

New Build Heat Standard Consultation: Part II

Analysis of Consultation Responses

June 2023

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Executive Summary

The [public consultation](#) which ran between 28 July and 20 October 2022 was an opportunity for the Scottish Government to understand a wide variety of stakeholders' views on their proposed New Build Heat Standard (NBHS). This will prohibit the use of direct emissions heating (DEH) systems in new buildings and some conversions warranted from April 2024. The consultation contained six closed and eight open questions. In total, 112 consultation responses were received from 21 individuals and 91 organisations.

Prohibition of direct emissions heating (DEH) systems in new domestic buildings

Agreement with the proposed approach for NBHS was high. However, many who agreed raised potential unintended consequences when prompted. The most prevalent concern was the perception that Scotland's current electrical grid capacity and infrastructure is insufficient. Several highlighted their belief that the proposals could be challenging to implement in rural or island areas which may be off-grid or where capacity may be lower.

The second most prevalent theme was challenges with the supply, installation, and maintenance of zero-direct emissions heating (ZDEH) systems, due to skills and material shortages. Other possible unintended consequences included: the delay or termination of planned developments of new homes; the possibility that more expensive heating systems could exacerbate fuel poverty; a sense of consumer unease over the ZDEH technology; and an uneven impact on rural areas with more off-grid locations.

Broader considerations about the proposals included the need for consumer education on ZDEH technology, concerns about energy efficiency of houses and about energy ratings systems, and a request for government-supported fiscal support package. Mixed views were expressed about the timescales for implementing NBHS; some called for it to be introduced more slowly, while a few called for it to be implemented quickly.

Technologies

Respondents were asked whether there would be a need for bioenergy under some circumstances in future new build developments; around one third felt there may be situations where this was required. The most common theme was for rural communities to be exempt from bioenergy system bans, due both to the lack of connection to the electrical grid and the robustness of the grid system. A few respondents argued that exempting bioenergy systems in off-grid locations or allowing hybrid heat pumps would provide a further choice of energy supply for rural consumers. Another reason for considering exemptions included environmental concerns, particularly the use of sustainable types of bioenergy that could offer sustainable solutions for waste material, such as biomass.

Other themes each mentioned by small numbers included: suggestions for a defined criteria to determine if a home is suitable for electrification or whether biomass may be a more suitable alternative, taking into account technological, economic and environmental factors; support for the proposed Bioenergy Policy Working Group; and a desire for an acknowledgement that biofuels are evolving and should be kept under review.

Approach to conversions

There was support for the proposal related to conversions, although unintended consequences were highlighted even by those who agreed with the approach. The most common theme was a belief that the proposed approach to conversions could have negative economic consequences for individuals and communities. For example, some noted the regulations could reduce the number of buildings being converted due to increased costs. Several respondents noted that poorly fabricated houses may require a complete renovation to elevate the home to the standard of energy efficiency needed for ZDEH systems to operate effectively. A few called for more clarity around the definitions set out in the proposals.

Respondents highlighted a range of factors they believed would make the approach to conversions reasonably practicable. These included the economic feasibility of the project, grid capacity allowances, supply chain and workforce concerns, and buildings that may prove challenging to convert entirely to ZDEH systems, such as historic and multioccupancy buildings.

Ensuring equalities

When asked how the proposals could impact people with protected characteristics, the most common theme was a concern based on the presumption that ZDEH could raise the cost of heating homes. Respondents suggested this increase could result from greater use of electricity, which they believe would cost more than gas, or because a conversion may not meet insulation standards. The second most common theme was a belief that the proposals would have no impact on equalities or people with protected characteristics. Some respondents mentioned positive outcomes for those with protected characteristics suggesting that costs for heating with ZDEH systems would be lower.

Of those responding to the question about the how proposals help the Scottish Government ensure the three needs of the Public Sector Equality Duty (PSED), the most common theme was that it would advance equality in housing between those who have protected characteristics and those who do not. Some respondents suggested ways in which the PSED can be considered, such as ensuring ZDEH systems are accessible and easy to use for all.

Non-domestic buildings

More than half anticipated some non-domestic buildings will require DEH after 2024. This was mostly due to technical factors, such as buildings with complex heat and hot water needs, concerns about grid capacity, and keeping utilities working in buildings which provide communities with emergency heat and hot water. Others noted that some buildings, such as warehouses, may be incompatible with heat pumps.

Some respondents supported the proposal in full and had no noted concerns about using ZDEH in new non-domestic buildings. Others provided recommendations for alternate energy solutions for situations where ZDEH systems may not work, such as mixed technology approaches. A few noted a concern that applying the new standard to non-domestic buildings may negatively impact Scotland's industry and economic development.

Introduction

Scotland was one of the first nations to declare a global climate emergency. The Scottish Government is a leader in the drive for a decarbonised energy system and has legally committed to reducing emissions by 75% by 2030 and achieving net zero by 2045. Homes and workplaces account for approximately a fifth of Scotland's greenhouse gas emissions. According to the [Heat in Buildings Strategy](#), currently only about 11% of households in Scotland use low emission or renewable heating systems. Non-domestic buildings account for around 7% of Scotland's total greenhouse gas emissions. The Scottish Government understands it is imperative to transition to zero emissions heating systems, beginning with new build domestic and non-domestic buildings.

The New Build Heat Standard (NBHS) is being developed for introduction in 2024. It is the culmination of years of research starting with '[A Low Carbon Building Standards Strategy For Scotland](#)' published in 2007 and [updated in 2013](#) with a goal of providing a 'net zero carbon' standard for new developments¹. While decarbonisation of the energy system is the goal, there is recognition that additional support for the transition to zero direct emissions heating (ZDEH) systems is needed, whether that is in upskilling the workforce, increasing funding packages to offset costs, or continuing discussions around infrastructure concerns.

A [public consultation](#) ran between 28 July and 20 October 2022. This was an opportunity for the Scottish Government to understand a wide variety of stakeholders' views on their proposal for the NBHS, prohibiting the use of direct emissions heating systems in new buildings warranted from April 2024. The consultation contained six closed and eight open questions, covering:

- Regulatory approach to new build domestic and non-domestic buildings.
- Technology, specifically bioenergy systems.
- Approach to conversions.
- Equality.

During the consultation process, the Scottish Government held three engagement events with stakeholders: a Consumer and Equality Workshop, an Island Communities Workshop, and a Non-Domestic Building Workshop. Issues raised at the workshops often aligned with the responses provided to the consultation and relevant points from these engagement events have been included in this analysis.

¹ It also considers [UK Housing: Fit for the Future](#). This report, by the Committee on Climate Change and its Adaptation Committee, assesses whether the UK's housing stock is adequately prepared for the challenges of climate change; both in terms of reducing emissions from UK homes and ensuring homes are adequately prepared for the impacts of climate change.

Respondent Profile and Analysis Approach

Respondent profile

In total, 112 consultation responses were received. Most were submitted via the online consultation platform, Citizen Space. Those received in an alternative format, for example an email or PDF document, were entered into Citizen Space by the Scottish Government.

Individuals provided 21 responses to the consultation; the remaining 91 were from organisations. To aid analysis, each organisation was assigned a sector or type. The largest share of organisational responses came from property developers and builders, trade bodies in the energy sector, and local authorities, as shown in the table below.

Sector	n	%
Property developer or builder	34	30%
Energy – trade body	15	13%
Local Authority	12	11%
Energy – manufacturer / supplier	11	10%
Construction related trade / membership body	10	9%
NGO / Third sector	6	5%
Public body	1	1%
Other	2	2%
Individuals	21	19%

Within the property developer or builder category are 23 responses received as part of a co-ordinated campaign by Homes for Scotland. Of these, 16 gave a near identical email response, and each of these has been included in the analysis as a separate response as each came from a different organisation². This response was not structured according to the consultation questions, but most of the key points aligned with the themes evident in other respondents' answers to Q1 and Q2. As such, this co-ordinated response has been included in the analysis of these questions.

The other seven³ responses shared similar wording, based on answers to each question which had been provided by Homes for Scotland. These answers have been included in the analysis of each question.

² A total of 17 responses using this wording were received. One organisation provided two responses, which were combined into one.

³ A total of 13 responses using this wording were received. However, three organisations submitted multiple responses; these were combined into one response per organisation.

Analysis approach

The Lines Between was commissioned to provide robust, independent analysis of the consultation responses, including the engagement events. This report presents the range of views expressed by respondents under each section of the consultation document.

Quantitative analysis

There were six closed questions in the consultation. A full breakdown of the number and percentage response to each question can be found in the body of the report and is also included in Appendix A to allow for an easy comparison. Please note that figures in the tables may not add to 100% due to rounding.

As not all respondents answered each closed question, the quantitative analysis in the main report is based on those who answered each question. Each table shows:

- The number of respondents from the **total sample** of 112 who selected each response, and the corresponding percentage.
- The number and percentage response **among those answering each question**, broken down by individual and organisation responses and by type of organisation.

Qualitative analysis

Qualitative analysis outlines the key themes identified in responses to each question. The analyst team coded each response against a coding framework which was developed based on a review of the consultation questions and a sample of responses. In a small number of instances where alternative format responses contained information that did not align to specific questions, analysts exercised judgement about the most relevant place to include this material for analysis purposes.

A few organisations provided detailed responses reflecting their subject matter expertise. There is not scope in this report to fully summarise these responses; however, the responses are referenced where possible. Where appropriate, quotes from individuals and organisations are included to illustrate key points and to provide useful examples, insights, and contextual information. Full responses to the consultation, where permission for publication was granted, can be found on the Scottish Government's website⁴.

Limitations of the analysis

When reviewing the analysis presented in this report, we would ask that the reader consider:

- A public consultation means anyone can express their views; individuals and organisations with an interest in the topic are more likely to respond than those without. **This self-selection means the respondents' views do not necessarily represent the views of the population.**
- In some instances, the context of a comment was unclear from the wording of a response. For example, a respondent may not have specified whether they are expressing a view about new builds or about all buildings, or if they are describing a

⁴ 89% of respondents granted permission for publication of their responses.

situation that involves new domestic buildings or all new build buildings. If the context was not clear, analysts assumed that questions were answered in the context of both domestic and non-domestic new builds, except for Q2 and Q11 which were specifically about domestic and non-domestic new builds respectively.

- More broadly, it is possible that some respondents have not fully read or engaged with the consultation paper, leading to answers which do not directly address the questions. These answers have been noted in the report.
- In a few cases, responses from energy sector trade bodies or manufacturers provided background information about the benefits of certain heating systems. These have been included in the analysis where directly relevant to the question.
- There are other instances where respondents make factual claims, but do not give evidence to support their statements. In those instances, we have used language to highlight that the comments are the belief or perception of the respondent.

Weight of opinion

Qualitative analysis of open-ended questions does not permit the quantification of results. To assist the reader in interpreting the findings, we use a framework to convey the most to least commonly identified themes across responses to each question:

- The most common / second most common theme; the most frequently identified.
- Many respondents; more than 30, another prevalent theme.
- Several respondents; 10-29, a recurring theme.
- Some respondents; 5-9, another theme.
- A few / a small number of respondents; <5, a less commonly mentioned theme.
- One / two respondents; a singular comment or a view identified in two responses.

Chapter One: Prohibition of Direct Emissions Heating (DEH) Systems in New Domestic Buildings

Using its power under the [Buildings \(Scotland\) Act 2003](#), the Scottish Government intends to prohibit DEH systems being installed in new domestic buildings warranted from 1 April 2024. The [Building \(Scotland\) Amendment Regulations 2022](#) defined a DEH system as a system by which the building is heated or is cooled, or by which hot water is made available, which uses thermal energy produced by a source of production that is located within the building and that produces greenhouse gas emissions at the point of production of that thermal energy during normal operation. Any indirect or upstream production of greenhouse gas emissions, such as those normally produced to run a heat network or electrical grid, are considered out of scope. Moreover, the 2022 building regulations also set out standards for energy efficiency in the fabrication of all new builds, which would support the implementation of the NBHS. For more information on the 2022 building regulations, please refer to the consultation paper.

1. Do you agree with the approach set out in [2.1](#) to regulate direct emissions heating systems in new buildings?
2. Do you envisage any unintended consequences as a result of the approach set out in 2.1 to regulate direct emissions heating systems in new buildings? Please provide reasons for your answer.

Although Q1 and Q2 focussed on the proposed approach in the consultation paper and potential unintended consequences of this, respondents gave a wide range of answers in response to Q2. One third made open comments which reiterated or gave reasons for their support for the approach and the broader decarbonisation of heating. Most commonly, however, respondents raised concerns about the approach; these were not necessarily unintended consequences but wider concerns around implementing the New Build Heating Standard (NBHS).

In addition, most of the 33 respondents who responded in an alternative format, i.e. not through the Citizen Space portal, outlined reasons for their support or opposition to the proposals. While not answering Q1 and Q2 directly, most of the themes evident in these responses aligned with Q1 and Q2 and so are included in the analysis of these questions.

Finally, 16 near identical responses from housebuilders were received as part of a response co-ordinated by Homes for Scotland. A summary of this response is provided in the box overleaf. Once again, as the key points aligned with the themes evident under Q1 and Q2 these responses have been included in the analysis below.

Housebuilder response co-ordinated by Homes for Scotland

These 16 responses were received from organisations who employ 1,490 people and are responsible for 2,943 new homes in the last year, including 1,471 affordable homes.⁵

While supporting the Scottish Government's commitment to net zero, these responses stated that it will not be possible to deliver the new standard in the proposed timeframe without support for: infrastructure improvement, particularly grid capacity; improved supply of ZDEH systems and technology; skills development; and support and education for consumers.

These responses argued that without consideration of these issues there will be a decline in the number of new homes being built across Scotland.

Views on the proposed approach

Three fifths (62%) of those answering Q1 agreed with the proposed approach to regulate DEH systems in new buildings; three in ten (30%) disagreed and 7% were unsure.

Agreement was higher among organisations than individuals - 66% compared to 52% respectively. All Local Authorities (100%) agreed, as did 80% of manufacturers and suppliers in the energy sector and 80% of those in the wider construction sector. Views among trade bodies in the energy sector were more mixed: half (50%) agreed, while 25% disagreed and 25% were unsure. Among property developers / builders, however, 63% disagreed with the proposed approach, with 38% agreeing.

Q1. Do you agree with the approach set out in 2.1 to regulate direct emissions heating (DEH) systems in new buildings?					
Base	n=	Yes	No	Don't know	Not answered
All respondents	112	51	25	6	30
All respondents (%)	112	46%	22%	5%	27%
All answering (%)	82	62%	30%	7%	-
- Individuals	21	52%	43%	5%	-
- Organisations	61	66%	26%	8%	-
- Property developer / builder	16	38%	63%	0%	-
- Energy – trade body	12	50%	25%	25%	-
- Local Authority	12	100%	0%	0%	-
- Energy – manufacturer / supplier	10	80%	20%	0%	-
- Construction	5	80%	20%	0%	-
- Other	6	67%	0%	33%	-

Wider support

⁵ These totals are based on figures provided by each of the 16 organisations in their responses.

Respondents were not asked to elaborate on their reasons for agreeing or disagreeing with the proposed approach at Q1. However, one third of respondents provided an open comment which expressed support for regulating DEH in new buildings, either at Q2 or in the introduction to their response. Participants in consultation workshops also expressed general support for the proposed regulations. Respondents recognised the value of the proposals in advancing decarbonisation of heating and reducing emissions through electrification, in turn helping Scotland reach its climate change targets. A few noted their agreement with using the building warrant process to regulate and deliver the NBHS.

In most cases, however, support was caveated with the need to consider and address some of the concerns outlined below. Specifically, of the 51 respondents who agreed at Q1, 30 also identified unintended consequences at Q2, which are outlined later in this section. Only a small number of comments were given by the remaining respondents.

“The Heat Pump Association strongly supports this approach. The Scottish Government intends to reduce carbon emissions by 75% by 2030, this approach must be part of the new build standard moving forward. Heat pumps are the perfect Zero Direct Emission Heating systems solution for new build properties, alongside low-temperature heating systems. There is no reason why new homes cannot be designed to accommodate these systems, and there must be regulation to ensure properties are built in line with net zero emission targets. To further net zero aims for property-related emissions, we believe there should be an additional requirement in building standards of having a minimum proportion of the roof area covered by solar panels. The combination of heat pump and solar PV brings an added possible benefit of self-sufficiency of a household’s energy requirements, which reduces fuel bills, and improves customer experience. In addition, new builds are helping to grow the reputation of heat pumps, which will be needed if they are to be adopted more widely in the retrofit sector.” Heat Pump Association

“Kingspan agrees that in order to decarbonise new buildings there is a need to prohibit the use of direct emissions heating systems (DEH) in any new building applying for a building warrant from 1 April 2024 onwards. Kingspan note that whilst technologies, such as heat pumps are zero emissions at the point of use, scope 2 emissions (from purchased electricity and heat) will remain until the grid and heat networks are fully decarbonised. However, regulation of direct emissions will help to enable buildings to be future proofed and ultimately carbon neutral, as the grid and heat networks are decarbonised... Kingspan are supportive of how the Scottish Government intend to regulate to prohibit the use of direct emissions heating (DEH) systems in new buildings from 2024.” – Kingspan Insulation Ltd.

“The NIA agrees with the approach set out in 2.1, as it sends a clear message and ambition to prohibit the use of direct emissions from heating systems in any new build from April 2024. The NIA support this as it provides a clear steer of the role heating can play in decarbonising new builds. Although the grid and heat networks are in transition to become decarbonised, this regulation prepares future buildings ultimately meet carbon neutral, and will be important in a decarbonised future.” – National Insulation Association

“The case for pursuing Net Zero is well established and accepted by Scottish Government. In order to meet Net Zero targets, buildings will need to be equipped with ZDEH (Zero direct emission heating systems). It would be unfair to householders to construct new homes without ZDEH systems as the buildings would then require significant and costly retrofits in order to become Net Zero compatible.” – BEAMA

While they did not directly express support for the proposals, in their co-ordinated response housebuilders noted their support for the Scottish Government’s commitment to make Scotland net zero by 2045.

Summary of concerns and unintended consequences

At Q2, respondents were explicitly asked to identify any unintended consequences of the proposals. Both supporters and opponents of the proposals outlined a variety of concerns which they felt needed to be addressed before implementing the NBHS. The remainder of this section begins with an analysis of the results of closed question Q2, and is followed by an analysis of the open section of Q2, which asked respondents to outline any possible unintended consequences. Responses are organised into themes and presented in order of most to least commonly mentioned.

Unintended consequences

Among those answering Q2, three quarters (76%) envisaged unintended consequences from the proposed approach to regulate DEH, while one quarter (24%) did not. Organisations were more likely to anticipate unintended consequences than individuals (79% compared to 67% respectively). All property developers / builders and all those in the wider construction sector who answered the questions indicated there could be unintended consequences, as did 90% of Local Authorities. There was less concern among the energy sector – 67% among manufacturers and suppliers and 58% among energy sector trade bodies.

Q2. Do you envisage any unintended consequences as a result of the approach set out in 2.1 to regulate direct emissions heating systems in new buildings?				
Base	n=	Yes	No	Not answered
All respondents	112	60	19	33
All respondents (%)	112	54%	17%	29%
All answering (%)	79	76%	24%	-
- Individuals	21	67%	33%	-
- Organisations	58	79%	21%	-
- Property developer / builder	16	100%	0%	-
- Energy – trade body	12	58%	42%	-
- Local Authority	10	90%	10%	-
- Energy – manufacturer / supplier	9	67%	33%	-
- Construction	6	100%	0%	-
- Other	5	40%	60%	-

Electrical grid infrastructure and capacity

The most prevalent concern identified in responses was whether Scotland's electrical grid could cope with the additional demand from greater electrification of heat in new buildings. Respondents argued that the existing infrastructure and capacity is insufficient, and that investment is required to ensure the grid is upgraded and maintained to meet and withstand future needs.

Several respondents highlighted their belief that this could be a particular challenge in rural or island areas where connections to the grid are more difficult and capacity could be lower. Several others noted that this may not be a challenge solely for introducing the NBHS; other changes such as more electric vehicles are also placing additional demand on the electrical grid.

In their co-ordinated responses, housebuilders called for improvement in infrastructure, particularly grid capacity, and for the Scottish Government to: "*assist this process by making funding available to support sites that already have planning and/or building warrant approval to enable the necessary grid reinforcement and to support early adoption of zero-carbon heating technologies*". Homes for Scotland also suggested that the Scottish Government should allow a 'by exception' approach post 2024 should some sites not have the required electrical capacity.

"Additionally, we are concerned that the capacity of existing infrastructure is insufficient to fully support a reliable switch to electric and decarbonised heating. Research⁶ has highlighted the need for network-wide innovation in order to mitigate concerns regarding the security of supply as consumer reliance on the electricity network increases, especially in rural networks with overhead lines supplying sparsely located demand centres. To avoid possible unintended consequences and costs, regulations should only be implemented once capacity challenges within the wider network have been understood and addressed."
- The Chartered Institute of Building (CIOB)

Supply chain and skills shortages

The second most prevalent theme was challenges with the supply, installation, and maintenance of Zero Direct Emissions Heating (ZDEH) systems. There were two distinct strands within these comments. Beliefs about issues around the supply chain, particularly for heat pumps, were highlighted slightly more frequently. Many respondents described the significant increase required in ZDEH supply and expressed concern that current manufacturing rates will not be able to meet increased demand or be sufficiently scaled up by 2024.

Concern about a potential skills shortage⁷ was the other strand within these comments. As well as a shortage of skilled manufacturers, many respondents highlighted their view that there may be a lack of trained or qualified technicians to install, service, maintain or repair

⁶ Garry, Galloway, and Burt, Decarbonisation of Rural Networks Within Mainland Scotland: In Support of Intentional Islanding, March 2021

⁷ LiquidGas referenced the following Scottish Government report to support their comments about skills shortage: [Heat In Buildings Strategy: Achieving Net Zero Emissions in Scotland's Buildings \(www.gov.scot\)](https://www.gov.scot/publications/heat-in-buildings-strategy/achieving-net-zero-emissions-in-scotland-s-buildings/pages/10-to-12.aspx).

ZDEH systems. It was noted that there is an even smaller pool of qualified engineers outside the central belt; this was reiterated in the Island Communities workshop. One organisation noted that many current gas safety engineers may leave the profession, rather than re-train. The co-ordinated response from housebuilders notes that the 2024 timeframe for NBHS is ambitious given the lead time required to develop training then recruit and train learners. More specifically, NIBE Energy Systems Limited highlighted a potential unintended consequence that ZDEH systems could be poorly installed due to lack of training and suggested that installation should be supported by quality checks and training to ensure they meet the Building Regulations in new buildings.

“Without significant innovation for alternative technologies in the relatively short period before the NBHS is in place there will be a heavy reliance on air source heat pumps to deliver this approach. This will put a great strain on an already struggling supply chain.” – Cala Group Ltd

“Once the most appropriate ZDEH solutions have been identified supply chains will need time to scale up. Initial volumes may be insufficient to cope with demand leading to shortages, this could lead to a reduced number of new homes being delivered. There is also the possibility that the insufficient supply of the most appropriate ZDEH solutions leads to the use of solutions that are less than optimum. This could have a negative impact on consumer running costs.” - Individual

Conversely, the Scottish National Investment Bank argued that introducing the NBHS demonstrates the Scottish Government’s support for decarbonised heat in buildings. This gives investors the confidence to fund the businesses and projects which will allow the sector to grow and scale up their activities, thereby strengthening the supply chain.

“Manufacturers are ready to increase supply in response to demand and policy signals, and the supply chain has matured over the last ten years, with a design an(d) installation standards framework for installers (MCS) for installers now in place.” - BEAMA

Reduction in new homes being built

Another prevalent theme raised by many respondents was that planned developments of new homes could be delayed or cancelled, and there could be a reduction in the number of new homes being built. A few reasons were given for this. Delays could result from the supply chain issues noted above, as homes could not be built without the required ZDEH systems. Several respondents linked delays to issues with the electrical grid capacity; as noted above, those providing the co-ordinated response described the potential for delays in already approved sites unless there is grid reinforcement. A few noted that these challenges could reduce the number of new homes available across all tenures, including the delivery of the Affordable Housing Supply Programme and homes in rural areas.

A specific unintended consequence of this, noted by two anonymous local authorities, is that some developers could delay applications for building warrants until late 2023 under the current regulations, so they are still able to install DEH heating systems during the duration of their building warrant, post-2024. A response from a builder noted that some of the challenges presented in this section, particularly the supply chain for heat pumps,

could put small and medium size builders out of business, reducing the number, range and choice of new homes available in Scotland.

“As a result, the unintended consequences will be many and varied. Many fewer houses will be built. The housing crisis we are in will worsen. The construction industry is recognised as being a major driver in a strong economy. To significantly reduce the output of the housebuilding industry will result in a corresponding damage to the wider economy.”
- The Energy Poverty Research initiative; Common Weal; and the Built Environment Asset Management (BEAM) Centre, Glasgow Caledonian University (joint response)

Scone and District Community Council noted their support for the regulations even at the increased cost to builders and buyers, and the effect it may have on housing stock.

“There will be increased costs to developers, and thus house buyers, but this is not an unintended consequence. Developers should not have the right to build houses that will add to emissions, nor to build houses that are not properly insulated. As a (completely powerless) community council member any attempt to object to planning applications about the energy inefficient builds is met with officers saying ‘We can’t force them, there is no legislation.’ We need this legislation now now.” - Scone and District Community Council

Cost implications and fuel poverty

Many respondents anticipated that consumers could face higher energy bills because of the proposals, which in turn could exacerbate fuel poverty in Scotland. This is because these respondents believe that electricity costs substantially more per unit than gas, and households switching to ZDEH for heating and hot water will increase their electricity consumption. The responses from the Consumer and Equality workshop also reflected this in relation to people switching from coal to ZDEH systems. Several respondents argued that this, and the currently high cost of energy, could add to the cost-of-living crisis, and that consideration needs to be given to those who may be unable to pay extra costs. Solar Energy Scotland called for the NBHS to include provisions for onsite generation of electricity in new buildings, through solar energy systems, for example, which would reduce the amount households have to pay suppliers.

More specifically, some respondents noted that households could pay more if they do not have the most appropriate or efficient ZDEH systems installed in their homes because of supply chain issues, or if they are using their ZDEH inefficiently (see consumer education below). Conversely, Kingspan Insulation Limited noted that new Building Standards should improve energy efficiency in new builds from 2022, in turn reducing costs.

Related to costs, a small number of respondents raised each of the following:

- That the proposals could increase the cost of new build properties, making them prohibitive or unaffordable for some.
- Households may face higher purchase and installation costs of ZDEH. One local authority noted that an unintended consequence could be less efficient systems being installed as they are cheaper than the most efficient solutions.

- Infrastructure costs will be incurred e.g., costs to upgrade grid infrastructure or for local authorities to install additional substations in new developments.

Concerns over use of Zero-Direct Emission Heating

Concerns about ZDEH technology were raised by many respondents. Two themes were evident in these comments. Most commonly, several respondents who gave a co-ordinated response were concerned, suggesting that it may be a short timeframe for introducing the Standard, which could mean the ZDEH systems installed are not the best long-term solution and could be more costly for households than technology which is currently being developed. A few argued this could stifle future innovation.

More generally, the other recurring theme was respondents' impression that ZDEH technology is problematic, impractical, untested, too expensive or does not currently have the scale to supply the new build market. Respondents also described negative perceptions of heat pumps (e.g., noise) and district heating networks (e.g., legal and contractual complexity).

“The [Air Source Heat Pump] technology has not been demonstrated to be the long-term solution to de-carbonisation and its forced introduction at this stage will stifle opportunity to investigate alternative carbon reducing methods of achieving net zero. Early adopters including social housing providers will be forced to adopt a new technology (ASHP), that is little used and not adequately market tested, which could well prove inefficient and likely become obsolete as new improved systems come to market.” – Homes for Scotland

“Communal ground Source, Heat Networks and other options – in principle we are supportive however there are very few built pilot examples to review, compare and consider at the relevant scale of development. We're aware that this 'fear of the unknown' is prevalent across the industry and the customer base.” – Springfield Properties

Need for consumer education

Though not a concern or an unintended consequence, another theme raised by many respondents was the need for consumer education on ZDEH technology and to make ZDEH systems as easy to use as possible. This theme was reflected throughout the Consumers and Equality workshop, where the role of publicity and the need for a clear communications campaign by the Scottish Government to educate consumers on ZDEH systems was suggested. Most broadly, the co-ordinated response from property developers called for a compelling and comprehensive public information campaign to increase public awareness of the benefits of net zero homes. Other respondents specifically described how many households will need to be educated in new technology so that they can run and maintain their ZDEH systems efficiently. One organisation noted the transition may be more challenging for elderly or disabled people.

Timescales

Several respondents, most of whom were part of the co-ordinated response, argued that the timescales for introducing the NBHS are too short, and it is not deliverable. This is due to the factors outlined across analysis of these initial questions, particularly grid capacity and supply chain issues. The co-ordinated response noted the perception that little progress has been made to address these issues since they were raised in a previous

consultation. One organisation in the wider construction sector described how other European countries are planning to make similar changes but over a longer period, for example Denmark's target is by 2028.

Conversely, some organisations thought the Standard should be introduced more quickly. These organisations noted that introducing the standard in 2024 would mean that some homes being built in 2027/28 could still be using DEH technology. Others noted there is a missed opportunity in reducing emissions from the DEH heating systems which will be installed in new homes prior to April 2024 and will continue to emit over their lifetimes. In addition, two organisations called for the Scottish Government to establish and communicate clear timelines and milestones to provide certainty to the sector.

“However, there may be unintended consequences from this approach with the implementation date being set as 1 April 2024. If the April 2024 date is implemented, around 10,000 direct emission heating systems are estimated to be installed between October 2023 and April 2024, which could contribute a total of over 1.8 ktCO₂ emissions during this heating season. Additionally, those 10,000 systems could be in place for another 15 years, consuming a cumulative 1.53 TWh of energy over their lifetimes, which could equate to 250 ktCO₂ emissions. We therefore believe the ambition should be increased for this standard by bringing the timeframe for implementation forward to October 2023 (6 months earlier) to cover the heating season that precedes April 2024, reflecting the urgency of the need for change. The majority of these emissions can be displaced if the standard is implemented in October 2023, allowing for Net Zero goals to be achieved as soon as possible.” - NIBE Energy Systems Limited

Calls for improved building efficiency

A recurring theme raised by several respondents was the need for the NBHS to be accompanied by other efforts to improve the energy efficiency of buildings. Some called for greater promotion of a whole building or fabric first approach to improve building standards and energy efficiency⁸. The importance of properly insulated homes was raised by SELECT and National Insulation Association. Kingspan Insulation Limited also noted their concern about insulation but highlighted that Building (Scotland) Regulations changes in 2022 should help ensure energy efficiency of new homes.

Three organisations including Homes for Scotland made a specific call for all regulations relating to energy use in the home to be implemented through Building Regulations as opposed to planning regulations, otherwise individual planning authorities could introduce their own requirements.

⁸ Proposals to develop the NBHS have coincided with the recent conclusion of the [Building Standards Energy Review](#). The improved energy efficiency standards for new buildings, set under the revised building regulations, will pave the way for the implementation of the NBHS in 2024

“With regards to implementation of the proposals, BEFS welcomes the general principles, but considers that there is still some work to be done towards a broader culture shift within the construction industries, as well as Scotland’s homeowners, businesses, suppliers, and manufacturers. All need to understand that a fabric first - incorporating a maintenance first - approach will pay dividends and help to support the transition to net zero.” - Built Environment Forum Scotland

“Restricting the use of the most polluting forms of heating and implementing more efficient alternatives is, in our view, only part of the solution. It is critical to link the standards and their application alongside requirements for reductions in demand. It is essential that the new standard is implemented in conjunction with improvements in the performance requirements of buildings and their energy efficiency.” - The Royal Incorporation of Architects in Scotland (RIAS)

Related to this, some respondents called on the NBHS to recognise that the right ZDEH solution could vary for different buildings. For example, some suggested air source heat pumps may work well with individual homes, but not with flats. Another respondent, NIBE Energy Systems Limited, however, noted that blocks of flats could benefit from large-scale ground source heating systems or individual exhaust air heating systems, such as their own product.

“The SEA advocates a technology agnostic approach and believes that overly prescriptive policy can inhibit innovation and lead to unintended consequences. A host of low-carbon heating technologies, ancillary products, and energy efficiency measures that meet the heterogenous space and water heating demands of a building, and lead to the right outcomes, should be supported by government schemes.” - Sustainable Energy Association

Fiscal package

The co-ordinated response from developers called for the Scottish Government to provide a fiscal support package to encourage and support consumers in the transition to net zero homes. They suggested this should include: an enhanced grant regime for delivering new affordable homes; the introduction of net zero carbon grant support for new home buyers; and discounted LBTT (Land and Building Transaction Tax) rates to incentivise consumer behaviour to encourage purchase of low carbon homes. One individual also suggested that there could be public subsidies for adopting ZDEH systems but noted this could be an unpopular use of public funds.

Less commonly mentioned themes

Several respondents highlighted that rural areas face additional barriers to moving to ZDEH, including less grid capacity, more off-grid buildings and uncertainty over electricity supply. A small number suggested that this could mean that it will not be possible to build new homes in some areas until better technology is available. Solutions were suggested by a few respondents, including the adoption of a regional response to the standard to allow fuel or biomass burning devices for back-up in rural areas, to introduce a phased approach for rural or off-grid areas, or to permit exceptions if grid capacity is unavailable beyond a certain level.

The exclusion of biomass and bioenergy systems from new builds after 2024 was also raised by some respondents including detailed responses from Oil Firing Technical Association (OFTEC) and United Kingdom and Ireland Fuel Distributors Association (UKIFDA) and AMP Clean Energy. Views on the use of bioenergy systems are presented in the analysis of Q3. As well as raising the exclusion of biomass, Scottish Renewables argued that solar should be included as an option in all building specifications.

Across Q1 and Q2 and the alternative format responses, several other concerns or consequences were raised by very small numbers. These included:

- Calls for a further review of the EPC (Energy Performance Certificate) to ensure it and the NBHS are aligned. A few respondents, including the co-ordinated responses, also noted that there have been delays to the new iSAP (Standard Assessment Procedure) software which is impacting preparation for the new Building (Scotland) Regulations changes in 2022 and that this may also impact the delivery of the NBHS in 2024.
- One respondent noted that as no gas network will be built to new homes, this could prevent homes switching to green gases⁹ such as hydrogen in the future. Another called for the regulations to be drafted in a way which would accommodate hydrogen in the future if trials are successful, and two called for hydrogen to be considered as an alternative. One respondent noted that hydrogen boilers could eventually be considered ZDEH, but that they create Nitrous Oxide emissions, so they called for the NBHS to focus on systems which do not produce Nitrous Oxide.
- A need for upstream reduction in emissions from electricity generation.
- Designs of houses will need to change to accommodate ZDEH solutions.
- Noise pollution from multiple heat pumps could be an unintended consequence.
- Job losses in businesses supplying wood burning stoves.
- The potential for direct greenhouse gas emissions from leakage of refrigerants from a larger number of air source heat pumps if they are not regulated or serviced.

⁹ Throughout the report, respondents mention 'green gases'. By this, they are referencing gases which they believe would not contribute to direct greenhouse gas emissions. However, this consultation is technology agnostic, and the Scottish Government is still conducting research into the direct emissions associated with the burning of 100% hydrogen gas.

Chapter Two: Technologies

As the NBHS focuses on prohibiting heating systems which produce direct emissions, bioenergy systems¹⁰ would not comply with the regulations, in relation to both new domestic and non-domestic buildings. This chapter explores respondents' views on specific situations where bioenergy systems could be required in new buildings.

Q3. Are there any limited, specific situations where the use of bioenergy systems would be required in new buildings?

Very mixed views were evident among those who answered Q3. One third (35%) stated there could be situations where bioenergy systems would be required in new buildings, 23% felt there were not, and two fifths (42%) were unsure.

Property developers / builders were most likely to be unsure (80%), followed by those in the wider construction sector (60%). Local Authority responses were mixed – 42% thought there would be specific situations for bioenergy, 25% did not and 33% were unsure. Among those in the energy sector, 63% of energy trade bodies indicated there would be some requirements for bioenergy systems, compared to 22% of manufacturers and suppliers in the energy sector.

Q3. Are there any limited, specific situations where the use of bioenergy systems would be required in new buildings?					
Base	n=	Yes	No	Don't know	Not answered
All respondents	112	27	18	32	35
All respondents (%)	112	24%	16%	29%	31%
All answering (%)	77	35%	23%	42%	-
- Individuals	21	43%	24%	33%	-
- Organisations	56	32%	23%	45%	-
- Property developer / builder	15	0%	20%	80%	-
- Energy – trade body	8	63%	25%	13%	-
- Local Authority	12	42%	25%	33%	-
- Energy – manufacturer / supplier	9	22%	44%	33%	-
- Construction	5	40%	0%	60%	-
- Other	7	57%	14%	29%	-

¹⁰ Bioenergy is electricity or gas generated from organic matter known as biomass. This could be plants and timber, to agricultural or food waste.

Q4. If 'Yes', what do you believe the criteria should be for introducing such an exemption? Please provide evidence to support your answer.

Exemptions for rural and off-grid areas

Of the 39 respondents who answered Q4, the most common theme was for rural communities to be exempt from bioenergy system bans. This was raised by a range of stakeholders, from individuals to local authorities and from those in the energy sector to manufacturers, property developers and builders. It was also mentioned in all the consultation workshops held by the Scottish Government. Although it was not explicitly noted in most responses, it is apparent from the range of references within answers that respondents were describing use in both domestic and non-domestic buildings.

Concern for those in rural areas focused on perceived concerns about both the lack of connection to the electrical grid and the robustness of the grid system, though respondents did not provide evidence of this being the case. Some cited the need for bioenergy as a back-up in case of grid failures, such as was the case with Storm Arwen, mentioned specifically by a small number of respondents.

A few noted that as well as rural communities being at risk of longer grid failures, the poor weather disrupting the grid system can make these communities more difficult to access, limiting assistance and stopping residents from seeking shelter elsewhere.

“Small secondary heating appliances such as wood burning stoves supplying a single room should be allowed in rural areas where electricity supplies are potentially at risk. The condition for the exemption would need to take into account the location and distance from an energy generation point i.e. large conurbations would not qualify as these areas are first to be reconnected after damage to power lines.” – Individual

“We believe that there are some limited, specific situations where the use of bioenergy systems would either be required or would be the most appropriate option in new buildings. This would be the case off the electricity grid where there is no existing or planned local electricity grid. A bioenergy heat network or individual home systems could use sustainably sourced bioenergy with emissions abatement technology to reduce local air pollution.” – Energy Saving Trust

A few respondents argued that exempting bioenergy systems in off-grid locations or allowing hybrid heat pumps would provide a further choice of energy supply for rural consumers. One noted that photovoltaics could be used alongside heat pumps and battery storage to help off-grid locations be self-sustaining.

“Aberdeenshire Council has a significant rural population. Transportation and infrastructure may limit technology options, especially where electricity grid constraints are an issue. In these cases, our close proximity to biomass sources may make bioenergy a viable choice.” – Aberdeenshire Council

Sustainable bioenergy

Some respondents highlighted other environmental concerns in responding to this question, specifically the zero-waste movement and the use of sustainable types of bioenergy. Some argued that biofuel burning stoves could offer sustainable solutions for waste material, in particular biomass, and that these options could potentially offer the only viable low-carbon option for some buildings.

“As bioenergy is a tricky area for policy a balance needs to be set between utilising fuel sources that are sustainable now or can be developed sustainably, whilst not locking ourselves into future dependencies on bioenergy fuels that could lead to increasing demand from new systems and the insufficient development of local, sustainable supply chains requiring the demand gap to be met by importing biofuels from unsustainable sources. What is really needed here are robust projections of future energy demand (from existing and new buildings, and from existing and new heat networks) set against robust projections of supply from both biological waste streams (domestic, agricultural, forestry) and from the existing and future contributions from managed forestry and woodlands” – The Energy Poverty Research initiative; Common Weal; and the Built Environment Asset Management (BEAM) Centre, Glasgow Caledonian University (joint response)

Less commonly mentioned themes

Themes each mentioned by a small number of respondents included the following:

- Concerns about costs associated with the transition to ZDEH, particularly the running costs of ZDEH systems.
- Requests for exemption for certain buildings that may not meet fabrication standards and where alterations would be impossible, such as buildings with asbestos or school buildings which would require extensive closure times to convert. While this was raised in answers to this question, it is not relevant to new build properties.
- Suggestions for a defined criteria to determine if a home is suitable for electrification or whether biomass may be a more suitable alternative, taking technological, economic and environmental factors e.g. zero-waste into consideration.
- Support for the proposed Bioenergy Policy Working Group, which could provide further research on whether bioenergy can be applied to efficiently reduce emissions, particularly in rural examples.
- Acknowledgement that biofuels are evolving and should be kept under review.

Chapter Three: Approach to Conversions

An analysis of responses to four questions about conversions is presented in this chapter. Conversions are defined as the changes to the occupation or use of a building that cause Building Regulations to apply. To not overburden minor conversions, the Scottish Government proposes the NBHS regarding ZDEH systems apply only to conversions where heating is introduced to a building for the first time, or where an existing heat generator is located in the part of the building subject to conversion.

Q5. Do you agree with the proposed approach to conversions as set out in section 2.3?

Just over half of those answering Q5 agreed with the approach to conversions – 54% of all respondents agreed, including 52% of individuals and 55% of organisations.

Agreement varied considerably across organisations, however. Four fifths (80%) of those in the wider construction sector agreed, followed by 73% of Local Authorities and 67% of manufacturers and suppliers in the energy sector. Two fifths (40%) of energy sector trade bodies agreed. Only one fifth (21%) of property developers / builders agreed with the proposals; the majority of this group (64%) were unsure, rather than disagreeing (14%).

Q5. Do you agree with the approach to conversions as set out in section 2.3?					
Base	n=	Yes	No	Don't know	Not answered
All respondents	112	41	16	19	36
All respondents (%)	112	37%	14%	17%	32%
All answering (%)	76	54%	21%	25%	-
- Individuals	21	52%	33%	14%	-
- Organisations	55	55%	16%	29%	-
- Property developer / builder	14	21%	14%	64%	-
- Energy – trade body	10	40%	50%	10%	-
- Local Authority	11	73%	8%	19%	-
- Energy – manufacturer / supplier	9	67%	11%	22%	-
- Construction	5	80%	0%	20%	-
- Other	6	83%	0%	17%	-

Q6. Do you envisage any unintended consequences as a result of the proposed approach to conversions as set out in section 2.3? Please provide reasons for your answer.

Among those answering Q6, three fifths (59%) envisaged unintended consequences as a result of the proposed approach to conversions, while 41% did not. Concern was higher among individuals (67%) than organisations (56%).

However, views among organisations were mixed and slightly conflicting. Almost all Local Authorities (91%) indicated there could be unintended consequences. While all organisations in the wider construction sector felt there could be challenges, only 20% of property developers / builders felt this could be the case. Similarly, while 67% of trade bodies in the energy sector anticipated issues, only 33% of manufacturers and suppliers in the energy sector were concerned.

Q6. Do you envisage any unintended consequences as a result of the proposed approach to conversions as set out in section 2.3?				
Base	n=	Yes	No	Not answered
All respondents	112	39	27	46
All respondents (%)	112	35%	24%	41%
All answering (%)	66	59%	41%	-
- Individuals	18	67%	33%	-
- Organisations	48	56%	44%	-
- Property developer / builder	10	20%	80%	-
- Energy – trade body	9	67%	33%	-
- Local Authority	11	91%	9%	-
- Energy – manufacturer / supplier	9	33%	67%	-
- Construction	4	100%	0%	-
- Other	5	40%	60%	-

Cost implications

Across the 53 open responses to Q6, the most common theme was a belief that the proposed approach to conversions could have negative economic consequences for individuals and communities. A few respondents noted that while consumers might be willing to accept the cost of replacing a boiler with a new ZDEH system, there will be instances that call for a complete retrofit of the existing heating infrastructure in a building being converted which could be financially burdensome. This was also referenced in the consultation workshops.

Some respondents noted that the regulations could reduce the number of buildings being converted due to increased costs as noted in responses to Q2, which respondents believed could affect community improvement and available housing. To mitigate the increased costs of retrofitting heating systems and properly insulating building fabrication, a small number of respondents recommended grant programmes or financial incentives.

“Mothballing of potential conversion projects that would bring much needed affordable and social homes online for social landlords and local authorities... Retrofitting the fabric of the building could be cost prohibitive, depending on the construction materials used in the building, as well as any conservation area requirements for listed buildings.” - Representative of Scottish Local Authorities

Several respondents noted that poorly fabricated houses may require a complete renovation to elevate the home to the standard of energy efficiency needed for ZDEH systems to operate effectively. Historic Environment Scotland also noted it would require a skilled and knowledgeable workforce to implement the approach correctly and safely. Participants in the Island Communities workshop and the Consumer and Equality workshop noted concerns about the fabrication of older homes, particularly stone built, and the cost associated with renovation exacerbated by the complicated supply chain in island communities.

“However there is a potential when converting buildings ... that the age of the building may not allow for the air-tightness required for systems such as heat-pumps. This could make the conversion of buildings impractical or too costly to run afterwards. In rural areas this could prevent buildings being kept in usage, again increasing depopulation.” – Individual

A few respondents noted that increased costs may force smaller projects to complete the work without oversight and the correct permissions, with one anonymous local authority suggesting the need for enforcement frameworks to ensure this does not occur.

Suggested changes

Some respondents recommended changes to the NBHS that they believed would limit unintended consequences. These included the following:

- To reconsider applying the regulation to areas of the building where a heat generator is located due to conversions often being relatively minor and occurring in internal garages and attic spaces where boilers may be located.
- Providing clearer guidance or assessments for determining when ZDEH systems are needed. For instance, the Heat Pump Association suggested it should be based on a mandatory increase in EPC rating and participants in the Island Communities workshop questioned whether a minimum change in floor area should be required. The Heat Pump Association suggested a minimum 25% of floor area increase could be clear guidance to determine if an existing DEH system will need to be replaced. In response to Q7, Fife Council suggested that if the conversion *“is less than 50% of the overall building area served by a DEH system then the heat generator can be retained”*
- Exemption of buildings with biomass heating systems.

Clarification

While not a direct response to the question, a few respondents called for various clarifications. Areas needing greater clarity included: whether heating systems are defined as both the heat generator and the distribution system, as one respondent highlighted it would be difficult to replace a whole distribution system in historic homes in a cost-effective manner; whether conversions would also include provisions on area (square metres) of renovation; and whether building warrant applications will trigger a need to comply with NBHS.

A small number noted that the regulation as proposed could be misinterpreted or create misunderstanding. While most respondents did not elaborate on how the NBHS could be

misinterpreted, one local authority worried without clear definitions, regulations may be implemented differently across the country.

Less commonly mentioned themes

A small number of respondents mentioned the following unintended consequences and considerations:

- The impact of the regulation on different building types, such as multi-occupancy buildings or historic buildings, where it may not be easy to change the heating system.
- The possibility that NBHS will affect an applicant's ability to secure planning permission for buildings with historic significance.
- A negative environmental impact as the NBHS drives builders toward new builds instead of undertaking conversion projects, increasing carbon emissions.
- Consumer confusion if they do not understand the new ZDEH systems as discussed more in Chapter One.
- Impacts on the construction sector if conversions become too costly.

Q7. What criteria would you use to define the replacement of a direct emissions heating (DEH) system as being 'reasonably practicable'?

Q8. What criteria would you use to define it as being 'not reasonably practicable'?

Respondents provided very similar answers to Q7 and Q8, and in most cases their understanding of what was reasonably practicable was often the inverse of what was not reasonably practicable. For this reason, these questions have been analysed together and the themes evident are presented below.

Economic Feasibility

Of the 76 respondents who provided open answers to Q7 and the 71 who provided open answers to Q8, the most common way to define a project as reasonably practicable or not was economic feasibility and cost effectiveness.

A reasonably practicable replacement of a DEH system included conversion projects where the cost was minimal or proportionate to the work required, or if the costs were justified in the longer term. This included: buildings that meet high efficiency standards, with Passivhaus standards¹¹ named as an example by a few respondents; where the technology could easily be adapted without much expense; and where the building fabrication can be altered without much expense.

A small number of respondents suggested a cost benefit analysis of the cost of installation compared to the potential energy savings may help identify situations where the costs are

¹¹ Passivhaus construction methods focus on the reduction of energy needed to heat and cool a building, creating buildings with greater insulation, 20-times more airtightness than standard builds, triple-glazed windows and mechanical ventilation with heat recover systems.

too high, or if the risks could include loss of housing or abandonment of building or projects. Other comparative measures mentioned by a few respondents included cost of the adaptation of heat systems in relation to the value of the property, the financial burden on individuals or companies involved, and the long-term utility savings.

“Being reasonably practicable would generally be seen as something that is not cost prohibitive, perhaps measured against a percentage of the overall project costs. A full cost benefit analysis in this respect should be undertaken.” - Local Authority Building Standards Scotland

While many respondents mentioned high costs as a reason why moving to a ZDEH system may not be reasonably practicable, some others recommended considerations for the regulations, such as:

- Create a scale to ensure the emissions benefit outweighs the financial burden, i.e. a conversion would need to produce over a certain amount of greenhouse gas in order to be subject to new regulations.
- Create a limit in relation to area/cost, e.g. if the conversion is less than a certain percentage of an overall building already served by a working DEH system then a replacement ZDEH system is not required.

As discussed in greater depth in the analysis of Q2, some respondents also noted that an outcome where a household’s energy costs increase or become unaffordable should be considered not reasonably practicable.

A small number noted that if it was deemed not reasonably practicable to transition to a ZDEH system at the time of conversion, all aspects of the heat system in the conversion must be ZDEH compatible to ensure a smooth transition in the future.

“Is there a potential solution to safeguard future ZDEH for conversions where these are justified as not being reasonably practical to deliver ZDEH at the time? As noted above, technologies and/or costs may change as time progresses and therefore future opportunities to change heat systems to ZDEH may fall within the ‘reasonably practical’ category at the point of heating upgrade.” – Perth and Kinross Council

The importance of funding opportunities to support projects that are not financially viable was highlighted by a few respondents.

Grid capacity concerns

Many respondents noted that a replacement being reasonably practicable was dependent on the availability and capacity of electrical grid systems. Some expressed a view that all conversions taking place in urban and suburban locations should be considered reasonably practicable. Conversely, several others noted that rural areas should be considered not reasonably practicable if the grid in those areas could not support the transition of homes to ZDEH systems.

“We believe the default position should be that replacement of direct emission heating is reasonably practicable in all circumstances. We believe that only in circumstances where a new property is in a rural area where the connection of electricity (off grid) is unfeasible, should other heating options be considered.” – Scottish Power

Supply chain and workforce concerns

Several respondents reiterated the challenge of supply chain shortages and how this could make replacing DEH systems with ZDEH systems in conversions not reasonably practicable. This applied to both manufacturers and the supply of the materials needed to upgrade buildings and infrastructure, as well as the skilled workforce necessary to meet development demands and to maintain existing systems. One anonymous individual suggested implementing a staged rollout across Scotland to ensure supply chain function and skilled worker availability.

Clarity and transparency questions

Several respondents questioned whether a transition to a ZDEH system in a conversion could be defined as practicable when there are still several unknown factors. These respondents requested greater transparency about the implementation plan for NBHS, such as information about infrastructure upgrades, the plan to upskill the workforce, manufacturing plans, engagement with energy providers, and the impact of other recent regulatory changes such as the Building (Scotland) Amendment Regulations 2022.

Less commonly mentioned themes

Other themes evident in response to Q7 and Q8 included:

- Some had concerns that certain types of buildings may not be reasonably practicable to transition, such as multiple occupancy or listed, historic buildings.
- General concerns about the technological viability of ZDEH systems were mentioned by some. The Royal Institution of Chartered Surveyors noted that technical feasibility is based on energy demand of the building, which must be low, and the suitability of the heating delivery units.
- Some respondents noted that the overall disturbance to the building should be considered in the NBHS. For example, Fife Council noted that it could be considered reasonably practicable to transition to a ZDEH system if the pipework systems within the building are sized and arranged to facilitate the necessary connection.
- According to some respondents, there will never be a case where it is not reasonably practicable for a transition from DEH to ZDEH if the conversion met the conditions stated in the consultation paper.
- A few respondents recommended that the NBHS considers the age of the heating systems that may need replaced in a conversion. For example, one argued that if a boiler is old enough to need replaced then it should be considered reasonably practicable to mandate transition to a ZDEH system. However, a relatively new boiler should be considered not reasonably practicable to replace.
- Flexibility and deciding what was reasonably practicable on a case-by-case basis was requested by a few respondents.

- Kingspan Insulation Ltd. suggested that any definition of reasonably or not reasonably practicable should be reviewed over time as technology will evolve.
- When asked about non-domestic new built buildings at Q11, a few commented that applying the same regulations to existing buildings would incur a very high cost for the building fabric upgrades needed to transition heating systems and to make the existing space energy efficient. This was specifically noted in relation to historic and listed buildings and buildings with stone extensions or conversion. One respondent noted that capital funding was not currently available to complete upgrades to the fabric of buildings.

Chapter Four: Ensuring Equality

Respondents were asked about the possible impact of the proposed regulations on people with one or more of the protected characteristics as defined by the [Equality Act of 2010](#). The Scottish Government is also interested in understanding how the proposal ensures due regard for the three needs of the Public Sector Equality Duty: elimination of discrimination and harassment; advancement of equality of opportunity between people who have protected characteristics and those who do not; and to foster good relationships between those who share protected characteristics and those who do not.

Q9. How might these proposals impact upon people with one or more of the protected characteristics listed in the Equality Act 2010 (for example: a positive, negative or neutral impact)?

Negative impacts

Of the 48 respondents who answered Q9, the most prevalent theme was a belief that the proposed NBHS would negatively impact people with protected characteristics. There is no pattern evident in the types of respondents who provided this answer.

As mentioned in Q2, some respondents believe the cost of running a ZDEH system may be more expensive than a DEH system, due to the higher cost of electricity compared to gas. Given this perception, some respondents at Q9 felt the cost of running a ZDEH system in a new build could be more expensive than alternatives, which could negatively impact on those with protected characteristics who buy those properties. Some others explicitly mentioned the higher cost possibly affecting those living in converted properties. For example, one individual noted that women, particularly single mothers, suffer lower wealth and discrimination in financial support, and they would be disproportionately affected by the conversion regulations if the transition to ZDEH required expensive fabrication or structural upgrades. An anonymous local authority also agreed that if conversion of heating systems was completed in poorly fabricated homes without additional fabrication adjustments, it could exacerbate fuel poverty among groups with protected characteristics as they are typically more likely to suffer from deprivation. However, high fabrication standards and more efficient ZDEH systems could ease some of these concerns according to the Energy Saving Trust.

“Those who are older or with certain disabilities may require greater levels of heating and/or hot water. The potential consequences of higher bills and reduced access to instantaneous water may cause further issues for these householders. It is therefore critical that ZDEH systems have low running costs, which supports the argument that more efficient systems such as heat pumps should be installed instead of less efficient systems such as traditional electric heating. The fact that it is possible to install extremely efficient heating systems means that the introduction of this Standard presents a significant opportunity for people to live in homes with minimal heating costs and to use those systems efficiently – ensuring that homes remain comfortable for all with the minimum amount of energy use.” – Energy Saving Trust

Some other respondents noted that the reliability of ZDEH systems, which could be compromised by electrical grid failures for example, may negatively impact groups who depend upon stable heating, such as the elderly, people with certain disabilities, and pregnant women and children.

Other less commonly mentioned negative impacts included:

- That some groups, especially the elderly, may find ZDEH confusing or complicated. This was also reflected in the discussions at the consultation workshops.
- Developers delaying or cancelling conversions and new build projects could affect supply of new homes or projects such as care home conversions being abandoned.
- The unknown aspects of the regulation, such as the overall costs and grid capacity, were noted as possibly causing disruption and stress to vulnerable groups, such as the elderly or women who are more likely to live in social housing or private lets.
- Discussion in the Consumer and Equality workshop also highlighted the importance of correct ventilation for air quality in ZDEH efficient homes. They suggested using mechanical ventilation with heat recovery systems where stuffiness was an issue.
- Event participants also noted the need for controls to be wheelchair accessible.

Neutral impact

Several respondents highlighted that they did not believe the proposals would impact or unfairly disadvantage any group. One anonymous respondent noted that people with protected characteristics are protected under other legislation, including the new building regulations coming into effect in December 2022.

“We have previously raised concerns that the Scottish Government’s proposals for decarbonising existing buildings risk negative impacts on women, and particularly pregnant women and women with children (as defined by sex), and those vulnerable groups who are deemed to require an enhanced heating regime... However, as this consultation covers new build and conversions these concerns do not apply here. As regards conversions, and our understanding of the likely definition of these, we would expect these concerns not to apply, given that a building owner investing in a significant conversion would be expected to have secured substantial investment and developed a clear assessment of capital and operational costs in order to do so. However, a risk arises if the definition of ‘conversion’ were to include residential buildings (including residential facilities such as care homes) being converted where the purposes of being used for residential purposes are retained. Therefore, care needs to be taken when finalising this definition.” – The Energy Poverty Research initiative; Common Weal; and the Built Environment Asset Management (BEAM) Centre, Glasgow Caledonian University (joint response)

Positive impact

Some respondents mentioned positive outcomes for those with protected characteristics. In contrast to the above, some respondents noted that the quality and energy efficiency of new build homes should improve, reducing the cost of heating. This would positively

impact groups with protected characteristics with more affordable living costs and warmer homes. One individual felt it would likely improve fuel poverty rates.

“The new build heat standard overall, should have a positive effect on those with protected characteristics, by building homes that are warm, energy efficient, and offer low-cost heating.” - Representative of Scottish Local Authorities

Considerations

A few respondents provided recommendations to mitigate any negative impacts of the NBHS on groups with protected characteristics. They supported a revision of the Affordable Housing Support Programme grant funding to reflect increased delivery costs of new technology to avert the costs being passed onto tenants.

Q10. How might these proposals help the Scottish Government ensure due regard of the three needs of the public sector equality duty (PSED)?

Advancement of equality in housing

There were 27 respondents who answered Q10. The most common theme in responses was that the proposal would ensure regard for advancing equality in housing between those who have protected characteristics and those who do not. While a few respondents generally noted that the presumed benefits from the NBHS would affect all equally, others provided specific examples. A few noted people on lower incomes would benefit from high efficiency ZDEH systems which would reduce their bills, and the Heat Pump Association suggested the smart technology that accompanies heat pumps could help people monitor and manage their electricity usage. Improved building standards were mentioned by a few respondents, including two local authorities who felt the proposal would assist in eliminating disadvantages across housing tenures.

“These proposals do not aim to target a specific tenure of Housing property and therefore this contributes to ensuring that there is no discrimination across the tenures; a new build house that is built by a local authority for social housing will need to meet the same criteria as one that is being built by a housing developer for private sale and therefore ensures consistency of a standard approach.” – Perth and Kinross Council

Recommendations to ensure due regard of PSED

Some suggested pathways to ensure due regard of PSED. These included:

- Ensuring heating and hot water control systems are easy to use.
- Upskilling enough technicians to provide assistance during the transition to ZDEH systems and ensure that assistance is accessible to all.
- Allowing those who can to access private energy sources, such as solar panels and wind turbines, which are on a separate grid, allowing for self-sufficiency and a further economic avenue for households.
- Ensuring the heating regime of ZDEH systems delivers the same standards as the temperature regime underpinning the Scottish definition of fuel poverty.

Negative effects on equality in housing

Examples of situations where the proposals do not ensure due regard of PSED were mentioned by some respondents. Some felt it could increase fuel poverty due to higher heating costs for those on low incomes. Two others noted that the elderly, some disabled people, pregnant women and children may be disadvantaged by higher heating costs as they may need to keep the temperature warmer in homes.

Chapter Five: Non-Domestic Buildings

This chapter presents an analysis of the final consultation question about proposed regulations on non-domestic buildings applying for a building warrant from April 2024. As with new build domestic buildings, the Scottish Government has proposed regulations that would prohibit DEH systems for heating and hot water in all non-domestic new builds, including bioenergy. It should be noted that the approach to using biofuel to power heat networks will be assessed in a future consultation on the Heat Networks Delivery Plan.

This question asks about specific non-domestic new builds that may require DEH after 2024. While the consultation paper focussed on new non-domestic buildings, it was not always clear whether respondents were describing a need for DEH in new non-domestic buildings or in non-domestic buildings more generally.

Q11. Do you anticipate any form of heating within a non-domestic building which will require DEH after 2024? Please provide details of the factors – whether technical, economic or social – which would require DEH after 2024?

Almost three fifths (58%) of those answering Q11 anticipated some non-domestic buildings requiring DEH after 2024. Individuals were less likely to anticipate this than organisations (45% compared to 65% respectively).

Views varied among organisations. Most (70%) Local Authorities could anticipate some eventualities where this could be required. All those in the wider construction industry indicated this could be required, compared to 43% of property developers / builders – perhaps reflecting the focus on domestic buildings in the work of the latter category. Trade bodies in the energy sector were more likely to anticipate DEH in non-domestic buildings than not (67% compared to 33%).

Q11. Do you anticipate any form of heating within a non-domestic building which will require direct emissions heating (DEH) after 2024?				
Base	n=	Yes	No	Not answered
All respondents	112	35	25	52
All respondents (%)	112	31%	22%	46%
All answering (%)	60	58%	42%	-
- Individuals	20	45%	55%	-
- Organisations	40	65%	35%	-
- Property developer / builder	7	43%	57%	-
- Energy – trade body	6	67%	33%	-
- Local Authority	10	70%	30%	-
- Energy – manufacturer / supplier	8	50%	50%	-
- Construction	5	100%	0%	-
- Other	4	75%	25%	-

Technical factors

Of the 54 open responses to Q11, the most common concern was that technical factors could require DEH systems in non-domestic buildings after 1 April 2024.

Several respondents noted that certain non-domestic buildings have complex heat and hot water needs that may mean they are unsuitable for ZDEH systems. These included buildings with specific types of heating systems, e.g., steam distribution systems or radiant heating systems, and buildings which need very hot water for sanitation purposes. Examples of types of buildings mentioned by some respondents included: hospitals, care homes, large depots, manufacturers and production facilities, hotels, leisure centres and swimming pools, and places that serve food. Participants in the Non-Domestic Building workshop also mentioned distilleries, schools with laboratories, foundries and glass blowing factories as being affected by the exclusion of bioenergy heating systems.

A few respondents mentioned concerns about the grid capacity. They questioned whether it could handle the increased load, specifically considering the addition of some non-domestic new builds that will require higher than normal electrical resources, such as manufacturing plants and data centres.

“The only area we can see that would be an issue would be where the electricity grid cannot cope with the addition of ZDEH as a result of other technologies being added such as data centres.” - Federation of Environmental Trade Associations

Community centres, churches, and town halls, which provide people with heat and hot water in emergencies, were suggested by a few as needing alternate power sources in the event of grid failure. Others specifically mentioned hospitals as places that offer vital services and would need back-up DEH energy supplies as electrical grid failures could put people at serious risk.

Other technical concerns included themes not unique to non-domestic buildings and covered in the previous chapters, such as geographic and geological issues, as well as factors related to labour and the lack of the skilled workforce necessary to manage an entirely ZDEH system. Specific concerns about grid issues in rural areas, as mentioned in Chapter One, were highlighted by a few others.

“As outlined in our responses above, there are significant barriers that exist, especially in Scotland’s highland and island communities, to the successful uptake of ZDEH technologies. Of paramount importance is affordability and reliability of not only individual systems but the wider energy network to which they connect.” - The Chartered Institute of Building (CIOB)

Building fabrication

The quality of non-domestic buildings was mentioned by several as a barrier to using ZDEH systems. They mentioned buildings with low energy efficiency, such as warehouses and large distribution centres, as being incompatible with heat pumps, for example.

No concerns with the proposal

Some respondents supported the proposal in full and had no noted concerns about using ZDEH in new non-domestic buildings.

“We do not anticipate that DEH would be required in new non-domestic buildings after 2024. We would support non-domestic buildings being included in this standard for new buildings.” – Scottish Power

“There is always a way to avoid DEH. Simple funding availability is the key” – Ground Source Heat Pumps Ltd

Recommendations

Recommendations for alternate energy sources for situations where it was believed that ZDEH systems would not work were provided by some respondents. These included: hydrogen, liquid petroleum gas, and biomass. A few others supported ZDEH systems like district heating and solar panels. Mixed technology approaches were preferred by a few respondents.

Economic impact

A small number of respondents noted a concern that applying the new standard to non-domestic buildings may negatively impact industry and economic development in Scotland. One argued it could prevent new investment as organisations will not want to build or maintain properties if operations are too expensive.

Conclusions and next steps

Many individuals and stakeholders with detailed knowledge took part in the consultation, providing their insight on the proposals and the impact of implementing the New Build Heat Standard. Their views will assist the Scottish Government in finalising the NBHS regulations to put to Parliament in 2023. This report provides a summary of the consultation responses; for more detail, readers are encouraged to review individual responses where permission was given for publication¹².

There was support for the proposed NBHS in relation to domestic new builds. However, many respondents provided caveats to their support. They noted concerns about the electrical grid capacity, skills, and supply chain shortages, as well as possible unintended consequences, such as a reduction in the number of new homes being built and rising energy costs associated with the increased electrification of heating.

Respondents proposed exemptions to the exclusion of bioenergy systems at point of use, covering rural and island communities with poor grid connections, and for sustainable sources of bioenergy, such as biomass, which may positively impact zero-waste goals. Respondents outlined what they considered to be reasonably practicable for conversions and noted some unintended consequences of the proposals for conversions. There was most concern about the need for, and cost of, improved building fabrication, especially in historic buildings, which led to questions about the energy efficiency and costs associated with transitioning to ZDEH.

In line with the Just Transition goals, the consultation inquired about the impact of the NBHS on people with protected characteristics. In relation to conversions particularly, some felt the increased cost of ZDEH systems in poorly fabricated homes may exacerbate fuel poverty and inequality, particularly among groups with high heat needs. Others, however, suggested a new universal building standard would ensure all tenants would have warm, efficient homes regardless of tenure.

Slightly more than half of respondents felt there may need to be exemptions for some non-domestic new builds after April 2024. Reasons included buildings with high heat and hot water needs, buildings that rely on energy to provide care such as hospitals, and places that provide heat and shelter during electrical grid failures.

Next steps

- Reconvening of NBHS working group to present recent work and share publication details amongst our stakeholders.
- Engage with stakeholders to address all relevant issues discovered through the consultation analysis.
- Propose further working group and sub-working group activities to aid development and forming of the NBHS.
- Prepare legislation in Spring 2023 for the NBHS coming into force in April 2024.

¹² Responses are published on the Scottish Government's consultation website: <https://consult.gov.scot/>

Appendix A: Quantitative Analysis

The following tables detail the results for each of the 6 closed questions in the consultation.

As not all respondents gave an answer to these questions, the quantitative analysis in the main report is based on those who answered each question.

The following tables for each question show:

- The number of respondents from the **total sample** of 112 who selected each response, and the corresponding percentage.
- The number and percentage response **among those who answered each question**, broken down by:
 - Individual and organisation responses.
 - By type of organisation¹³.

Q1. Do you agree with the approach set out in 2.1 to regulate direct emissions heating (DEH) systems in new buildings?					
Base	n=	Yes	No	Don't know	Not answered
All respondents	112	51	25	6	30
All respondents (%)	112	46%	22%	5%	27%
All answering (%)	82	62%	30%	7%	-
- Individuals	21	52%	43%	5%	-
- Organisations	61	66%	26%	8%	-
- Property developer / builder	16	38%	63%	0%	-
- Energy – trade body	12	50%	25%	25%	-
- Local Authority	12	100%	0%	0%	-
- Energy – manufacturer / supplier	10	80%	20%	0%	-
- Construction	5	80%	20%	0%	-
- Other	6	67%	0%	33%	-

¹³ The 'Other' category comprises 6 NGO/third sector organisations, 1 public body and 2 'other' organisations.

Q2. Do you envisage any unintended consequences as a result of the approach set out in 2.1 to regulate direct emissions heating systems in new buildings?

Base	n=	Yes	No	Not answered
All respondents	112	60	19	33
All respondents (%)	112	54%	17%	29%
All answering (%)	79	76%	24%	-
- Individuals	21	67%	33%	-
- Organisations	58	79%	21%	-
- Property developer / builder	16	100%	0%	-
- Energy – trade body	12	58%	42%	-
- Local Authority	10	90%	10%	-
- Energy – manufacturer / supplier	9	67%	33%	-
- Construction	6	100%	0%	-
- Other	5	40%	60%	-

Q3. Are there any limited, specific situations where the use of bioenergy systems would be required in new buildings?

Base	n=	Yes	No	Don't know	Not answered
All respondents	112	27	18	32	35
All respondents (%)	112	24%	16%	29%	31%
All answering (%)	77	35%	23%	42%	-
- Individuals	21	43%	24%	33%	-
- Organisations	56	32%	23%	45%	-
- Property developer / builder	15	0%	20%	80%	-
- Energy – trade body	8	63%	25%	13%	-
- Local Authority	12	42%	25%	33%	-
- Energy – manufacturer / supplier	9	22%	44%	33%	-
- Construction	5	40%	0%	60%	-
- Other	7	57%	14%	29%	-

Q5. Do you agree with the approach to conversions as set out in section 2.3?					
Base	n=	Yes	No	Don't know	Not answered
All respondents	112	41	16	19	36
All respondents (%)	112	37%	14%	17%	32%
All answering (%)	76	54%	21%	25%	-
- Individuals	21	52%	33%	14%	-
- Organisations	55	55%	16%	29%	-
- Property developer / builder	14	21%	14%	64%	-
- Energy – trade body	10	40%	50%	10%	-
- Local Authority	11	73%	8%	19%	-
- Energy – manufacturer / supplier	9	67%	11%	22%	-
- Construction	5	80%	0%	20%	-
- Other	6	83%	0%	17%	-

Q6. Do you envisage any unintended consequences as a result of the proposed approach to conversions as set out in section 2.3?				
Base	n=	Yes	No	Not answered
All respondents	112	39	27	46
All respondents (%)	112	35%	24%	41%
All answering (%)	66	59%	41%	-
- Individuals	18	67%	33%	-
- Organisations	48	56%	44%	-
- Property developer / builder	10	20%	80%	-
- Energy – trade body	9	67%	33%	-
- Local Authority	11	91%	9%	-
- Energy – manufacturer / supplier	9	33%	67%	-
- Construction	4	100%	0%	-
- Other	5	40%	60%	-

Q11. Do you anticipate any form of heating within a non-domestic building which will require direct emissions heating (DEH) after 2024?				
Base	n=	Yes	No	Not answered
All respondents	112	35	25	52
All respondents (%)	112	31%	22%	46%
All answering (%)	60	58%	42%	-
- Individuals	20	45%	55%	-
- Organisations	40	65%	35%	-
- Property developer / builder	7	43%	57%	-
- Energy – trade body	6	67%	33%	-
- Local Authority	10	70%	30%	-
- Energy – manufacturer / supplier	8	50%	50%	-
- Construction	5	100%	0%	-
- Other	4	75%	25%	-

Appendix B: Consultation Questions

1. Do you agree with the approach set out in 2.1 to regulate direct emissions heating systems in new buildings?

(Closed response question – Yes / No / Don't know)

2. Do you envisage any unintended consequences as a result of this approach? Please provide reasons for your answer.

(Closed response question – Yes / No - with open response option)

3. Are there any limited, specific situations where the use of bioenergy systems would be required in new buildings?

(Closed response question – Yes / No / Don't know)

4. If 'Yes', what do you believe the criteria should be for introducing such an exemption? Please provide evidence to support your answer.

(Open response question)

5. Do you agree with the proposed approach to conversions as set out in section 2.3?

(Closed response question – Yes / No / Don't know)

6. Do you envisage any unintended consequences as a result of this? Please provide reasons for your answer.

(Closed response question – Yes / No - with open response option)

7. What criteria would you use to define the replacement of a direct emissions heating (DEH) system as being 'reasonably practicable'?

(Open response question)

8. What criteria would you use to define it as being 'not reasonably practicable'?

(Open response question)

9. How might these proposals impact upon people with one or more of the protected characteristics listed in the Equality Act 2010 (for example: a positive, negative or neutral impact)?

(Open response question)

10. How might these proposals help the Scottish Government ensure due regard of the three needs of the Public Sector Equality Duty (PSED)?

(Open response question)

11. Do you anticipate any form of heating within a non-domestic building which will require DEH after 2024? Please provide details of the factors – whether technical, economic or social – which would require DEH after 2024?

(Closed response question – Yes / No - with open response option)



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