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Affordable Warmth Report: Policy Annex

WWF Scotland Briefing – February 2023

SUMMARY

This paper sets out WWF Scotland's full policy recommendations from the *Affordable Warmth: next steps for zero carbon heat* report (February 2023). It provides the assumptions and calculations underpinning the emissions analysis and policy costings in that report –a full introduction to the project should be read first **here**.

Our policy recommendations for both regulations (requiring installation of energy efficiency and zero emission heating systems in homes) and public funding support to households are designed meet Scotland's crucial 2030 climate target for housing. To ensure a fair transition we propose that all households receive some support from Scottish (and UK) Government, with this targeted at those on lower incomes. Our proposals would:

- Achieve a c.68% reduction in climate emissions from homes by 2030 (on a 2020 baseline) in line with Scottish Government ambitions for existing homes.
- Energy efficiency across the housing stock improved to recommended levels, and over 1.5 million homes fitted with low carbon heating systems.
- See almost all fuel poor households (assuming a rate of 35%) receive an energy efficiency upgrade, and a third receive a low carbon heating system.
- Require a total capital expenditure of between £23.5bn and £26.5bn to 2030.
- See investment split 50/50 between Government funds and those from homeowners and private and social landlords.
- Require capital investment by the Scottish Government to increase to between £2bn and £3bn per year from 2025 to 2030, with a total investment over the next Parliamentary period of £10bn to £15bn.

CONTEXT

The *Affordable Warmth* project was undertaken by WWF Scotland to understand the impacts of Scottish Government proposals to decarbonise home heating as set out in the 2021 ***Heat in Buildings Strategy***. Experts from Cambridge Architectural Research (CAR) were commissioned to explore the costs and practicalities of fitting energy efficiency and low carbon heating systems to Scottish homes, and we have used their analysis (accessible **here**) to assess the impact on carbon emissions of the Government's proposals and how they could be improved. This paper sets out our policy recommendations, and their workings, in full.

SUMMARY

Using the results of the consultancy research, WWF Scotland makes two headline recommendations:

More climate ambition needed

WWF analysis of Scottish Government proposals in the *Heat in Buildings Strategy* shows that these are inadequate to meet our crucial 2030 climate target. Emissions from homes in 2030 are estimated to be over double the ambition set out in the Climate Change Plan Update (of a 68% reduction on 2020 emissions) – amounting to around 2.6 million tonnes of additional climate emissions each year. Closing the gap to these targets will require accelerated timelines for requiring the replacement of fossil fuel boilers and bringing homes up to minimum standards of energy efficiency. Our proposals to do so are set out below.

Support for households is crucial

External research conducted by Cambridge Architectural Research on behalf of WWF Scotland found that a majority of Scottish houses could soon enjoy lower energy bills after moving to a heat pump, but that upfront costs remain a challenge – the cost of systems in houses starts at £12,000. Government support should continue to be provided alongside regulation, with full support for low-income households through fuel poverty schemes and upfront grants for other households. Installation costs in future could fall, allowing grants to be reduced.

Our proposals for grant support from 2025:

Owner occupied & private rented homes

- Fully funded energy efficiency and heat pump installations for fuel poor households (assumed cost per home of £7,000 for energy efficiency and £13,500 for heat pumps)
- Continue existing grants up to £7,500 for heat pumps (with £1,500 rural uplift) for owner occupied and homes (and extend these to private landlords)
- Continue existing grants up to 75% of the cost of energy efficiency upgrades, to a maximum of £7,500 (with £1,500 rural uplift) for owner-occupiers. Continue current loan schemes for private landlords and provide a £2,000 grant for energy efficiency upgrades (to help meet the higher proposed standard) where tenants are in fuel poverty and apply for help.
- Up to 60% grant for solid wall insulation, up to a max. of £7,500, available to both owner occupiers and private landlords.

Government should also make Air to Air heat pumps eligible for grants and explore whether a grant uplift for smaller homes is needed.

Social rented homes
• Provide capital support to social landlords meeting energy efficiency targets and replacing fossil fuel boilers - £5,000 per home for heat pumps and £4,000 per home for energy efficiency upgrades.
Heat networks & communal systems
Grants to support heat networks and communal systems installed in flats and tenements - £6,500 per home (public funds would likely be split between the homeowner and the network operator) to a total of 350,000 homes by 2030.

Public and private investment

Our scenario of regulations and funding is designed to fairly meet climate targets for housing to 2030 and would require a total capital expenditure of between £23.5bn and £26.5bn (depending on heat pump cost reduction). Scottish (and UK) Government would provide over half of this funding, with the rest coming from homeowners and private and social landlords. Capital investment by the Scottish Government would need to increase to between £2bn and £3bn per year from 2025 to 2030, with a total investment over the next Parliamentary period of £10bn to £15bn.

The benefits of this investment are:

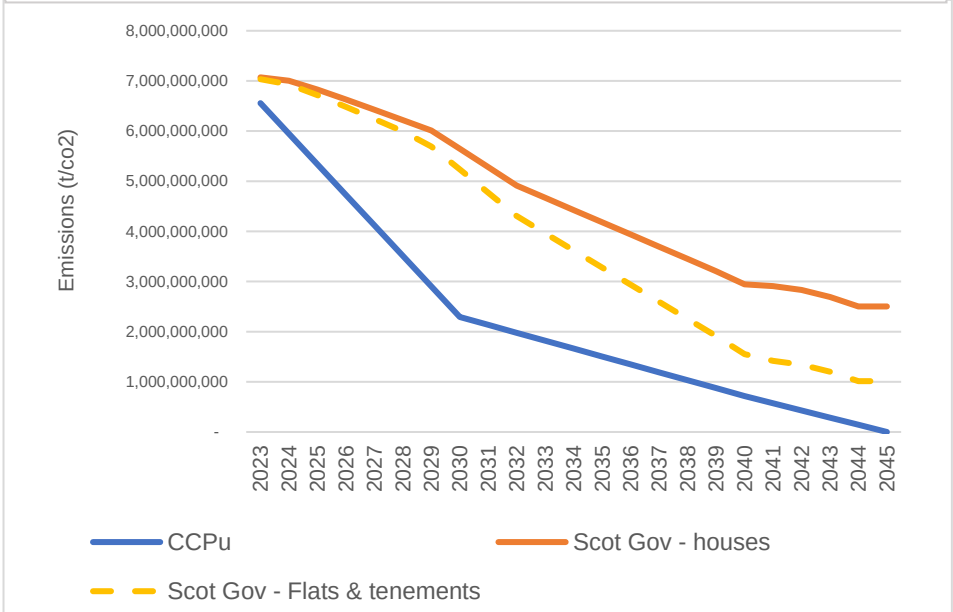
- A 68% **reduction in climate emissions** from existing homes by 2030 (on a 2020 baseline, as required by the Scottish Government's Climate Change Plan Update).
- **Fuel poverty**: by 2030 around 850,000 households in fuel poverty would have received a fully funded insulation upgrade up to equivalent of EPC C/B. Assuming a fuel poverty rate of 35%, this would mean that almost all fuel poor households benefit from lower energy bills and their homes are ready for low-carbon eating.
- A third of fuel poor households would also receive a fully funded upgrade to a heat pump, likely bringing **lower energy bills, and protection against fossil fuel price instability**.
- Around 750,000 owner-occupied and privately rented houses supported to fit a heat pump.
- Connection of 350,000 flats and tenements to heat networks and communal systems.

The WWF proposals are designed to illustrate what Scottish Government policies are required to deploy energy efficiency and low carbon heating at the scale needed to meet our crucial 2030 climate target, whilst also supporting all households to make that investment. We have not factored in the ability of supply chains to adapt and deliver at this scale and speed, but their ability to do so will be aided by clear targets and the certainty of demand that regulation can provide. This rest of this paper sets out the assumptions and workings underpinning our policy recommendations and estimates for the levels of capital investment required and Scottish (and UK) Government contributions.

CLIMATE TARGETS

Using the results of the CAR modelling we have assessed the emissions impact of proposals in the Scottish Government's ***Heat in Buildings Strategy*** (HIBS). We applied carbon abatement from energy efficiency measures and heat pumps in the CAR analysis to estimates of the number of homes required to install upgrades each year by the regulations (and their 'trigger points') proposed in HIBS. Although the Government proposals would decarbonise emissions from homes by 2045, annual emissions in 2030 could be over double (2.6 million tonnes) targets for housing set out in the 2020 Climate Change Plan Update (CCPu). This assessment assumes that Scottish Government targets for heat network delivery in 2027 and 2030 are met (with 45% of this output connected to flats e.g. via communal and district heating systems). The analysis is set out in the figure below (the dotted line is the contribution from heat networks).

Estimated emissions from housing, Scottish Government targets & policy



Note: 2045 emissions are above zero due to residual power sector emissions in the modelling. Electricity supply is expected to fully decarbonise by 2045, resulting in zero emissions from electric heating.

POLICY PROPOSALS

Accelerating action

Meeting the 2030 target will require accelerated action and our recommendations for doing so are set out below, alongside Scottish Government proposals in HIBS. We target the highest emitting homes first (those with oil and old gas boilers) and spread effort equally across different tenures.

Scottish Government proposals (HIBS) and WWF recommendations for accelerated action:

Scot Gov proposal (HIBS)	WWF proposals
Energy Efficiency – homes to reach a minimum standard:	
Minimum standard: a new fit for purpose metric on EPC's to indicate the target level of energy efficiency to be reached	Efficiency standards should be set as a space heating demand target in kWh/m2/year. Broadly equivalent to EPC C, and EPC B for social rented homes and fuel poor homes improved through Government schemes.
Owner occupied houses at point of sale from 2025, and a deadline for all homes to reach standard by 2033	Earlier deadline of 2030 for all homes to reach standard
Private rented houses at new tenancy from 2025, all homes to reach standard by 2028	No change
Social rented homes must all reach EPC B* by 2032	Earlier deadline of 2030 for all homes to reach standard
Flats: combined energy efficiency and heat standard to be met by 2045	An interim energy efficiency standard for flats to reach by 2030
Replacement of heating systems	
Off-gas boilers: phase out new installations of coal, oil and LPG boilers from 2025 (houses); final deadline of 2045 or earlier	Earlier deadline of 2033 for all remaining boilers to be replaced
Gas boilers: phase out need for gas boilers from 2030, final deadline of 2045 (houses)	• No home purchase (houses) with old (non-condensing) boiler from 2025 • No new boiler replacements from 2027 (houses) • Target for social landlords to replace 30% of gas boiler stock by 2030 • Grants & marketing to encourage early adopters to move from gas boilers early (before regulation applies – 190,000 by 2027)
Heat networks: targets for growing these by 2027 and 2030 and new legislation licensing and granting other powers to encourage development.	• Set a deadline to provide information to households in flats about the potential for heat networks or communal systems in their local area by 2025.

* standards will be set using updated metrics for EPCs

Both our analysis of Scottish Government's proposals, and the WWF recommended policies, assume that Scottish Government targets for heat network output (1.5 TWh by 2027 and 6 TWh by 2030) are met. Achieving this will require the rapid implementation of measures

contained in the *Heat Networks Act* and 'zoning' of suitable areas by local authorities as part of 'Local Heat and Energy Efficiency Strategies' (LHEES). This information should be provided to households to explain the potential for such systems in their local area by 2025.

As well as the regulations outlined in the table above, we factor the following into our assessment of Scottish Government policies:

- 9,500 fuel poor households receive insulation upgrades through existing fuel poverty schemes, and 3,500 receive heat pumps each year from 2024.
- 2,500 houses with electric storage heaters replace these with heat pumps each year, receiving the same grant support as other households.

The WWF proposals are designed to illustrate what Scottish Government policies are required to deploy energy efficiency and low carbon heating at the scale needed to meet our crucial 2030 climate target, whilst also supporting all households, and particularly those on low incomes, to make that investment. The scenario would see over half of all homes (1 million) and 45% of flats and tenements (385,000) fit low carbon heating systems by 2030. Emissions from homes would be reduced by c.68% by 2030 (on 2020 levels). We have not factored in the ability of supply chains to adapt and deliver at this scale and speed, but their ability to do so will be aided by clear targets and the certainty of demand that regulation can provide.

Supporting households

The CAR research shows that heat pumps can provide similar or lower running costs in houses when regulations enter force in 2025. However, upfront costs are likely to remain a challenge.

The capital costs assumed in this analysis are:

- Heat pump installation costs of £13,000 (per house)
- Heat network cost per flat: £9,500 (per flat)
- Energy efficiency upgrade cost of £2,000 without solid wall insulation; £11,200 with solid wall insulation (per home/house)
- Energy efficiency in social rented/fuel poor homes (to meet a higher fabric standard, see next section): £7,000 per home

Continued Government support will be crucial to make these costs affordable – both upfront grants and help to borrow where this is needed. We therefore propose that existing Government grants for energy efficiency and heat pumps continue after regulations enter force in 2025. Fuel poor households should receive fully funded upgrades, with grants for others – levels should be reduced as technology costs fall (although in our analysis costs remain the same). Costs are likely to reduce as supply chains expand and mature, and so households that are first to comply with the standards should be rewarded for their early action, which helps build supply chains.

Our principles for making the transition affordable are:

- Provide fully funded installations to households in fuel poverty. Eligibility criteria should be widened to ensure that more households are able to access the help that they need.
- Provide upfront grant support to other households – helping to reduce the cost of required investments, as well as support to borrow funds where necessary.

Our full recommendations for Scottish Government support to accompany regulations are as follows. The costs given are those we have used to estimate total costs to Government later in this paper.

Owner occupied & private rented homes

- Fully funded energy efficiency and heat pump installations for fuel poor households (assumed cost per home of £7,000 for energy efficiency and £13,500 for heat pumps)
- Continue existing grants up to £7,500 for heat pumps (with £1,500 rural uplift) for owner occupied and homes (and extend these to private landlords)
- Continue existing grants up to 75% of the cost of energy efficiency upgrades, to a maximum of £7,500 (with £1,500 rural uplift) for owner-occupiers. Continue current loan schemes for private landlords and provide a £2,000 grant for energy efficiency upgrades (to help meet the higher proposed standard) where tenants are in fuel poverty and apply for help.
- Up to 60% grant for solid wall insulation, up to a max. of £7,500, available to both owner occupiers and private landlords.

Government should also make Air to Air heat pumps eligible for grants and explore whether a grant uplift for smaller homes is needed.

Social rented homes

- Provide capital support to social landlords meeting energy efficiency targets and replacing fossil fuel boilers - £5,000 per home for heat pumps and £4,000 per home for energy efficiency upgrades.

Heat networks & communal systems

Grants to support heat networks and communal systems installed in flats and tenements - £6,500 per home (public funds would likely be split between the homeowner and the network operator) to a total of 350,000 homes by 2030.

TACKLING FUEL POVERTY

Around 25% of all Scottish households were deemed to be in fuel poverty before the current energy crisis[1]. Russia's war on Ukraine (which began in spring 2022) has pushed fossil fuel prices, and particularly gas, to record levels in Europe. As a result, fuel poverty has risen to around 35% of households[2] even with UK Government support (through the Energy Price Guarantee, EPG) to cap energy prices. Our workings (for calculating the number of homes receiving fully funded upgrades) assume that fuel poverty rates remain at 35%[3]. Energy prices are expected to fall from those fixed by the EPG[4], but we have chosen a conservative estimate to provide a conservative estimate. Using these assumptions and our policy proposals, by 2030:

- All fuel poor homes (c.860,000) would have been brought up to a higher standard of energy efficiency (broadly equivalent to an EPC B, see 'standards' section).
- A third of these homes would have received fully funded heat pumps, through requirements and grants in the social housing sector and through support to owner-occupiers complying with regulations.

If our forecast that most homes with heat pumps will have lower energy bills than fossil fuel boilers by 2025 is correct, these homes would be benefitting from more affordable warmth. The higher standards of energy efficiency that these homes are brought up to (see later sections) would further ensure lower energy bills.

PUBLIC & PRIVATE INVESTMENT

Total capital investment

Using values from the CAR report and our own analysis we estimate the total capital investment required to fit energy efficiency and low-carbon heating in our scenario to 2030 at £23.5bn to £26.5bn depending on heat pump cost reduction (we do not factor in reductions for energy efficiency or heat networks).

Public/private investment

Our proposals would see half of the required capital investment come from homeowners and social and private landlords, and the other half from public funds (via grants and fuel poverty support). Capital investment by the Scottish Government would need to increase to between £2bn and £3bn per year from 2025 to 2030, a very significant increase on current levels. Total funding in the next Scottish Parliament (2026 to 2031) of £10bn and £15bn per year would be required. Potential avenues for this uptick could include additional public funding from the UK Government, which will also need to increase investment if it is to meet its own climate targets and industry. The UK Government's proposed 'market-based mechanism' would require boiler manufacturers across the UK to sell an increasing proportion of heat pumps from 2024 - they may need to provide incentives to increase consumer uptake.

[1] Scottish Government, 2019, Scottish House Condition Survey
[2] Scottish Government, 2022, Cost of Living Bill, Key Statistics
[3] We increase fuel poverty rates across tenures/fuels as reported in the 2019 SHCS proportionally
[4] https://www.cornwall-insight.com/winter-2023-24-price-cap-forecasts-fall-further-below-2022-23-epg-but-long-term-prospects-remain-uncertain/

Other considerations

We have not factored in the ability of supply chains to adapt and deliver at this scale and speed, but their ability to do so will be aided by clear targets and the certainty of demand that regulation can provide. The roll out of heat pumps at this speed and scale would also accelerate the need for electricity network upgrades, where these are needed. Given these and other constraints, we recognise that delivering the full set of proposals will be very challenging. But it needs to be done if we're to have any chance of meeting climate targets and creating warm, high-quality housing on a par with European equivalents.

PROPOSED STANDARDS

This section explains assumptions regarding energy efficiency and heating standards used to inform this analysis.

Previous Scottish Government proposals for minimum energy efficiency standards were based on the existing system of Energy Performance Certificate ratings. Recognising that these are no longer fit for purpose (being based primarily on energy costs rather than building characteristics) the Scottish Government committed, in its *Heat in Buildings Strategy* to reform EPCs with additional metrics.

The analysis for WWF Scotland conducted by CAR recommends that the new metric be set as space heating demand, expressed in kWh used per m2 per year. This will ensure that standards focus on the most salient aspects of providing efficient heating: heat loss (through building fabric) and heating demand. This echoes recommendations of by the Regulatory Assistance Project (RAP) for the Existing Homes Alliance Scotland[5] (of which WWF is a member).

Using CAR's analysis, we recommend that energy efficiency standards proposed in the Heat in Buildings Strategy be implemented in the following ways:

- **Minimum energy efficiency standard:** for houses to be 'heat pump ready'. This would ensure efficient heat pump operation (e.g. meet the desired level of heating on cold days, without very high flow temperatures over 50C that make heat pumps operate less efficiently). It should be set as a target for space heating demand of 65-85 kWh/m2/year, with lower values for more modern and compact homes. Flexibility may be required where it is technically not possible to add some recommended types of insulation e.g. additional loft insulation where there is already an attic room. This target would replace existing Scottish Government commitments to bring all homes to EPC 'C'.

- **Interim Standard for Flats:** we propose an additional standard be introduced for flats and tenements, to encourage early and achievable 'no regrets' action in these types of dwelling, giving householders clarity on what can be done now whilst the long-term policy framework is finalised (including the use of heat network zones and triggers, and means to coordinate insulation and heating system upgrades at the building-level).

- **Social housing and fuel poverty standard:** a minimum standard of energy efficiency that all homes in the social housing sector, and in fuel poverty in the owner occupied and

[5] Existing Homes Alliance Scotland (2022) **Owning the future**

private rented sector, should be brought up to (replacing current Scot Gov commitments to bring all such households to EPC by 2030/2040). This standard would require higher levels of energy efficiency, to provide maximum reductions in heating cost and enhanced comfort.

- **All-Tenure Zero Emissions Heat Standard:** as proposed by Scottish Government, requiring the installation of zero carbon heating systems in existing homes. The standard is to be phased in progressively, and we recommend additional triggers and earlier dates for compliance. Qualifying technologies are: heat pumps (all kinds), storage radiators, direct electric radiators.

Trigger points and dates

The Scottish Government's Heat in Buildings Strategy proposes that regulations could apply at numerous 'trigger points':

- Change of tenancy (when a property is empty);
- Point of sale;
- Major refurbishment;
- Replacement or installation of a new heating system.

We support the use of all of these trigger points and set out the rationale, and dates at which action should be required, below. Our proposals are designed to meet the crucial 2030 target fairly – targeting the highest emitting fuels and homes first and sharing burden equally amongst different tenures.

Energy efficiency in owner occupied and private rented homes

We support Scottish Government proposals[6] to implement an energy efficiency standard at the point of sale, rental or major renovation, as these are all suitable points at which to make such interventions. This will enable upgrades to take place within a larger financial transaction (with increased scope for borrowing if required) and allow households to choose whether the seller or purchaser meets costs. Homes changing owner or tenant will also be likely to have a period of vacancy, allowing works to be done. Our additional 'interim' standard for flats would also apply at these points.

We also support the proposal to set a 'backstop' date for compliance with the standard, to ensure that homes that are seldom bought or sold are also upgraded in a timely manner, and to accelerate improvements such that the majority of homes are improved before the phase out of gas boilers commences. We propose a backstop date of 2030 for all houses to meet the standard – this is earlier than Scottish Government proposals (2033) reflecting our more ambitious timescale for the phase out of gas boilers (to ensure that homes are ready for heat pumps). It would apply:

- At point of sale or rental for owner occupied and private rented houses from 2025.
- Backstop: all remaining houses required to meet the standard by December 2028 (private rented sector) and 2030 (owner occupied).

Energy efficiency in social housing and fuel poor homes

Homes in the social rented sector, and those improved through Government fuel poverty alleviation schemes, should be brought up to a higher standard of energy efficiency (broadly

[6] See Scottish Government, 2019, Energy Efficient Scotland: Consultation

equivalent to EPC B). This could be at the lower end of the proposed space heating range, requiring additional energy efficiency measures such as floor insulation and triple glazing. We propose that targets for to meet minimum standards of energy efficiency be enforced. The date for all homes to be brought up to this standard should be brought forward to 2030, and the target for social housing could be enforced in a similar fashion to the current EESH2 standard.

Zero emission heating

The Heat in Buildings Strategy proposes regulation to require the installation of zero or very near zero emissions heating systems in existing buildings. The strategy suggests that these regulations could be implemented at the same 'trigger points' as those for energy efficiency (sale/purchase, rental/change of occupancy) although it is suggested that the replacement of an existing heating system will be the starting point. The standards would apply to homes across all tenure types. We support initial Scottish Government proposals but suggest they be made more ambitious in the following ways:

- Point of sale: no purchase of houses with old (non-condensing) gas boilers from 2025
- Boiler replacement: phase out new installations of gas boilers from 2027
- Set a backstop deadline for replacement of remaining coal, oil and LPG boilers of 2033

This standard would **apply only to houses**, in recognition of the greater challenge to installing individual low carbon heating systems in flats and likely role for communal systems whose long lead-in times will make action over the proposed timescales challenging. Regulation of heating systems in flats should be driven through heat network zones[7], identified by local authorities in their Local Heat and Energy Efficiency Strategies (LHEES).

Boiler replacement

We support applying regulation at the point that boilers are replaced, as an approach that enables households to plan and that is already being taken in a number of other European countries including Austria, Holland and France. A challenge of this approach is the need to quickly replace a heating system when it is broken and cannot be repaired – often termed 'a distress purchase' – which today is often not possible with heat pumps[8] and would take longer where significant energy efficiency upgrades are also required. However, evidence suggests that this is the case in only a third of all boiler replacements[9] ('non-emergency' situations where a boiler is reaching the end of its life, needs repairs too often or major renovation account for the other two-thirds). The number of homes impacted in this way could be reduced by early signalling of the regulations, incentives to replace ageing boilers (marketing incentives as a 'scrappage scheme' could encourage uptake by the relevant households). A service to provide emergency electric heating could act as a final mitigation where homes are without heating and hot water whilst they wait for works to be carried out[10].

We propose setting a backstop date of 2033 for the removal of all remaining high-carbon boilers. Early signalling to households coupled with incentives can help reduce new

[7] Once a zone is created and a viable scheme is proposed, flats within reach of the proposal should be required to connect within a specified period of time

[8] At present, due to supply chain constraints/bottlenecks. These should ease in time as the installer base grows.

[9] UK Government, 2013, '**Homeowners' Willingness to Take Up More Efficient Heating Systems'**; Ipsos MORI and the Energy Saving Trust

[10] For further ideas on how this could be delivered see: **https://www.nesta.org.uk/interim-boilers-for-broken-heating**

installations of such boilers between now and 2025, reducing the number of systems that would be retired before their natural end of life.

Looking further ahead, we propose that installations of new gas boilers in houses be prohibited from June 2027, earlier than the proposed date of 2030.

No sale/rental with old gas boilers
We also propose that restrictions on fossil fuel boilers be introduced at the point of sale i.e., preventing the sale of some homes with specified boilers. This would further increase the replacement of fossil fuel boilers and intervene at a time that is more convenient for households. We propose that the purchase or new rental of houses with an old gas boiler (defined as a non-condensing unit) be prohibited from January 2025. Non-condensing boilers have higher energy use and carbon emissions (around 20%) than more efficient 'condensing' units that have been a requirement for all new gas boiler installations since 2005 (and 2007 for oil). This would apply across all tenures, in tandem with energy efficiency standards**.** Owners could be given 12 months to comply and a new online boiler register would likely be required to aid enforcement, with heating engineers required to register details of the boiler being replaced and the new system.

In summary, the proposed heating standards would:

- Prohibit new installations of high carbon boilers (oil, LPG and coal) in houses (not flats) from January 2025
- Prohibit the sale or rental of houses with an old gas boiler (defined as a non-condensing model) from January 2025
- A backstop date of 2033 for replacement of all remaining coal, oil and LPG boilers in houses
- Prohibit new installations of gas boilers in houses from June 2027

Social housing heat target
As well as improvements to regulations, we propose a target for heat decarbonisation in social housing. Given the nature of that housing stock (few oil boilers, prevalence of more modern gas boilers) boiler replacement in these homes is unlikely to be on a large scale until the gas boiler phase out (in houses) begins in 2027. Social housing providers are already being supported and encouraged by Scottish Government to replace heating systems with low carbon alternatives, and a target would help galvanise action and take-up of this support. Most homes will need interventions to meet the proposed energy efficiency standards which presents an opportunity to replace some heating systems at the same time.

Early adopter drive
Polling indicates that up to 25% of the UK population would be prepared to pay the full cost (£10-12,000) of a heat pump[11]). To secure additional heat pump switching in gas-heated homes we propose that Government, through a sustained marketing/awareness raising push, aim to encourage 190,000 'early adopter' households to switch to a heat pump by 2028 (ahead of regulations requiring more of these households to switch).

[11] https://www.nesta.org.uk/report/estimating-willingness-pay-heat-pump/

Numbers of homes

The table below shows our estimates of homes affected by the proposed regulatory triggers, used to calculate emissions reductions and policy costs.

	Per year		Total to 2030	
	Total	**Fuel Poor**	**Total**	**Fuel Poor**
Regulations: energy efficiency				
Owner occupied homes (houses & flats) at point of sale, backstop 2030	200,000	70,000	1.2 million	420,000
Private rented homes from new rental 2025, backstop 2028	75,000	40,000	264,000	160,000
Social rented homes to reach new standard by 2030	84,000	44,000	590,000	300,000
Regulations: Zero emissions heating				
No new replacements of off-gas boilers (houses) from 2025, backstop 2033	20,000	8,000	160,000	64,000
No house purchase with old gas boiler from 2025	22,000	8,000	110,000	40,000
No new replacements of gas boilers (houses) from 2027	94,000	33,000	330,000	130,000
Additional schemes				
Social landlords target: 30% of gas boilers replaced by 2030			194,000	97,000
Early adopter grants for early gas boiler replacement			190,000	
Heat pump grants used to replace electric storage radiators			50,000	

Key assumptions underpinning the above figures:

- 100,000 home transactions per year[12]
- 30,000 new private lets per year[13]
- 12,000 off-gas boiler replacements a year
- 150,000 gas boiler replacements a year[14]

[12] https://www.ros.gov.uk/data-and-statistics/house-price-statistics/property-market-report-2021-22#:~:text=Mortgage%20market-,In%202021%2D22%3A,68%25%20of%20the%20residential%20market

[13] https://www.gov.scot/binaries/content/documents/govscot/publications/statistics/2021/11/private-sector-rent-statistics-scotland-2010-2021/documents/private-sector-rent-statistics-scotland-2010-2021/private-sector-rent-statistics-scotland-2010-2021/govscot%3Adocument/private-sector-rent-statistics-scotland-2010-2021.pdf

[14] https://existinghomesalliancescotland.co.uk/wp-content/uploads/2022/05/ehas_owning-the-future_F2.pdf

- Figures for homes meeting backstop deadlines for action assume linear deployment from 2024/5 to 2030

STANDARDS: TECHNICAL DETAILS

Our proposals for energy efficiency standards are informed by **research** conducted on our behalf by CAR. The modelling explored the least cost way to reduce household heating emissions across a selection of archetypes representative of the Scottish housing stock. The modelling explores whether the energy efficiency of each archetype allows operation of a heat pump at a constant or nearly constant temperature and whether the space heating demand for each could be supplied by existing or possibly upgraded radiators, at a flow temperature that a heat pump can deliver efficiently.

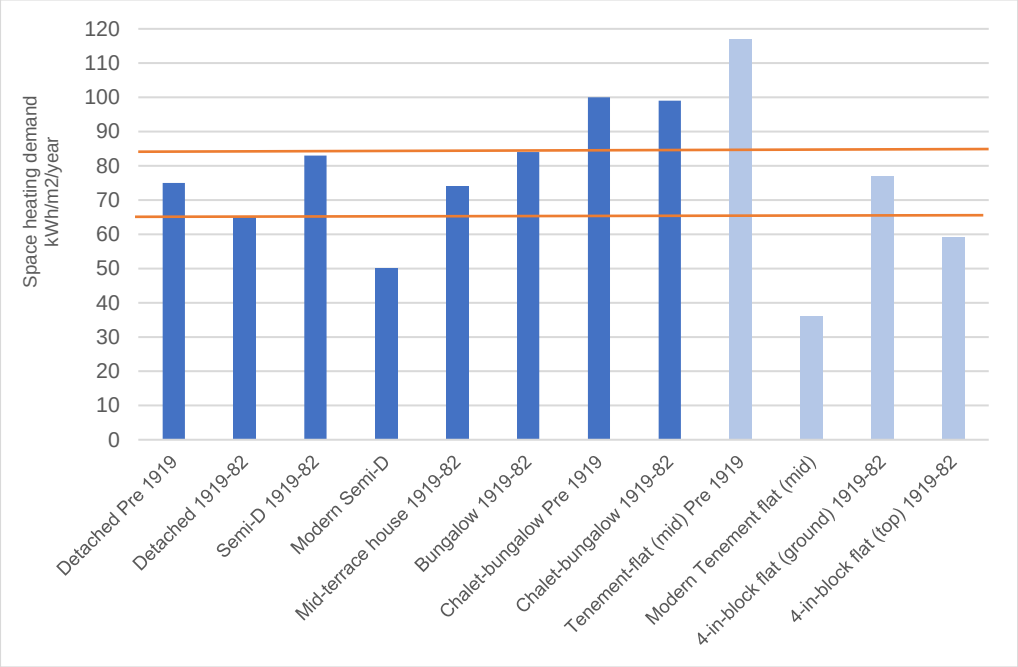
Energy efficiency standard for all homes

CAR recommend that space heating demand (measured per m2 per year) is used as the metric for minimum standards. Many of the upgraded archetypes have a space heating demand of between 65-85kWh/m2, which is suitable for installing a heat pump: enough for the houses to meet the desired level of heating on cold days, without very high flow temperatures (i.e above 50°C) that would make the heat pumps operate less efficiently. We therefore recommend this as the target range for a minimum energy efficiency standard to be set by the Scottish Government.

The Figure below illustrates the space heating demand values for each of the archetypes modelled by CAR – the proposed range for a new standard is shown by orange lines. The archetype values vary because the modelling applies a 'cost effective' level of energy efficiency rather than aiming to meet a specified standard.

We assume that 78% of all homes require energy efficiency upgrades (as per the CAR report, this figure is higher than previous estimates due to a high proportion of low-cost draught proofing). When looking only at insulation measures, around half of homes require these, which is in line with previous estimates (e.g. SHCS) of homes currently below and EPC 'C' rating.

Space heating demand per m2 per year for upgraded archetypes



Archetypes that exceed the space heating demand range do so because further measures to reduce this do not pay back within 15 years; conversely, some archetypes adopt measures that reduce space heating demand well below the target range because it is cost effective to do so. This suggests that it would be necessary to vary the standard according to dwelling age and size (with a lower target for smaller and more modern homes) and potentially introduce cost-exemptions to prevent excessive costs for some dwellings that struggle to reach the target range due to their specific characteristics. These flexibilities are discussed below.

Varying the standard for smaller and modern homes

The more modern archetypes as well as the flats tend to meet or exceed the target, aided by better as-built energy efficiency[15] or building geometry (the ratio of external wall to floor). This suggests that standards may need to be set for some common archetypes (e.g. small and modern homes). Proposed standards in the Netherlands give an example of the approach that could be taken in Scotland. There, a net heating demand target for dwellings varies both with the age of a dwelling and the ratio of floor to wall area[16].

Solid wall insulation

The CAR study found solid wall insulation to be cost effective in most of the solid wall houses (pre 1919 archetypes). However, it is expensive (average cost £9,200) and potentially disruptive. It is possible to fit heat pumps in the typical houses without it, provided other energy efficiency measures are in place. Running costs against gas are the same or slightly higher without it, and a larger heat pump is required. The recommended standard of energy efficiency would require insulation of solid walls in most houses. However, in light of the challenges that upfront costs, internal disruption (for IWI) and visual impact could pose to public acceptance it could be made an optional measure for owner occupied properties.

[15] For example floor insulation and air tightness tend to be better in post 1982 properties

[16] Regulatory Assistance Project, RAP (2022) How much insulation is needed? A low-consumption, smart comfort standard for existing buildings. Brussels: RAP.
https://www.raponline.org/wp-content/uploads/2022/05/rap-sunderland-insulation-standard-2022-may-4.pdf

Homes that choose not to fit solid wall insulation will have lower upfront costs, but some will risk higher running costs after fitting a heat pump- households will need advice specific to their home. Government grant support should be provided to encourage uptake. This is desirable because solid wall insulation lower bills but also provides wider benefits - e.g., reduced fuel poverty risk and demand on electricity networks. Solid walls should be insulated wherever possible in the social rented and private rented sectors.

Flexibility to exceed the target

If solid wall insulation is made a requirement for houses, the CAR research suggests that there could be a role for a cost cap where homes have invested significantly in fabric improvements but still fail to reach the target standard. Three of the upgraded archetypes exceed the target range - the chalet-bungalows (which cannot further insulate attic rooms[17]) and the pre-1919 tenement for which external wall insulation was not found to be cost effective[18]. The detached pre 1919 archetype does not adopt any solid wall insulation when a heritage constraint[19] is applied because the large number of rooms in this dwelling substantially increase the costs of fitting wall insulation internally. It still achieves lower running costs against the oil/gas/electric baselines, as it has other energy efficiency measures in place. This suggests that in these limited cases, a cap on costs could prevent prohibitive upgrade costs without risking much higher energy bills with heat pumps – homes could be allowed to exceed the target by showing a minimum level of investment in fabric upgrades. For example, the pre 1919 chalet bungalow exceeds our target range despite adopting external wall insulation[20] but the modelling does not add more measures (like floor insulation or triple glazing) because these are not cost effective. In this case, the expenditure threshold could be set at the level of an upgrade package that includes solid wall insulation (in this case c.£90 per m2[21]).

Such a cap would also mirror the modelled approach to the 'heritage' pre 1919 detached archetype – the cap would still require the installation of the most cost-effective efficiency measures but would exempt the property from fitting internal wall insulation, which is expensive to fit to this kind of (very large) property. The CAR modelling shows that the capital costs are such that it is more cost effective to fit a larger heat pump in these homes with the basic efficiency upgrades than to fit internal wall insulation (with a smaller more efficient heat pump). Such a home could show proof of planning restrictions and the evidence of the cost/m2 for other installed efficiency measures to receive an abeyance. Such a cost-cap would not preclude the more modern chalet bungalow from adopting more expensive measures of floor insulation or triple glazing to meet the target range, measures which are generally not required across the modelled stock. Despite exceeding the target range this archetype has an acceptable heating performance[22] which suggests that should the cost cap and target variation by age and size fail to protect some homes from very high costs, technical abeyance could be used as a last resort. In this case, evidence of an already insulated attic roof could make a home eligible for flexibility (e.g., allowance to exceed the

[17] This would involve significant disruption both to remove and replace the existing attic ceiling and the resulting lower ceiling height

[18] Because of the lower ratio of external wall area. Note that the study did not include savings from coordinating such work at the building-level (e.g. reduced scaffold costs).

[19] Simulating planning restrictions, in this case precluding fitting of solid wall insulation to external walls and instead requiring this to be done to the interior of a property

[20] As well as having draught proofing and double glazing

[21] The cost of adding double glazing, draught proofing and external wall insulation to this archetype is £14,000; the dwelling is 157m2.

[22] Running costs versus fossil fuel boilers are marginally lower, with flow temperatures within our 'low flow' range

target by a set %). Such abeyances carry risks; if set incorrectly they could lead to many too many homes being exempted and facing higher heat pump running costs.

Interim standard for flats

This standard could also be set as a space heating kWh/m2/year target, requiring measures than can be installed in flats now – draught proofing, loft insulation, cavity wall insulation (in lower rise flats like four in a blocks) and double glazing. It would not require solid wall properties to fit insulation, given the challenges of coordinating such works at the building-level between multiple owners and to allow more time for such works to be organised if required. This would also allow ongoing work by the Scottish Government to reform legal frameworks regarding tenement maintenance and repair to take its course, and to provide flexibility: it could be that building-level assessment flats and tenements identify alternative cost-effective combinations to decarbonise such dwellings.

Social housing and fuel poor homes

As with our other proposals, this standard could be set as a maximum space heating kWh/m2/year target. It could be set at or around the lower end of the range proposed by the CAR research – 65 kWh/m2/year for houses. Meeting this target would require most homes to adopt additional efficiency measures[23] such as floor insulation or triple glazing. Flexibility to use other measures that reduce heat pump running costs (radiator upgrades, solar PV or solar thermal) could provide a lower cost or less disruptive means of achieving the desired heating performance. Such flexibility would require a cost-efficiency metric as part of the standard, as these measures reduce running costs but don't directly reduce space heating demand. A similar target could be set for flats, but as with the interim flats standard proposed above be set at a lower level that does not require solid wall insulation, reflecting the challenges and timescales of delivering this measure.

Zero emission heat standard

We support proposals by Scottish Government to implement a 'Zero Direct Emissions Heat' standard that would prohibit the installation of any heating system that generate greenhouse gas emissions at the point of use, which would permit the installation of heat pumps (all kinds), storage radiators, direct electric radiators and solar thermal[24]. Biomass and hydrogen boilers would not meet such a definition[25], and although in theory both can be low emission (if using sustainably sourced biomass or 'green' hydrogen) restricting use of these fuels for home heating is consistent with the recommended uses of these fuels. There are a number of benefits to this approach, including alignment with standards being introduced for new builds in Scotland in 2024[26].

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[23] Beyond the standard measures that most homes are required to have to meet the 'Heat Pump Ready' standard: loft, cavity wall, double glazing and draught proofing

[24] https://www.climatexchange.org.uk/media/5386/cxc-direct-greenhouse-gas-emissions-from-low-and-zero-carbon-heating-systems-february-2022__.pdf

[25] Although carbon emissions from biomass combustion can be low carbon if sourced from sustainably produced and managed resources, combustion produces a number of other emissions. The combustion of hydrogen produces nitrous oxide.

[26] Existing Homes Alliance (2022) Owning the Future