# Written evidence from Jigsaw Infrared

## Executive Summary

1. It is possible to build a Net Zero property now. There are already Carbon Positive properties being produced and tested. However, developers are not properly encouraged to build them on a larger scale.

2. The consensus from our client base is that there is no single source of advice for how to build this property. The public is misinformed as to the best course of action to reach Net Zero with their building. Builders must source all this information themselves and make the best judgement based on advertising, sales tactics, and out of date figures.

3. By favouring technologies such as Air Source Heat Pumps (ASHP) and Ground Source Heat Pumps (GSHP) in regard to subsidies, builders and developers from experimenting and innovating with new methods of construction.

4. Meanwhile, Infrared (IR) heating is one of the most cost-effective heating systems available, efficiently converting electrical energy into far-infrared heat. Jigsaw uses aluminium in the construction of the heaters, ensuring that the panels produce the most efficient heating. IR heat works exactly like the world's largest natural heater, the sun. Every object emits and absorbs IR radiation and the hotter an object is, the more IR radiation it emits.

5. The "playing field" must be evened out for all technologies and innovators to create the most efficient solutions for the range of new build, retrofit, domestic and commercial properties across the UK.

## About Jigsaw

1. Jigsaw Infrared is a family-owned West Midlands-based manufacturer and installer of IR heating, a more efficient, greener, and comfortable heating system.

2. Jigsaw is committed to finding the most efficient and environmentally friendly products.

3. Jigsaw champions the fabric first approach, using less grid energy and more self-generated electricity to live cleaner.

<u>To what extent have the Climate Change Committee's recommendations on decarbonising the structural fabric of new homes been met?</u>

1. Progress has been made based on the Climate Change Committee's recommendations, but there is still a way to go. To make sizeable gains and, ultimately, achieve the report's recommendations, a revaluation of the evidence and assumptions underpinning policymaking is required.

*Finance and funding*

2. There are still urgent funding gaps that must be addressed, including secure UK Government funding for low-carbon sources of heating beyond 2021 and better resources for local authorities.

3. IR heating is one of the most effective heating systems available, efficiently converting electrical energy into IR heat. However, current Government policy lags behind what is a success story of UK technological development, disadvantaging it compared with less green technologies by excluding it from the Domestic Renewable Heat Incentive Initiative (RHI).

4. According to the Institute for Government, the current RHI scheme failed to encourage the uptake of renewable heat technologies. IR heating, as a sustainable and economically efficient technology, can provide an increased incentive. However, without updating current guidelines, the sector's potential will be limited, as will its ability to contribute to key Government targets on the environment.

5. The Environmental Audit Committee (EAC) has called for the Green Homes Grant (GHG) voucher scheme to be overhauled and extended, which would help with the broader national policy debate on decarbonising heat in homes by 2050.

*Building new homes*

6. New homes should be built to be low-carbon, energy and water-efficient, and climate-resilient.

*Performance and compliance*

7. The way new homes are built and existing homes retrofitted continues to fall short of stated design standards.

8. The Government has not considered new and emerging technologies in their 2019 Future Home Standards paper. Most current documentation pushes ASHP heavily without any consideration for the building that they will be installed in. Or the potential of better alternatives being available. There is not a single answer to the Net Zero question. The UK is full of innovators that are developing products and services to reach the global marker that is 2050. The Government must be more open to these innovators to achieve carbon neutrality.

9. The issues currently arising are that some new home builders are making positive changes in the pursuit of Net Zero now. Though, one of the key issues from preventing them from innovating is the constant delay of the updated SAP figures. In 2018, Alex Smith wrote about how changes to the energy use calculation could accelerate a move from gas to electric heating in homes. In the article, Smith discusses that the lower

carbon emissions factors for electricity, which reflects the rapid decarbonisation of the National Grid.

How can materials be employed to reduce the carbon impact of new buildings, including efficient heating and cooling, and which materials are most effective at reducing embodied carbon?

10. IR heating is one of the most cost-effective heating systems available, efficiently converting electrical energy into far-infrared heat. Jigsaw uses aluminium materials in the construction of the heaters, ensuring that the panels produce the most efficient heating. IR heat works exactly like the world's largest natural heater, the sun. Every object emits and absorbs IR radiation and the hotter an object is the more IR radiation it emits.

11. In domestic installations, the addition of an IR panel or panels to new buildings is extremely simple. The panels require a standard 2.5mm twin and earth power cable feed to each heater and a control device. A panel can be installed in most situations within an hour. A whole 2/3-bedroom house can be completed in one day. Larger properties would require two days.

12. IR heating is becoming more of a standardised installation. This is because buildings will be built and/or retrofitted to need far less heat energy. It is important to realise that a single item installation will not solve all issues for all properties in the UK. Several pieces of the building will need to be addressed.

13. This includes improving fabric and services, heat recovery technologies (decentralised air ventilation in built-up areas), on-site renewable energy generation (solar, wind, battery), IR heating with individual room control (with PIR control), and smart tariffs (allow cheaper energy to charge batteries/cars).

What role can nature-based materials can play in achieving the Government's net zero ambition?

14. The current Government-led advice from BEIS in the Future Home Standards Part L document for decarbonisation discusses the "minor role" that direct electric heating will play. With a greener grid and more micro-generation on properties, we believe that direct electric heating such as IR will become a standard for many properties. A water-based heating system is not viable for a large percentage of homes in the UK. So why is the Government heavily advising of ASHP installations for most applications? Only a small percentage of homes in the UK can fit an ASHP with little modification to the property or heating equipment. The total cost of installation and building modification with IR heating will be less than an ASHP install. Our calculations show that it would be possible to install a whole heating and control system with water and solar panels for the same cost as an ASHP installation.

15. The consideration must be made for other technologies which can do the same job on a more cost-effective front.

16. Air source pumps work by extracting heat from the surrounding air. The pumps work well at milder temperatures but will start to struggle and will rely more on electricity making them expensive to run at lower temperatures. On colder days, the system will not be able to provide enough heat to warm the building.

17. IR heaters (in this case, far-Infrared heaters) work by passing electricity through an element. Jigsaw's products use two different types of heating mats. These fill around 90% of the surface area of the panel. This enables heat and IR light to be released into the room and warm the fabric of the building, furniture, and the people in the room.

What role can the planning system, permitted development and building regulations play in delivering a sustainable built environment? How can these policies incentivise developers to use low carbon materials and sustainable design?

18. It is possible to build a Net Zero property now. There are already Carbon Positive properties being produced and tested. So why are the developers not building them? Unfortunately, because they are not required to.

19. The consensus from our client base is that there is no one source of advice for how to build this property. The public is confused misinformed as to the best course of action to reach Net Zero with their building. Builders must source all this information themselves and make the best judgement based on advertising, sales tactics, and out of date figures. The "playing field" must be evened out for all technologies and innovators to present their case. By favouring technologies such as ASHP and GSHP with subsidies it stops builders and developers from experimenting with new methods of construction.

*Recommendations at Government level*

- Develop an RHI/Green deal to allow a wider variety of participation and associated innovation
- Give SME's opportunities to access test facilities such as the BRE to prove their products freely
- Build a centre of NET ZERO excellence for the presentation of emerging technology
- Support and reward industry collaborations to reduce carbon emissions
- Develop legislation to ensure all new homes are built carbon neutral by 2028 and carbon positive by 2030
- Provide a clear map for the renovation of current housing stock to decarbonise (Based on age and construction type)
- Support business and university collaborations to develop and design decarbonisation technologies after ERDF funding expires

Should the embodied carbon impact of alternative building materials take into account the carbon cost of manufacture and delivery to site, enabling customers to assess the relative impact of imported versus domestically sourced materials?

20. Yes. Currently, the Government focuses too heavily on operational carbon. To provide a full picture, factors such as manufacture, delivery, and the impact of installation should be considered.

21. Only 10% of UK homes would benefit from an ASHP installation without modification to interior or insulation. A further 30% of homes will need modifications to make it work efficiently.

22. Similarly, the viable economic lifespan of a unit is only 10 years.

23. Without understanding and considering the fullest picture, inefficient solutions will continue to be proposed, passing up opportunities to impact housing being built currently that is likely to have a lifespan beyond 2050.

How well is green infrastructure being incorporated into building design and developments to achieve climate resilience and other benefits?

24. It is possible to build a Net Zero property now and there are already Carbon Positive properties being produced and tested. However, fixation on a narrow set of pre-agreed solutions prevents and/or discourages developers from more climate-friendly construction.

25. In 2025 the Future Homes Standard will be introduced and will set energy-efficient standards for new homes and extenders. It will ensure that new homes are future proofed with low carbon heating systems and high levels of efficiency and the new homes will produce 75-80% fewer carbon emissions than homes built under current regulations. This is an important shift for the housing stock in the UK. The heating system for these buildings will need to be quicker at responding and more accurate to ensure that overheating does not occur.

How should we take into account the use of materials to minimise carbon footprint, such as use of water harvesting from the roof, grey water circulation, porous surfaces for hardstanding, energy generation systems such as solar panels?

26. One of the biggest concerns with a move to electric heating is where is all the power coming from. There is consistent growth in renewables in the UK. Each addition of a wind turbine, solar panel, Hydroelectricity, bioenergy, and other green equipment makes the grid greener and less dependent on fossil fuels. This trend is growing as more homeowners and developers make a concerted effort to add to this yearly. This equates to Mega Watts per year.

27. Due to the growth in green energy, we are seeing a declining use of fossil fuels to produce electricity. In 2020 the Government's official data revealed that renewable energy made up 47% of the UK's electricity generation in the first three months of the year, smashing the previous quarterly record of 39% set in 2019.

28. To reduce energy usage and grid dependence, our clients have been installing solar and battery storage in conjunction with IR heating. This enables the property to make use of green, renewable energy by feeding the electricity gathered by the solar panels directly into the heating or hot water systems. Secondly, the batteries also have another use. The Time of Use tariffs allow the battery to charge at off-peak when the electricity is in low demand and to then use the energy when electricity is at its highest cost. This balances out the cost of using IR electric heating and brings the overall cost of running the system close to gas prices. This also reduces the demand on the grid as each house has its own power supply. This is useful in winter when there is a reduced amount of solar energy.

29. One of the biggest barriers that Jigsaw has found when upgrading heating is the total incoming amperage to a property. This problem is twofold as this and local power infrastructure places a limit on the number of solar panels that can be installed on a property. Jigsaw works with a supplier of inverters and batteries which can minimise this disruption. The batteries can reduce the power exported from the solar array to the grid in times of surplus electricity. This negates the issue of overloading local transformers and having to upgrade systems.

30. Grid balancing technology is getting smarter. AI systems will be able to learn the peak demands of any property and make judgements on whether the battery will need to charge or if the solar panels will be able to recover enough energy during the day. Our control system for the heating will also soon be able to make decisions on when to heat the home. Again, this will make use of the Time of Use tariff system. If it is determined that the property will need to be heated in the high-cost period, the heating will heat the home to a slightly higher temperature to ensure that the peak period is not used. This will be an important addition seeing that 14% of homes in the UK are in fuel poverty.

31. The combination of a control system is an extremely important part of the efficient nature of IR. Jigsaw's Genius system uses motion detection to only heat rooms that are being used to a required temperature of 19-21º. Rooms that are not occupied can be set to a lower temperature, usually 14º. Jigsaw's heaters have been shown to raise the temperature from 14-21º in 14 minutes. This quick response time ensures that the occupant can be warmed when needed very quickly. This is in comparison to a gas radiator which requires hours of use and underfloor heating, which can take days. The fast response time with IR heating ensures that lower amounts of energy are being used. This provides a cost-effective way of heating a property.

<u>How should re-use and refurbishment of buildings be balanced with new developments?</u>

32. Much of the existing housing stock across stock has a lifespan beyond 2050.

33. Through the 2025 Future Homes Standard, homeowners will only be affected if they are planning on building an extension or making thermal upgrades. Existing homes will also be subject to higher standards with a "significant improvement" on the

standard for extensions, making homes warmer and reducing bills. Replacements and repairs will also have to be more energy efficient.

34. This will include the replacement of windows and building services such as heat pumps, cooling systems, or fixed lighting. But currently not IR heating panels and control systems.

35. As construction moves to a more passive build, revolutionary methods of heating must be considered. IR heating in these properties will be a small fraction of that required in the current housing stock. This new generation property will require a complete system that manages data from many sources to create a comfortable balance:
    a. Temperature
    b. Air quality/moisture
    c. Water temperature
    d. Occupancy - AI & geofencing driven data
    e. Car charging
    f. Optimisation of renewables

What can the Government do to incentivise more repair, maintenance and retrofit of existing buildings?

36. Encourage and incentivise greater use of technologies that are vastly more appropriate and/or efficient.

37. The present limited focus can discourage prospective retrofitters through a combination of up-front cost, aesthetics, efficiency, or necessary installation and remedial work.

38. Solutions like IR can provide retrofitters with a solution that could be more applicable and efficient to run within their current property, be more easily installed, and cost less to install.

39. However, while policy assessments are delayed and funding pushes consumers and developers down pre-set generic routes, there will continue to be drop-off when homeowners recognise the one size fits all approach is inadequate.

*August 2021*