



WWF

REPORT

SCOTLAND

2014

A young child with light-colored hair, wearing a blue jacket and yellow pants, is carrying a large stack of logs on their back. The child is standing on a gravel path in a natural setting with green grass and trees in the background. The scene is lit with warm, golden light, suggesting late afternoon or early morning.

# The burning question: What is Scotland's renewable heat future?

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The burning question:  
What is Scotland's renewable heat future?  
February 2014

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With thanks to SEPA.

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Heating our hot water and buildings accounts for 50% of Scotland's carbon emissions.

80%

EMISSIONS REDUCTION  
REQUIRED IN  
SCOTLAND BY 2050

50%

HEATING SCOTLAND'S  
BUILDINGS AND HOT  
WATER ACCOUNTS FOR  
APPROXIMATELY 50%  
OF SCOTLAND'S TOTAL  
CO<sub>2</sub> EMISSIONS

2050

THE SCOTTISH  
GOVERNMENT HAS A  
COMMITMENT TO  
SECURING A LARGELY  
DECARBONISED HEAT  
SECTOR BY 2050

5%

THE HOUSING SECTOR IS  
EXPECTED TO SOURCE  
APPROXIMATELY 5% OF  
ITS HEAT DEMAND FROM  
RENEWABLE SOURCES  
BY 2020



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# EXECUTIVE SUMMARY

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Delivering renewable heat will play a critical role in cutting Scotland's greenhouse gas emissions by 80% – the target set in Scotland's Climate Change Act. If we're to achieve this reduction,

we'll need our homes and buildings to be near zero-carbon by 2050. This will be impossible unless we replace the fossil fuels in our current heat supply with renewable energy.

The nature of Scotland's built environment, with its rural communities and non-traditional housing, presents unique challenges for renewable heat. This means that alongside large-scale district heating projects, Scotland's homes will have to rely on renewable heat technologies at the individual household or building level. So engaging with householders will be vital.

This paper summarises a technical report that Element Energy and the Energy Saving Trust<sup>1</sup> produced for WWF Scotland. The report considers two levels of ambition for renewable heat in the future, compared to business as usual growth. It analyses the key conditions that will be required to achieve them and concludes with a series of policy recommendations designed to facilitate faster implementation of renewable heat in Scotland.

The research makes clear that there's a worrying gap between the current plans and the steps that will be required to achieve 'significant progress' by 2030 towards a 'largely decarbonised heat sector by 2050' – the ambition set out in the government's climate action plan. The report's key insights and policy recommendations include:

- Current government plans aren't sufficient to meet government ambitions for renewable heat by 2030. **A greater contribution from the domestic housing sector is needed.**
- The Scottish Government needs to **provide leadership and support to deploy district heating** schemes in order to meet renewable heat targets.

**80%**  
EMISSIONS  
REDUCTION REQUIRED  
IN SCOTLAND BY 2050



**2050**  
**'SIGNIFICANT**  
**PROGRESS' BY 2030**  
**TOWARDS A 'LARGELY**  
**DECARBONISED HEAT**  
**SECTOR BY 2050'**

---

- The UK government should **extend some form of financial support (such as the Renewable Heat Incentive) until at least 2030** to achieve the necessary uptake of renewable heat technologies by individual households.
- Given the high reliance on heat pumps to deliver carbon reductions, the Scottish Government needs to **achieve greater uptake of home insulation to improve the efficiency of heat pumps.**
- The Scottish Government needs to develop **a strategy on engaging with householders and businesses** to educate and reassure them about renewable heat technologies. This will be critical to delivery.

This paper illustrates that moving away from traditional fossil fuel heating systems to cleaner, renewable heat requires a considerable shift from where we are today. This is challenging and it'll require changes for us all. But in return, Scotland will meet its climate targets and benefit from lower energy bills, greater energy security, and new jobs. **Given sufficient political will to implement the supporting policies, this transition to a low-carbon heat future is achievable.**



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Alternatives such as wood fuel will help end our reliance on gas and oil heating.



# INTRODUCTION

Heating Scotland's buildings and providing our hot water accounts for approximately 50% of

Scotland's total CO<sub>2</sub> emissions<sup>2</sup>. The latest figures suggest that just 4.1% of this heating comes from renewable fuels<sup>3</sup>; the majority of Scottish homes and offices rely on gas.

This dependence on fossil fuels, coupled with poorly-insulated buildings was largely responsible for Scotland missing its first target under the Climate Change Act<sup>4</sup>. Indeed, the need to end our reliance on gas and oil heating is clearly spelt out in the Scottish Government's own climate action plan<sup>5</sup>, with the following transformational outcome:

*'A largely decarbonised heat sector by 2050 with significant progress by 2030 through a combination of reduced demand and energy efficiency, together with a massive increase in the use of renewable or low-carbon heating.'*

The Scottish Government has set a target of 11% of the heat consumed in 2020 to come from renewable sources.<sup>6</sup> The Energy Saving Trust's assessment of progress states that 'Scotland is ahead of the projections provided by the Renewable Heat Action Plan for meeting the 2020 target'<sup>7</sup>. Scottish Renewables has recommended that, 'a more stretching target could be set in order to stimulate greater development and uptake of renewable heating systems.'<sup>8</sup>

This research focuses on the domestic housing sector's contribution to renewable heat generation. According to the Renewable Heat Action Plan, the housing sector makes up over 50% of Scotland's heat demand and is expected to meet approximately 5% of its heat demand from renewable sources in 2020, or approximately 1.4TWh/yr. The industrial and commercial sectors are already making progress towards the government's 11% renewable heat target. But the biggest heat sector – housing – will need support if it's to make the necessary headway towards decarbonisation.

This paper looks at how future renewable heat generation might look in Scottish households in 2020 and 2030, under two scenarios of renewable heat ambition.

**11%**  
BY 2020 THE  
SCOTTISH  
GOVERNMENT TARGET  
IS FOR 11% HEAT  
DEMAND TO BE MET  
BY RENEWABLES



**50%**  
HEATING SCOTLAND'S  
BUILDINGS AND HOT  
WATER ACCOUNTS FOR  
APPROXIMATELY 50%  
OF SCOTLAND'S TOTAL  
CO<sub>2</sub> EMISSIONS

# SCENARIOS

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The research looks at two routes to heating the majority of Scotland's homes from renewables. It shows what the Scottish Government's ambition to make 'significant progress' towards a renewable heat sector by 2030 could look like, and what factors will influence success.





# SCENARIOS

The research set out to define the level of renewable heat provision and the associated technology

mix in Scottish homes under two scenarios that sought to quantify the Scottish Government's ambition to realise significant progress towards decarbonising the heat sector in Scotland by 2030. The study modelled a baseline scenario and two possible alternative future scenarios as follows:

- A **medium abatement scenario** based on the UK Committee on Climate Change's Fourth Budget report<sup>9</sup>. This equates to renewable heat contributing 30% towards Scotland's total domestic heat demands by 2030.
- A **high abatement scenario** which is in line with Scottish Government's ambition to have made 'significant progress by 2030' towards a largely decarbonised heat sector in Scotland by 2050. This was interpreted as needing to achieve 50% penetration of renewable heat in the domestic sector by 2030.



**200,000**  
DWELLINGS NEED TO  
BE UPGRADED PER  
YEAR TO 2020

## Assumptions

The research was based on a model of Scotland's housing stock, including an indication of the level of insulation and an assumed average thermal demand per dwelling. The baseline assumption is that all uninsulated dwellings receive some form of insulation upgrade over the next decade. This is consistent with the government's climate action plan, the Report on Proposals and Policies. The expected uptake of energy efficiency measures equates to upgrading around 200,000 dwellings per year to 2020, resulting in a 28% reduction in the total thermal demand of Scotland's homes between 2011 and 2020<sup>10</sup>.

To put this in context, the 2013 progress report by the Committee on Climate Change (CCC) noted that the installation rate of cavity wall insulation has remained steady at an average of around 43,000 per year. In addition, 600,000 homes with cavity walls remain uninsulated alongside 32,000 lofts. And 546,000 homes are without solid wall insulation<sup>11</sup>.

**600,000**  
**HOMES WITH CAVITY**  
**WALLS REMAIN**  
**UNINSULATED**  
**IN 2014**

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Lowering the heating demand for Scotland's homes is critical to ensuring properties are technically suitable for heating technologies such as heat pumps and for reducing the renewable heating capacity needed.

In terms of district heating, the research considered the various constraints and incentives that influence district heating uptake, such as: the technical and economic viability of district heating; heat density; connection costs; coordination of different tenures; and diversity of use for a steady and smooth demand for heat.

## Methodology

The research calculated uptake of renewable heat technologies at the household level through consumer choice modelling – considering the various factors that influence decision-making such as price, performance, utility and priority. For district heating, the scenarios identified opportunities with favourable conditions to estimate uptake. These results were then brought together to calculate the overall uptake of renewable heat in 2020 and 2030. The full methodology can be found in the technical report<sup>12</sup>.

## The scenarios in more detail

### Household technologies: baseline growth

The baseline scenario makes assumptions for the main variables that affect the uptake of renewable heat. It includes the policies currently in place or those to which the UK and Scottish Governments are already committed<sup>13</sup>. These variables are:

- Financial support for renewable heat
- Supply side restriction
- Fuel price projections
- Technology cost and performance
- Hassle barriers (e.g. consumers' time to research new technology)
- Suitability of property
- Boiler replacement rate

Using these baseline assumptions, the report analyses the impact of the Renewable Heat Incentive (RHI) to 2015 and alternative timescales for RHI – to 2020 and 2030 (see Figure 1). The results are

presented in terms of renewable heat delivered across Scotland's dwelling stock by 2020 and 2030. The analysis concludes:

- Without continued RHI support beyond 2015, the uptake of renewable heat falls well below both the medium abatement scenario projection for 2020 and the contribution the domestic sector needs to make towards the Scottish Government's 2020 target that 11% of total heat demand should come from renewables.
- The impact of the RHI to 2015 only delivers 5.5% of RH relative to heat demands from Scottish dwellings in 2030. That's less than a fifth of the amount required to meet the medium abatement scenario.
- With RHI support continuing to 2030, the results suggest that renewable heating installations could deliver around a third of total heat demands by 2030. This is broadly consistent with the uptake required for Scottish dwellings to make a proportionate contribution towards meeting the medium abatement ambition.
- The air source heat pump (ASHP) is the dominant technology. This is due to the lower capital costs of the system and its greater suitability to a wider variety of properties when compared to ground source heat pumps (GSHPs) and biomass boilers.

This demonstrates that without an ongoing financial incentive RH technologies will be unlikely to gain significant market share. Research for DECC on consumer attitudes to renewable heat technologies also supports this view<sup>14</sup>.

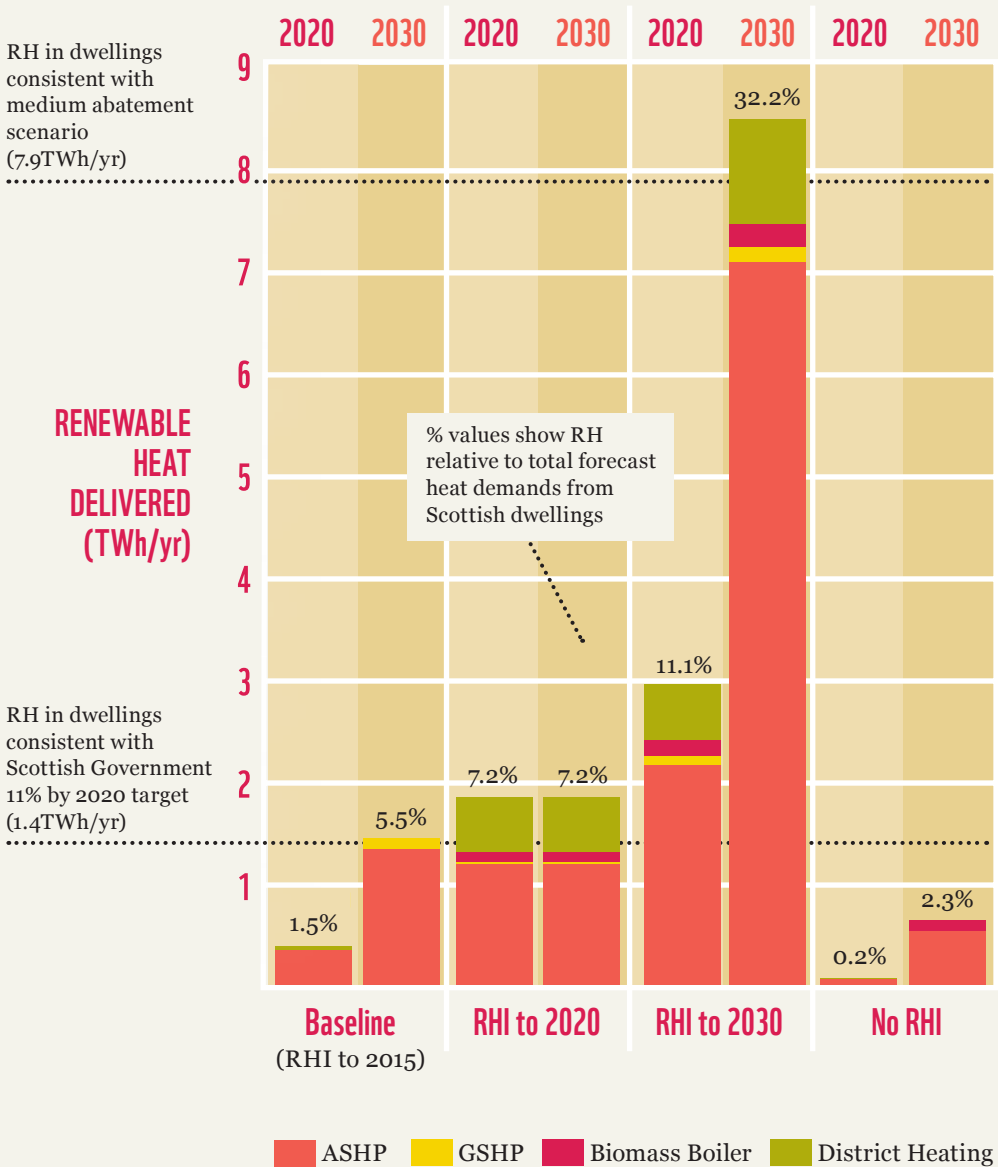
### Medium abatement scenario – 30% of heating demand by 2030

Renewable heat uptake under the UK CCC's medium abatement scenario equates to around 35% of total UK heat demand being met by renewable heat by 2030. The UK CCC states that for Scotland this would be the equivalent **to meeting 30% of forecast 2030 domestic heat demand from renewable sources** (or 7.9TWh/yr). The analysis by Element Energy takes the 30% milestone identified by the UK CCC. It uses a consumer choice model, and outlines six different pathways<sup>15</sup> to meeting this 30% scenario. The scenario can be achieved under various parameters but in all cases delivery is dominated by ASHPs.



**Medium  
=30%**  
30% OF DOMESTIC  
HEAT DEMAND IS MET  
FROM RENEWABLE  
SOURCES BY 2030

**FIG 1: Renewable heat in Scottish dwellings for a selection of scenarios in 2020 and 2030**



To further illustrate the approximate contributions from different technologies, the following table provides a closer look at one of the pathways – which adopts high fossil fuel prices based on UK government projections to 2030. The table shows a detailed breakdown of generation by technology type under a RHI to 2030.

If 30% of the Scottish housing sector’s heat is to be provided by renewables, it’ll require a significant transformation of the domestic heating system market in Scotland. Sales of renewable heating technologies will have to grow to account for more than half of all new heating system sales by 2030. This level of transformation will require a combination of actions:

- Providing a sufficient financial case for consumers to consider installing a renewable heating technology.
- Raising awareness of renewable heat among consumers who are largely indifferent to heating system choice and are generally accustomed to reliable and (relatively) cheap energy that meets their needs.
- Inspiring confidence among consumers regarding renewable heating technologies, to a level where they’ll consider switching from the existing systems.

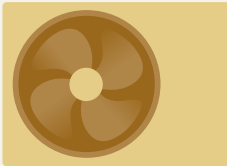
**TABLE 1: Renewable heat generation mix in line with the medium abatement scenario – high fossil fuel pathway (TWh/yr)**

	2020	2030
ASHP	1.31	7.65
GSHP	0.02	0.17
BIOMASS BOILER	0.10	0.22
RENEWABLE DISTRICT HEATING	0.53	1.06
TOTAL	1.96	9.10
% OF TOTAL DOMESTIC HEATING DEMAND	7.6%	34.3%
PROJECTED DOMESTIC HEATING DEMAND	25.5	26.5



- Developing and sustaining supply chains to meet growing demand and delivering effective after-sales service.

The Scottish Government’s expectation for the amount of renewable heat generated by the domestic sector in 2020 is approximately 30% lower than where the medium abatement scenario suggests we must be in order to be on the right track for 2030.



**High  
=50%**  
50% PENETRATION  
OF RENEWABLE HEAT  
IN THE DOMESTIC  
SECTOR BY 2030

### High abatement scenario – 50% of heating demand by 2030

The high ambition scenario interpreted the Scottish Government’s milestone of ‘a largely decarbonised heat sector by 2050 with significant progress by 2030’ as equivalent **to meeting half of Scotland’s domestic heating demand from renewable sources by 2030**. As with the medium abatement scenario, the analysis outlines six different routes towards meeting the target. For each of these pathways, bar one pathway led by district heating, growth rates of 80% in annual sales of technologies are a prerequisite for the initial years. Each of the six pathways also assumes that half of all properties in areas with district heating potential are connected to a network.

Underpinning each of the pathways are three critical projections that must be the focus of renewed policy effort and public sector support if they’re to be fulfilled:

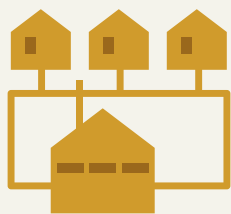
- **Heating demands are significantly reduced** from c. 35 TWh/yr in 2011 to c. 26.5TWh/yr by 2030, including the forecast demand from approximately 400,000 new dwellings over the same period.
- **ASHP installations are more efficient** – the average seasonal performance factor is assumed to increase from 2.5 to 3.5 by the middle of the next decade.
- **Cost reductions** are also included in the baseline such that by 2030 costs are 38% below 2010 values.

It’s likely that failing to achieve these projections, in particular the efficiency improvements, would have a severe impact on the uptake of heat pumps. And if heat pumps fail to perform as projected, or if the proportion of dwellings suitable for this technology is significantly lower than assumed here, a significant shortfall from the 50% 2030 target is likely.

**TABLE 2: Renewable heat generation mix in line with the high abatement scenario – barrier removal pathway (TWh/yr)**

	2020	2030
ASHP	2.35	10.4
GSHP	0.05	0.32
BIOMASS BOILER	0.15	0.3
RENEWABLE DISTRICT HEATING	1.12	2.23
TOTAL	3.67	13.2
% OF TOTAL DOMESTIC HEATING DEMAND	14.4%	49.8%
PROJECTED DOMESTIC HEATING DEMAND	25.5	26.5

The table above provides a breakdown of the contribution from the different technologies under one of the pathways – barrier removal. This assumes the RHI continues to 2030, the barriers around unfamiliarity with heating technologies are overcome, supply growth rates are high, and fuel price projections are high.



**350,000**  
**TO GET ONE THIRD**  
**OF RENEWABLE HEAT**  
**FROM DISTRICT**  
**HEATING BY 2030,**  
**350,000 DWELLINGS**  
**MUST BE CONNECTED**

- As a minimum, under the barrier removal pathway approximately 17% of the renewable heat generated would be met by district heating (DH) by 2030.
- Under the DH-led pathway this increases so that just under a third of the renewable heat from the domestic sector would come from DH. This corresponds to around 350,000 Scottish dwellings being connected to (renewables-fed) district heating by 2030 (13% of the 2030 dwelling stock). Meeting this level of district heating uptake is equivalent to 50% of all households in Aberdeen, Dundee, Edinburgh and Glasgow being connected to district heating systems by 2030. This level of uptake is highly unlikely without strong leadership from the public sector and firm commitments to develop large scale schemes connecting a mix of building types.

- It's highly unlikely that a 50% 2030 renewable heat target will be met by dwelling-scale technologies alone. All scenarios that meet this ambition include a greater contribution from district heating relative to the CCC scenario and this will be required to ensure full decarbonisation of heat by 2050. This will be challenging given the limited number of economic opportunities for district heating under current market conditions.
- This level of uptake will also require the removal of a combination of barriers – for example, supply side restrictions and time for consumers to understand and evaluate new technologies.

# KEY FINDINGS AND POLICY RECOMMENDATIONS

Heat pumps, biomass, district heating – all will have their part to play in a renewable heat future. But unless policies and incentives change, this report shows that uptake in renewable heat will fall well short of what is needed to meet government targets.





# KEY FINDINGS

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## Meeting ambitions for renewable heat

Based on current policy commitments (i.e. RHI funding committed until financial year 2015/16<sup>6</sup>), the uptake of renewable heat in Scottish dwellings falls well short of the levels required to meet ambitions for decarbonising heat supply and the contribution from the domestic sector to the 11% renewable heat target.

There are numerous pathways towards achieving renewable heat uptake in line with the medium abatement scenario. All require continued intervention to support renewable heating technologies beyond 2030. Meeting the high abatement scenario is possible, but it would require a greater proportion of renewable heat from district heating combined with very rapid ramp-up in dwelling-scale renewable heat technology sales.

For district heating, uptake varies considerably depending on the constraints and the incentives that exist for connection or capital cost reduction. Under the most favourable conditions within the scenarios as much as 4TWh/yr of renewable heat is supplied to Scottish homes in 2030. This is almost double the total renewable heat generated across the entire Scottish economy in 2011. Under the least favourable housing constraints and with unsupportive policy context this contribution drops to less than 0.5TWh/yr.

**4TWh/yr**  
DISTRICT HEATING  
COULD PROVIDE UP  
TO 4TWh/YR OF  
RENEWABLE HEAT TO  
SCOTTISH HOMES  
IN 2030

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## Barriers and risks to meeting renewable heat ambitions

The research found significant barriers to delivering on renewable heat ambitions:

- There are **numerous challenges to developing district heating** (including high capital costs, revenue uncertainty, phasing issues, etc).
- Meeting medium and long-term renewable heat targets will require a **significant transformation of the household**

**heating market** in Scotland. Supply chain growth rates will need to be towards the upper end of those experienced in more mature European renewable heating markets.

- Failure to **adequately insulate homes** could lead to heat pump efficiency values not being achieved and undermine medium to long-term renewable heat targets.
- The single largest barrier to renewable heat uptake is **the lack of an economic case**. The RHI is expected to provide sufficient incentive to stimulate the renewable heating market. But it may not be accessible to all consumers and doesn't address the issue of capital costs. Without a breakthrough in technology costs, the renewable heat sector is likely to depend on financial support through to 2030.
- Given the fundamental importance of heat generation to people's everyday lives, financial incentives alone are unlikely to be sufficient to drive significant uptake. **High consumer confidence** in the technologies will also be required. So demonstration of successful installations will be crucial to building consumer confidence in technology.
- **Providing loans** could help overcome the capital cost barrier. But increased renewable heat uptake is only expected with medium to low-cost finance.

# POLICY RECOMMENDATIONS

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The findings highlight the scale of the challenge in meeting the requirements of the Climate Change (Scotland) Act and ensuring we're on the

path towards decarbonising heat by 2050. This transformation won't be met with a single support scheme such as the RHI. It will require additional actions. Our key recommendations for achieving this are set out below.

## District heating

This briefing demonstrates that the deployment of district heating must be stepped up if we're to decarbonise our housing sector. The Expert Commission on District Heating<sup>17</sup> report acknowledges the challenges ahead. It sets out recommendations regarding the need for an action plan, setting baselines and targets, building capacity, providing guidance and using various government levers to provide incentives for uptake of district heating. The Scottish Government must deliver in full the recommendations from the Expert Commission if we're to see the required step change in district heating provision. In addition, we recommend:

1. The Scottish Government should ensure that the development of **regulation for energy performance in the domestic housing sector includes consideration of district heating**. This should include an analysis of the connection requirements in other countries and options to replicate or build on these for Scotland.
2. The Scottish Government should **provide local authorities with powers to require that heat users, including householders at the point of heating system change, connect to a district heating system if feasible**<sup>18</sup>. Such powers should be set within reasonable limits: for example, local authorities and/or the Scottish Government would need to help with connection costs for vulnerable households,





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The pace and scale of district heating installations must be stepped up in order to decarbonise the housing sector.

and seek guarantees from the district heating operator that heat would be supplied at the same price or below that of the current fuel supply.

3. **Local authorities should be required, whenever technically possible, to connect their public buildings to district heating networks.** This would provide some guarantee of heat load to developers and encourage private sector involvement in developing projects.
4. **Planning authorities should require district heating in suitable new developments,** including the potential to connect to existing district heating schemes. When considering applications for developments in high density areas<sup>19</sup>, planning authorities should require evidence that the proposed heating, cooling and power systems have been selected to minimise carbon dioxide emissions.

## Dwelling-level renewable heat technologies

The report's findings show that if we're to achieve large-scale and rapid rollout of renewable heating at the household level, the following actions will be critical:

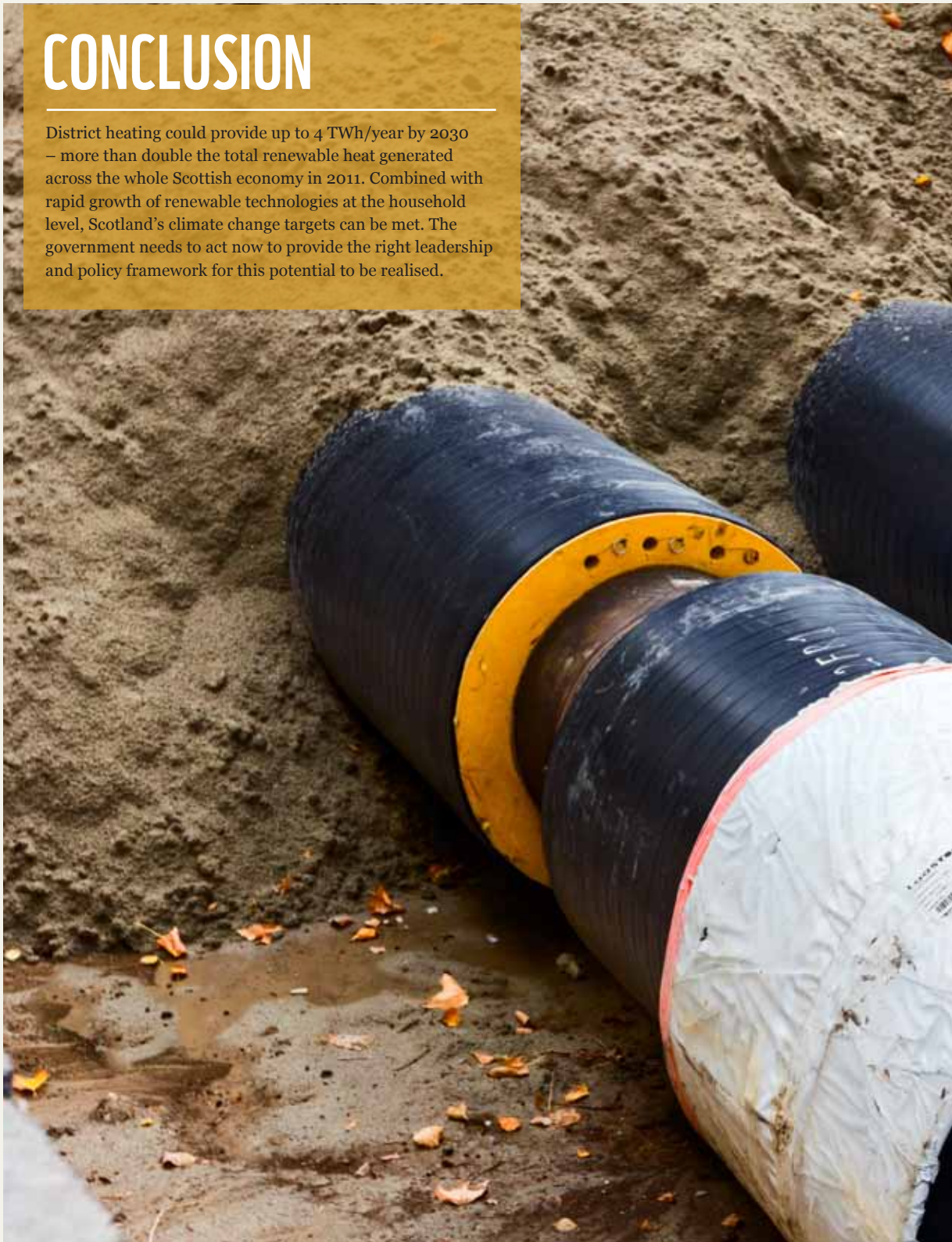
1. The UK and Scottish Governments should provide **clear indications of the long-term framework for renewable heat** (i.e. beyond 2020), to support both dwelling-scale technologies and renewables-fed district heating. This should cover financial and fiscal incentives, regulatory support, information provision and consumer protection.
2. The UK government should **review minimum energy-efficiency eligibility criteria** as information becomes available from field trials and findings from the Renewable Heat Premium Payment Programme to ensure heat pump Seasonal Performance Factors are realised.
3. The Scottish Government must continue to focus on achieving the **fastest possible uptake of insulation in Scotland's homes**, to ensure heat pump Seasonal Performance Factors are maximised. This should include the introduction of regulation of all private sector housing on energy performance. In time, regulation may require the use of renewable heat technologies when replacing fossil-fuel boilers, where this is practical.

4. The Scottish Government should work through Scottish Enterprise to **help develop and sustain supply chains** to meet growing demand and deliver effective after-sales service. Confidence in the long-term future of renewable heating markets is needed to attract investment.

# CONCLUSION

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District heating could provide up to 4 TWh/year by 2030 – more than double the total renewable heat generated across the whole Scottish economy in 2011. Combined with rapid growth of renewable technologies at the household level, Scotland's climate change targets can be met. The government needs to act now to provide the right leadership and policy framework for this potential to be realised.





# CONCLUSION

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Renewable heat has a critical role to play in meeting the greenhouse gas emissions reduction targets

for 2020 and 2050 in Scotland's Climate Act.

If we're to meet these targets we need our homes and buildings to be near zero-carbon by 2050.

This will be impossible without decarbonising the heat supply.

There's no doubt that moving away from traditional fossil-fuel heating systems to cleaner, renewable heat will require a considerable shift from where we are today. But this paper clearly demonstrates through two possible scenarios that such a transition is achievable. It will result in a low-carbon domestic heating sector that's largely dominated by heat pumps in highly insulated homes, alongside households connected to district heating powered by renewables wherever feasible.

This paper also shows that the current government plans don't put us on a path to achieve 'significant progress' by 2030 towards a 'largely decarbonised heat sector by 2050'. The Scottish Government has shown good intentions with its District Heating Action Plan and a draft Heat Generation Policy Statement is expected in the near future, which will set out how the government will maximise renewable heat production. It now needs to demonstrate strong leadership and provide a positive policy framework that's aimed at a rapid step-change in renewable heat delivery. The transformation set out in this briefing will help ensure that Scotland meets its climate targets, while benefiting from future lower energy bills, greater energy security, and new jobs.

## 2050

TO MEET THESE  
TARGETS WE NEED OUR  
HOMES AND BUILDINGS  
TO BE NEAR ZERO-  
CARBON BY 2050

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Renewable heat will allow us to benefit from lower energy bills, greater energy security and new jobs.

# NOTES

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2. See Department for Energy and Climate Change (DECC) (2010) Renewable Heat Incentive Consultation. See [www.decc.gov.uk/en/content/cms/consultations/rhi/rhi.aspx](http://www.decc.gov.uk/en/content/cms/consultations/rhi/rhi.aspx)
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6. See [www.scotland.gov.uk/Topics/Business-Industry/Energy/Energy-sources/19185/Heat/RHUpdate11](http://www.scotland.gov.uk/Topics/Business-Industry/Energy/Energy-sources/19185/Heat/RHUpdate11)
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8. See [www.scottishrenewables.com/media/uploads/publications/110320\\_sr\\_-\\_renewable\\_heat\\_report\\_final.pdf](http://www.scottishrenewables.com/media/uploads/publications/110320_sr_-_renewable_heat_report_final.pdf)
9. See [www.theccc.org.uk/publication/the-fourth-carbon-budget-reducing-emissions-through-the-2020s-2/](http://www.theccc.org.uk/publication/the-fourth-carbon-budget-reducing-emissions-through-the-2020s-2/)
10. Total thermal demand for all Scottish dwellings was 35.7TWh in 2011 and under this baseline is projected to reduce to 25.5TWh in 2020 and 26.5TWh in 2030.
11. CCC (2013) *Reducing emissions in Scotland: 2013 progress report* [www.theccc.org.uk/wp-content/uploads/2013/03/1674\\_CCC\\_Scots-Report\\_bookmarked\\_2.pdf](http://www.theccc.org.uk/wp-content/uploads/2013/03/1674_CCC_Scots-Report_bookmarked_2.pdf)
12. See [scotland.wwf.org.uk/srhf](http://scotland.wwf.org.uk/srhf)
13. The detail of the baseline assumptions can be found in the Technical Report. See [scotland.wwf.org.uk/srhf](http://scotland.wwf.org.uk/srhf)
14. DECC 2013 *Research report on homeowners' willingness*



- to take up more efficient heating systems.* [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/191541/More\\_efficient\\_heating\\_report\\_2204.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/191541/More_efficient_heating_report_2204.pdf)
15. Detail of the six pathways can be found in the Technical Report. See [scotland.wwf.org.uk/srhf](http://scotland.wwf.org.uk/srhf)
  16. *Domestic Renewable Heat Incentive: The first step towards transforming the way we heat our homes* (July 2013) DECC. [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/212089/Domestic\\_RHI\\_policy\\_statement.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/212089/Domestic_RHI_policy_statement.pdf)
  17. Expert Commission on District Heating: Recommendations to the Scottish Government, November 2012. [www.scotland.gov.uk/Resource/0040/00408383.pdf](http://www.scotland.gov.uk/Resource/0040/00408383.pdf)
  18. In Denmark, local authorities have the power to require that all or part of a local authority area connects either to a natural gas supply or district heating. See: [http://193.88.185.141/Graphics/Publikationer/Forsyning\\_UK/Heat\\_supply\\_in\\_Denmark/html/full\\_publication.htm](http://193.88.185.141/Graphics/Publikationer/Forsyning_UK/Heat_supply_in_Denmark/html/full_publication.htm)
  19. A dwelling density of 3,600 dwellings per square kilometre is often considered a minimum density for district heating schemes in areas on the gas network. See for example: Owens, S. 1986 *Energy, Planning and Urban Form*, London: Pion 120pp ISBN 0-8506-118-7.

# GLOSSARY

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**ASHP** Air source heat pump

**CCC** Committee on Climate Change

**DECC** Department of Energy and Climate Change

**DH** District heating

**GSHP** Ground source heat pump

**kW** Kilowatt (unit of power equal to one thousand watts)

**kWh** Kilowatt hour (unit of energy)

**MW** Megawatt (1MW = 1,000kW)

**MWh** Megawatt hour (1MWh = 1,000kWh)

**RH** Renewable heat

**RHI** Renewable Heat Incentive

**TW** Terawatt (1 TW = 1,000,000 kW)

**tWh** Terawatt hour (1TWh = 1,000,000 kWh)



# Renewable heat in numbers

100%  
RECYCLED



WWF · THE BURNING QUESTION: WHAT IS SCOTLAND'S RENEWABLE HEAT FUTURE?

50%

Half of Scotland's CO<sub>2</sub> emissions come from heating buildings and hot water

11%

Scottish Government target is for 11% heat demand to be met by renewables by 2020



50%

Half of Scotland's heat demand is from the housing sector

2050

The Scottish Government has an ambition for a largely decarbonised heat sector by 2050



## Why we are here

To stop the degradation of the planet's natural environment and to build a future in which humans live in harmony and nature.

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