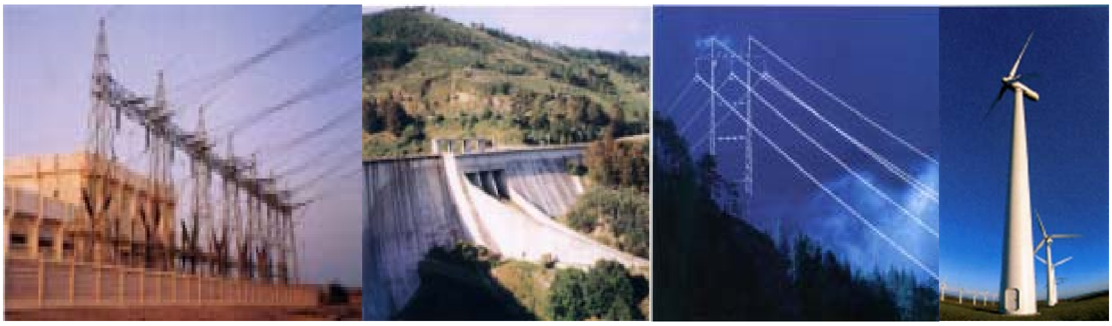
Final Report



Renewable Heat in Scotland: 2020 Vision

to

Scottish Renewables

April 2009

IPA Energy + Water Economics

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EXECUTIVE SUMMARY

Renewable Heat Demand by 2020

As part of meeting the EU target for renewable energy to make up 20% of overall EU final energy consumption (not just electricity) by 2020, the Scottish Government has indicated that Scotland will need to increase the percentage contribution of renewables to total heat supply from 1% to 11%, this will require over 9 TWh_{th} of renewable heat each year.

The domestic sector accounts for around half of the heating demand in Scotland. Fuel poverty is a key driver for retrofitting heating systems: the existing housing stock in Scotland has relatively poor insulation leading to high heating costs and with around a third of Scottish households not on mains gas, there is a large market for the installation of lower cost renewable heating. However, planning and space issues make the retrofit of renewable technologies unsuitable for certain dwellings.

Commercial and public sector use account for a sixth of heating demand in Scotland, with the remaining third from industry. These sectors are more willing to invest in renewable heating if they can see cost-benefits over a slightly longer period than domestic customers, or if given effective incentives.

There are a significant number of buildings under public management in Scotland. This may make national purchasing programmes and targets for public buildings an effective incentive to increase renewable heat use, although these options may be restricted for those under PFI/PPP contracts.

With the introduction of Scottish Planning Policy 6 (SPP6), new build businesses and housing are more likely to incorporate renewable heating, although this will not on its own be sufficient to meet the 11% requirement. The replacement of 50,000 boilers in Scotland every year provides an ideal opportunity for organic growth in renewable heat technologies to levels which could meet the 11% target.

Section 1 of this report gives an overview of the scale of the challenge to reach 11% Renewable Heat in Scotland by 2020.

Incentivising Renewable Heat

There is an array of incentives for renewable heat technologies in Scotland, but this can be confusing with many of these not being consistent. Many renewable heat technologies are currently cost-competitive with conventional sources over their lifetime, but high up-front costs and poor awareness discourage their uptake amongst consumers, especially amongst domestic consumers which expect to see a return on investment within 3 years.

Encouraging the adoption of renewable heat technologies will require the UK and Scottish Governments to provide an appropriate consent regime and incentives that are sufficient, simple and stable. Equally importantly, greater public awareness must be fostered through marketing and education campaigns, with appropriate and well-publicised quality standards.

In this, industry should contribute to raising public awareness, including of incentives, and adopt appropriate standards to assist in building consumer confidence.

Section 2 of this report outlines the ways that UK and Scottish Government and Industry can contribute towards achieving the Renewable Heat target.

GVA and Employment Benefits

Renewable heat industry could generate a turnover of £2.7 billion in Scotland by 2020, with a total Scottish GVA over 10 years of £0.9 billion (excluding the fuel supply chain).

The remainder of this value is not expected to be retained as, at present, most of the renewable heat capital equipment is manufactured outside Scotland. However, some companies have indicated interest in establishing manufacturing capability in Scotland if they see sufficient and stable Government support to stimulate market demand.

Employment in Scotland in the renewable heat market would benefit from an estimated creation of around 2,000 full-time jobs.

The number and capability of installers is currently limited. Plumbing and heating engineers are well-placed to provide the skills necessary for the installation of renewable heat technologies with further training and accreditation. However current accreditation, the Microgeneration Certification Scheme, is largely seen as expensive and onerous, with no guaranteed returns without government market stimulus. The result is reduced competition, keeping installation costs high and creating a barrier to the uptake of renewable heat technologies.

Section 3 of this report details the benefits to Scotland of meeting the Renewable Heat target in terms of GVA and employment

TABLE OF CONTENTS

1 SCALE OF THE CHALLENGE

At the European Council in March 2007, EU Heads of Government agreed a binding target to reduce Europe's greenhouse gas emissions by at least 20% by 2020 (compared to 1990 levels) and to increase this commitment to a 30% reduction if an international agreement is reached. In parallel with this decision a new Energy Policy for Europe was agreed, which set a number of objectives including the following key targets:

- Improvement in **energy efficiency** to save 20% of the EU's projected energy consumption in 2020;
- Binding target for **renewable energy** to make up 20% of overall EU final energy consumption (not just electricity) by 2020; and
- Binding target for **biofuels** to supply a minimum 10% of transport needs by 2020.

The Commission has proposed a burden sharing arrangement across the EU, taking into account the current situation on renewable energy in each Member State and the relative GDP of each country. The UK's proposed share is 15%, representing a significant increase from the current figure of less than 2%. Scotland will be expected to contribute to the UK's overall share and the Scottish Government believes that Scotland should aspire to 20% of overall energy use from renewables [20].

The Scottish Government has drafted a Scottish Climate Change Bill, including a target to reduce emissions by 80% by 2050. The Scottish Government's Strategy for Economic Development includes an overall interim target of reducing emissions by 2011 and a longer term target to reduce overall emissions by 80% by 2050. It also includes a national indicator to achieve 50% of gross electricity consumption from renewable sources by 2020, with an interim target of 31% by 2011.

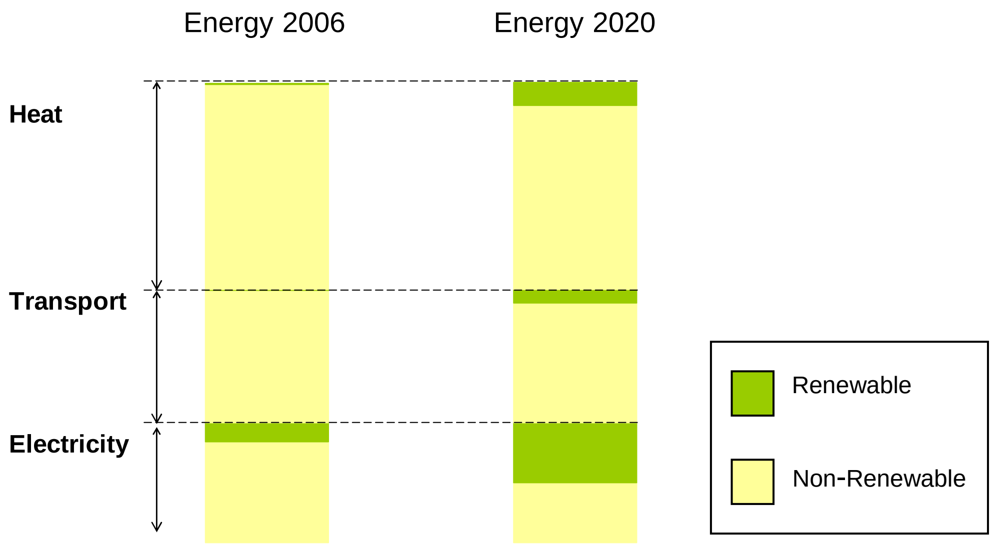
1.1 Energy Demand in Scotland

The current breakdown of total energy use by sector in Scotland is 45% heat, 29% transport; and 26% electricity. The current energy use from renewable sources in Scotland in 2006 was estimated at 16% of gross electricity consumption, 1% of heat and 0.44% biofuels for transport in petrol and diesel [20].

Overall Scottish final energy consumption from renewables was 4.6% in 2006.

Assuming renewables provide 50% of gross electricity consumption (the Scottish Government's target), 10% of transport use (the EU target) and renewables in heat staying at 1%, renewable sources would provide some 15-17% of total energy use in Scotland by 2020. Therefore, renewable heat would need to increase to at least 11% of total heat use for renewables as a whole to account for 20% overall.

Figure 1: Scottish Government's proposed energy mix by 2020

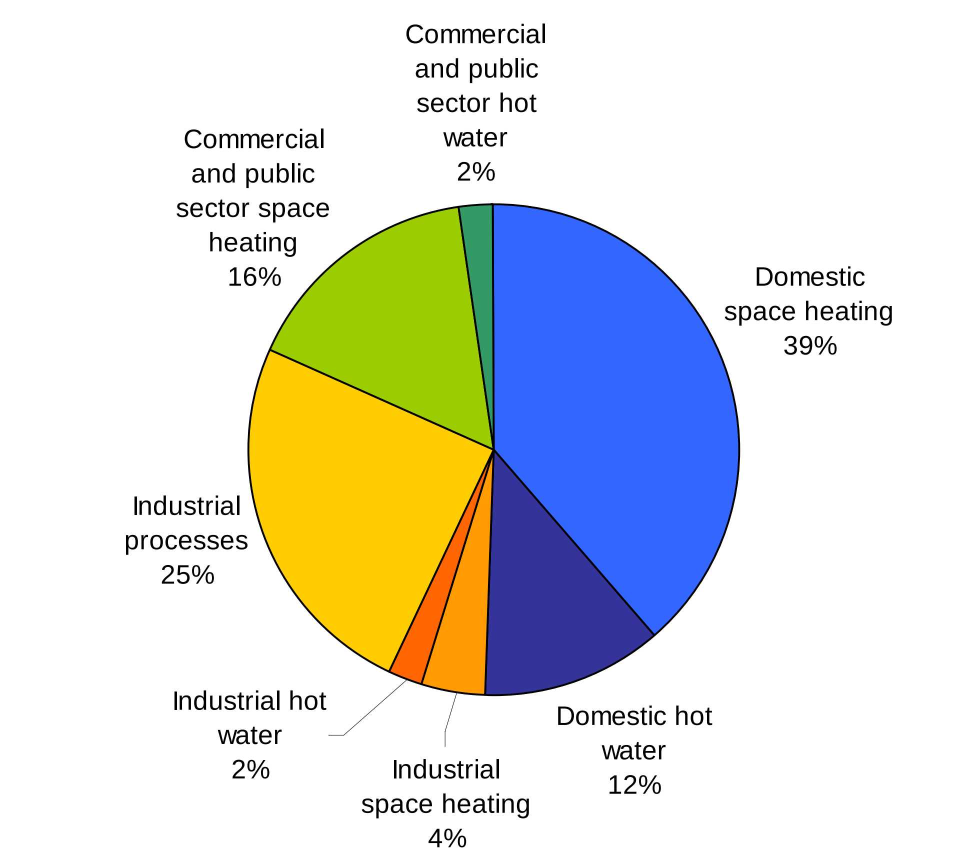


It is clear that heat is most of the consumption. However, most effort on encouraging renewables to date has been focused on the electricity sector.

1.2 Heat Demand in Scotland

The split of heat demand in Scotland is shown in Figure 2. Household heat demand is shown in blue, commercial, public and service sector heat demand are shown in green and industrial heat demand is in orange.

Figure 2: Split of Scottish Energy Demand [10]



1.3 Types of Consumer

1.3.1 Domestic

Household use represents around half of the heating demand in Scotland. Demand for energy for heating and hot water in the domestic sector is currently around 45 to 50 TWh_{th} per year.

- ***Housing mix***

Figure 3: Scottish Housing Mix [22]

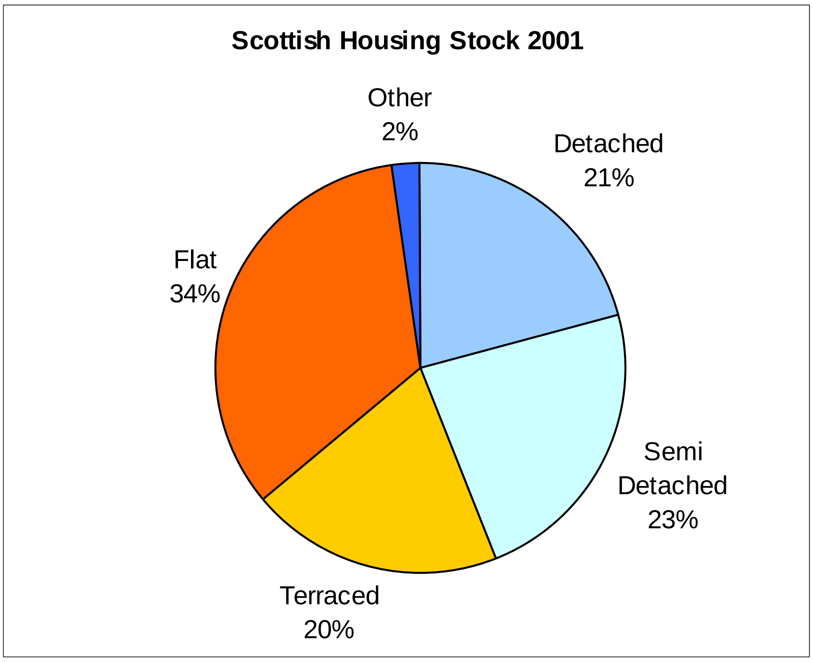
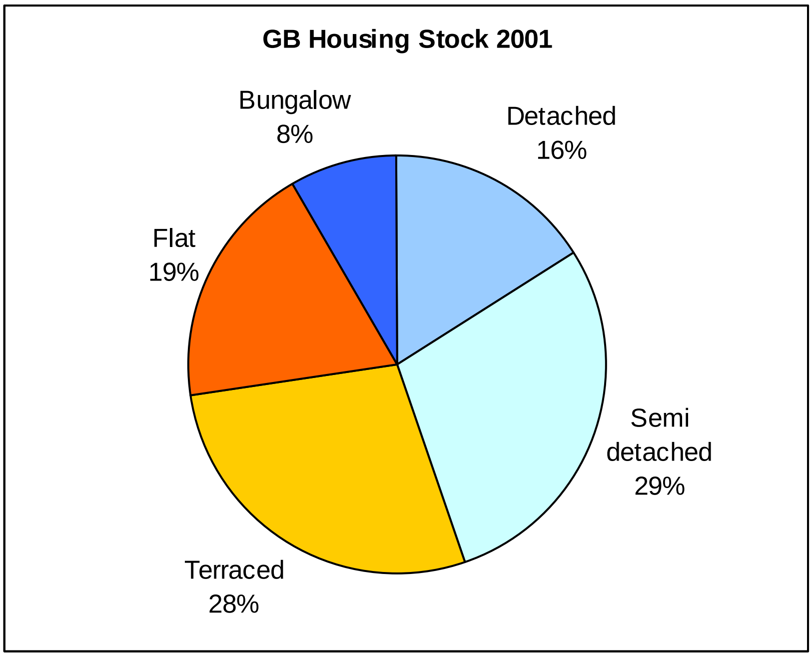


Figure 4: GB Housing Mix for Comparison [8]



The total number of dwellings in Scotland in 2001 was about 2 million. The predominant type of dwelling is high density housing in urban areas (tenements and other flats or terraces). Planning and space issues may make some types of heating technology unsuitable and the number of individual owners and types of tenure can make replacing existing systems with renewable heat technologies more complex.

A key driver for retrofitting heating systems in domestic properties is fuel poverty. Around one third of Scottish houses are estimated to be in fuel poverty [19]. A contributing factor to fuel poverty can be reliance on more expensive electric heating. Around a third of Scottish households are not on mains gas. Some of these are remote properties with limited access to gas, but a significant number of developments in towns and cities are also fitted with electric heating only [19].

The housing stock in Scotland is also relatively disadvantaged in that a third of properties don't have cavity wall, and a quarter have no loft: making conventional insulation difficult and requiring more costly measures such as internal and external solid wall insulation [19].

Figure 5: Edinburgh Tenements

- ***New Build***

The rate of new build in Scotland is currently around 1% of the existing housing stock per annum [10]. This may be expected to reduce somewhat over the next few years if the housing market continues to be depressed.

The vast majority of new homes (80 to 90%) are built by and for the private sector [10].

The introduction of Scottish Planning Policy 6 (SPP6) raises an expectation that for developments with a total cumulative floor space over 500m^2, the developers will explore fully the opportunities for the installation of low and zero carbon equipment to contribute to at least an extra 15% reduction in carbon emissions beyond the 2007 building regulations standard for carbon dioxide emissions.

- ***Retrofitting***

According to the Scottish & Northern Ireland Plumbing Employers Federation (SNIPEF), around 50,000 boilers are replaced in Scotland every year. That means that around 500,000 will be replaced in the decade between 2010 and 2020. This is more than enough to exceed the 11% target by 2020.

- ***Investment decisions***

  When making a choice of heating system, consumers:

  - Place a high value on convenient and readily available heat. Space and refuelling required are perceived as a substantial inconvenience as is requiring a garden to be dug up for trench-based ground loops for ground source heat pumps. They want reliability, without a need to stay at home for maintenance or a possible period without heating [7].
  - Place a very low value on ongoing energy costs compared with up-front capital costs and are only willing to pay around £3 up-front to make an annual saving of £1 [7].

  This investment decision process presents a considerable barrier for microgeneration technologies which are characterised by high up-front costs with low on-going costs.

  Furthermore, a significant proportion of households in Scotland are rented, with landlords having less incentive than owner-occupiers to make an investment in a change of heating system, as normally tenants will be responsible for energy bills.

  Housing associations and public authorities own around a third of houses in Scotland [10]. This may present itself as an opportunity or as a barrier: if these are obliged or given sufficient incentive to retrofit, then a mass roll out of renewable heat technologies could occur; but if not, then both landlords and tenants will have no reason to incur the costs of switching.

1.3.2 Commercial and Public Sector

Commercial and public sector use in Scotland represents about 15-17 TWh_{th} per year or about one sixth of the heating demand in Scotland.

In both the commercial and industrial sectors there are fewer individual purchasing decisions to deliver the same quantity of renewable heat, which may make them an important target market. In addition commercial customers may be prepared to see cost-benefits over a slightly longer period than domestic customers, making renewable technologies more clearly cost-competitive.

Many buildings in this category are under the management of local authorities and NHS trusts etc. This may make national purchasing programmes and renewable heat targets for public buildings an effective incentive, although many of these buildings are under PFI/PPP contracts, which may restrict options for retrofitting new technology.

1.3.3 Industrial

Industrial use accounts for about a third of heating demand in Scotland, 25-30 TWh_{th} per year. Based on UK figures, over half of this is likely to be space heating and low temperature processes. The major industries in Scotland are chemical, timber and, of course, distilleries.

In the industrial sector, Climate Change Agreements (CCAs) are in place to incentivise efficiency although the duration of these is under some doubt as current CCAs expire in March 2013, although the Government announced in the Pre Budget Report in 2007 that "the scheme will continue until 2017, subject to State Aid approval, and [it] will discuss with business the most effective way of taking this forward".

1.4 Types of Technology

Table 1 provides a brief description of technologies available for renewable heat.

Table 1: Renewable Heat Technologies

Technology	Brief Technology Description
Biomass	• Grown plant material, co-products from harvesting activities • Directly burned to generate heat or electricity • Solid and relatively dry • Well automated - wood chips, wood pellets
Anaerobic Digestion (AD)	• Anaerobic digestion involves the decomposition of organic matter by microbiological organisms in the absence of oxygen. • This process creates methane • Methane can be used for generating electricity or heat • Constraints: feedstock is crucial
Landfill Gas	• Biogas which can be used to generate electricity or as heat • Generated on landfill sites • Natural decomposition of organic matter in the waste in the absence of oxygen
Biogas in the gas network	• Biogas from landfill gas or AD can be injected in the gas network. • Utilises existing heat infrastructure (gas grids). • Does not require consumers to install new heating installations and also avoids building more network infrastructure.

Energy from Waste (EfW)	• Collective term for different processes based on the combustion of Municipal Solid Waste (MSW): • Large scale mass burn of MSW based on conventional grate combustion • Fluidised bed combustion suitable for smaller scale • Pyrolysis gasification – immature and not fully developed yet
Solar Thermal	• Well established and global applied technology • Low uptake in the UK, due to less favourable climate conditions • Collection of solar heat-radiation, water cycle • Suitable for space heating and warm water • Suitable for low temperature heat • Very often in combination with conventional boiler
Ground Source and Water Source Heat Pumps	• A ground or water sourced heat pump uses the temperature difference between the ground or a large body of water and the surrounding atmosphere • In a cycle process (similar to a refrigerator) the low grade heat from the ground or water gets pumped up to a higher temperature level which can be used to heat water or provide space heating • With a relatively small mechanical effort heat pumps can generate a relatively high temperatures • The efficiency depends on the temperature difference between ground and atmosphere • Suitable for low-grade heat for space and water heating • Technology is well developed and understood
Air Source Heat Pumps	• As ground and water, except using external temperature gradient • Less efficient than ground or water source, but with more potential applications • In a cycle process (similar to a refrigerator) the ground temperature gets pumped up to a higher temperature level • Suitable for low-grade heat for space and water heating
Wind to Heat	• Using devices to turn wind energy to heat, e.g. via mechanical forces and friction or feeding electricity generation straight into a heating system with storage. • Suitable to heat spaces and water • Transferring mechanical wind energy to heat

Electrification of heat	• Renewable energy will form a significant percentage of electricity in Scotland. Therefore homes and businesses heated by electricity will have an increasing contribution from renewables sources. • Electrical heating is relatively unpopular with consumers, particularly storage heaters as heat is not typically available at peak times when required. • Electrical heating is relatively expensive and has therefore been linked with fuel poverty.

Figure 6 provides an indication of the approximate costs of some of these technologies (precise costs are site-dependent). This is taken from Ernst and Young analysis [5] and [12]. For the renewable heat technologies this includes the capital cost at an appropriate discount factor and ongoing operating costs to give a levelised cost per MWh. Table 2 indicates the suitability of some of these technologies to different applications. This is IPA's own assessment and based on generalisations, individual suitability of applications will vary.

Figure 6: Approximate costs of heat from different technologies [5, 12]

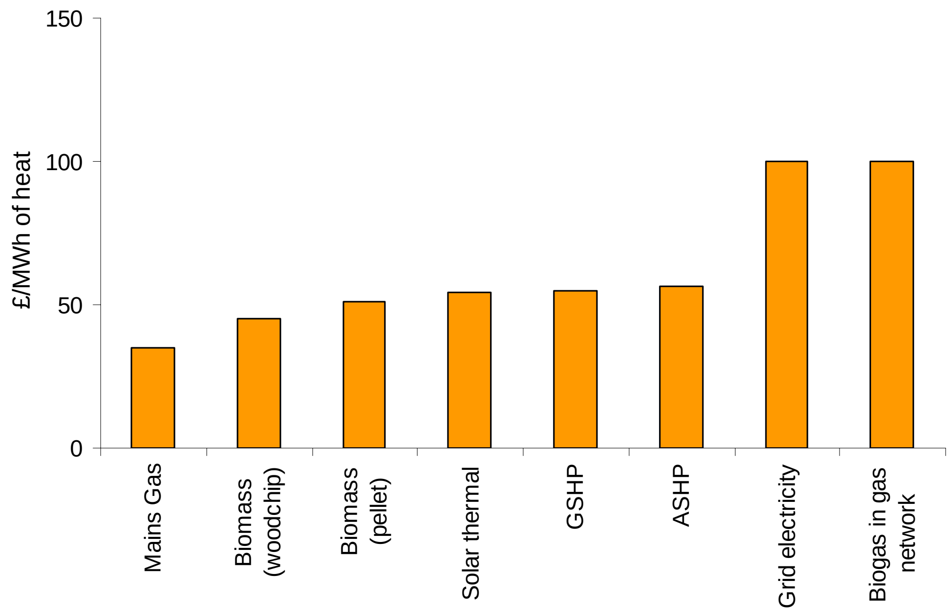


Table 2: Indication of the suitability of various technologies to different applications (IPA analysis)

		Biomass	AD	EfW	GSHP	ASHP	Solar Thermal	Wind to Heat	Biogas in gas network
Domestic	High Density Homes: Space Heating	✓*	✓*	✓*		✓			✓
	Low Density Homes: Space Heating	✓	✓*	✓*	✓	✓	✓+	✓	✓
	High Density Domestic Hot Water	✓*	✓	✓*		✓+			✓
	Low Density Domestic Hot Water	✓	✓*	✓*	✓+	✓+	✓+	✓	✓
Commercial	Space Heating	✓	✓	✓	✓	✓			✓
	Hot Water	✓	✓	✓	✓+	✓+	✓		✓
Industrial	Space Heating	✓	✓	✓	✓	✓			✓
	Low Temp Process	✓	✓	✓					✓
	High Temp Process								✓

✓ Usually suitable
✓ May have some constraints (e.g. high cost, space requirements, natural resource)
Usually unsuitable

* District heating or similar.
\+ Pre-heating.

Low density homes include larger terraced houses, detached and semi detached houses.
High density homes include tenements, flats and smaller terraced houses.

Local renewable heat, from biomass, solar or heat pumps, is typically more expensive than mains gas and can require additional infrastructure (either within the premises or in district heating schemes).

Biogas and electric heating are seen as very attractive options as they do not require additional infrastructure to distribute the energy or any individual consumer investment. However, they have associated problems. In particular, the both biogas and electric heating are relatively expensive compared to alternatives (see Figure 6) and therefore could contribute to fuel poverty. If more electric heating is used it requires a proportional increase in the amount of renewable electricity generated as well if it is to contribute to targets.

Overall, we feel it is important to strike a balance between the different technical solutions to renewable heat by adopting the technologies most suited to different applications.

2 INCENTIVISING RENEWABLE HEAT

Estimates of Scottish heat demand vary from 85 to 95 TWh_{th} per year. Based on the lower end of this range and assuming stable heat demand, we would expect that in order to reach the Scottish Government's target by 2020, renewable heat consumption must exceed 9 TWh_{th}.

As shown in Figure 6 in the previous section, many renewable heat technologies are currently broadly cost-competitive with conventional heat sources over their lifetime, but high up-front costs and poor awareness discourage consumers from taking them up.

This section considers the ways that Scottish Government and Industry can contribute towards achieving the renewable heat target.

2.1 Current Support for Renewable Technologies

There is a sometimes bewildering array of incentive and support schemes that can cover renewable heat technologies in Scotland. The main types of incentive include:

2.1.1 Grants

Some grants are available to consumers, including:

- SCHRI (Scottish Communities and Householder Renewables Initiative);
- CESP (Community Energy Saving Programme);
- EAP (Energy Assistance Package); and
- LCBP (Low Carbon Buildings Program).

Grant schemes have been popular with consumers but are dependent on annual budgets. Fluctuations in demand make these hard to budget for and this has particularly affected the LCBP.

In the past, grant schemes have tended to produce a "boom and bust" effect on the industry, which is not sustainable in the long term and sporadic availability of grants may actually damage consumer acceptance. There is also some anecdotal evidence that installers may be pricing to reflect the grants available, rather than the true cost of the technology which may distort consumer choice.

2.1.2 Tax Incentives

There are a number of tax incentives for energy saving technologies; including renewable heat systems:

- ECA (Enhanced Capital Allowances) for business; and
- 5% VAT on energy saving equipment, including heat pumps.

These are reasonably popular and easy for consumers to understand, but on their own are unlikely to be sufficient to support significant development.

2.1.3 Obligations

A number of obligations impact the renewable heat market:

- The CERT (Carbon Emissions Reduction Commitment) obligation on regulated energy suppliers requires them to deliver carbon dioxide emissions savings, which can include a limited percentage of savings achieved through renewable heat installations. Under these obligations only the lowest cost systems are incentivised, for example energy suppliers have tended to meet a relatively large proportion of their requirements through energy saving light bulbs.
- The Renewables Obligation on electricity suppliers incentivises renewable electricity production. While this does not impact renewable heat directly, CHP generation producing usable heat and electricity from renewable sources (biomass, EfW etc.) is supported.

2.1.4 Feed-in tariffs

Tariffs can be more popular with investors than the obligations model discussed as they are easier to understand and forecast. Two new incentives have been proposed which could impact the market, but these have not yet been fully developed:

- Proposed UK Renewable Heat Incentive (RHI). Banded system supporting renewable heat technologies. However, it is not certain when it will be introduced or what technologies it will cover
- Microgeneration Feed In Tariff, likely to cover installations of <5MWe installed capacity.

2.1.5 Building and Planning Regulations

Mandating through building and planning regulation can be effective for encouraging take up of proven technologies.

- Scotland has implemented a “Merton Rule” style of planning guidance (SPP6), which expects 15% of energy requirements in large new developments to come from renewable technologies.
- Condensing boilers, a more efficient form of gas boiler, have been mandated through building regulations throughout the UK.

2.1.6 Public Procurement Policy

Public procurement policy has not been officially used in Scotland to encourage renewables, although some local authorities, care trusts and other public agencies have voluntarily adopted policies to use renewable energy and other sustainable technologies where possible.

2.1.7 Marketing/ Publicity Campaigns

There has not yet been any significant central publicity promoting renewable heat technologies in Scotland.

2.1.8 R&D Funding

Research, development and deployment funds can provide a path to commercialisation for developing technologies. In the UK, good sources of funding are available for early stage research, but pre-commercial demonstration projects sometimes struggle to obtain appropriate funding which has historically delayed commercial deployment of promising technologies once they have "left the lab".

2.1.9 Easier Consenting

New permitted development rights make some renewable heat technologies such as solar thermal normally exempt from the requirement for planning approval, making new installations quicker and simpler for householders. However, air source heat pumps were excluded from the recent revision of permitted development rights.

Some local authorities such as the City of Edinburgh Council have had moratoria in place on the approval of wood fuel biomass heating systems over fears about particulate emissions, despite a recent Scottish Government study showing emissions at levels of around half of what had previously been believed and new guidance being issued.

The streamlining of planning procedures removes barriers to the industry's development, but does not itself provide any incentive for implementing renewable heat.

2.2 Examples of International Experience

Internationally a number of schemes have been introduced to support or encourage various forms of renewable development. The following sections provide brief descriptions of a number of schemes.

2.2.1 Germany

The MSP (Market Stimulation Programme) was introduced in Germany in 1999. The grant scheme covers ~15% of investment costs and are available to private individuals, small and medium-sized companies and municipalities. It has been very successful in stimulating demand for renewable heat technologies.

The scheme is financed by German Federal Government from the public budget. There have been difficulties in providing sufficient funds to support the MSP due to fluctuations in demand.

A renewable heating law was introduced early in 2009. This requires that new buildings have RES heating systems for 20% demand. There are further financial incentives to equip older buildings.

2.2.2 Spain

In September 2002, Spain was the first European country to introduce a "feed-in tariff" funding system for solar thermal power. The initial level was too low to be bankable and, the solar thermal premium was increased in 2004 by 50% to 18 € cents/kWh for 25 years [21].

There have since been a number of large scale developments, for example the PS10 project, an 11 MW Solar Thermal Power Plant in Southern Spain.

Spain has also made the installation of solar-thermal appliances obligatory in new and refurbished buildings, unless another form of sustainable technology is already in place.

2.2.3 Australia

Australia has introduced a Mandatory Renewable Energy Target (MRET), which operates on similar principles to the UK Renewable Obligation. This obliges large wholesale purchasers of electricity to support renewable energy electricity generation. These companies are required to surrender of renewable energy certificates (RECs, one REC is equivalent to one MWh of eligible renewable electricity). Failure to surrender enough RECs results in a Renewable Energy Shortfall Charge (penalty) of A$40 per REC.

To incentivise solar thermal developments, these have been made eligible for deemed RECs. The amount of RECs earned varies by installation as individual models are tested to determine the amount of electricity that they displace and RECs are issued in respect of the "avoided electricity". This will provide additional cost reductions to eligible hot water systems on top of existing incentives such as "Solar Hot Water Rebate".

2.3 Lessons Learnt

Based on international experience there are a number of common experiences that Scotland can learn from. These are that:

- The level of renewable heat incentives must be sufficiently high to encourage development;
- Marketing and awareness raising is absolutely key to success;

- Governments should avoid any political link through central subsidies: fluctuating annual budgets may disrupt continuity of support and England, Germany, Italy etc. have all experienced difficulty in maintaining availability of funds for schemes resulting in ‘feast and famine’ and creating very bad consumer impressions when funding is seen as arbitrary and fluctuating from year to year;
- Support policies must be long term and last over 5 years to develop a stable industry;
- Different incentives may be suitable for commercial and residential sectors;
- A simple administration / application process is essential; and
- Appropriate quality requirements are essential to maintain consumer confidence as allowing or encouraging poor quality systems early on can damage the market for later developments.

The Government (Scotland and UK) could contribute by providing:

- Sufficient, simple and stable incentives;
- Appropriate consenting regime;
- Public awareness campaigns, including availability of incentives; and
- Appropriate and well-publicised quality standards,

Industry should contribute to:

- Public awareness, including of incentives; and
- Adopt appropriate quality standards to provide customer assurance.

3 BENEFITS TO SCOTLAND

This section details the benefits to Scotland of meeting the Renewable Heat target in terms of GVA and employment.

3.1 Assumptions

Relatively little data is available about the renewable heat sector in Scotland.

We have assumed that the UK and Scottish Governments will provide some form of economic driver to encourage consumers to invest in this area. However, it is not yet clear which technologies will be supported or taken up.

For simplicity, we have assumed that fiscal and other measures are sufficient to boost take-up to 11%. We have also needed to make a number of assumptions about the different technologies. Where possible these have been based on publically available information (see Appendix 1 for details).

3.2 Types of Economic Benefits

The increase in renewable heat generation in Scotland will have economic impacts in the following categories:

- **Direct impacts -** the onsite and immediate effects created by spending money on the renewable heat projects. This includes construction labour and manufacturing employment;
- **Indirect impacts -** refer to the increase in economic activity that occurs when a contractor, vendor or manufacturer receives payment for goods and services and his expenditure on financial services, suppliers of parts, materials and services; and
- **Induced impacts -** are the changes in wealth that result from people spending who are directly and indirectly employed by the industry: heating engineers or manufacturing employees will spend money on food, clothing and other goods and services, some of which will benefit local businesses

For the purpose of this project we have assumed new renewable heat generation developments in line with the government's 2020 targets and have assumed a mix of installations as described in Appendix 1.

3.2.1 Employment

Little information is available on employment in the renewable heat sector. A brief survey of installers seemed to indicate about 1 FTE per 10 installations per year, this ranges across domestic and commercial installations and does not include indirect and supply chain jobs. This reflects the fact that there is currently a relatively small market for renewable heat.

To meet the 11% target there could be up to 300,000 installations over 10 years, providing a much more sustained and stable market.

Installers are currently almost all small business, with over 70% of companies having fewer than 8 employees.

3.2.2 Gross Value Added

We have estimated the potential Gross Added Value (GVA) to Scotland of renewable heat by considering the value of the installation that is "retained" in Scotland.

3.2.3 Leakage

While the development of renewable heat projects will create opportunities for greater value added in Scotland, the GVA retained will depend on a number of factors including manufacturing capacity, the technology and skills base. Currently much of the technology and manufacturing capacity for renewable heat technologies has been developed on the Continent and in the United States and the renewable heat market in the UK is largely dependent on importing the equipment and technology.

The development of a sustained demand for renewable heat technology bringing new manufacturers, expansion and consolidation of the regionally based supply chain together with suitable technical training and accreditation scheme may contribute in the long term to a greater proportion of the gross value added and employment creation being retained in Scotland.

3.3 Estimated Economic Benefits

3.3.1 Leakage and the Manufacturing Sector

At present, much of the renewable heat plant itself is manufactured outside Scotland and imported. This means that little of the money spent on technology is retained in Scotland. However, some companies have indicated interest in establishing manufacturing capability in Scotland if they see sufficient and stable Government support to stimulate market demand. For local renewable heat solutions, a significant proportion of the amount spent on an installation that goes to labour, expert advice, fitting, etc. will normally be retained in the Scottish, and often very local, economy.

Based on our calculations we estimate that 40% of the capital cost of local renewable heat solutions is retained in the Scottish economy. For larger renewable heat installations, such as biogas and energy from waste, this percentage is likely to be smaller at 20%. For both types of project, much more could be retained if the equipment (~60-70% of cost) is of Scottish manufacture.

3.3.2 Employment

Based on employment multipliers taken from other renewable energy sectors, we estimate that around 2,000 FTE jobs could be retained in Scotland. This includes direct, indirect and induced employment.

An important factor is that these jobs are likely to be sustainable in the long term. A properly established incentive scheme should produce sustained demand for these jobs to 2020. Subsequent to this, work can be expected on maintenance and replacement, familiarity leading more people choosing renewable option and possibly continued incentives combining to support a switch to renewable heat technologies.

Most of these jobs seem likely to be additional jobs. Our rough initial calculations are that only about 100 existing plumbing/heating jobs will transfer to the sector.

3.3.3 Gross Value Added

Based on a number of assumptions around current installed cost for renewable energy technology, technology mix and retained value (see Appendix 1), we believe that the renewable heat industry could generate a turnover of £2.7 billion in the renewables sector by 2020, excluding fuel supply chains.

We estimate that £0.9 billion of this value could be retained in Scotland over 10 years. This represents about 34% of installed value being retained in Scotland. This is on a conservative basis: if they are convinced that there will be a sustained demand for renewable heat then more manufacturers may establish in the region, allowing a greater proportion of this value to be retained.

3.3.4 Fuel Supply Chain

Ongoing economic benefits from fuel supply chains (such as biomass) are beyond the scope of this study. It is important to note that this sector too has the potential to benefit the Scottish economy.

Wood pellet manufacturer, Balcas is currently constructing a large woodchip factory in Invergordon. This involved an investment of £24m and is likely to create 38 full-time posts at the plant and a further 307 indirect jobs. The plant has an output capacity of 100,000 tonnes per annum (an average household might use 5 tonnes per annum). Therefore, once Balcas has established their manufacturing plant at Invergordon, Scotland will be a net exporter of wood pellets for heat generation, with the majority of output going to England and Europe.

However, if the 11% target is met largely through biomass, as suggested by a number of sources, then up to eight manufacturers of the capacity of Balcas may be required just to supply the Scottish market. At present Balcas will use wood that is unsuitable for other purposes. However, if the market expands biomass will increasingly compete with other sectors for forestry and other wood supplies, although the existence of a sustainable demand for fuel is likely to stimulate expansion of the supply chain.

3.4 Skills

The number and capability of accredited renewable heat installers is currently limited, which reduces competition. Historically, training has mainly been offered by manufacturers, and is specific to their equipment.

Plumbers and heating engineers are well-placed to enter this field, having many of the required skills already. New apprenticeships starting this year now cover renewables, and there are about 500 apprentice plumbers trained per year (although the recession may mean fewer apprentices are employed). Employers are reluctant to support training unless they see future returns, but a large uptake in renewables due to government support will stimulate greater industry training.

The main form of accreditation available for companies wanting to get involved in renewable energy systems is the Microgeneration Certification Scheme. The incentive to join the scheme is currently grant eligibility under the Low Carbon Buildings Program and there is little other publicity for the scheme.

The Microgeneration Certification Scheme has long been cited as a barrier to the development of the market. Installers complain about the costs and limited number of locations where the training is offered and consequently there has been limited uptake of this accreditation, stalling the spread of competition and resulting in installation costs remaining high, creating a barrier to the uptake of renewable heat technologies.

APPENDIX 1: ASSUMPTIONS

Our analysis is based on the following key assumptions:

Scottish heat consumption [4, 10]:

- Domestic: 45,000,000 MWhth per year
- Commercial and industrial: 40,000,000 MWhth per year

Number of sites (based on the number of electricity meter points as an approximate indicator [23]):

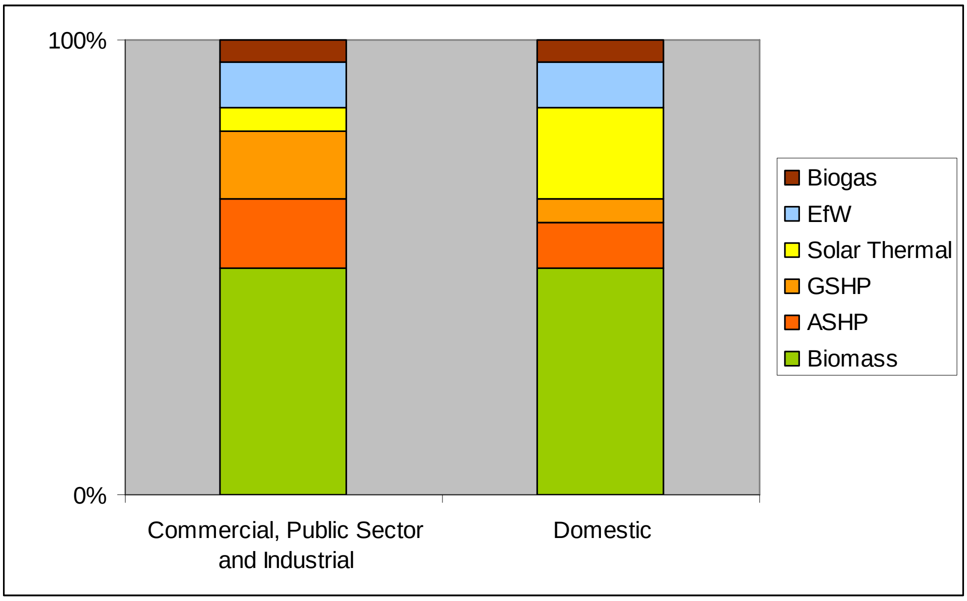
- Domestic: Around 2,700,000 sites
- Commercial and industrial: Around 220,000 sites

There is as yet no clarity on the potential split of effort by consumer group (domestic, commercial, public sector and industrial). Government analysis has tended to focus on the domestic sector to date, but this seems to be largely to do with the availability of information rather than a specific targeting. As domestic is the bulk of the heat demand it is likely to be a significant area. However, the public, commercial, service and industrial sites require fewer purchasing decisions and may be persuaded to make changes on more purely economic grounds.

At present, we feel there is no reason not to assume that all sectors will make an effort proportionate to their share of the heat demand.

There are no firm indications of a possible split of technologies, as this will largely depend on the form and level of any Government incentive. We have therefore made some assumptions about the type of renewable heat technology implemented, see Figure 7.

Figure 7: Type of renewable heat technology (IPA analysis and [1, 5])

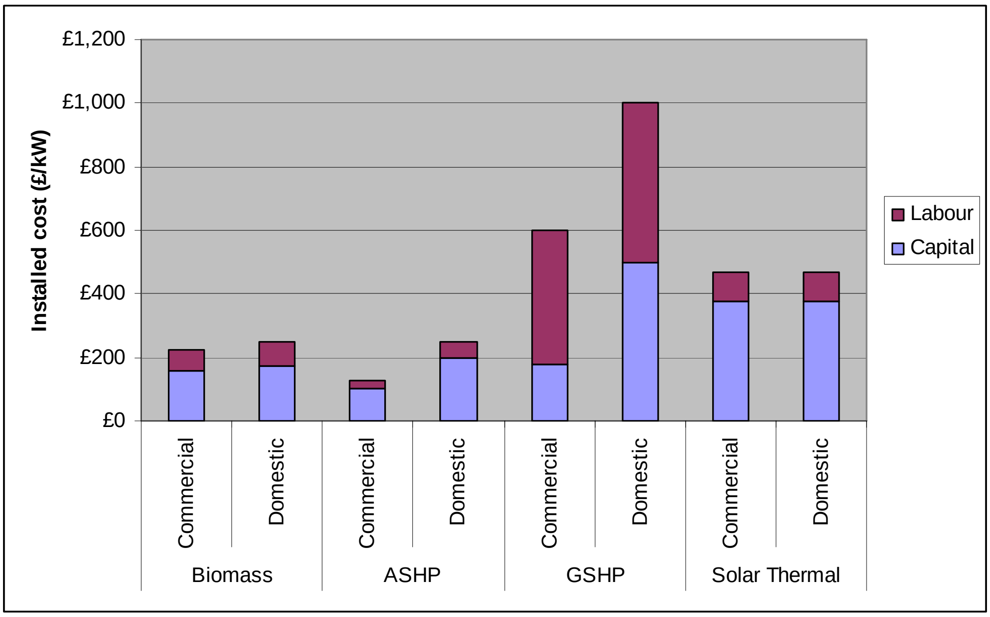


Average installation size of local renewable heat options (biomass, heat pumps and solar thermal, IPA estimate):

- Domestic: 10 kW
- Commercial: 120 kW

Cost of local renewable heat options:

Figure 8: Installed cost (IPA proprietary data and [5])



Cost of large scale renewable heat options:

- Biogas in gas network: £100/MWhth cost [12]
- Waste to Energy: 32 MW plant capex is £180m, assumed load factor of 80% (no opex data available) [5]

Retained value, IPA assumption:

- Local: 15% of capital cost
- Local: 90% of labour cost
- Large scale: 20% of all costs

Employment multipliers in the renewable energy sector, IPA proprietary data:

- 4.5 direct jobs per MW constructed
- 2.2 indirect or induced jobs per MW constructed

APPENDIX 2: REFERENCES

Ref. No.	Reference Details
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