

Heat Policy Statement

**Towards Decarbonising Heat:
Maximising the Opportunities for Scotland**

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Maximising the Opportunities for Scotland**

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Any enquiries regarding this publication should be sent to us at
The Scottish Government
Victoria Quay
Edinburgh
EH6 6QQ

ISBN: 978-1-78544-440-1

Published by The Scottish Government, June 2015

Ministerial Foreword

A resilient heat system which transitions to affordable low carbon heat for households, organisations and industry and which seizes the economic opportunities that this transformation offers is key to the Government's main purpose of increasing sustainable economic growth.

This concise Heat Policy Statement brings together and sets out Scottish Government's framework for achieving such a system across the heat system – demand, transmission and generation. It builds on the detailed draft Heat Generation Policy Statement and the consultation in 2014 and it represents a further component in the establishment of a fully integrated energy approach in Scotland.



We have made significant progress, even since publishing the draft Statement in March 2014. Moving to a largely decarbonised heat system by 2050 requires action by householders, business, industry, the public sector and communities across Scotland. We will continue to encourage reducing the need for heat and efficient use of lower carbon heat sources through our support programmes. We are retaining our level of ambition to achieve 1.5 TWh of Scotland's heat demand to be delivered by district or communal heating and to have 40,000 homes connected by 2020. New and emerging initiatives covered within this document include:

- Designating energy efficiency as a National Infrastructure Priority. The cornerstone of this will be Scotland's Energy Efficiency Programme (SEEP) which will provide an offer of support to all buildings in Scotland – domestic and non-domestic – to improve their energy efficiency rating.
- The Low Carbon Infrastructure Transition Programme (LCITP), launched in March 2015, with £76 million over the first 3 years, to provide tailored project development support for established and start-up infrastructure projects, including heat, across the private, public and community sectors.
- A support programme for local authorities to develop a strategic approach to district heating and supporting use of the Scotland Heat Map to do so.

These initiatives demonstrate the direction of travel we wish to take and how we aim to support a commercially viable, diverse heat sector in Scotland to 2050.

Fergus Ewing

Minister for Business, Energy and Tourism

A handwritten signature in black ink that reads "Fergus Ewing". The signature is written in a cursive style with large, flowing loops.

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Chapter 1 – Summary and Introduction

Heat in the Energy System

1.1 Heat is at the core of Scotland’s energy system. It is the biggest element of our energy use (over 55%), and the largest source of our emissions (47%). We spend £2.6 billion annually on heating and cooling our homes and businesses in Scotland¹. The Scottish renewable heat sector is growing with an estimated turnover of £2.7 billion by 2020². The Scottish Government is committed to largely decarbonising our energy system by 2050, at an affordable price to consumers through maintaining and developing secure supplies of energy.

1.2 We have done a lot already to reduce heat demand upon which this Statement builds. We have invested and recycled over £45 million since 2007 to support Scottish households, businesses and organisations to finance the implementation of energy efficiency and renewable measures and the development of district heating schemes, generating loans in excess of £65 million to over 4,000 applicants³. The Scottish Government has already allocated **over half a billion pounds since 2009 on a raft of fuel poverty and energy efficiency programmes** which has already made hundreds of thousands of homes warmer and cheaper to heat. Nearly 1 in 3 of all households (over 700,000) have now received energy efficiency support.

1.3 This Heat Policy Statement sets out the Scottish Government’s future policy direction for addressing the three key aspects of the Heat system:

- how we use it (heat demand and its reduction)
- how we distribute and store it (heat networks and heat storage)
- where our heat comes from (heat generation)

1.4 Each of these aspects of the heat system is addressed by three specific objectives as set out in our **Heat Hierarchy: reducing the need for heat; supplying heat efficiently and at least cost to consumers; and using renewable and low carbon heat.**

1.5 The challenges facing Scotland are to:

- largely decarbonise its heat system by 2050, to reduce greenhouse gas emissions;
- diversify its sources of heat generation and supply to reduce our reliance on fossil fuels, and therefore support a resilient heat supply;
- reduce the pressure on household and business energy bills through reducing heat demand and providing affordable heat, in particular supporting the fuel poor; and

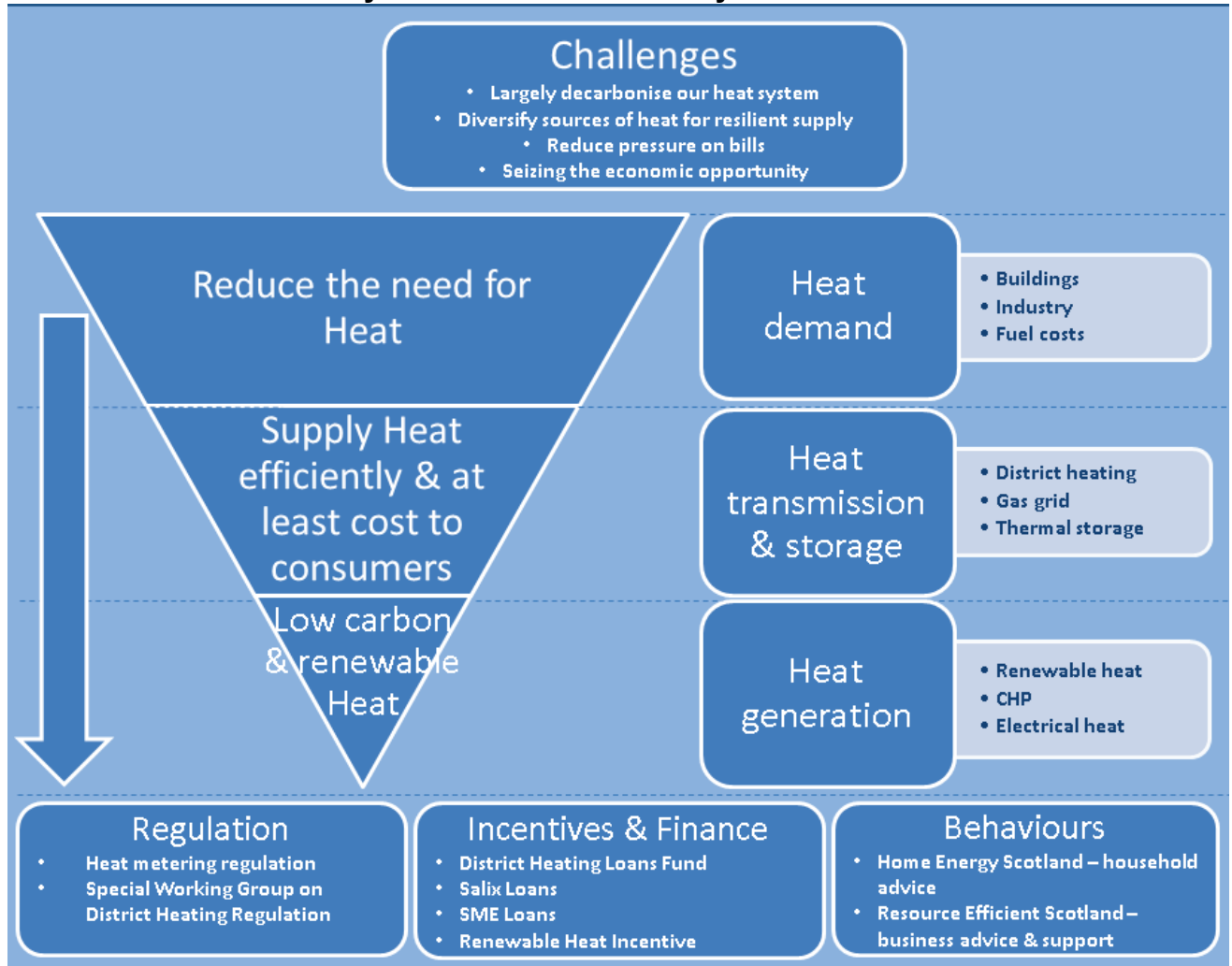
¹ This figure excludes industry heat spend. Source: Heat Pathway Scenarios Model (HPSM). For details on this model see: <http://www.gov.scot/Resource/0045/00451939.pdf>. Throughout this statement references to heat should generally be taken to include cooling.

² http://heatpoint.co.uk/PDF/Renewable_Heat_in_Scotland_2020_vision_its_HEATPOINTS_journey.pdf

³ Figures include finance / loan funding made available from Salix, Resource Efficient Scotland SME Loans, District Heating Loan Fund and Home Renewables Loans.

- seize the sizeable economic opportunities that this transformation offers through the development of new heat generation, distribution and demand reduction programmes.

Chart 1 – Scottish Heat System and Heat Hierarchy



1.6 The Heat Policy Statement sets out the actions being taken by the Scottish Government with its partners to tackle these challenges. The delivery of this policy statement can only be achieved by a partnership of public, private and community groups.

Scottish Government achievements since publication of the draft Statement

1.7 Since we consulted on the draft Statement⁴ in 2014 we have:

- Launched the Low Carbon Infrastructure Transition Programme (LCITP), in March 2015, with £76m over the first 3 years, to provide tailored project

⁴ Towards Decarbonising Heat: Maximising the Opportunities for Scotland, draft Heat Generation Policy Statement for consultation. <http://www.gov.scot/Publications/2014/03/2778>

development support for established and start-up infrastructure projects, including heat, across the private, public and community sectors.

- In conjunction with the Fuel Poverty Forum developed a work plan to help deliver the Forum's Final Report recommendations including amending the Home Energy Efficiency Programmes Scotland (HEEPS) to recognise rural area issues;
- Increased the funding of our domestic fuel poverty and energy efficiency programmes to £119 million this year. We have also launched a new energy efficiency loan scheme offering interest-free loans of up to £10,000 per household helping cover the upfront costs of installing energy efficiency measures; and we have introduced the Energy Efficiency Standard for Social Housing (EESH) in 2014;
- Enabled local strategic heat planning and identification of opportunities by providing Scotland Heat Map datasets and training to all Scottish local authorities and other public bodies;
- Continued our support for district heating through:
 - the Heat Network Partnership, where we have completed 19 out of 23 actions set out in the District Heating Action Plan, with the remainder ongoing or under review;
 - working with the UK Government to develop and implement the Heat Network (Metering & Billing) Regulations 2014;
 - announcing a further 12 projects supported under the District Heating Loan Fund in January 2015, bringing the total projects supported to 33.
- Continued to support the uptake of the domestic and non-domestic Renewable Heat Incentive (RHI) through our Home Energy Scotland and Resource Efficient Scotland programmes. This has helped Scotland to secure a better than pro-rata share of RHI installations – a high proportion of which are in rural areas and off the gas grid.

Further Scottish Government action

1.8 The Scottish Government will support a range of actions to deliver the three objectives of our Heat Hierarchy. We will:

Heat Demand

- Place energy efficiency at the heart of the approach that we will take to decarbonising the whole energy system, by designating energy efficiency as a National Infrastructure Priority. The cornerstone of this will be Scotland's Energy Efficiency Programme (SEEP), which will provide an offer of support to all buildings in Scotland – domestic and non-domestic – to improve their energy efficiency rating.
- Develop a Rural Fuel Poverty Task Force, to consider issues such as greater levels of fuel poverty. We have contributed to publication of the Joint Housing Delivery Plan for Scotland.
- In partnership with the Fuel Poverty Forum, implement the Forum's workplan. This includes providing grant and loan assistance through the Scottish Government's HEEPS programmes; and promoting the uptake of incentives to establish community owned renewable energy assets in deprived areas.
- Support resource and demand reduction in the non-domestic sector by investing annually into the Scottish Government's £9.3 million Resource Efficient Scotland programme and SME (Small and Medium sized Enterprises) loan scheme.

- Provide an additional £1.5 million in 2015/ 16 for the Resource Efficient Scotland SME loan scheme.
- Continue our SALIX energy efficiency loans scheme to support resource efficiency and decarbonisation across the public sector.

Heat Transmission and Storage

- Retain our level of ambition to achieve 1.5 TWh of Scotland's heat demand to be delivered by district or communal heating and to have 40,000 homes connected by 2020.
- Continue to support projects with the £8 million committed to the District Heating Loan scheme between 2014 and 2016, bringing the total to over £11 million.
- Consider the recommendations of the Special Working Group of the Expert Commission on District Heating when it reports in Summer 2015 on potential regulatory frameworks for district heating in Scotland.
- Report, at the end of 2015, the findings of our National Comprehensive Assessment and Cost Benefit Analysis, establishing the potential for high efficiency CHP (Combined Heat and Power) and efficient District Heating in Scotland, as required under Article 14 of the EU Energy Efficiency Directive.

Heat Generation

- Provide funding in 2015/16 for feasibility studies exploring the potential for geothermal energy capacity for local community benefits, such as district heating.
- Provide an additional £3 million for Home Renewables Loans in 2015/16 for renewable technologies by householders and increased uptake of the RHI.
- We will continue to press the UK Government to commit to the long term sustainability of the RHI beyond 2015/16 to provide confidence for funders and stimulate investment in renewable heat technologies.

Cross cutting activity:

- Work with Resource Efficient Scotland and partners to develop a Scottish specific summary of the UK's heat intensive industry decarbonisation road map in Autumn 2015. This will inform an agreed programme of industrial decarbonisation for the cement, ceramics, chemicals, food & drink, glass, oil refining, paper & pulp, retail, and steel sectors.
- Support the development and acceleration of over 100 low carbon infrastructure projects in the next 3 years through the Low Carbon Infrastructure Transition Programme (LCITP), stimulating commercial investment in low carbon sector.

Towards a fully integrated Energy approach for Scotland

1.9 Heat and cooling is at the core of Scotland's energy system, accounting for over 55% of our energy demand. We use heat to keep our homes and where we work or study warm. We use energy to cool them in hot weather. We also use heat or cooling to provide us with hot water, to preserve and cook our food, and to manufacture goods on which our economy depends. Currently, most of our heat comes from gas, oil, coal, biomass and electricity. In this document we generally refer to heat as a short hand for heat and cooling.

1.10 This Heat Policy Statement builds on the comprehensive draft Heat Generation Policy Statement and the consultation responses and stakeholder engagement in 2014⁵. It provides the Government response to that consultation.

1.11 The Heat Policy Statement complements the policies set out in other key documents such as the Electricity Generation Policy Statement, Scotland's Sustainable Housing Strategy, and the Community Energy Policy Statement. Scotland has achieved significant progress in these areas – on meeting our renewable electricity targets, on delivering a step change in provision of energy-efficient homes in Scotland, and on placing community energy at the heart of local energy systems and ensuring that they have the right to share in the benefits of realising the green energy resource around them.

1.12 This Heat Policy Statement also represents a further component in the establishment of a fully integrated energy approach in Scotland. The Scottish Government recognises the importance of a comprehensive, holistic approach to the whole energy system that addresses the heat challenges and acknowledges the interactions and complementarities between electricity generation and supply.

1.13 A modern approach to decarbonising the Scottish energy system is the central plank of our approach to reducing greenhouse gas emissions in Scotland. In 2009, the Scottish Parliament unanimously set Scotland's ambitious climate change targets, including an 80% reduction in greenhouse gas emissions by 2050. In addition, the Scottish Government has set linked targets including that by 2020:

- total final energy consumption in Scotland is reduced by 12% (against a baseline of the average final energy consumption in 2005-07); and
- 11% of non-electrical heat demand is delivered from renewable sources.

1.14 The Scottish Government will continue to work closely with industry, academia, non-governmental organisations and consumer groups in developing our approach to wider energy priorities. We will ensure that the further decarbonisation of the energy system plays a central role in the third Report on Proposals and Policies, scheduled for publication in 2016.

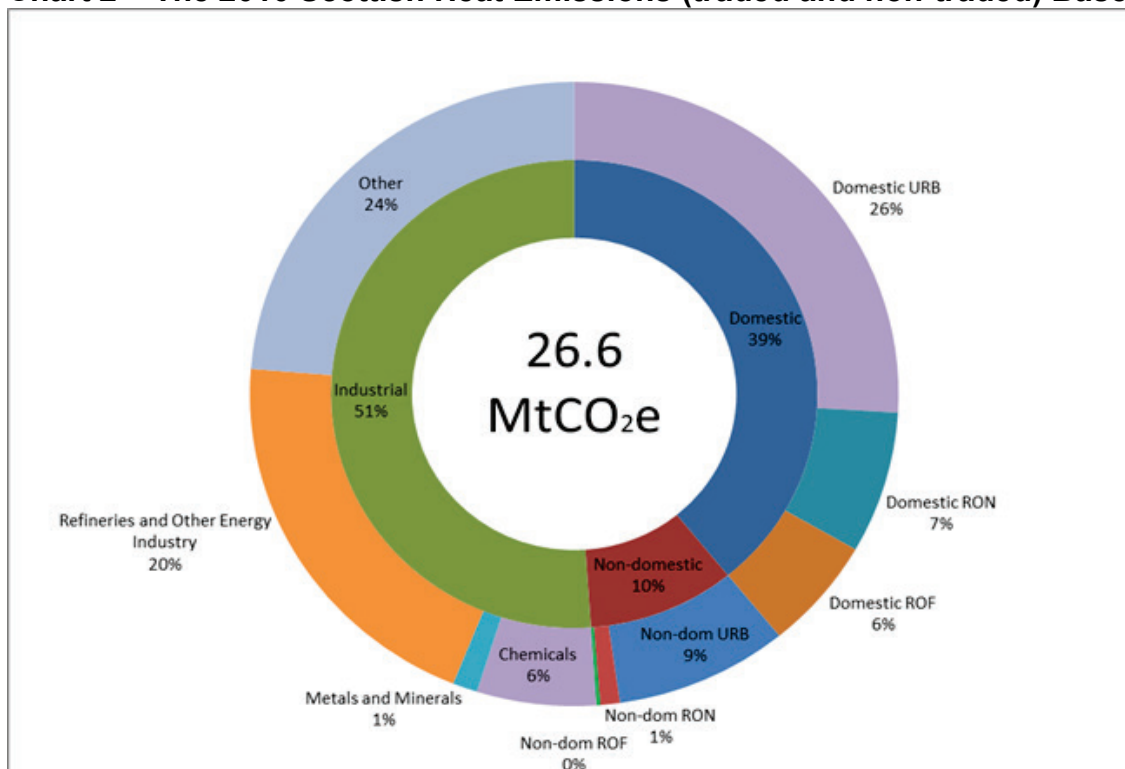
1.15 Reducing the carbon intensity of heat is central to achieving these targets. Heat is responsible for approximately 47% of total Scottish emissions⁶. Over half the greenhouse gas emissions from electrical and non-electrical heat in Scotland are industry-based with over a third from domestic properties⁷. The action taken to reduce emissions will reduce our reliance on fossil fuels. Through energy efficiency improvement, diversification of heat sources and increased storage we can have a more resilient heat system.

⁵ Consultation Analysis Report on "Towards Decarbonising Heat: Maximising the Opportunities for Scotland, Heat Generation Policy Statement, see: <http://www.gov.scot/Publications/2014/10/9929>

⁶ This includes direct emissions e.g. a boiler in a building and indirect emissions from electricity use.

⁷ Heat Pathway Scenarios Model Factual Report, 2014.
<http://www.gov.scot/Resource/0045/00451939.pdf>

Chart 2 – The 2010 Scottish Heat Emissions (traded and non-traded) Baseline



URB = Urban, RON = Rural On-Gas Grid, ROF = Rural Off-Gas Grid. Source: Heat Pathway Scenarios Model Factual Report, Scottish Government, 2014

[A guide to this document](#)

1.16 Detail on the actions which we are taking to support our objectives across all elements of the Heat system is set out in the following chapters:

- **Chapter 2** looks across the Heat system, and sets out how heat is used in Scotland and the cost of different heat energy sources for both domestic and non-domestic consumers. It outlines the work that is underway to develop the evidence base needed to underpin our heat policy moving forward, develop robust heat policy, and to understand the options to largely decarbonise our use and generation of heat.
- **Chapter 3** focuses on heat demand, and outlines our existing policies, progress and future action to help reduce the need for heat through encouraging and supporting individuals and business and industry to change behaviours and to invest in resource efficiency. It also outlines the actions which the Scottish Government is taking to tackle fuel poverty and support householders with energy costs.
- **Chapter 4** addresses heat transmission, and outlines our existing policies and progress to support efficient heat supply through district heating and thermal storage.
- **Chapter 5** considers heat generation, and outlines our existing policies and progress to support low carbon and renewable heat technologies through financial incentives such as the Renewable Heat Incentive and the Local Energy Challenge Fund, the Low Carbon Infrastructure Transition programme, the SME Loans Scheme and in-depth advice programmes for householders.

Chapter 2 – Scotland’s heat system – current and future trends

2.1 This section summarises current and future trends on:

- where our heat comes from (heat generation and supply)
- how we use it (heat demand, its cost, and its reduction)
- how we transmit and store it (heat networks and heat storage)

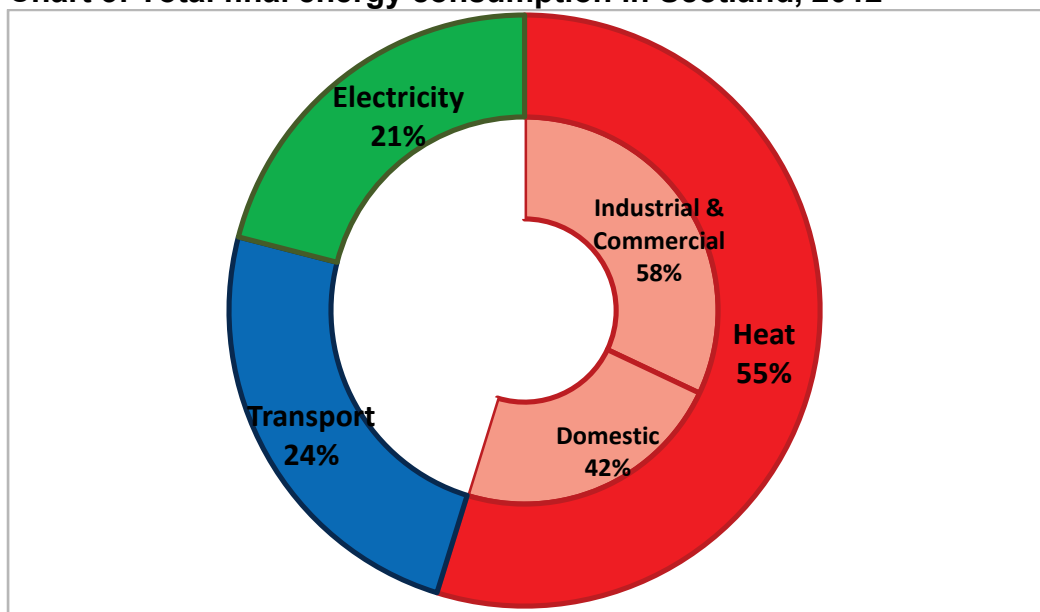
It also outlines actions which the Scottish Government is taking to tackle fuel poverty and support householders with energy costs.

Current trends

Heat generation and supply

2.2 Heat accounts for over half of Scotland’s total energy use. Chart 4 shows that non-electrical heat demand alone makes up over 55% of final energy consumption. Approximately 42% of this non-electrical heat can be attributed to the domestic sector and 58% to the industrial and commercial sectors.

Chart 3: Total final energy consumption in Scotland, 2012



Sources; 1) DECC, Total Final Energy Consumption Statistics: 2014 2) DECC, Energy Trends: Electricity generation and supply figures for Scotland, Wales, Northern Ireland and England: 2004-13⁸

2.3 Gas fuels the majority (78%) of Scottish households’ primary heating systems, electricity accounts for 13% and oil 6%. Communal heating and solid fuels cover the majority of the remainder⁹. Heat is not generally bought and sold as a commodity in Scotland, unlike some other European countries. Instead we buy electricity or fuels such as gas, oil or solid fuels, including biomass and peat, and use on-site appliances such as boilers, kilns, furnaces, electric heaters and ventilation systems to provide heating or cooling.

⁸ Assumes the split of bioenergy & waste consumption between the domestic and industrial & commercial sectors is the same as the average of the other fuel types.

⁹ Scottish Government, Energy in Scotland 2015, p.64

2.4 The Scottish Government wants to see our heat system largely decarbonised by 2050. This will involve all parts of the heat hierarchy including fuel switching towards renewable and low carbon forms of heat. To help incentivise this shift, we have set an ambitious target that by 2020, 11% of non-electrical heat demand, should be met by renewable sources. Whilst we are making progress as set out in Table 1, meeting the target remains a challenge.

Table 1: Renewable Heat Target - Renewable heat as a % of heat demand¹⁰

	2009	2010	2011	2012	2013
Total Renewable Heat Output (GWh)	845	1,696	2,263	2,481	2,904
Non-electrical Heat Demand – annual estimate (GWh)	85,039	87,123	85,328	82,722	Data not yet available
% of Renewable Heat Output (annually) (using demand estimate for same year)	1.0%	1.9%	2.7%	3.0%	-

Heat demand and cost

2.5 Since 2005 there has been a significant reduction in the consumption of energy used for heating (and cooling) in Scotland—decreasing by 15% from 97,800 GWh to 82,700 GWh. This level of reduction is similar in both the domestic and industrial commercial sectors¹¹. However, too much of the heat generated in Scotland and the associated costs continue to be wasted; it is a by-product of processes and escapes from poorly insulated buildings, is used to heat unoccupied spaces or to achieve temperatures beyond what people consider comfortable. For example the cost of heating an Energy Performance Certificate (EPC) “C” rated 3 bedroom semi-detached home is approximately £400 per year while heating a similar house rated “E” costs around £990¹².

2.6 The Scottish Government remains committed to eradicating fuel poverty and taking action that tackles this problem is a priority. Latest statistics from the 2013 Scottish House Condition Survey¹³ show there was a four percentage point rise in fuel poverty (to 39%) between 2012 and 2013 (an increase of 100,000 households), driven by a 7% increase in fuel prices. The fuel poverty rate for 2013 would have been around 11% instead of 39% if fuel prices had risen in line with inflation between 2002 and 2013.

2.7 The average direct debit domestic gas bill in Scotland increased in real terms by approximately 117% over the period 2004 – 2014, while the average electricity bill rose by approximately 46%.

¹⁰ We now monitor the renewable heat target using an improved methodology which supports annual monitoring of both renewable heat output and heat demand reduction which are both key aspects of the target. More explanation of the two methodologies is set out in Energy in Scotland 2014. Source of latest figures Energy in Scotland 2015.

¹¹ Source: Scottish Government, Energy in Scotland 2015, p.63.

¹² These are median values based on a standard heating regime. Source: Scottish Government analysis using Scottish House Condition Survey 2012.

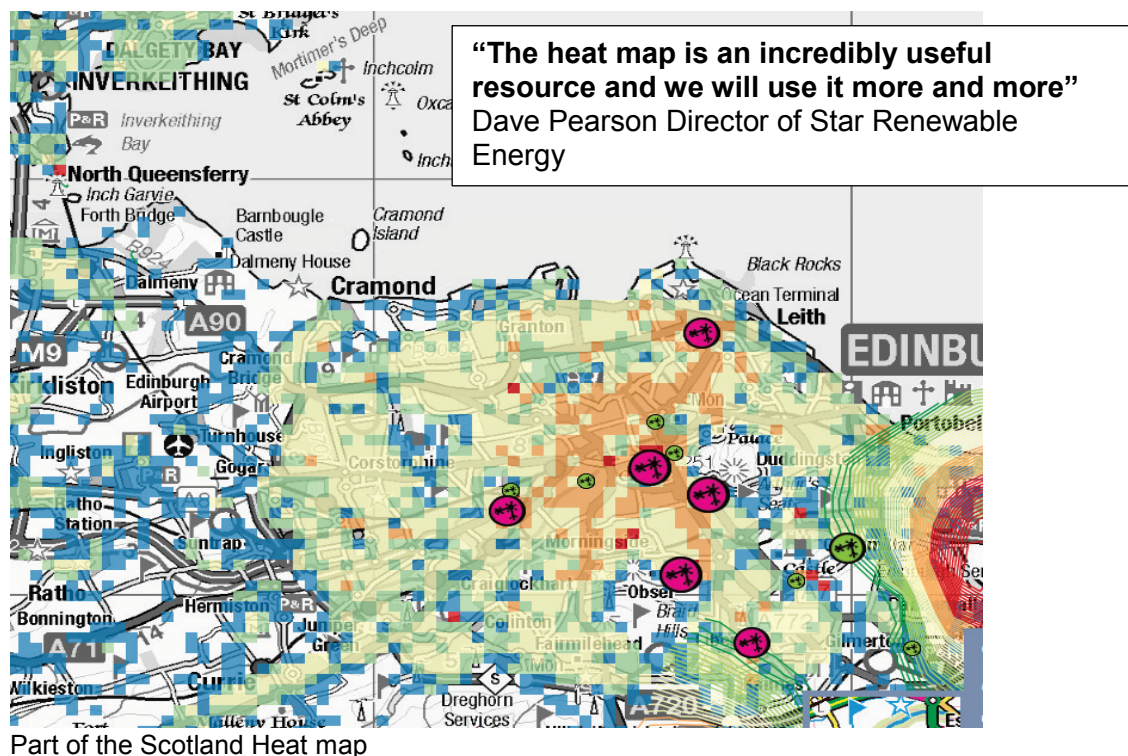
¹³ <http://www.gov.scot/Publications/2014/12/6903>

2.8 A report by the independent Committee on Climate Change demonstrates that the annual energy bill increased by almost £500 between 2004 and 2013, 80% of this increase was associated with the rising costs of wholesale energy & system costs and therefore unrelated to low-carbon policy. In contrast, support for low-carbon investment added £40 over the same period, accounting for approximately 8% of the overall increase. Support for energy efficiency schemes accounted for another 10% (£50) of the increase.

2.9 For **industry**, UK government data for 2014 shows that over the past five years (2009 to 2014) average industrial electricity prices have risen by 7.6% (a fall of 3.1% in real terms), with an increase of 0.9% (a fall of 0.8% in real terms) in the last year. Over the same period average industrial gas prices have increased by 18% (6.2% in real terms) and decreased by 12% (13% in real terms) over the last year¹⁴. We continue to support business and industry to reduce their energy costs through our programmes set out in Chapters 3 and 5.

Heat networks & heat storage

2.10 A key consideration for heat is where it is needed. At present, the vast majority of heat in Scotland is generated from gas transmitted via the mains gas network, from the North Sea through pipelines directly to homes and businesses. The gas is combusted in boilers or local CHP plants. As we move forward to a decarbonised heat sector we need to consider the important question of how best to distribute heat. Opportunities in relation to efficient distribution include district heating and thermal storage, and there is also significant potential to link this to recovery of excess heat from power generation or industrial processes. There are also important questions about the future of the gas network as we increasingly decarbonise Heat towards 2050.

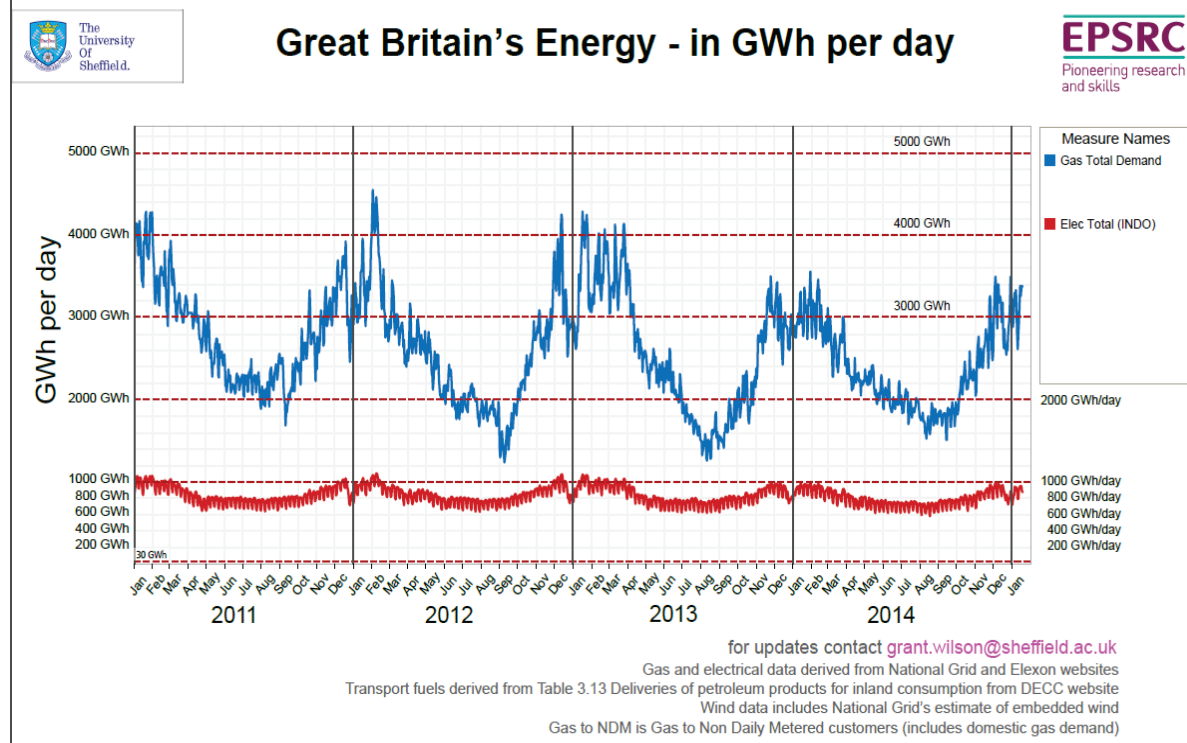


¹⁴ Source: DECC, 2015, [Annual prices of fuels purchased by manufacturing industry \(p/kWh\) \(QEP 3.1.4\)](#)

2.11 In order to gain a greater understanding of the heat demand and supply needs across Scotland we have developed the Scotland Heat Map with data provided by Scotland public sector organisations. We have provided data sets to all Scottish local authorities and published **Scotland heat map interactive** – a web version of the heat map. To date feedback from stakeholders confirms a wide and useful application of the heat map, which will be further supported by our Heat Network Partnership supporting local authorities to develop a strategic approach to local heat planning (see Chapter 4). We will continue to update and make improvements and additions to the Scotland Heat Map dataset.

The Heat interface with the wider Energy system

2.12 Heat demand varies over the day, at weekends and holidays and, in the case of space heating, heat demand is significantly higher in winter months. In the UK, demand for heat in the winter can be as much as five times the demand for electricity.



2.13 A greater understanding of heat use across the system and how this is changing or may change in the future can help ensure that the system is designed and built to meet our needs and remain resilient. How we choose to address the overarching challenge of the decarbonisation of heat creates important interactions with the electricity system in cases where there is fuel switching from gas or heating oil to electrical heating.

2.14 Heat can be transported in the right circumstances over a number of miles, but not over as great distances as electricity without significant energy losses. However, a significant swing to electric heating could require extensive upgrades to the electricity distribution network, depending on the nature of the demand and

where it is created. Consumers in the North of Scotland already pay relatively high distribution costs on their bills due to the infrastructure required to serve remote and rural communities spread out over a wide area.

2.15 Our modelling shows that decarbonising heat by moving to electric heating from renewable sources without addressing when daily and seasonal demand is at its highest, or the efficiency of the heat technology used, could actually be counterproductive to electricity decarbonisation if it triggered a requirement for additional electricity generating capacity at peak times. A significant portion of the need to balance more pronounced peaks is likely to be met by fossil-fuelled generation and therefore tend to increase the overall carbon intensity of electricity generation. A tightening of the electricity supply margins may also drive an increase in electricity bills.

2.16 Electric heating can also have a beneficial effect on the grid where installations do not accentuate the system peaks in electricity demand but do the reverse – for example, where off-peak electricity can be used to produce heat which is then stored and released when needed. In some situations there is the potential for this type of installation to increase the capacity of renewable generation that can be accommodated onto the grid and maximise the use of existing grid assets before requiring more costly upgrades. Installations where the timing of thermal storage can be controlled and deliver benefits to grid system operation also present an opportunity for revenues by the owners of the storage and could relieve some of the pressure on consumers bills that would result from more costly alternative grid system balancing operations.

Future trends

2.17 To enhance the evidence base informing the Heat Policy Statement (HPS), the Scottish Government commissioned the development of a **Heat Pathway Scenarios Model and report (HPSM)** to explore scenarios and pathways for largely decarbonising the heat system in Scotland up to 2050¹⁵. The HPSM brings together all heat use and generation within Scotland associated with the use and occupation of buildings, including space heating and cooling, hot water supply, cooking, and industrial processes. From this basis, the HPSM can be used to examine how different measures change the thermal performance of the building stock and impact on the demand for and supply of heat and subsequent greenhouse gas emissions.

2.18 The HPSM analysis considered four illustrative heat decarbonisation pathways based on low and high levels of Government Intervention (GI) and Uptake of low carbon technologies and behaviours (U). These scenarios do not represent the Scottish Government's view of what will happen nor are they proposals of what should happen. They are illustrative scenarios that provide insight into some of the potential choices and trade-offs associated with a move to a largely decarbonised heat system.

¹⁵ Scenarios for Scottish Heat, Heat Pathways Scenarios Model Factual Report, see <http://www.gov.scot/Resource/0045/00451939.pdf>

2.19 The four illustrative scenarios were compared against a reference case scenario which reflected the continuation of existing heat related policies as set out in the Second Report on Proposals and Policies¹⁶. The variation in the levels of heat demand as a result of energy efficiency technologies and behaviour change, and the technologies which are used to supply it, drive changes in the cost of the system compared to the reference case. Table 2 highlights total system costs and carbon emissions in 2050 for each of the 4 scenarios¹⁷.

Table 2: Heat Emissions and Costs in 2050 by Scenario

Scenario	Emissions 2050 (MtCO2e)	2050 Emissions Reduction Compared to 2010	40 Year Costs Relative to Reference Case (£ million)
High Government Intervention / Low Uptake	8.45	68%	£15,260
Low Government Intervention / Low Uptake	15.05	43%	£6,110
Low Government Intervention / High Uptake	8.31	69%	£639
High Government Intervention / High Uptake	5.05	81%	-£1,470

Source: Heat Pathway Scenarios Model Factual Report, Scottish Government, 2014

2.20 In one scenario, (High GI, High U) it is possible to both reduce the carbon intensity of heat beyond the reference case and deliver a heat system with lower costs to 2050 than the reference case. These results are driven by savings in operating costs resulting from increased adoption of new technologies, reductions in demand for increasingly expensive fossil fuels and widespread adoption of energy efficiency and demand management measures.

2.21 The modelling undertaken suggests that while the cost per kWh of heat is likely to increase in real terms between 2010 and 2050, there is significant potential to reduce the demand for fuels through the use of new technology, demand reduction and increased energy efficiency. By 2050 this action would mean that the total cost of energy for heating and hot water could be around 20% lower in real terms than in the 2010 base year.

¹⁶ Low Carbon Scotland: Meeting our Emissions Reduction Targets 2013-2027. The Second Report on Proposals and Policies, see: <http://www.gov.scot/Publications/2013/06/6387>

¹⁷ The costs and emissions presented are associated with the whole heat system and its capital and operating costs (fuel costs and maintenance). They exclude costs associated with electricity generating capacity beyond what is covered by the predicted electricity prices in the DECC central price scenario. As the scenarios cover whole heat system costs and both direct and indirect emissions they do not directly represent and are not comparable to scenarios developed using other models such as those presented in the RPP2.

Chapter 3 – Heat Demand – reducing the need for heat in homes, business, industry and the public sector

3.1 The Scottish Government's analysis for the Heat Policy Statement examines household fuel consumption and costs. The analysis highlights the importance of using heat efficiently if we are to ensure that Scottish consumers are protected and that the country's heat system decarbonises efficiently. If we can deliver the same heat and comfort with the use of less resources then we can deliver a system which tackles fuel poverty, reduces greenhouse gas emissions and provides a boost to business competitiveness.

3.2 The key economic challenges are to ensure we provide affordable low carbon heat which households and businesses in this energy rich nation can benefit from; and to maximise economic benefits from decarbonising heat. Whilst there will be costs associated with largely decarbonising the heat system, doing nothing would also involve costs and impact on fuel bills. We are keen to ensure that heat decarbonisation benefits all users of heat in Scotland and that any costs are minimised by reduced demand wherever possible.

3.3 It will require a significant change in the approach by the whole of Scottish society to energy use, conservation and reduction, to achieve our climate change targets. We are making good progress towards our 2020 12% reduction target for energy efficiency. In 2012, final energy consumption, including energy used for heat, power and transport, was 11.8% lower than the baseline (2005-2007). Non-electric heat demand has reduced by 12.9% over the same period¹⁸.

3.4 Here we outline our existing policies, progress and future action to help reduce the need for heat through encouraging and supporting individuals, business and industry to change behaviours, as well as investment in resource efficiency.

Changing habits and choices

3.5 We are encouraging households and businesses across Scotland to reduce their demand for energy, and use lower carbon options through the **Greener Scotland** engagement, the growing **Green Homes and Green Business Networks**¹⁹ which allow people to see low carbon technologies in use in others' homes and workplaces, the forthcoming roll-out of smart meters and our wider programmes. **We will publish Energy Performance Certificate (EPC) data**, making it easier to access energy efficiency information on the Scottish building stock.

Housing and Fuel Poverty

3.6 The Scottish Government remains committed to eradicating fuel poverty (see Chapter 2 for latest figures). As the Scottish Government has no powers over the UK-regulated energy market, it has focused on addressing fuel poverty by improving

¹⁸ Energy in Scotland 2015: <http://www.gov.scot/Topics/Statistics/Browse/Business/Energy/EIS2015>

¹⁹ For business: <http://greennetworkforbusinesses.energysavingtrust.org.uk/> and for homes: <http://greenhomesnetwork.energysavingtrust.org.uk/>

energy efficiency of Scottish households. Since 2008, more than 900,000 measures have been installed in homes in Scotland. Nearly 1 in 3 of all households (over 700,000) have now received energy efficiency support²⁰.

3.7 Scottish Government spending on domestic energy efficiency, which is £119 million this year (2015/16) and £94 million last year, has already made hundreds of thousands of homes warmer and cheaper to heat and, as the Scottish House Condition Survey indicates, has helped to mitigate the rise in fuel poverty. The majority of this funding is directed at our flagship Home Energy Efficiency Programmes for Scotland (HEEPS), which will lever in additional investment to tackle fuel poverty, reduce carbon emissions and support jobs.

3.8 The Scottish Government and Scottish Fuel Poverty Forum have developed a work plan based on recommendations made by the Forum. This includes actions already carried out such as HEEPS allocations to recognise rural area issues and those being progressed such as promoting the uptake of incentives to establish community owned renewable energy assets in deprived areas.

3.9 Looking more widely at all housing, our Sustainable Housing Strategy²¹ sets out a route-map to 2030 for warm, high quality, affordable, low carbon homes, and identifies a number of actions that will help deliver this vision, including our Home Energy Efficiency Programmes for Scotland (HEEPS), the role of energy efficiency standards²², and the need for a wider market transformation so that people recognise the benefits of energy efficiency and value it. The Scottish Housing Event we held in November 2014 identified a number of actions to strengthen our approach, including developing a Rural Fuel Poverty Task Force. Following this event we have published the Joint Housing Delivery Plan for Scotland.

3.10 In April 2015 we launched a new energy efficiency loan scheme, HEEPS: Loans, offering interest free loans of up to £10,000 per household helping cover the upfront costs of installing energy efficiency measures. We also launched a further phase of HEEPS Cashback providing a rebate towards installing eligible energy efficiency measures to private sector households and social landlords. We will continue to sponsor the Home Energy Scotland advice centre, which provides independent and impartial tailored energy advice and information on financial support and mechanisms available to householders²³.

²⁰ More detail on our work can be found in “Progress Report on the Scottish Fuel Poverty Statement” (<http://www.gov.scot/Topics/Built-Environment/Housing/warmhomes/fuelpoverty/Progtowtarg/2014-report>) and the “HEEPS Delivery Report 2013-14” (<http://www.gov.scot/Topics/Built-Environment/Housing/warmhomes/heels>) published in December 2014. The latter notes that in total, across all of our HEEPS schemes in 2013/14 over 34,000 energy efficiency measures were installed.

²¹ <http://www.gov.scot/Publications/2013/06/6324>

²² We introduced the Energy Efficiency Standard for Social Housing (ESSH) in 2014: achievement of the ESSH by social landlords will mean that around 600,000 social houses will be either an EPC band C or D by 2020 saving 761 ktCO₂, equivalent to household emissions from Aberdeen and Dundee combined. See: <http://www.energyefficientsocialhousing.org/> for details.

²³ Detail on advice, loans and cashback for householders is available at: <http://www.energysavingtrust.org.uk/scotland/domestic/grants-and-support>

3.11 We are also working to ensure UK-wide programmes such as the Energy Company Obligation (ECO) and Green Deal are being effectively delivered in Scotland and to increase uptake and benefits.

3.12 The Smith Commission recommended powers relating to the design and implementation, but not the overall scale, of energy obligations such as the Energy Company Obligation and the Warm Home Discount be devolved to Scotland, alongside powers over the Winter Fuel Payment and Cold Weather Payment. This was reflected in the recently published Scotland Bill. Whilst the additional powers are welcome, further negotiations will be required to understand the scope of Scottish Ministers to do something different in this area.

3.13 The powers set out in the Scotland Bill give us the opportunity to design and develop schemes that better suit Scotland's unique characteristics. We are now going to place energy efficiency at the heart of the approach that we will take to decarbonising the whole energy system, by **designating energy efficiency as a National Infrastructure Priority**. This responds directly to calls from energy experts, environmental NGOs and the Committee on Climate Change for intensified action on energy efficiency. Further details will be set out in the Infrastructure Investment Plan later this year.

3.14 The cornerstone of this will be **Scotland's Energy Efficiency Programme (SEEP) which will provide an offer of support to all buildings in Scotland – domestic and non-domestic – to improve their energy efficiency rating**. The detail of the programme still needs to be developed. We will work with stakeholders over the next couple of years, before launching the new programme in 2017/18, once the powers recommended by the Smith Commission are in place.

Business & industry

3.15 We will continue to support resource and demand reduction in our business and industry through investing annually into the Scottish Government's **£9.3 million Resource Efficient Scotland programme and SME loan scheme**. The programme offers information, advice and support to private, public and third sector organisations to implement energy, material resource and water efficiency measures. It has delivered advice and support to over 33,000 organisations to realise over £49 million and 910 GWh worth of lifetime energy savings through applied better resource efficiencies since April 2013. The Resource Efficient Scotland programme is focusing efforts on Scotland's nine most energy and heat-intensive sectors to develop a programme of advice and support for decarbonisation, energy efficiency and heat recovery. We are **increasing the Resource Efficient Scotland SME loans by £1.5 million in 2015/16**.

3.16 With our partners, **we will deliver a skills system that is responsive to the future skills challenges which new technologies and business growth opportunities present**. The Low Carbon Skills Fund, developed and managed by Skills Development Scotland (SDS), has enabled employers to upskill and reskill by supporting more than 3,000 training opportunities (including renewables). Additionally, through the Energy Skills Partnership (ESP) we have worked to develop

and align college capacity to support low carbon priorities and environmental technology provision.

The public sector

3.17 Scottish Public Sector Bodies have a key leadership role to play through the actions they take on their own estates to minimise heat demand, as well as identifying opportunities for utilising unused excess heat. Developing energy efficiency programmes of scale across the public sector will facilitate efficiencies, such as in procurement, and through identification of a pipeline of projects encouraging the development of the associated supply chain in Scotland. The Scottish Government is developing in partnership with public sector representatives, a **non-domestic energy efficiency (NDEE) procurement framework for the Scottish public sector**. By late 2015 this will allow public bodies to procure estate wide energy efficiency works. Stakeholder engagement to date indicates that **the total value of projects going through the NDEE framework could be in the range of £250-300 million within the next four years**.

The City of Edinburgh Council has developed a pilot programme of non-domestic energy efficiency retrofit measures across a number of its buildings during the course of 2014 and 2015 with the aims of reducing energy consumption, reducing emissions and maximising local economic benefit. As part of this pilot programme the Council is utilising the London RE:FIT model for the procurement and delivery of the non-domestic energy efficiency retrofit measures. The experience from the programme will inform the development of the Scottish NDEE framework.

3.18 The Scottish Government provides financial support for public bodies through the **SALIX loans scheme** to help fund energy efficiency projects encouraging uptake of low carbon technologies and stimulating wider investment in energy efficiency.

Cross-sectoral support

3.19 The **Low Carbon Infrastructure Transition Programme (LCITP)**, supported by European Structural Funds, was launched on 20 March 2015. The LCITP is a **Scotland-wide, collaborative cross-sector project development unit** with the aim of accelerating the number of low carbon infrastructure projects in Scotland to investment readiness stage. **With £76 million over the first three years, the ambition is to provide an integrated programme of advice and support to over 100 low carbon projects**.

Regulations

3.20 Building regulations which apply to new buildings or when existing buildings are altered have a key role in improving energy performance. New standards published in 2014 will come into force in October 2015. However, the energy performance of buildings - both domestic and non-domestic - can be considered at other trigger points, such as the sale or rental of a building. Following consultation (2011-2013), **regulations requiring the assessment and improvement of the energy performance of existing non-domestic buildings** will be laid in Parliament

in 2015, with proposed implementation in summer 2016. We will also **consult during summer 2015 on proposals for draft regulations that would set minimum standards for energy efficiency in private sector housing**. These proposals have been developed by a working group of key stakeholders²⁴.

²⁴ For more information on the implementation of Section 63 “Energy Performance of Non-domestic Buildings” of the Climate Change (Scotland) Act 2009 see <http://www.gov.scot/section63>. The Scottish Government has implemented the Energy Efficiency Standard for Social Housing. Detail on the development of proposals for consultation on the Regulation of Energy Efficiency in the Private Sector (REEPS) is at: <http://www.gov.scot/Topics/Built-Environment/Housing/sustainable/Energy-efficiency-private-sector-homes>

Chapter 4 – Heat Transmission & Storage – supplying heat efficiently and at least cost to consumers

4.1 Heat is not just about products and people. It is also important to consider places and infrastructure – the places where heat is required and where heat can be generated and distributed and the opportunity for infrastructure investment. The way heat is provided and used in different places already varies significantly, depending on the types and density of the buildings, the different temperatures of heat required and the types of fuel available in the area. This will affect the options going forward. We recognise this and the fact that how well buildings are insulated can also impact on whether heat systems can run at low temperatures. This reinforces the Heat Hierarchy – well-insulated buildings allow technologies and heat sources that operate at lower temperatures, such as heat pumps and district heating schemes using a secondary heat source, to supply heat efficiently.

4.2 The Scottish Government has already adopted a number of policies to address future heat networks and storage requirements, which in appropriate situations can deliver significant benefits:

- **Heat mapping** – the Scotland Heat Map (see Chapter 2) is an important resource to identify opportunities for efficient heat supply projects and support their development.
- **The Planning system** – at the national level, the National Planning Framework 3 (NPF3)²⁵ and Scottish Planning Policy (SPP), published in June 2014, provide the national planning policy context for delivering heat networks.
- **Heat networks development** – the Scottish Government has **completed 19 of the 23 actions in the District Heating Action Plan** published in 2013²⁶, with the remaining actions ongoing or under review. Completed actions include establishing the **Heat Network Partnership which co-ordinates support for district heating development** across a number of agencies and programmes. We have seen real progress in developing district heating infrastructure in our cities (with a developing pipeline of projects, some of which are supported through LCITP), and continued to fund projects through the District Heating Loan Fund to drive the sector going forward. In 2014-15 we announced **funding for 12 projects under the District Heating Loan Fund, totalling £2.7 million**, bringing the total awarded since 2011 to £7 million in loans to 33 projects.
- **Heat networks regulation** – the Scottish Government has made important progress, working with UK Government to develop the Heat Network Regulations and supporting industry development of voluntary initiatives.

4.3 We will build on our action so far and take forward further activities to address future heat networks and storage requirements.

²⁵ <http://www.gov.scot/Topics/Built-Environment/planning/National-Planning-Framework>

²⁶ The District Heating Action Plan and update on progress are available at:
<http://www.gov.scot/Topics/Business-Industry/Energy/Energy-sources/19185/Heat>

Using Heat Maps

4.4 The Scottish Government will further enhance our existing understanding of the spatial opportunities for heat network development and CHP through **publishing a Scottish-specific chapter for the National Comprehensive Assessment (NCA)** indicating the potential for high efficiency CHP and efficient district heating and cooling as required by Article 14 of the EU Energy Efficiency Directive 2012, by December 2015. We will subsequently consider what further steps will be necessary to develop these heat networks and support for local and regional heat markets, as required by the Directive, in the light of the NCA. We will take the opportunity to **enhance the Scotland Heat Map²⁷ dataset by adding the cooling demand layer** produced as part of the NCA.

4.5 Using the heat map as a foundation, our Heat Network Partnership²⁸ will continue rolling out our District Heating Strategy Support Programme, running a series of workshops in 2015 for local authorities to support them through a structured process to develop district heating strategies. This will include using the heat map and local knowledge to allow them to identify the source of both heat supply and demand and identifying if the circumstances are appropriate for potential district heating projects. To further assist authorities and other public sector organisations we will provide an interactive tool²⁹ identifying the opportunities for district heating associated with the public sector estate to help enhance their strategic planning.

Planning

4.6 We will continue to consider local development plans during their preparation to ensure that they have fully taken account of the Scottish Planning Policy³⁰ which sets out that local development plans should:

- Use heat mapping to identify the potential for co-locating developments with a high heat demand with sources of heat supply;
- Support the development of heat networks in as many locations as possible, even where they are initially reliant on carbon-based fuels if there is potential to convert them in the future;
- Identify where heat networks, heat storage and energy centres exist or would be appropriate and that the plan will include policies to support their implementation. This includes that policies should safeguard piperuns, consider energy centres and may require new development to include infrastructure for connection; and
- Encourage micro-generation and heat recovery technologies in, or associated with, individual properties where heat networks are not viable.

²⁷ Scotland heat map, see: <http://www.gov.scot/HeatMap>

²⁸ See: www.districtheatingscotland.com

²⁹ Tool was developed during analysis undertaken of the Scotland National Heat Map to identify opportunities for district heating networks associated with the public sector estate. The analysis report is available at <http://www.gov.scot/HeatMap> - go to the "Use the map" section of this page.

³⁰ This document merely highlights aspects of the heat related policy in the SPP. Please see the full text at <http://www.gov.scot/Topics/Built-Environment/planning/Policy>

Heat network development

4.7 A study by BSRIA in 2013³¹ estimated that 14% of UK heat demand could be cost-effectively met by heat networks by 2030 and around 43% by 2050. Creating the infrastructure, however, requires significant long-term up-front capital investment in infrastructure with very long lifespans, and would have important implications for other heat infrastructure such as the gas network. By 2050, the Heat Policy Scenario Model (HPSM) analysis indicates that Scotland could supply around 8 TWh of heat through district heating. During the consultation on the Heat Policy Statement we sought evidence on the current and potential extent of appropriately situated district heating in Scotland. However, whilst stakeholders provided their views, little evidence was presented to support these. **We will retain the level of ambition set out in the draft Heat Generation Policy Statement to achieve 1.5 TWh of Scotland's heat demand to be delivered by district or communal heating and to have 40,000 homes connected by 2020.**

4.8 Since March 2014, a great deal of work has been done through the Heat Metering Regulations, and Heat Network Partnership, to improve information on existing and potential district heating scheme in Scotland. This is ongoing work (see below), which will significantly improve our understanding of the extent and potential of district and communal heating over the coming years. **Looking beyond 2020, we will use the improved information to better identify the longer term potential for district heating in Scotland.**

4.9 The Scottish Government will continue to support the development of new business models for the delivery and financing of heat networks, learning from current Scottish experience and more widely from abroad, for instance existing and emerging Energy Supply Companies.

Case study - Several Scottish local authorities are currently developing ESCOs. For example Glasgow City Council announced its intention to develop a not-for-profit Energy Service Company in a move to tackle fuel poverty, cut carbon emissions and create new jobs. The ESCo's first step is the management of the district heating scheme at the Commonwealth Games Athletes' Village.

4.10 Additional forward actions include our joint work with the **Danish Energy Agency (DEA), to deliver a work programme under the MOU, on priority learning areas on best practice on district heating.**

Heat network regulation

4.11 – Compared to gas and electricity, regulation of heat supply is in its infancy. The **Heat Network Regulations 2014**³² aim to give heating, cooling and hot water

³¹ BSRIA, UK District Energy 2013 Summary of Key Findings by Henry Lawson, September 2013

³² The **Heat Network (Metering and Billing) Regulations 2014** implement requirements in the Energy Efficiency Directive with respect to the supply of distributed heat, cooling, and hot water. The regulations set a number of requirements including: all Scottish suppliers of heat through district or communal heating to notify Scottish Ministers of key information by 31 December 2015; all district heating to have block meters by 2014; and requirements relating to individual heat meters, heat cost allocators or assessment of technical or economic viability. See: <https://www.gov.uk/heat-networks>

customers greater control over their consumption and billing, and improve the efficiency of heat networks. **We will continue to work with UK Government and the National Measurement and Regulation Office to implement the Heat Network Regulations, with some requirements already in force and notification required before the end of 2015.**

4.12 Historically, the scale of the market has not been sufficient to require regulatory intervention. However, as more homes and businesses connect it is important to ensure that existing and potential consumers have confidence that the supply is reliable and bills are transparent. As the market grows, the Scottish Government plans to develop appropriate regulation, commensurate with the scale of the heat market, ensuring both consumer protection and further industry development. We have established the Special Working Group³³ of the Expert Commission on District Heating to consider **potential regulatory frameworks** for district heating and provide advice to Government late this Summer. **We will consider these recommendations working with industry and heat user representatives to develop any further regulations in such a way that they support development and do not act as a barrier at this early stage in the growth of the heat supply market, nor place excessive costs on the sector which could be passed on to consumers.**

4.13 We will continue to look to the industry to act responsibly and welcome the development of the **Heat Trust**³⁴ and the **Heat Networks: Code of Practice for the UK**³⁵. **We will raise awareness of these through our programmes.**

Thermal storage

4.14 Thermal storage provides a way of managing the peaks and troughs of heat demand over a period of time. Heat stores (or heat accumulators) store heat normally in the form of hot water, for example in large insulated tanks, above or below ground. Used in conjunction with other technologies, greater thermal storage capacity has the potential to reduce the cost of delivering our heat needs. The Low Carbon Innovation Coordination Group³⁶ estimated that innovation in heat pumps, heat networks and heat storage could reduce UK energy system costs significantly to 2050. The Scottish Government has commissioned ClimateXChange to carry out a literature review and summary of the many recent papers on energy storage, and **we will use this to provide a basis for further stakeholder engagement and policy development across our energy policy.**

³³ This includes representatives of industry, consumers protection and environmental organisations.

³⁴ Previously called the **Independent Heat Customer Protection Scheme**. It sets out obligations and service standards for heat suppliers which are comparable to the quality and performance standards for regulated utilities. More information is available at www.heatcustomerprotection.co.uk/

³⁵ Developed by the Association of Decentralised Energy and CIBSE, it includes minimum requirements and best practice standards to enhance the quality of heat networks and reduce costs by standardising procurement. http://www.theade.co.uk/www.chpa.co.uk/code-of-practice_2468.html

³⁶ <http://www.lowcarboninnovation.co.uk/>

Chapter 5 – Heat Generation – increasing the proportion of low carbon heat and renewable heat

5.1 This chapter considers the opportunities for using low carbon technologies and renewables to provide our heat source, an important aspect of the heat hierarchy.

5.2 Our analysis indicates that over 40 years between 2010 and 2050, heat equipment and energy efficiency improvements worth over £100 billion in today's prices will be replaced or installed. Going forward, if we are to meet our climate change targets, these installations will increasingly need to be low carbon installations, achieved through a mixture of increasing efficiency such as better controls, insulation, district heating and heat recovery, delivering renewables such as geothermal and biomass and, as we decarbonise the electricity grid, electric heating such as heat pumps. Each of these technologies has different advantages and it is clear from the modelling that all will have a role in delivering low carbon heat. Demand for lower carbon technologies will increase as the economics of heat generation shifts in response to increasing fossil fuel and carbon costs and to regulation.

5.3 Low carbon and renewable heat technologies can support emissions reductions in the short, medium and in some cases long term. They can also offer significant economic opportunities to reduce industry and householder costs and enable new or emerging sectors to develop products and services for use around the world. Some of these technologies can also help us to diversify our sources of heat, to build up security of supply for the future.

5.4 The Scottish Government is already providing support to enable the decarbonisation of our heat generation and supply in three main ways:

- support for renewable heat
- support for other forms of low carbon heat
- support for industrial heat decarbonisation.

Renewable heat

5.5 The Scottish Government estimates that renewable heat generation in 2012 equated to 3% of Scotland's non-electrical heat demand. This grew from 1% in 2009. While we are making progress, further growth in generation from 3% to 11% in the 8 years from 2012 to 2020, required to meet the renewable heat target, remains challenging.

5.6 The Scottish Government has put in place a number of **supporting measures, including significant project development and finance resource** such as through the Low Carbon Infrastructure Transition Programme, Resource Efficient Scotland (see Chapter 3), our Community and Renewable Energy Scheme (CARES), the Local Energy Challenge Fund and Home Renewables Loan scheme (below) to support the development of low carbon and renewable projects including heat, and to maximise investment in those projects.

5.7 The **Local Energy Challenge Fund (LECF)** was announced in October 2014. It is a £20 million fund offered under CARES to demonstrate the benefit of integrating low carbon energy sources in local energy systems. Six projects were successful in the first round, which included examples of projects which will deliver renewable heat to local consumers. **We will run the second round of the Local Energy Challenge Fund making up to £500,000 available for Phase 1 (covering project development and feasibility applications) in 2015/16**, including consideration of low carbon and renewable heat projects. Capital funding awards will follow for the successful projects in this year's challenge.

5.8 Another element of CARES is the pre-planning loan fund³⁷ which provides loans of up to £150,000 to support the development of community and locally-owned renewable energy projects, the latter providing wider community benefits. Loans are available towards the high risk, pre-planning stage of renewable energy projects. CARES supports our target to reach 500 MW of community and locally owned renewable energy by 2020 as well as our wider renewable energy targets.

Promoting the Renewable Heat Incentive

5.9 Alongside the **launch of the UK domestic Renewable Heat Incentive (RHI)**³⁸, the **Home Renewables Loan scheme**³⁹ was boosted with a further £5 million in 2014/15 and a further £3 million this year. Financial incentives are an important tool to drive uptake of renewable technologies. Over time, the cost of technologies will reduce through market growth and innovation, and building consumer confidence to encourage greater take up. However in the meantime we **will continue to press the UK Government to commit to the long term sustainability of the RHI beyond 2015/16** to provide confidence for funders and stimulate investment in renewable heat technologies. We are supportive of the provision included in the Infrastructure Act 2015, which enables RHI tariffs to be paid to third party owners of renewable heating systems. This could help householders and businesses overcome the capital costs of installing new heat technologies, which can be a barrier to uptake. The aim is to open up the RHI scheme to enable new financing models, allowing a third party, such as an organisation or community group, to finance the purchase and installation of the renewable heating technology and in exchange receive RHI payments directly.

5.10 A primary focus of the domestic RHI is to support **homes off the gas grid**, of particular benefit to the 22% of Scottish households that do not use gas as their primary heating fuel. In Scotland an estimated **84% of domestic RHI accreditations are from properties off the gas grid** compared to 70% for GB as a whole⁴⁰. The local authority areas with the largest proportion of accredited domestic installations are Highland with 20%, Aberdeenshire with 9% and Perth and Kinross with 7%. Similarly for the **non-domestic RHI** Dumfries and Galloway accounts for

³⁷ <http://www.localenergyscotland.org/communities/>

³⁸ Launched in April 2014 the GB wide domestic RHI covers individual domestic dwellings and is open to homeowners, private landlords, social landlords and self-builders. Financial support is paid to the owner of the system at a set rate per unit of heat produced for seven years.

³⁹ Loans of up to £10,000 up to a maximum of 75% of the capital cost are available for the installation of eligible technologies.

⁴⁰ Energy in Scotland 2015: <http://www.gov.scot/Topics/Statistics/Browse/Business/EIS2015>

the largest proportion (19%) of installations and Highland accounts for the largest proportion of overall capacity in Scotland with 21%.

5.11 The Scottish Government will **continue to supplement financial support with national advice and support programmes which support uptake of the RHI by households and businesses**. For example, in 2014-15 Home Energy Scotland promoted renewable heat technologies and the domestic RHI as part of the support available at about 90 local events, many involving local authorities, housing associations or community groups. On behalf of the Scottish Government, the Energy Saving Trust also helped to highlight availability of the domestic RHI, including 40,000 letters to households and 55,000 emails sent as part of the 2014 'Feel the Heat' campaign. This has helped to boost uptake in Scotland with **over 6,300 accreditations for the domestic RHI to date (including legacy applications); a 19% share which is above pro-rata**⁴¹. In addition we will work with stakeholders to consider how micro-generation can play a bigger role in the decarbonisation of heat.

5.12 To date **18% of renewable heat capacity under the non-domestic RHI is in Scotland** – well above pro-rata. **£23 million has been paid to Scottish installations under the non-domestic RHI**⁴². The majority of these installations are biomass projects, with large scale biomass accounting for almost half the RHI eligible heat generated. However in recent months we have seen increased interest in other technologies such as water and ground source heat pumps, with 20 ground source heat pumps accredited in Scotland under the non-domestic RHI.

5.13 While up-take of the non-domestic RHI in Scotland is well above the GB pro-rata, uptake across GB has been lower than expected. We are considering recent research findings on barriers to the uptake of RHI. During 2015 we will work **with key stakeholders to better understand barriers to uptake and further promote opportunities provided by the non-domestic RHI to Scottish businesses**.

5.14 We will continue to monitor delivery of the Renewable Heat Incentive in Scotland and will work with DECC to get more detailed and meaningful data.

Renewable Heat Technologies

5.15 There are a large number of renewable heat technologies at varying stages of market development and many supported by the Renewable Heat Incentive. These include solar thermal collectors⁴³, biomass boilers, heat pumps (including ground source, water source and air to water heat pumps), deep geothermal, and combined heat and power generating heat from biomass, biogas or waste. **Innovative technologies** are also being developed such as the **heat recovery from sewers**.

⁴¹ Ofgem data to April 2015.

⁴² Ofgem data, see <https://rhi.ofgem.gov.uk/Public/ExternalReportDetail.aspx?RP=RHIPublicReport>

⁴³ In the HPSM (and the indicative scenarios presented in the draft Heat Generation Policy Statement), solar thermal is presented as a complementary technology, contributing to hot water needs. Levels of solar thermal heat generation vary between the different illustrative scenarios; in the High GI, High Uptake scenario solar thermal generation accounts for approximately 2% of total heat generation by 2050, whereas the equivalent figure in the Low GI, Low Uptake scenario is approximately 1%.

Scottish Water Horizons are working with Sharc Energy on a project to deliver heat from sewerage. The hermetically sealed system (ensuring no odour issues) will deliver 0.7MW of heat capacity, equating to 1.8 GWh/annum, to Borders College at a 15% reduction on the kWh price of gas. The project is currently being built and will go live for the start of the academic year. Sharc raised capital, financed from Equitix, and will recover their costs through the RHI and metered heat sold to Borders College, with Scottish Water receiving a rental income over the lifetime of the asset.

5.16 Our policy on **biomass** is set out in detail in the Electricity Generation Policy Statement, Section 36 Thermal Guidance, and in the Section 36 Biomass Scoping guidance⁴⁴. Essentially, because of the multiple energy uses to which biomass can be put, the limits to supply, and the competition for that supply from other non-energy sectors, we need to encourage the most efficient and beneficial use of what is a finite resource. We would **prefer to see biomass used in heat-only or good quality combined heat and power schemes, off gas-grid** wherever possible, and at a **scale appropriate** to make best use of both the available heat, and of local supply.

5.17 Supporting local supply, in partnership with the Forestry Commission Scotland, we will provide **workshops in rural areas to inform and assist biomass suppliers and consumers comply with the new biomass sustainability requirements** of the Renewables Obligation and RHI which apply from 5 October 2015. The Forestry Commission Scotland will also publish **updated guidance on the impact of biomass on air quality** later in 2015 to help local authorities fulfil their statutory responsibilities.

5.18 With the introduction of the **Waste (Scotland) Regulations 2012**, the rolling out of household **food waste collections** by local authorities and support programmes such as RHI, we are seeing growing application of **anaerobic digestion, biogas, biomethane** injection into the gas grid. The **first large scale biomethane gas to grid plant** in Scotland came into production in December 2014. At maximum capacity the plant will provide enough renewable gas for up to 5,000 homes in the summer and 1,500 in the winter. A second gas to grid plant is currently under construction and will commence gas production later in 2015.

5.19 Modelling by DECC in 2013⁴⁵ included a projection of 20 TWh of biomethane in the gas network by 2050. This roughly equates to 4% of the projected total gas supply in 2050. The Discussion Paper “Low Carbon Heat Foresighting”⁴⁶ undertaken by Scottish Enterprise, considers 3 studies on the potential of biomethane injection to the gas grid. The studies provide wide variations in the estimated volumes of biomethane for heat and therefore whilst biomethane could help in “greening” the gas network, it is not clear how it could sustain the network as a whole.

⁴⁴ <http://www.gov.scot/Topics/Business-Industry/Energy/Infrastructure/Energy-Consents/Guidance/Biomass-scoping-advice>

⁴⁵ The Future of Heating; Meeting the Challenge
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/190149/16_04-DECC-The_Future_of_Heating_Accessible-10.pdf

⁴⁶ Low Carbon Heat Foresighting – <http://www.evaluationsonline.org.uk>

5.20 Biogas like biomass is a finite resource. **Where biogas is combusted for non-transport purposes we would prefer to see it used in heat-only or good quality combined heat and power schemes.**

5.21 After carrying out a call for evidence on **biopropane**⁴⁷ DECC found that inclusion in the RHI would be unlikely to incentivise any new production plants to come online by 2020 and it is unclear there would be overall environmental benefits of an incentive encouraging the import of the fuel.

5.22 Everyone who produces, keeps or manages waste (including local authorities) is duty bound to apply the **waste hierarchy**⁴⁸ which considers **prevention of waste to be the best option followed by reusing goods, then recycling materials.** Only after these options have been exhausted is recovery of the value, often in the form of energy, from the remaining waste promoted. Disposal such as landfill is considered the option of last resort. **Where energy from waste plant is required, we would prefer only good quality combined heat and power schemes to be developed.** As with other thermal electricity generation plants these should be **sited where they can make best use of heat to make the most of our resources**, while minimising environmental impacts and take account of Scotland's high standards on air quality. This is supported by a regulatory framework through planning, existing thermal treatment of waste guidelines⁴⁹ and the new PPC regulations⁵⁰ on the use of waste heat and by support programmes such as the district heating strategy support for local authorities and wider activities supporting development of district heating (see Chapter 4).

5.23 In November 2013, we published a study⁵¹ highlighting that there may be significant potential for deep **geothermal energy** in Scotland to provide a renewable source of heat or heat and power. Alongside other technology sectors, we would like to see a self-sustaining geothermal energy sector play a significant role in our energy future. We established a Geothermal Energy Expert Group⁵² to provide advice for the development and implementation of geothermal heat, or heat and power. In response to initial recommendations from the Expert Group, we launched the **£250,000 Geothermal Energy Challenge Fund**⁵³ **calling for proposals for feasibility studies exploring the potential for geothermal energy to local community benefit**, taking consideration of environmental impacts, achieving measurable carbon reductions, and which are commercially sustainable on a long term basis.

⁴⁷ See RHI Evidence Report on biopropane available at:

<https://www.gov.uk/government/publications/evidence-gathering-on-potential-renewable-heating-technologies>

⁴⁸ The waste hierarchy, as set out in the European Waste Framework Directive, is a key cornerstone of the Scottish Government's Zero Waste Plan. The Waste (Scotland) Regulations 2011 amended the Environment Protection Act 1990 placing the duty to apply the hierarchy.

⁴⁹ Thermal Treatment of Waste Guidelines 2014. See: http://www.sepa.org.uk/media/28983/thermal-treatment-of-waste-guidelines_2014.pdf

⁵⁰ The Pollution Prevention and Control (Scotland) Amendment Regulations 2014 (SSI 2014 No.267) came into force on 30 October 2014 <http://www.legislation.gov.uk/ssi/2014/267/contents/made>

⁵¹ Study into the Potential for Deep Geothermal Energy in Scotland

⁵² See <http://www.gov.scot/Topics/Business-Industry/Energy/Energy-sources/19185/GeothermalEnergy/GEEG> for the remit and membership of the Group

⁵³ Detail at <http://www.gov.scot/Topics/Business-Industry/Energy/Action/lowcarbon/LCITP/geothermal>

5.24 Scottish Enterprise has identified a range of research and development opportunities including for new **heat pump** technologies. Despite strong regional competition in the heat pump market from Sweden, Germany, and Denmark as well as global competition⁵⁴, there are Scottish and wider UK based companies active in the market such as Star Renewable Energy and Colt International. **Scotland has companies with an international competitive edge** in heat pumps and other heat recovery technologies⁵⁵.

5.25 To date the most popular technology GB-wide under the domestic RHI is heat pumps, with over 2,800 air source and around 600 ground source heat pumps accredited under the scheme to April 2015 (including legacy applications). However there is **potential for large scale applications** either in conjunction with district heating and heat recovery, geothermal heat or using ambient heat. There are several other schemes currently being assisted by the Heat Network Partnership which are also considering the use of larger scale water source heat pumps, in both urban and rural settings.



Water source heat pump, small scale district scheme at Foyers caravan and camping site on Loch Ness

5.26 Permitted development rights are already in place in Scotland for a range of renewable energy technologies, including air source heat pumps and solar panels. These rights are currently being reviewed by the Scottish Government with the intention of increasing the number of circumstances in which planning applications are not required for the technologies.

⁵⁴http://www.scottishrenewables.com/media/uploads/hidden_links/web_employment_in_renewable_energy_in_scotland_2013.pdf

⁵⁵ Scottish Enterprise, Heat Recovery: Sector Opportunities from Sustainable Growth in Scotland <http://www.scottish-enterprise.com/knowledge-hub/articles/insight/heat-recovery-low-carbon>

Other low carbon heat

5.27 **Combined heat and power systems** generate electricity and useful heat (water /steam). Combining generation is a thermodynamically efficient use of fuel, as it uses the heat that would otherwise be discarded in separate production of electricity. Heat and power can be generated by engines, generally using gas, though other fuels can be used such as biomass. Gas CHP is common, for example in district heating schemes, and is likely to continue to have a role in both the short and medium term with **benefits of newly installed gas CHP plant in reducing CO₂ being seen up to the middle of the 2020s**⁵⁶. The exact timescales depend on the rate of decarbonisation of the GB electricity grid. In future, the HPSM analysis indicates that to achieve the emission reductions required, district heating schemes will need to source a much higher proportion of heat from even more low carbon sources such as excess unused industrial heat, heat pumps and biomass. More recently hydrogen fuel cells have been developed which produce a greater proportion of power compared to heat.

5.28 There are **gas fuelled technologies** designed for domestic properties that provide lower carbon heat than gas fuelled condensing boilers, such as **hybrid boilers and microCHP**. As with large scale CHP the benefits of installing these technologies will be dependent on the rate of decarbonisation of other options of heat supply suitable to those properties. Similarly, the UK Government considered the inclusion of gas driven heat pumps in the RHI but have not been included to date.

Industrial heat decarbonisation

5.29 Industry has **already taken significant steps to become more energy and resource efficient** through significant investment in processes and building efficiencies, reflected in many Climate Change Agreements, and driven by major policies such as the EU Emissions Trading System and the CRC Energy Efficiency Scheme. However, a study on the opportunities for decarbonisation of heat intensive industries⁵⁷ found that there is **potential for further decarbonisation**.

5.30 Many industrial processes and commercial buildings generate heat as a by-product. The unused excess heat, often significant amounts of heat in the case of industry, is rejected as waste and can be costly to cool before being released into the environment. **Making use of the unused excess heat produced by Scottish business could reduce costs and be a source of income**. This heat can be used for many purposes, depending on its temperature and the wider circumstances. The Scottish Government is working with SEPA, Resource Efficient Scotland, Scottish Enterprise and industry to **identify sources of unused excess heat**, assess their potential for recovery and help establish an evidence base for excess heat from Scottish industry (as required by Article 14 of the EU Energy Efficiency Directive 2012). We are also working with Resource Efficient Scotland, Scottish Enterprise,

⁵⁶ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/389543/DECC_Summary_mini_publication_FINAL.pdf

⁵⁷ DECC, Decarbonisation of Heat in Industry, A review of the research evidence, by Ricardo AEA: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/230949/D13_951813_Ricardo_AEA_Industrial_Decarbonisation_Literature_Review_2011.pdf

Highlands and Islands Enterprise and the Scottish Manufacturing Advisory Service to establish a **programme of industrial decarbonisation for our most energy-intensive sectors** - cement, ceramics, chemicals, food & drink, glass, oil refining, paper & pulp, retail, and steel sectors. This will include publishing in Autumn 2015 an overall **Scottish summary of decarbonisation pathways for industry**, from the UK Government's eight industrial decarbonisation routemaps⁵⁸. This will be used to inform work that Resource Efficient Scotland, Scottish Enterprise, Highlands and Islands Enterprise and the Scottish Manufacturing Advisory Service take forward with the individual sectors to develop action plans and a programme of advice and support.

5.31 One of the most important potential technologies identified in the UK decarbonisation routemaps is **Carbon Capture and Storage (CCS)**, which will be particularly important in the longer term (post-2030) for the decarbonisation of large industrial CO₂-emitting sectors such as oil refineries, chemical processing plants, steel, and cement production. Large-scale deployment of CCS is expected to begin in the electricity generation sector, and the Scottish Government continues to support efforts to demonstrate CCS at commercial scale. **The world's first full-scale gas CCS project is moving closer to being built here in Scotland at Peterhead Power Station**⁵⁹. CCS is currently less advanced in energy intensive industries, and the UK decarbonisation routemaps recommend the need for further industry-specific technology development (e.g. oxy-combustion capture in the cement sector and top gas recycle with carbon capture in the iron and steel sector)⁶⁰, and for economies of scale to develop CO₂ transport infrastructure through clustering of industry and power generation using CCS. The Scottish Government will continue to work with the UK Government and as part of EU discussions on the proposed 'NER 400'⁶¹ mechanism, to ensure that CCS can be commercially demonstrated in industrial processes and aid future decarbonisation of energy-intensive industries.

⁵⁸ DECC, Industrial Decarbonisation & Energy Efficiency Roadmaps to 2050, March 2015: <https://www.gov.uk/government/publications/industrial-decarbonisation-and-energy-efficiency-roadmaps-to-2050>

⁵⁹ 1. The Peterhead CCS project is a collaboration between Shell and SSE which aims to capture over 1,000 ktCO₂ per year and transport the CO₂ by pipeline 100km offshore for long-term storage deep (2.5km) under the North Sea. Timeline: planning application submitted in March 2015, final investment decision expected end of 2015 and aiming to be operational in 2018/19. 2. Scottish Government announced joint funding of £4.2 million in March for Summit Power's Caledonia Clean Energy Project (a full-chain 570 MW Carbon-Capture-Storage (CCS) coal-gasification power station in Grangemouth) to undertake substantial industrial research and feasibility studies.

⁶⁰ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/419912/Cross_Sector_Summary_Report.pdf DECC, Industrial Decarbonisation & Energy Efficiency Roadmaps to 2050 – Cross Sector Report, March 2015

⁶¹ The European Council agreed on 23 October 2014 to renew the existing NER300 facility, including for carbon capture and storage and renewables, with the scope extended to low carbon innovation in industrial sectors and the initial endowment increased to 400 million allowances (NER400). http://www.consilium.europa.eu/uedocs/cms_Data/docs/pressdata/en/ec/145397.pdf



**The Scottish
Government**
Riaghaltas na h-Alba

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ISBN: 978-1-78544-440-1

This document is also available on The Scottish Government website:
www.gov.scot

Produced for The Scottish Government by APS Group Scotland, 21 Tennant Street, Edinburgh EH6 5NA
PPDAS48701 (06/15)

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