s that have since been removed.

5.13 Solar thermal area (m²) and capacity (kW_{th}) estimated by STA/ESTIF.

ESTIF estimates are informed largely by the work of the Solar Trade Association¹⁴. Different groups use different assumptions about areas for reporting purposes.

Table 44 Approximate panel area and capacity estimated by ESTIF (2008)¹⁵.

	New capacity in 2005	New capacity in 2006	New capacity in 2007	Cumulative UK (end 2007)
Collector area (m ²)	28,000	54,000	54,000	304,920
kW _{th}	19,600	37,800	37,800	213,444

If typical installation size of 3m² or 2.1 kWp is assumed, then 213,444 kW_{th} corresponds to 101,640 installations by end of 2007¹⁶.

Table 45 Calculations based on ESTIF data

Property	Estimate
Typical installation size	3 m ² , corresponding to 2.1 kWp
Inferred number of installations	101,640
Load factors	643 kWh/kWp/year (i.e. 7% capacity factor)
Inferred energy generated	137,444 MWh heat/year
kg CO ₂ /kWh assumption	0.31 – based on mean average of natural gas (0.19) and electricity (0.43). ¹⁷
Inferred CO ₂ savings	42,546 t CO ₂ /year

¹⁴ David Matthews, *Personal Communication*

¹⁵ ESTIF (2008) Solar Thermal Markets in Europe: Trends and Market Statistics 2007

¹⁶ If larger panel sizes are assumed - an upper limit for average size would be 4m², i.e. 2.8 kWp - the corresponding total number of installations would be 76,230

¹⁷ The exact distribution of fuel (and hence CO₂) offset by solar thermal in the UK is not well established.

5.14 Grid-connected microgeneration identified by ENA.

In January 2008, the Electricity Networks Association (ENA) provided Element Energy with estimates of grid-connected installed capacity at the end of 2006, based on G53 and G89 notification procedures.¹⁸

This includes installations with generating capacity up to 60 kWe, and therefore goes slightly beyond the Government’s preferred definition of installations up to 50 kWe. The data is provided at total capacity (in MWe) in three classes: up to 1.5 kWe, single phase; 16 A or 3 phase; up to 60 kWe. Data presented are combined across these three classes.

Element Energy has used the capacity data to estimate numbers of installations and energy generated using assumptions about unit size and load factors. Load factor estimates are necessarily very approximate when considering units spanning the wide range up to 60 kWe.

Table 46 Approximate grid-connected generation from units up to 60 kWe, using 2006 UK data supplied by ENA.

	Cumulative kW capacity end of 2006	Inferred number of units (end of 2006)	Estimated average kWh/kWp (capacity factor shown in brackets)	MWh/year	tonnes CO ₂ avoided/year
Micro-wind	543	159	876 (10%)	476	205
Micro-hydro	705	65	4380 (50%)	3,088	1,328
PV	8,493	2,460	850 (10%)	7,219	3,104
Micro-CHP	6,923	321	3,000 (34%)	20,769	8,931

¹⁸ ENA were unable to provide more up-to-date data at the time of writing.

Table 47 Breakdown of ENA kW Capacity data by class of registration.

kW capacity	Installed during 2006	Cumulative by end of 2006
Micro-wind		
Up to 1.5 kW single phase	9	9
< 16 A single or 3 phase	343	343
< 60 kW	191	191
Micro-hydro		
Up to 1.5 kW single phase	0	0
< 16 A single or 3 phase	20	250
< 60 kW	196	455
PV		
Up to 1.5 kW single phase	245	1,001
< 16 A single or 3 phase	835	4,033
< 60 kW	1,097	3,459
Micro-CHP		
Up to 1.5 kW single phase	1	21
< 16 A single or 3 phase	0	0
< 60 kW	182	6,902

5.15 Heat Pump installations estimated by the HPA and FETA¹⁹

FETA (Federation of Environmental Trade Associations) and the HPA (Heat Pump Association) estimate that:

- the domestic market for GSHPs is 1,500 per annum, and
- Ca. 2,500 ASHP units have been installed in domestic applications since 2004 in the UK.

No formal data capture programme has existed for ASHP sales, and therefore it has not been possible to confirm these estimates.

¹⁹ Terry Seward, *Personal Communication, September 2008*

6 APPENDIX 2: INSTALLATIONS FROM SELECTED PUBLIC INITIATIVES BY TECHNOLOGY

Note that these tables do not include schemes organised by local authorities or English Regional Development Agencies, including supplier-led initiatives or installations in new build as a result of planning policies. This is partly to reduce the potential to reduce the chance of double counting but also because there are no single sources of data.

Importantly, some installations may have received funding from more than one source, or received partial funding for a basket of measures. Efforts have been taken to reduce the risk of double counting, but this cannot be ruled out completely.

6.1 PV

Table 48 Cumulative number of installations of Solar PV through selected public programmes. Where data is available, this has been filtered to include only grid-connected installations < 50 kW_e.

Solar PV	England	Wales	Scotland	Northern Ireland	UK
Major PV Demo	1,513	106	65	118	1,802
Clear Skies	0	0	0	0	0
EEC2	0	0	0	0	0
LCBP1 –households	786	36	21	4	847
LCBP1- communities	15	0	0	2	17
LCBP1 - stream 2a	11	0	0	0	11
LCBP2	186	13	9	4	212
SCHRI	0	0	0	0	0
Reconnect	0	0	0	67	67
NIHE	0	0	0	37	37
EREF and additional NI	0	0	0	0	0
Scottish Renewable Heating (Fuel Poverty) Pilot	0	0	0	0	0
Total public installations	2,511	155	95	232	2,993

6.2 Micro-CHP

Table 49 Installation of Micro-CHP through selected public programmes.

Micro-CHP	England	Wales	Scotland	Northern Ireland	UK
Major PV Demo	0	0	0	0	0
Clear Skies	0	0	0	0	0
EEC2	8	0	1	0	9
LCBP1 -households	0	0	0	0	0
LCBP1- communities	0	0	0	0	0
LCBP1 - stream 2a	0	0	0	0	0
LCBP2	0	0	0	0	0
SCHRI	0	0	0	0	0
Reconnect	0	0	0	0	0
NIHE	0	0	0	42	42
EREF and additional NI	0	0	0	1	1
Scottish Renewable Heating (Fuel Poverty) Pilot	0	0	0	0	0
Total public installations	8	0	1	43	52

Note that the capacity and devolved nation distribution of EEC CHP installations has not been provided. A crude estimate has been made based on the distribution of households with gas, as these are most likely to be relevant for CHP adoption. The CHP Association was unable to provide additional data for this study.

6.3 Wind

Table 50 Installation of wind turbines through selected public programmes.

Wind	England	Wales	Scotland	Northern Ireland	UK
Major PV Demo	0	0	0	0	0
Clear Skies	325	32	0	116	473
EEC2	0	0	0	0	0
LCBP1 -households	438	54	49	14	555
LCBP1- communities	9	0	0	0	9
LCBP1 - stream 2a	5	0	0	0	5
LCBP2	7	0	0	0	7
SCHRI	0	0	199	0	199
Reconnect	0	0	0	152	152
NIHE	0	0	0	1	1
EREF and additional NI	0	0	0	3	3
Scottish Renewable Heating (Fuel Poverty) Pilot	0	0	0	0	0
Total public installations	784	86	248	286	1404

Where data is available, these have been filtered to include only grid-connected installations < 50kWe.

6.4 Micro-Hydro

Table 51 Installation of micro-hydro through selected public programmes.

Micro-hydro	England	Wales	Scotland	Northern Ireland	UK
Major PV Demo	0	0	0	0	0
Clear Skies	13	2	0	0	15
EEC2	0	0	0	0	0
LCBP1 -households	3	1	0	0	4
LCBP1- communities	0	0	0	0	0
LCBP1 - stream 2a	0	0	0	0	0
LCBP2	0	0	0	0	0
SCHRI	0	0	10	0	10
Reconnect	0	0	0	0	0
NIHE	0	0	0	0	0
EREF and additional NI	0	0	0	0	0
Scottish Renewable Heating (Fuel Poverty) Pilot	0	0	0	0	0
Total public installations	16	3	10	0	29

Where data is available, these have been filtered to include only grid-connected installations < 50kWe.

6.5 Solar thermal

Table 52 Installation of solar thermal through selected public programmes.

Solar Thermal	England	Wales	Scotland	Northern Ireland	UK
Major PV Demo	0	0	0	0	0
Clear Skies	5,209	387	0	203	5,799
EEC2	822	69	132	178	1,200
LCBP1 -households	2,894	279	3	8	3,184
LCBP1- communities	10	2	0	2	14
LCBP1 - stream 2a	13	2	0	1	16
LCBP2	31	5	0	0	36
SCHRI	0	0	1,139	0	1,139
Reconnect	0	0	0	1,422	1,422
NIHE	0	0	0	2,032	2,032
EREF and additional NI	0	0	0	2	2
Scottish Renewable Heating (Fuel Poverty) Pilot	0	0	13	0	13
Total public installations	8,979	744	1,287	3,848	14,857

Note that EEC regional breakdowns are not available. A crude estimate is shown, based on the relative number of houses without gas between devolved nations, as these are most likely to be relevant for solar thermal.

6.6 Biomass

Table 53 Installation of biomass boilers and pellet stoves through selected public programmes.

Biomass (including pellet stoves) < 45 kWth	England	Wales	Scotland	Northern Ireland	UK
Major PV Demo	0	0	0	0	0
Clear Skies	58	22		60	140
EEC2	0	0	0	0	0
LCBP1 -households	137	40	1	3	181
LCBP1- communities	3	0	0	0	3
LCBP1 - stream 2a	4	1	0		5
LCBP2	1	0	0	0	1
SCHRI	0	0	191		191
Reconnect	0	0	0	864	864
NIHE	0	0	0	7	7
EREF and additional NI	0	0	0	4	4
Scottish Renewable Heating (Fuel Poverty) Pilot	0	0	4	0	4
Total public installations	203	63	196	938	1400

6.7 Ground Source Heat Pumps

Table 54 Installation of GSHP through selected public programmes (<45 kWth).

GSHP	England	Wales	Scotland	Northern Ireland	UK
Major PV Demo	0	0	0	0	0
Clear Skies	325	32	0	116	473
EEC2	1,028	86	164	222	1,500
LCBP1 -households	248	36	1	11	296
LCBP1- communities	2	0	0	0	2
LCBP1 - stream 2a	3	0	0	0	3
LCBP2	14	1	0	0	15
SCHRI	0	0	864	0	864
Reconnect	0	0	0	233	233
NIHE	0	0	0	1	1
EREF and additional NI	0	0	0	0	0
Scottish Renewable Heating (Fuel Poverty) Pilot	0	0	28	0	28
Total public installations	1,620	155	1,057	583	3,415

6.8 Air Source Heat Pumps

Table 55 Installation of domestic ASHP through selected public programmes.

ASHP	England	Wales	Scotland	Northern Ireland	UK
Major PV Demo	0	0	0	0	0
Clear Skies	0	0	0	0	0
EEC2	0	0	0	0	0
LCBP1 –households	0	0	0	0	0
LCBP1- communities	0	0	0	0	0
LCBP1 - stream 2a	0	0	0	0	0
LCBP2	0	0	0	0	0
SCHRI	0	0	41	0	41
Reconnect	0	0	0	73	73
NIHE	0	0	0	0	0
EREF and additional NI	0	0	0	0	0
Scottish Renewable Heating (Fuel Poverty) Pilot	0	0	55	0	55
Total public installations	0	0	96	73	169

7 APPENDIX 3: ASSUMPTIONS ON HOUSING STOCK VARIATION BETWEEN DEVOLVED NATIONS

Factor	England	Wales	Scotland	Northern Ireland
% Households with mains gas connection	85%	79%	72%	8%
% of homes are houses (i.e. not flats)	83%	83%**	65%	91.6%
% Rural (i.e. not urban or suburban)	19%	36%	16%	29%
% of households in UK	83.3%	5.0%	9.1%	2.7%
Dwelling stock in 2006	21,989,000	1,314,000	2,407,000	702,000

Data has been collected from the Communities website, English House Condition Survey, Living in Wales Survey, Scottish House Condition Survey, Northern Ireland House Condition Survey using most recent data where available. ** The ratio of houses:flats is not available for Wales and therefore assumed same as England.

8 APPENDIX 4: ACKNOWLEDGEMENTS

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Any inaccuracies remain the responsibility of Element Energy Ltd.

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| Ampair | Micropower Council |
| Association for the Conservation of Energy | Mitsubishi Electric |
| BEAMA | National Energy Action |
| B&Q | National Energy Foundation |
| Baxi | OFGEM |
| BERR | Open University Design Innovation Group |
| Buildings Research Establishment (BRE) | Oxford University Environmental Change Institute |
| British Gas Services | Proven Energy |
| British Hydro Association | Quiet Revolution |
| British Wind Energy Association (BWEA) | RD Energy Solutions |
| Carbon Trust | Renewable Energy Association |
| Ceramic Fuel Cells | Renewable Energy Foundation |
| Ceres Power | Renewable Devices |
| CHP Association | RES Ltd. |
| Cranfield University | RoofTop Turbines |
| DEFRA | Samsun Energy |
| Dulas | Segen |
| E.On | Senertec |
| Earth Energy (GeoSciences) | Sharp |
| Econergy | Sharp Solar |
| EDF Energy | Solar Century |
| Energy Efficiency Partnership for Homes | Solar Thermal Association |
| Electricity Networks Association | Solar Trade Association |
| EnerG | Solar Twin |
| E.On UK | Solar UK |
| Energy Saving Trust (EST) | Somerset Council |
| FETA | Somerset Hydropower |
| FilSol Solar | Stobart & Associates |
| Genersys | Sun Dog |
| Ground Source Heat Pump Association | Talbotts |
| Heat Pump Association | Turquoise Associates |
| Heating and Hot Water Council | Valliant |
| HETAS | Veissmann |
| IEA | Viridian Solar |
| Iskra Wind | Whispergen |
| Mark Group | Windsave |
| Mendip Power Group | Wood Energy |
| Mercia Energy | |

9 APPENDIX 5: GLOSSARY

ASHP – Air Source Heat Pumps
 BERR – Department for Business, Enterprise and Regulatory Reform
 BHA – British Hydro Association
 BRE – Buildings Research Establishment
 BWEA – British Wind Energy Association
 CHP – Combined Heat and Power
 CHPA – CHP Association
 DEFRA – Department for the Environment, Food and Rural Affairs.
 DETINI – Department for Enterprise, Trade, and Investment in Northern Ireland
 EEC – Energy Efficiency Commitment
 EHCS – English House Condition Survey
 ENA – Electricity Networks Association
 EREF- Environment and Renewable Energy Fund
 EST- Energy Saving Trust
 ESTIF – European Solar Thermal Industry Federation
 FC – Fuel Cell
 FETA – Federation of Environmental Trade Associations
 GB – Great Britain
 GSHP – Ground Source Heat Pumps
 HHIC – Heating and Hot Water Industry Council
 HPA – Heat Pump Association
 kW – a unit of power
 kW_p- maximum or peak power (can be used for electrical or heating technologies)
 kW_e – unit of electrical power or generating capacity
 kW_{th} – unit of heat power or generating capacity
 LCBP – Low Carbon Buildings Programme
 Microgeneration – small scale systems that can provide heat or power with lower CO₂ emissions than conventional alternatives. The government’s definition of microgeneration is <50 kW_e and <45 kW_{th}.
 t CO₂ –tonnes of Carbon Dioxide.
 MW – Megawatts (a unit of power)
 MWh – Megawatt Hour (a unit of energy)
 NIHE – Northern Ireland Housing Executive
 PV – Photovoltaic
 OFGEM – Office for Gas and Electricity Markets
 ONS – Office for National Statistics.
 REA – Renewable Energy Association
 SCHRI – Scottish Communities and Householders Renewables Initiatives
 STA – Solar Trade Association
 UK – United Kingdom