

Built Different

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About Startup Coalition

Startup Coalition, formerly the Coalition for a Digital Economy (CoadeC), is an independent advocacy group that serves as the policy voice for Britain's technology-led startups and scaleups.

Startup Coalition was founded in 2010 by Mike Butcher, Editor-at-Large of technology news publisher TechCrunch, and Jeff Lynn, Chairman and Co-Founder of online investment platform Seedrs. Startup Coalition works across a broad range of policy areas that matter the most to startups and scaleups: access to talent, access to finance & regulation. We have over 3,500 startups on our mailing list. Startup Coalition is also represented on the Department for Business and Trade's Smart Data Council and on the Government's Digital Economy Council.

In 2022, Startup Coalition convened the ClimateTech Policy Coalition, consisting of the Startup Coalition, Undaunted, techUK, Tech Nation, Cleantech for UK, and TechZero. Together they represent a cross-section of entrepreneurs, inventors and innovators on the forefront of climate technology, or ClimateTech. The coalition publishes an annual report highlighting low to no cost policy opportunities to unlock climate innovation. The latest of these reports, from November 2023, can be found [here](#). In March 2024, Startup Coalition launched its inaugural ClimateTech Index, tracking the 1,000 best funded UK-headquartered ClimateTechs, which can be found [here](#).

Acknowledgements

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Executive Summary

In order to reach net zero, we need to reduce the environmental impact of buildings in the UK. Today, the greenhouse gas emissions of the built environment constitutes 20% of the total emissions we produce in the UK annually.

So far, however, we have failed to produce a credible plan to decarbonise this sector, with successive governments falling short with unambitious, complex, and ever-changing policies. Further, the Labour Government plans to accelerate housebuilding to fuel economic growth, but under current plans we do not have the carbon budget to deliver these homes in a way that is compatible with our net zero goals. This is a huge challenge, and has led to the growth of a highly innovative built environment startup sector developing cutting edge solutions across the buildings supply chain.

In 2023, the UK was home to a £878m built environment ClimateTech sector, employing over 2,500 people across the UK and contributing 12% of all ClimateTech exits over the last 14 years.

This sector is a national asset, featuring firms developing low carbon building materials and construction processes, to cutting edge low-carbon heating systems. From innovative insulation materials, to software to empower households to use energy more efficiently. If these startups are let loose on the challenge of decarbonising the built environment, we will not just accelerate climate action in the sector, but scale solutions that can then be exported across the globe to decarbonise the built environment everywhere.

To unlock this opportunity we must set the sector up for success with policies that work. For Startup Coalition, this means Building Differently, starting with **creating a holistic strategy for decarbonisation of the built environment** from breaking ground to household use. This is our top, and most complex, recommendation for the Government.

To ensure that we build low carbon buildings, the UK Government **should mandate embodied GHG emissions reporting for new builds** and then **explore policies and incentives to scale up the use of novel low carbon building materials** in construction that it directly or indirectly procures.

For the sector as a whole to incentivise the right behaviours and innovative technologies, **energy performance certificates must be reformed** to become more granular, updated regularly, and made accessible digitally. We also believe that the UK Government should **consult on whether to make the energy use metrics mandatory for non-domestic buildings**, and that in order to ensure that low-carbon electric heating is incentivised, the UK Government must **rebalance gas and electricity prices**.

To ensure that best in class startup technologies are used to retrofit existing buildings, the Labour Government should **introduce a retrofit sandbox** as a first initiative under its Regulatory Innovation Office. It should **explore innovative property-linked finance mechanisms to fund retrofits**, including **a salary sacrifice scheme to fund domestic retrofits**.

Finally, to empower households to use energy more efficiently, particularly through the use of cutting edge energy management startup software, **a Smart Data scheme for the energy sector** should be expedited.

Introduction

Why we must decarbonise the built environment

Reducing the environmental impact of the homes we live in is fundamental to combating climate change. In 2022, residential buildings made up 20% of total UK greenhouse gas (GHG) emissions, a 12% drop on 1990 levels, but a slight year on year increase between 2021 and 2022.¹

The built environment contributes to GHG emissions in a number of ways, including the embodied emissions from the production of raw materials used to build houses, including cement, concrete, steel and glass; the emissions produced from the process of constructing buildings; the emissions produced in generating power to heat homes; and the emissions produced to generate electricity that is used by households everyday.

Importantly, the operational emissions impact of buildings is a proxy for the cost of running that building. Against the backdrop of rising energy bills and a cost of living crisis, improving the efficiency and performance of buildings will reduce costs for people up and down the UK.

How we can decarbonise the built environment

In order to address the environmental impact of the built environment, we must take a holistic approach, and examine the lifecycle of buildings, from breaking ground, to household use. Fortunately, across every stage of this decarbonisation process, there are UK startups developing the tools, products and services to increase quality, reduce environmental impact, and lower costs for households.

New Builds: Building Differently

Firstly, we can reduce the environmental impact of the materials we use to build new homes and non-domestic buildings. On the one hand this could entail reducing the environmental impact of the production of core raw materials like cement and concrete. An example of this would be through the use of software and artificial intelligence (AI) to optimise the production process and increase energy use

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<https://assets.publishing.service.gov.uk/media/65c0cf2e70428200137521cd/2022-final-emissions-statistics-one-page-summary.pdf>

efficiency, such as that which can be achieved through the use of software such as [Carbon Re's](#) platform. Alternatively there are several UK ClimateTechs seeking to develop raw materials innovatively to decrease the embodied carbon footprint, such as [Recly8's](#) use of incinerator waste as concrete feedstock.

Secondly, building differently could look like using different materials, or different methods, entirely, with environmental impact a core consideration. For instance, the Climate Change Committee has called for increasing the number of timber-framed buildings built in the UK.² Meanwhile, the [Passivhaus Trust](#) advocates for a whole-building approach to construction with insulation, airtightness, air quality, and passive solar gains at the heart of the process. The goal of the initiative is to increase occupant comfort without the need for space heating and cooling.

Thirdly, building differently in the first place is the most cost-effective way to reduce the operational environmental impact once a home or building becomes occupied. A report for the Climate Change Committee previously found that the “costs of achieving higher standards via retrofit are three to five times higher than for new buildings”.³ Getting it wrong up front can cost more cash and carbon down the road.

Existing Buildings: Retrofit and Low Carbon Heat

For buildings that are already standing, maximising fabric efficiency is critical, through retrofitting efficient glazing, wall, floor and roof insulation, with average reductions of space heat demand from 4-18% available according to the CCC's analysis.⁴ Simultaneously, the source of heating a property must be as low-carbon as possible. If the aspirational outcome is low-carbon heat, there are numerous options, including heat networks and less widely deployed technologies like hydrogen boilers and infra-red, but the most widely deployed low-carbon technology to date has been air-source and ground-source heat pumps.

UK startups are providing technology to support the deployment of heat efficiency measures, as well as producing novel hardware and manufacturing new materials to support retrofitting. For instance, [Furbnow](#) offers an end-to-end “Home Energy Plan” to enable a homeowner to survey, plan, and action the retrofit of their property. In contrast, [Q-Bot](#) has developed underfloor insulation that can be installed by a robot. Meanwhile, [Anzen](#) is a UK-based startup that has developed a solid-state prefab wall with inbuilt heating and ventilation technology. Separately, this component of decarbonisation also includes shifting to low-carbon power beyond heating, including through the installation of on-site renewable generation and battery storage.

Finally, “retrofitting” can also be used to refer to the devices and hardware installed in buildings. This includes everything from LED light bulbs, which alone could result in 5.4 TWh energy savings by 2035 - which is more electricity than Cyprus produced in 2022, through to low-flow shower heads, which can further increase efficiency of heat usage.⁵

² <https://www.theccc.org.uk/wp-content/uploads/2019/02/UK-housing-Fit-for-the-future-CCC-2019.pdf>

³ <https://www.theccc.org.uk/wp-content/uploads/2019/07/The-costs-and-benefits-of-tighter-standards-for-new-buildings-Currie-Brown-and-AECOM.pdf>

⁴ <https://www.theccc.org.uk/wp-content/uploads/2020/12/Sector-summary-Buildings.pdf>

⁵ <https://www.iea.org/regions/europe/electricity>

Using Buildings: Behaviour Change

Beyond the physical composition of a building, a critical part of optimising the efficiency and reducing the environmental impact of the built environment is the behaviour of occupiers. For instance, the CCC has calculated that switching off lights alone in homes could result in a 0.4 TWh energy by 2035.⁶ Though behaviour change can be challenging for policymakers to influence beyond public awareness campaigns, innovative firms have had success where they can tie behaviour change to direct financial benefit. For instance, [Octopus Energy](#) has developed Smart Tariffs to enable homeowners to use energy at the times of day when it is cheaper and lower-carbon, using installed hardware like batteries, heat pumps and smart meters for optimisation.

Reasons to Accelerate Action

It has never been more urgent to accelerate action to reduce the environmental impact of the built environment for four key reasons.

Firstly, the Labour Government is about to build a whole load of new homes. Just four days after the General Election in July 2024, Chancellor Rachel Reeves used her first major speech to announce major planning reforms, including the reintroduction of mandatory house building targets. Economic justification aside, it is unavoidable that building more homes will use more resources, which will generate more GHG emissions. This is a challenge because analysis from March 2023 suggested that the UK would use the remaining carbon budget for house building as defined under its legally mandated net zero target by 2036, and this was under the old approach to house building.⁷ Building more homes will just bring this date forward, leaving the Government in the position that continuing to build the homes it wants will breach its own emissions law.

Secondly, despite progress in recent years, the plan to decarbonise the built environment isn't working quickly enough. According to the Climate Change Committee (CCC), "the UK's legally-binding climate change targets will not be met without the near-complete elimination of greenhouse gas emissions from UK buildings".⁸ Under UK Government projections, current policy commitments will only achieve a 60% reduction on 1990 levels.⁹ This will leave a hefty chunk of residual emissions that will need to be offset, more in fact than the CCC's projected offset capacity for the whole of the UK in 2050.¹⁰

Thirdly, a failure to take action to decarbonise homes and buildings is not just an environmental harm, but a social harm too. Leaky, damp homes do not just cost more to heat, emitting more GHG emissions in the process, they are also worse to live in. In the UK, evidence suggests that we have some of the oldest and leakiest homes in Europe, losing heat on average 3 times faster than homes in Norway

⁶ <https://www.theccc.org.uk/wp-content/uploads/2020/12/Sector-summary-Buildings.pdf>

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<https://www.sciencedirect.com/science/article/abs/pii/S092180092200386X#:~:text=The%20results%20show%20that%20maintaining%20domestic%20floor%20area%20per%20capita>

⁸ <https://www.theccc.org.uk/wp-content/uploads/2019/02/UK-housing-Fit-for-the-future-CCC-2019.pdf>

⁹ <https://ukgbc.org/wp-content/uploads/2021/11/UKGBC-Whole-Life-Carbon-Roadmap-A-Pathway-to-Net-Zero.pdf>

¹⁰ The CCC estimates that under current plans 115 MtCO₂e would need to be offset.

or Germany.¹¹ Indeed, evidence has shown that insulating homes properly could save the UK economy £136bn over thirty years, including a £13bn to the NHS alone.¹²

Finally, if we do decarbonisation of the built environment right, it also represents a huge growth opportunity for the UK economy.

The Opportunity of Building Different

Research from the Centre for Energy Policy suggests that for every £1m spent on energy efficiency improvement programmes, between £4.3m and £14.1m in cumulative GDP gains, and between 2 and 7 jobs, could be delivered.¹³ A core growth opportunity within this will be the low-carbon built environment startup sector. This sector includes startups engaged in the production of novel and sustainable building materials, the building of sustainable homes, or the use of data to empower residents and building owners to use energy in their buildings more efficiently. This sector also includes startups who enable the production of renewable energy within the domestic built environment.

In Startup Coalition's 2024 ClimateTech Index, which analysed the fundraising journeys of the 1,000 best funded ClimateTechs that have been founded in the UK, the cumulative raise of startups within the built environment was £689m, the fourth most of any sector. The 92 built environment startups in the Index were valued at a combined £878m and employed over 2,500 people as of December 2023. The sector also constituted 12% of all ClimateTech exits.

The Government has an opportunity to deploy policy that not only accelerates decarbonisation of the built environment, but also supports the growth of these companies. Built environment ClimateTechs can then export their technologies to the rest of the world, resulting in further gross-value added to the UK economy, as well as increased decarbonisation of the built environment around the globe. As articulated clinically in the Tony Blair Institute for Global Change's report in May 2024, if we want to have an impact on climate action globally, one of the most efficient and effective scalable opportunities to do so is through exporting technology and services that are low-carbon.¹⁴

We must accelerate decarbonisation of the Built Environment. There is an opportunity for the UK Government to combine its Warm Homes Plan, its ambitions to build more homes, and forthcoming changes to building regulations, including the Future Homes Standard and Home Energy Model, to produce a real strategy.

11

<https://ovo-data-dashboard.com/editorials/is-your-home-more-at-risk-ovo-data-shows-the-impact-of-uk-s-leaky-homes-with-british-properties-losing-heat-three-times-faster-than-houses-in-norway-or-germany#>

12 https://files.bregroup.com/corporate/BRE_the_Cost_of_ignoring_Poor_Housing_Report_Web.pdf

13 <https://www.sciencedirect.com/science/article/pii/S0301421521002457?via%3Dihub>

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<https://assets.ctfassets.net/75ila1cntaeh/4C5HdkDv6a8jA3JK2zghWR/fda0fe68da85de1ed52813b0b6d94add/ttAE7q54qsQ7V2dg7WLqX--143913062024>

Recommendation 1: Create a holistic strategy for decarbonisation of the built environment from breaking ground to household use. This is our top, and most complex, recommendation for the Government.

The rest of this report will be focused on the role of technology as part of this strategy rather than the strategy itself, and also on ways to accelerate the decarbonisation potential of technology in the short term, whilst we wait for a broader strategy from the government to take shape.

Building Differently

Embodied GHG emissions are those embedded into the materials used to construct buildings in the first place, including from the construction and refurbishment of buildings. Combined embodied emissions constitute 20% of UK built environment emissions today.¹⁵ Globally, the embodied GHG emissions in the raw materials that constitute our built environment are huge contributors to climate change, with cement production contributing 6.8% of total global annual emissions, and steel 6.5%.¹⁶

But it doesn't have to be this way.

Whilst the CCC has recommended increasing the use of timber in construction, there are also dozens of startups in the UK working on decarbonising cement and concrete. Right now, however, the major suppliers of these raw materials are not sufficiently incentivised to work with these startups, and the startups developing low-carbon materials to compete with fossil-fuel rich incumbents are not price competitive, not least because the cost of emissions is not costed in.

In the UK, “around 30% of construction projects are undertaken by or on behalf of the public sector”, meaning the UK Government is itself one of the most important ‘buyers’ in the construction supply chain.¹⁷ The UK government must ensure that the new homes and buildings are low-carbon, starting by ensuring that we improve our visibility of embodied emissions of buildings.

The Carbon Emissions (Buildings) Bill

As it stands, the embodied emissions of buildings do not have to be calculated, let alone shared. This must change. Mandating the measurement of whole-life embodied carbon emissions of a building has been identified as a critical gap by colleagues across industry as well as by many policymakers, including the Environmental Audit Committee (EAC) in 2022.¹⁸

Recommendation 2: The UK Government should mandate embodied GHG emissions reporting for new builds.

This should be achieved through the introduction of a new Part Z into the Building Regulations, as recommended by an industry campaign group of the [same name](#), through passing the Carbon Emissions

¹⁵

<https://ukgbc.org/our-work/topics/advancing-net-zero/embodied-carbon/#:~:text=Embodied%20carbon%20refers%20to%20the.refurbish%20and%20repurpose%20a%20building.>

¹⁶

https://rmi.org/wp-content/uploads/dlm_uploads/2024/07/structuring_demand_for_lower_carbon_materials_report.pdf

¹⁷ <https://www.theclimategroup.org/our-work/news/public-sector-needs-its-game-embodied-carbon>

¹⁸ <https://committees.parliament.uk/publications/22427/documents/165446/default/>

(Buildings) Bill.¹⁹ These new regulations would outline the requirement for new builds to undertake an embodied emissions lifecycle assessment. We agree with the proposal to require this assessment for projects with “a gross internal area of more than 1000m², or that create more than 10 dwellings.”

In its 2023 consultation on the Future Homes Standard, the Government stated that “The government intends to consult on our approach to measuring and reducing embodied carbon in new buildings in due course.”²⁰ This must be expedited with a view to introducing the legislation as soon as possible, but there are additional ways in which the Government can support the infrastructure to enable embodied emissions reporting in the short term, starting with another of the EAC’s 2022 recommendations to require the collection and publication of Environmental Product Declarations (EPDs) through Government procurement.²¹ This would entail an amendment to Procurement Policy Note (PPN) 06/21 requiring an EPD to accompany the currently mandated Carbon Reduction Plan.²² The government could support vendors, and in particular small businesses, to adhere to this new requirement through grants in parallel to fund EPDs, just as was done in the US under the Inflation Reduction Act.²³ We agree with EAC that an accompanying EPD database comprising the EPDs gathered through procurement processes should be digital, freely available to end users, and user-friendly.

Fortunately, there are a number of startups in the UK that have developed software to support developing lifecycle assessments, meaning adding this requirement does not need to add a huge amount to the overall construction project cost. Indeed, there were fifteen ClimateTechs in our 2023 ClimateTech Index focusing on services and software to optimise the construction process, valued at a combined £178m.

Quantification of embodied emissions is only the first step, however, and the UK Government has a major role to play in demanding low-carbon products and services across every part of society, including in house-building.

¹⁹

<https://bills.parliament.uk/bills/3211#:~:text=A%20Bill%20to%20require%20the,buildings%3B%20and%20for%20connected%20purposes.>

²⁰

<https://www.gov.uk/government/consultations/the-future-homes-and-buildings-standards-2023-consultation/the-future-homes-and-buildings-standards-2023-consultation>

²¹ <https://committees.parliament.uk/publications/22427/documents/165446/default/>

²²

https://assets.publishing.service.gov.uk/media/60ba4d208fa8f57ce980b5b7/PPN_0621_Technical_standard_for_the_Completion_of_Carbon_Reduction_Plans_2_.pdf

²³

<https://www.epa.gov/greenerproducts/grant-program-reducing-embodied-greenhouse-gas-emissions-construction-materials-and>

Demanding Low-Carbon Building Materials

Labour's House Building Goals

As stated in the introduction, one of the first speeches that the new Chancellor Rachel Reeves gave after Labour's landslide General Election victory in July 2024 was to announce major planning reforms, including the reintroduction of mandatory house building targets. Subsequently, Housing Secretary Angela Rayner announced that local authorities across England would be given new house building targets as part of a nationwide drive to deliver 1.5m more homes. Such a target, if met using current building methods, would make adherence to the UK Government's legally binding net zero targets extremely challenging, with the remaining budget for house-building set to be exhausted by 2036 *under old house-building targets*.²⁴

Importantly, the raw ingredients are there for this increased urgency to build homes to not necessarily encumber climate action, and indeed it could even accelerate decarbonisation of the built environment. Climate change action and net zero alignment were key parts of the Government's Summer 2024 consultation on changes to the National Planning Policy Framework, as is a commitment to innovation.²⁵ Further, in 2021, the then Conservative Government introduced mandatory Carbon Reduction Plans for suppliers of goods and services to the UK Government worth over £5m through PPN 06/21.²⁶ But more action is needed to ensure that Labour's house building plans can accelerate the adoption of low-carbon construction materials and services to the pace that the climate crisis demands, and in a way that enables UK-based startups providing these goods and services to scale and export to the rest of the world.

The Future Homes and Buildings Standard

It is vital the UK government sets ambitious standards for the economic performance of new homes, not least because it is three to five times more expensive to retrofit energy efficiency measures than it is to build them into a building in the first place.²⁷ The environmental impact of newly built homes and non-domestic buildings is defined through building regulations in the UK but is devolved. In its 2021 Heat and Buildings Strategy, the then Conservative Government set out ambitions to define a new Future Homes and Buildings Standard (FHBS) for buildings built in England, which is now set to come into force

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<https://www.sciencedirect.com/science/article/abs/pii/S092180092200386X#:~:text=The%20results%20show%20that%20maintaining,domestic%20floor%20area%20per%20capita>

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<https://www.gov.uk/government/consultations/proposed-reforms-to-the-national-planning-policy-framework-and-other-changes-to-the-planning-system/proposed-reforms-to-the-national-planning-policy-framework-and-other-changes-to-the-planning-system#scope-of-consultation>;

https://assets.publishing.service.gov.uk/media/66acffddce1fd0da7b593274/NPPF_with_footnotes.pdf

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https://assets.publishing.service.gov.uk/media/60ba4d208fa8f57ce980b5b7/PPN_0621_Technical_standard_for_the_Completion_of_Carbon_Reduction_Plans_2_.pdf

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<https://www.theccc.org.uk/wp-content/uploads/2019/07/The-costs-and-benefits-of-tighter-standards-for-new-buildings-Currie-Brown-and-AECOM.pdf>

in 2025 after multiple consultations.²⁸ Though we are awaiting the Government's response to the latest consultation, the latest version of the FHBS included the following changes to "significantly lower carbon emissions compared to those built to the 2013 standards":

- New homes and buildings will have embodied carbon emissions that are at least 75% lower than those of homes built under 2013 standards.
- New homes and buildings will be built with the tightened energy efficiency standards for fabric design as confirmed in the Part L 2021 consultation.
- All new homes and buildings built from 2025 should require no retrofitting to reach net zero in the future.
- The Standard Assessment Procedure (SAP) will be replaced by a new Home Energy Model (HEM).

The FHBS is better than what has come before, but there has been criticism from industry that it does not go far enough, and founders from the built environment sector that we have engaged in this work have told us that many homes and non-domestic buildings are built beyond the FHBS by default today anyway. Indeed, for some this reform has been a missed opportunity to be more ambitious, perhaps with a further planned stage-gating of more rigorous requirements in the future. Evidence suggests that this would be possible, despite concerns about the ability of industry to respond to more ambitious timelines and high standards, with sufficient lead time, clear timelines, and policymaker commitment.²⁹ In comparison, the new Scottish New Build Heat Standard which came into force this year has banned the use of oil and gas heating sources in new build homes.³⁰

Importantly, we do not believe that the FHBS alone is sufficient to drive demand for novel, low-carbon materials at the pace and scale needed.

Demanding Low Carbon Building Materials

Recommendation 3: The Government should explore policies and incentives to scale up the use of novel low carbon building materials in construction that it directly or indirectly procures.

Today, low carbon building materials are not price competitive with high carbon alternatives - with some startups reporting their products to be 30-40% more expensive per tonne than the lowest price high carbon alternatives. This is due to a number of factors, but the relative immaturity of the supply chain, and consequent lack of economies of scale are fundamental. The UK Government must play a bullish role in driving demand for these materials to reduce their cost and increase economies of scale.

We call on the Government to play a more active role in demanding low carbon building materials. This could take a number of forms and starts with a call for evidence on how to build the market for low-carbon building materials:

²⁸ <https://www.gov.uk/government/publications/heat-and-buildings-strategy>

²⁹

<https://www.theccc.org.uk/wp-content/uploads/2019/07/The-costs-and-benefits-of-tighter-standards-for-new-buildings-Currie-Brown-and-AECOM.pdf>

³⁰ <https://spice-spotlight.scot/2023/10/11/the-new-build-heat-standard/>

Inflation Reduction Act-style direct procurement: Explicit funding for low carbon, novel building materials, in the way that the US Government has demanded them through the Buy Clean Initiative, as part of the Inflation Reduction Act (IRA).³¹ The IRA contained \$4bn for the procurement of low-carbon steel, concrete, asphalt and flat glass, and the Buy Clean Initiative introduced mandatory reporting, including EPDs, for prospective suppliers. Since the introduction of the funding, there has been a 15% uptick in concrete EPDs.³²

Innovative procurement processes for small businesses: Under the 2023 Procurement Act, a new Competitive Flexible Procedure was introduced to enable earlier stage technology providers to access government procurement.³³ Under this new arrangement, contracting authorities within the Government “can run a multi-stage procedure, including research and development (R&D) stages, with interim assessments and funding”. This may be a useful way for earlier stage built environment technologies to get a foot in the door for certain appropriate projects.

Local authority demand: Local authorities could be encouraged to go beyond the minimum legal requirements set out by the Westminster Government. Today, they have the power to request enhanced environmental performance under the Planning and Energy Act 2008. However, in 2023, then Housing Minister Lee Rowley said in the Commons that local authority plan-makers were not expected “to set local energy efficiency standards for buildings that go beyond current or planned buildings regulations.”³⁴ As it stands, the Future Homes Standard only focuses on scenarios where exceptional circumstances may lead a local authority to relax environmental conditions.³⁵ To further incentivise the adoption of low carbon materials and practices, the standard could more bullishly discuss the role of local authorities in pushing prospective providers to go beyond the minimum standards.

Legal limits on embodied emissions: The Part Z campaign suggests that once embodied emissions have been added to the Building Regulations, there should be legal limits on the embodied emissions in new builds introduced by 2028.³⁶ If the government was to introduce legally mandated limits in this way it would further drive demand for low-carbon materials.

Reduce the allocation of emissions permits to construction raw materials under the UK emissions trading scheme (UK ETS): Reducing the number of emissions permits available to suppliers of materials in scope under the UK ETS would have the effect of accelerating the decarbonisation of the sector, so long as the Carbon Border Adjustment Mechanism (CBAM) prevents high-carbon materials being imported.

Increasing innovation grant funding for the low-carbon construction sector. According to our ClimateTech Index, in 2023 the value of the low-carbon building materials sector, which includes software and services firms decarbonising the construction sector, as well as firms developing hardware and manufacturing low-carbon raw materials, was £262m. These firms only received 18% of the total

³¹ https://www.transportation.gov/sites/dot.gov/files/2022-09/Signed_Buy_Clean_Policy_Statement.pdf

³² <https://oneclicklca.com/en/resources/articles/buy-clean-initiative-impact-american-concrete-manufacturers>

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<https://www.gov.uk/government/publications/transforming-public-procurement-our-innovation-ambition/transforming-public-procurement-our-innovation-ambition-html>

³⁴

<https://hansard.parliament.uk/commons/2023-12-13/debates/2312133100011/PlanningLocalEnergyEfficiencyStandards>

³⁵ <https://www.gov.uk/government/consultations/the-future-homes-and-buildings-standards-2023-consultation>

³⁶ <https://part-z.uk/>

grant funding awarded to firms in the built environment sector - to increase the maturity and diversity of these technologies, this share could be increased.

Fixing the Foundations

Once a building is standing, measuring its environmental performance is paramount to understanding its operational environmental impact. In the UK, Energy Performance Certificates (EPCs) form the key metric for domestic property energy use and environmental impact. For founders in the UK, EPCs should be a critical enabler in incentivising the adoption of technologies that decarbonise the built environment. Instead, however, the infrastructure and process that goes into producing an EPC locks out innovation, meaning startups do not face a level playing field to offer their products and services to homeowners.

EPCs are a critical part of the UK's strategy to decarbonise the domestic built environment and if we want to build differently, we need to understand how they work, and how well they're working.

EPCs: An Assessment

What are EPCs?

An EPC is a measure with two ratings, both rated on a scale of 1 to 100 and then split into bands (A to G, with A the best, and G the worst): an energy efficiency rating and an environmental impact rating.

The EPC for a new build is produced via the Standard Assessment Procedure (SAP), a process owned by the Building Research Establishment (BRE). The SAP has been updated multiple times over the last few decades, and most recently in 2022. In essence, the SAP produces a rating after aggregating information about a property. This information includes the footprint of the building, what it's made from, the number and glazing type of windows, and how the property is heated. After it has been produced, an EPC is valid for ten years.

For existing buildings, a version of the SAP is applied that is "simpler and lower cost", called the Reduced data SAP (RdSAP).³⁷ In practice, this means that the data points, including those listed above, are often assumed, based on the profile of the property. It is usually the case that under RdSAP, no actual measurements occur.

After the EPC has been produced, the property owner receives a document with four distinct sections: an overview of the property; the energy efficiency and environmental impact ratings; top actions and recommendations to improve these scores; and a summary of building features.

³⁷ <https://www.gov.uk/guidance/standard-assessment-procedure>

In the UK today, the median energy efficiency rating for domestic properties in England and Wales is band D.³⁸ Newer properties are more energy efficient than existing properties: in the first quarter of 2023, new properties in England received an average SAP rating of 84, corresponding to a band B, in contrast to existing properties which had an average rating of 68, which is a band D.³⁹

What's the purpose of EPCs?

EPCs are required for any properties that are being built, rented out or sold, and therefore have become an embedded cost of property ownership in the UK. When they were first introduced in 2007 under EU regulations, it was against the backdrop of equipping purchasers of houses with more information about their property. In line with this, the underlying SAP methodology is built around aggregating information and assuming behaviour to predict the cost of heating a home to 21°C.

EPCs have become the bedrock of enabling homeowners and tenants alike to be able to understand, compare, and potentially improve the efficiency of the property, as measured by energy use - ultimately enabling them to also increase the cost of heating buildings too. Critically, EPCs were *not* originally introduced as a metric to underpin climate change policy, and yet, over the last decade, they have become foundational in the Government's approach to decarbonising the built environment.

Startups that we have engaged as part of this work all agree that EPCs must be improved, with some suggesting they aren't worth the paper they're written on. Whilst we have sympathy for this, we also believe that we must not throw the baby out with the bathwater, and must ground improvements in the actual issues at play, as well as the underlying purpose of the EPCs in the first place. In the main, the criticism is threefold:

1. The Poor Quality of EPCs: in practice, EPCs are of shoddy quality
2. The Poor Quality of Methodology: The underlying methodology is flawed
3. EPCs are an Inadequate Metric to Support Climate Action: EPCs must change if they are to be used to drive climate policy, because they are primarily measures of operational cost today

The Poor Quality of EPCs

Firstly, there is significant evidence to suggest that EPCs are of poor quality today. Evidence gathered by researchers at Leeds Beckett University in 2019 predicted that 27% of EPCs in the open record displayed at least one flag to suggest that it was incorrect, and that the true error rate could be between 36% and 62%.⁴⁰ This analysis was based just on what had been reported. Elsewhere, a widely reported

³⁸

<https://www.ons.gov.uk/peoplepopulationandcommunity/housing/articles/energyefficiencyofhousinginenglandandwales/2023>

³⁹

<https://www.ons.gov.uk/peoplepopulationandcommunity/housing/datasets/energyefficiencyofhousingenglandandwalesfiveyearsrolling>

⁴⁰ <https://eprints.leedsbeckett.ac.uk/id/eprint/5844/>

analysis in 2023 by CarbonLaces for the Sunday Times found that some EPCs overestimated energy use for properties by up to 344%, based on analysis of smart meter data.⁴¹

How could this be? On the one hand, we heard from founders in the sector that EPC assessor quality is unreliable, and that there is a shortage of assessors available on the market, meaning a lack of competition driving up quality. On the other hand, we also heard that the underlying methodology means that assessors aren't set up to succeed.

The Poor Quality of Methodology

As the CCC has identified, the underlying methodology behind the EPC is severely limited.⁴² Firstly, the underlying methodology behind an EPC, the SAP, only covers "regulated energy use", excluding anything that is not heating, hot water or lighting. Secondly, the SAP is often reliant on underlying assumptions that are frozen in time, including available technologies, carbon density of fuel, fuel costs and the Coefficient of Performance for technologies. Thirdly, as the energy efficiency rating is intrinsically a cost rating, it means that the actions recommended to a property owner will correspond to cost too, and not necessarily long term decarbonisation. The reduced-data version of the methodology, the RdSAP, is an even more flawed methodology by definition, with a high number of embedded assumptions failing to accurately reflect key components of an existing building that materially impact its efficiency. For instance, airtightness does not feature in the RdSAP at all.

The Government has long known that the SAP and RdSAP are not functioning well. In response it has commissioned trials of more elaborate home efficiency performance, including the SMETERS scheme in 2021 where providers used algorithms to calculate the Heat Transfer Coefficient (HTC) of occupied homes from smart meter data.⁴³ The HTC represents the heat lost from a building, through the walls, roof, floor and windows. A form of HTC is included in the SAP but not to the same degree as under the SMETERS trial.

From next year, the SAP will be replaced by a new Home Energy Model (HEM), which the Government consulted on at the start of 2024.⁴⁴ Though the final version is yet to be released, the model as consulted on looks set to be more complex and granular than the SAP with more detailed data gathering requirements around heat loss for example. The HEM also looks set to be more transparent than the SAP, with its underlying methodology and assumptions made public. Startups we engaged with in this work believe that the HEM is a step forward, but highlighted that the degree of granularity and how the HEM would function in practice remain unknown. Additionally, we are yet to see how the Reduced data HEM (RdHEM), which will replace the RdSAP for existing homes, will function.

⁴¹

<https://www.thetimes.com/life-style/property-home/article/why-misleading-epc-ratings-are-a-national-scandal-ztc5ss2b0>

⁴²

<https://www.theccc.org.uk/wp-content/uploads/2023/02/Annex-Reform-of-domestic-EPC-rating-metrics-to-support-delivery-of-Net-Zero.pdf>

⁴³

<https://assets.publishing.service.gov.uk/media/61f2cc5bd3bf7f78e80cb8bf/smeter-innovation-competition-report-executive-summary.pdf>

⁴⁴ <https://www.gov.uk/government/consultations/home-energy-model-future-homes-standard-assessment>

Regardless, whilst the underlying methodology looks set to improve under the HEM, this does not solve the issue of the final metric, and this has become additionally important because of how much now rests on the A-G grade.

EPCs are an Inadequate Metric to Support Climate Action

EPCs are no longer just a metric to support property owners to reduce the cost of running their home. Today, EPCs are used by the UK Government as a foundational policy lever to support climate action. The CCC identified that during the last Government there were at least 14 policies that include the EPC as a defining measure of success across the UK, including targets for private-rented homes, social housing and “fuel-poor” homes in the 2021 Net Zero Strategy, different targets in Scotland and Wales, and the minimum energy efficiency standard (MEES) for landlords.⁴⁵

For these policies to work, it is fundamental that the EPC is framed around the outcome of decarbonisation, but the EPC as it exists today is an inappropriate measure to be using: as discussed above, its underlying methodology is flawed, and it does not incentivise optimal environmental outcomes. Most notably, the adoption of a heat pump is often disincentivised, as in some cases a heat pump can be more expensive than a new gas boiler, particularly due to the imbalance in gas and electricity prices.⁴⁶

Today we are asking the single letter EPC grade to do too much: it is not possible to effectively signal running cost-comparisons for prospective households whilst simultaneously driving optimal climate action in an outcomes-oriented way. We can take steps towards making these two outcomes coalesce, which we discuss below, but instead, we believe that reform of the metric itself is long overdue, and have been calling for changes for the last few years.⁴⁷

Our Solution: Reforming EPCs

EPCs were originally introduced under EU regulations but the 2023 Energy Act gives the UK Government the ability to change EPCs in England and Wales, with the same powers devolved to Scotland and Northern Ireland. It's time these new powers were used, and we welcome the Government's commitment in September 2024 to bring forward a consultation. This is the first step in upgrading EPCs.

Improving the EPC Metric

In 2023, the CCC wrote to both UK Housing Minister Lee Rowley MP and Scottish Net Zero Carbon Buildings Minister Patrick Harvie MSP outlining that the EPC metric should be changed.⁴⁸ Instead of a single letter A-G grade, the EPC should consist of four primary metrics, three letters and a number:

⁴⁵

<https://www.theccc.org.uk/wp-content/uploads/2023/02/Annex-Reform-of-domestic-EPC-rating-metrics-to-support-delivery-of-Net-Zero.pdf>

⁴⁶ <https://www.theccc.org.uk/wp-content/uploads/2019/02/UK-housing-Fit-for-the-future-CCC-2019.pdf>

⁴⁷ <https://startupcoalition.io/u/2023/11/ClimateTech-Report-November-2023-FOR-RELEASE.pdf>

⁴⁸

<https://www.theccc.org.uk/wp-content/uploads/2023/02/CCC-Letter-Reform-of-domestic-EPC-rating-metrics-to-Lee-Rowley-MP.pdf>;

<https://www.theccc.org.uk/wp-content/uploads/2023/02/CCC-Letter-Reform-of-domestic-EPC-rating-metrics-to-Patrick-Harvie-MSP.pdf>

- 'Energy': Total energy use intensity (kWh/m²/yr)
- 'Fabric': Space heating demand intensity (kWh/m²/yr)
- 'Heating': Heating system type (categories of heating system, ranked from 1 to 6)
- 'Cost': Energy cost intensity (£/m²/yr)

Under this new design, the best in class property would be AA1A, and the worst GG6G. Breaking apart the single metric in this way would enable the EPC to better perform the two functions we are asking it to play today: enabling a homeowner to understand the operational cost of heating their home, and enabling the Government to build policy around accelerating the built environment's journey to net zero, as identified in Chris Skidmore's Independent Review of Net Zero.⁴⁹ This new approach is also similar to what the Scottish Government intends to do as outlined in its 2023 consultation.⁵⁰ In our view it is aspirational to have as much alignment across the country to reduce complexity and improve public awareness.

Importantly, Startup Coalition would want a clear line of accountability and transparency around the categorisation of heating systems, and does not believe that the CCC's approach of picking winners is the best we can do. Under its current recommendations, the CCC has categorised the main heating systems 1 to 6, with a heat pump at the top, and a fossil fuel boiler at the bottom.⁵¹ Such a prescriptive approach is prone to quickly become out of date and would also lock out innovation. For instance, infra-red heating is not listed, and also works in a fundamentally different way as it does not heat the air.

Instead of picking a menu of technologies based around the state of play at a given point in time, this ranking should be dynamic, with heating technologies ranked based on their operational emissions. This would also enable 'flexibility' to be incorporated into the rating system, insofar as a heating system type enables the adoption of time of use tariffs to optimise energy consumption based on carbon intensity. Further, new technologies, such as those being pioneered by UK startups, would then also be able to join the ranking instead of being locked out.

In addition to the new metric, we also believe that EPC validity should reflect how important up to date information is to take meaningful action to reduce the environmental impact of homes. To this end, the default validity of an EPC should halve to five years, meaning they are refreshed twice as frequently as they are today. Moreover, they should also be required to be updated every time there is a change of occupancy, including both new owners and new tenants.

Improving the Transparency of the EPC

We believe that the transparency of EPC metric can be improved in two ways. Firstly, by making the algorithm for the HEM open source, once it has been designed, this would increase the number of providers able to then calculate EPCs, and also enable startups and innovators to build services on top of EPCs.

⁴⁹

<https://assets.publishing.service.gov.uk/media/63c0299ee90e0771c128965b/mission-zero-independent-review.pdf>

⁵⁰ <https://www.gov.scot/publications/energy-performance-certificate-epc-reform-consultation/>

⁵¹

<https://www.theccc.org.uk/wp-content/uploads/2023/02/Annex-Reform-of-domestic-EPC-rating-metrics-to-support-delivery-of-Net-Zero.pdf>

Secondly, and linked to this transparency but focusing on the end user, the data that feeds into EPCs should be portable for households. This can be made possible under the powers set to be introduced under the Digital Information and Smart Data (DISD) Bill. Smart Data is the application of real-time data portability through regulation, meaning individuals can consent to share their data between providers quickly and securely, with no need to share credentials or passwords. Over ten million UK consumers have used Smart Data to port their financial data under Open Banking, and we believe that homeowners should have the ability to do the same with their EPC metric, and its underlying data. Today, the data that is accessible for EPCs is too high level, with more granular data required. We've heard from startups in the built environment that making the data that feeds into an EPC portable would increase their ability to offer value to prospective homeowners, and also to current home occupiers to make informed decisions about how to increase the environmental efficiency of their home.

Recommendation 4: The EPC metric must be reformed in line with the CCC's recommendations, be changed to renew every five years, and the metric's transparency be improved for both industry and households.

Practically, we must recognise that the HEM and this revised metric will increase the complexity of an EPC assessment. Startups that engaged in this work frequently flagged that even if the HEM and EPC were optimised, they are only as good as the work undertaken to record them. To this end, ensuring that there is an ambitious and realistic plan to increase the workforce able to decarbonise our built environment is fundamental.

Energy Performance in Non-Domestic Buildings - Measuring Use

The above analysis outlines an approach to modernise and improve the metrics that underpin policy to decarbonise the built environment in the UK across dwellings and non-domestic buildings that are required to have an EPC. One of the additional concerns often raised about EPCs is the fact that they refer to the design of the building, rather than its actual performance. However, for homes, measuring performance in practice must be voluntary to avoid overly invasive measures on households. In contrast, for non-domestic premises, particularly larger buildings, there are ways in which we can move towards measuring usage to then better incentivise the adoption of technology that is focused on the outcome of decarbonisation.

For public buildings, a Display Energy Certificate (DEC) is required, displaying the actual energy use of the building in an EPC-style A-G metric. For other non-domestic buildings there are other metrics that building owners can voluntarily opt in to, including the BREEAM assessment owned by BRE. Like EPCs, however, BREEAM assesses designed performance, rather than actual performance. For this reason, in 2020 BRE introduced NABERS UK, a UK version of the Australian building performance metric that measures resource use of non-domestic buildings across energy, water, waste, and indoor environment.⁵² The end metric is a star rating out of six. Unlike in Australia, however, a NABERS rating is not mandated for non-domestic buildings in the UK. We believe making this assessment mandatory should be explored by the Government.

Recommendation 5: As part of reforming EPCs, the UK Government should consult on whether to make the NABERS rating mandatory.

⁵² <https://www.nabers.gov.au/about/nabers-international/nabers-uk>

Rebalancing Gas and Electricity Prices

Finally, to ensure policies to accelerate the decarbonisation of the built environment, the UK Government must speed up plans to address the rebalancing of gas and electricity prices, known as the “spark gap”. Today, the UK has one of the highest spark gaps in Europe, with the ratio up to over 4:1 between electricity and gas prices, caused by numerous factors including the increased cost of electricity from gas generators due to levies not then applied to gas for domestic heating.⁵³ So long as electricity prices are distorted in this way, electrified low carbon technologies will be at a disadvantage.

Recommendation 6: The UK Government must rebalance gas and electricity prices.

To aid this rebalancing, we also believe that the UK government will need to think creatively about how to increase the economic efficiency of an electricity grid powered by an increasing number of decentralised, distributed renewable resources. On the one hand, ensuring that “firm power” base-load generation is invested in and increased is important, either through nuclear, including small modular reactors, or battery storage capacity. On the other hand, utilising Virtual Power Plants (VPPs), whereby a collection of distributed energy producers is aggregated under a single supplier, is also important to consider. For VPPs to scale, robust security and interoperability standards may be required.

Startup Coalition will soon be exploring further steps the UK Government could take to accelerate the use of technology as part of Labour’s decarbonisation of the UK energy grid, including specifically exploring the role of Great British Energy.

⁵³ <https://www.lowcarbonhub.org/p/spark-gap/>

Case Study: Kestrix

Kestrix is the "Google Maps of heat loss" – they commission thermal drones flights over whole neighbourhoods at a time, and are developing AI tooling to map heat loss from buildings in 3D, ascertaining key heat-loss metrics like U-values and energy use, and then generating plans to make those buildings more energy efficient. Its north star is to become the automated, non-invasive energy surveyor – the data layer to power a retrofit revolution.

For Kestrix, existing methods of measuring heat loss and designing retrofit roadmaps are either criticised for inaccuracy (like EPCs in the UK) or unscalable and expensive considering the scale of the task at hand (manual retrofit surveys). There is also no inexpensive, non-invasive way to verify that retrofits have been done properly; making it hard to prove when installers have done a good job, and meaning avoided emissions from insulation measures are difficult to prove.

Kestrix supports the reform of EPCs to enhance interoperability between data sources and advocates for the sector's proposed transition from the SAP to the HEM to inform EPCs and Energy Efficiency Ratings (EER). These changes should accelerate the adoption of digital technologies like Kestrix's Rapid Thermal Performance Assessment algorithms which estimate component and whole-home U-values and kWh/m²/yr. Alongside heat maps, historical data, and smart meters, Kestrix tech complements on-site surveyor inputs, valuable time, money, and labour efficiencies, alongside more accurate outputs are achieved by uncovering details that are invisible to the naked eye.

This technologically integrated approach sets the stage for precision retrofitting, allowing for the prioritisation of the most critical homes and enabling robust verification and tracking of net zero Progress.

Lucy Lyons, Founder of Kestrix, shared with us that "100m buildings require insulation in Europe alone for net zero buildings targets to be met. But if we have no way of knowing where exactly heat is being lost, what can be done to fix it, or whether insulation is actually working without going inside the home, how can we as a sector possibly be expected to rise to the challenge?"

Retro-Fit for the Future

Through building better in the first place and then improving the underlying metrics by which we measure the environmental performance of buildings, we have the first steps in building differently. But for the majority of homes in the UK that are already built, we then need to retrofit to reduce their environmental impact and save household bills. A key way to do this is to employ cutting edge technologies, and startups across the UK are providing the tools and hardware to deliver effective retrofitting. According to our ClimateTech Index, 42 of the 1,000 most valuable UK ClimateTech startups are from the retrofit sector, providing services or products, including heat pumps and on site renewable energy production, to support existing buildings to reduce their environmental impact, increasing efficiency and reducing operational costs. These firms have collectively raised over £345m over the last 13 years, were worth £318m at the end of 2023, and in 2023 the sector employed over 780 people directly from across the UK.

However, these firms are being held back by an inefficient and fragmented approach to retrofitting in the UK, which in turn stunts the growth of the nation's retrofit startups. It's time we fixed this, starting with ensuring that the best in class technology is made available to households, particularly where the government is supporting with financing.

Government Support for Retrofit

There are numerous schemes that the UK Government uses to incentivise retrofitting in the UK today, including:

- The Local Authority Decarbonisation (LAD) scheme, aims for as many social homes as possible to be improved to Energy Performance Certificate (EPC) band C by 2035
- The Home Upgrade Grant (HUG), which provides decarbonisation support for households in the least energy efficient, gas-heated homes.
- The Social Housing Development Fund (SHDF), which seeks to improve the energy performance of social rented homes in England.
- The new Energy Company Obligation (ECO) scheme, which requires large energy suppliers to install energy efficiency and heating measures to people's homes across Great Britain.⁵⁴ ECO4 is the latest version of this scheme.
- Great British Insulation Scheme (GBIS), introduced in 2023 to complement the ECO scheme, but expanding support to more households and targeting specific insulation measures.
- The Boiler Upgrade Grant (BUG), which offers a £7,500 grant to anyone buying a heat pump. In 2023, the scheme was extended to 2028.⁵⁵

⁵⁴ <https://committees.parliament.uk/publications/22427/documents/165446/default/>

⁵⁵

<https://www.gov.uk/government/news/shapps-sets-out-plans-to-drive-multi-billion-pound-investment-in-energy-revolution>

- The Optimised RetroFit (ORP) is a scheme run by the Welsh Government to enable social landlords and local authorities to access retrofit measures.⁵⁶
- Home Energy Scotland and Warmer Homes Scotland are schemes whereby the Scottish Government will support with full or partial subsidisation of retrofit measures, either through a loan or a grant.⁵⁷

Analysis elsewhere has suggested that these schemes, though partially successful, are insufficient. In its 2024 progress report, the CCC highlighted that a “substantial” increase in heat pump installation is required and that the UK still has “one of the oldest and worst insulated” housing stocks in Europe.⁵⁸ This report does not seek to add to this analysis, but instead focus on the role of cutting edge technologies in the schemes. Importantly, if we are serious about accelerating climate action in the built environment then we should be leveraging the best technologies and building systems and subsidies that incentivise and accommodate the adoption of these. This in turn builds the market for these startups, and enables them to grow and scale, supporting our goal of enabling the UK to become a key source of export for the global low carbon economy.

The Challenge: Cutting Edge Retrofit

For the past two years, Startup Coalition has highlighted that the systems and standards within the retrofit sector today do not accommodate innovation. Indeed, in our most recent ClimateTech policy report in November 2023, we exposed a critical gap for some innovative startups in the built environment sector: in order for vendors of cutting-edge technologies to offer their products under schemes including the ECO, the SHDF and the HUG, the PAS 2035 standard requires that they must be installed to a set of requirements for that technology’s “measure type”. For firms that provide new technologies, there is no “measure type” to adhere to, and consequently they are locked out of the scheme.

The challenge of how to access these schemes is more profound for firms, however, with the convoluted bureaucracy of retrofit offering no logical gateway for firms to raise issues, and offer solutions, to accelerate the use of innovative tech in these schemes. Firms also face a near insurmountable challenge identifying the right decision maker to change this, with multiple actors unable or not willing to claim ownership, including the BSI, Trustmark, Ofgem and central government. This is compounded by the fact that retrofit startups have only received an average of £540,000 in direct government grant funding over the last five years according to data from our ClimateTech Index. Government funding support is scarce through direct (e.g. UKRI grants) and indirect (e.g. through domestic retrofit schemes) routes. As it stands, this is an obstacle to achieving Professor Dame Angela McLean’s call in her “Pro-Innovation Regulation of Technologies Review: Advanced Manufacturing” for “greater testing and piloting of innovative solutions in the built environment”.⁵⁹ Therein lies the solution and the opportunity. We must exploit the asset of the innovative built environment sector, and this starts by building a front door for them.

⁵⁶ <https://www.gov.wales/optimised-retrofit-programme>

⁵⁷ <https://www.mygov.scot/energy-saving-funding>

⁵⁸

<https://www.theccc.org.uk/wp-content/uploads/2024/07/Progress-in-reducing-emissions-2024-Report-to-Parliament-Web.pdf>

⁵⁹

https://assets.publishing.service.gov.uk/media/65562168046ed4000d8b9a38/Annex_A_GCSA_to_CX_-_Advanced

A Retrofit Sandbox

In 2024, the BRE launched RetroNetZero, a “Network” to “guide innovators through the regulatory aspects of deploying products into domestic retrofit.”⁶⁰ RetroNet Zero acts as a gateway for innovative firms to understand the requirements for approval, be signposted to the right processes and organisations, and to feed in opportunities to iterate and improve the process. It is an excellent start. To really unlock the opportunity of RetroNetZero, however, it needs a new home to maximise its potential, else large incumbents and the standards bodies themselves may not embrace change. To do this, there is nowhere better than the Labour Government’s new Regulatory Innovation Office (RIO).

Recommendation 7: The Labour Government should introduce a retrofit sandbox as a first initiative under its Regulatory Innovation Office.

In their manifesto, Labour outlined plans to introduce the RIO to “help regulators update regulation, speed up approval timelines, and coordinate issues that span existing boundaries”. A retrofit sandbox would be a perfect test case for the RIO, bridging together the multiple disparate parts of the retrofit sector to streamline innovation onboarding, and then update the underlying processes. This would also accelerate a pivot in the sector towards an outcomes-oriented approach hyper focused on decarbonisation. Further, there is an additional opportunity for the sandbox to be used to support innovative technologies in the building of homes in the first place, thus supporting our third recommendation of increasing demand for low carbon building materials and services.

The introduction of a retrofit sandbox would go some way to accelerating the use of best in class technologies in the retrofit sector, but we also need to improve financing opportunities if we are to see adoption at the levels required to meet our net zero goals.

⁶⁰ <https://events.bregroup.com/wp-content/uploads/2024/07/RNZ-project-overview-June24-v2.pdf>

Case Study: Airex

Airex is a climate tech company with a mission to tackle fuel poverty and climate change through novel, cost-effective smart home solutions. They have designed and manufactured the world's first smart air brick that helps householders and landlords reduce their energy demand while managing air quality in homes. The AirEx brick is a smart ventilation control that replaces existing air bricks at a sub-floor level (under the floorboards). The AirEx bricks have built-in sensors to measure the environmental conditions (such as temperature and relative humidity) and use smart software algorithms to automatically regulate airflow. Each brick closes to reduce heat loss and improve thermal comfort but opens to reduce humidity and stop mould and damp. Robust trials have shown that AirEx Floorvent can save an average of 12% of whole home heat loss which led to the system being included in SAP (EPC). For most homes, AirEx can contribute 2-5 EPC points.

A recent project highlighting the energy-saving impact of AirEx Floorvent was carried out by Warmworks, the primary contractor for the Warmer Homes Scotland scheme, which focuses on improving energy efficiency for households at risk of fuel poverty. Warmworks has recommended Floorvent for all homes with suspended floors, and as of August 31, 2024, 1,075 households have had the system installed. This has resulted in a lifetime reduction of 6.7 million kg in CO2 emissions and combined annual fuel cost savings of £1,474,900 for residents. The partnership has been highly successful, delivering enhanced energy efficiency, increased comfort for residents, and significant environmental and financial benefits.

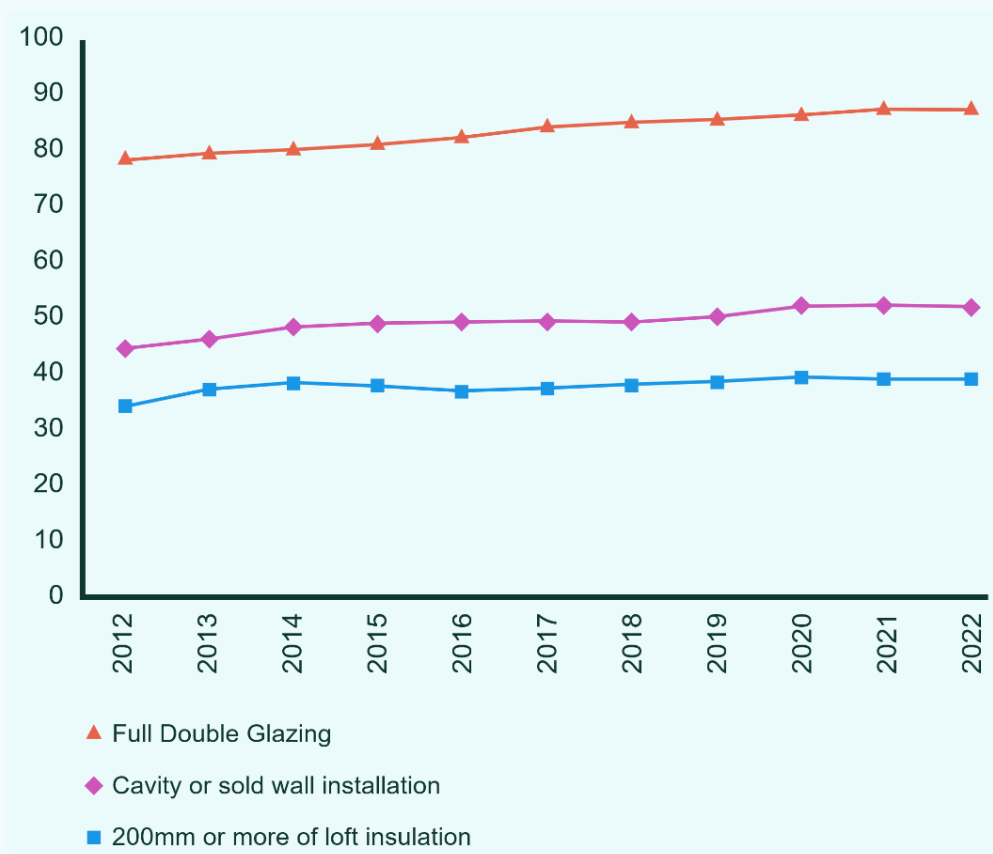
To unlock the full potential of innovative retrofit technologies in tackling fuel poverty and reducing carbon emissions, we believe there must be a clear, streamlined route for their introduction into government and energy supplier-funded fuel poverty programmes. This need is urgent, as technologies such as AirEx Floorvent are already available and capable of making a significant impact, yet are hindered by existing bureaucratic barriers. This change of approach should include clearly defined roles and responsibilities of regulators involved in the evaluation of new retrofit solutions being clearly defined and transparency around the assessment of the suitability of these technologies. It is also imperative that authorising organisations are held accountable for timeliness to avoid this approval process becoming a bottleneck.

Agnes Czako, CEO and co-founder of Airex told said that "AirEx's Floorvent system is one of a number of newer, but well established, technologies that are able to meaningfully contribute to the UK's climate and fuel poverty targets. However, despite being tested and certified by all relevant bodies, red tape is currently preventing the fuel poor households who need help the most benefitting from innovative these products. By cutting through this red tape, the new government has an opportunity to pave the way for lower cost, higher impact innovations to decarbonise our housing stock and reduce fuel poverty."

Fixing Retrofit Financing

One of the major obstacles to retrofitting the domestic built environment is cost. Indeed, Social Market Foundation research from 2022 found that over a quarter of households that had not insulated their homes stated affordability as the main obstacle.⁶¹ In practice, the costs of retrofitting measures are wide ranging, from as little as £440 for insulating the loft of a semi-detached house, to over £9,000 in fixed up front costs for the installation of a ground source heat pump.⁶² This barrier to financing is one of the reasons that the percentage of homes with cavity or solid wall insulation installed has barely increased over the last decade.

Insulation Measures in Dwellings, 2012 to 2022⁶³



To fix the retrofit financing challenge, we pose two possible solutions: property-linked finance, and a salary sacrifice scheme.

⁶¹ <https://www.smf.co.uk/wp-content/uploads/2023/03/Lagging-behind-March-2023.pdf>

⁶² <https://www.theccc.org.uk/wp-content/uploads/2020/12/Sector-summary-Buildings.pdf>

⁶³

<https://www.gov.uk/government/statistics/chapters-for-english-housing-survey-2022-to-2023-headline-report/chapter-5-energy-efficiency>

Property Linked Finance

The Green Finance Institute (GFI) has trailblazed with highlighting the potential opportunity presented from innovative green home financing models, including the Green Mortgage.⁶⁴ They have also outlined the potential opportunity presented by property-linked finance. In essence, the challenge of retrofit financing is often a challenge of access to low-interest, long term capital, combined with homeowner uncertainty about the return on investment presented by retrofitting a property. If a homeowner plans to sell within a few years, it is uncertain whether retrofit investments will payback in time, or if the retrofit investment will break even with an uplift on sale price. To remedy this, the GFI suggests creating loans attached to properties rather than individuals, or property-linked finance.⁶⁵ The concept is similar to the Property Assessed Clean Energy (PACE) Programs in the US which has financed over \$5bn in domestic retrofits to date.⁶⁶

For households this would mitigate the risk of investing in retrofitting measures, and in practice the net-increase in the cost of a home would likely be marginal.

Recommendation 8: The Government should explore whether enabling legislation is required to accelerate the use of property-linked finance mechanisms to fund retrofits.

A Salary Sacrifice Scheme

Alternatively, we heard from multiple startups as part of this engagement that another way to reduce the barriers to financing retrofits in the UK would be through introducing a salary sacrifice scheme for retrofits. Today, there are numerous salary sacrifice schemes available, whereby an employer enables its employees to forgo some of their pre-tax salary to fund a purchase over time. These are:

- Workplace Pension
- A Cycle to Work Scheme
- Qualifying Technology including laptops, mobile phones and TVs
- Workplace Childcare
- Electric Vehicles

Introducing a scheme for domestic retrofitting could conceptually work identically to these schemes, with the Government defining eligible vendors and technologies. It is critical that there is a clear route to eligibility for vendors framed around adherence to defined outcomes (e.g. improving a reformed EPC), instead of a list of eligible technologies and vendors being carved in stone with the launch of the scheme. Whilst insulation, solar and battery storage will always likely be critical retrofit technologies, innovation will likely improve these. Further, it may also be appropriate to include a “price” outcome as a condition for vendor eligibility, as the salary sacrifice mechanism may not be appropriate in all cases.

Recommendation 9: The Government should consult on the merits of introducing a salary sacrifice scheme to fund domestic retrofits.

⁶⁴ <https://www.greenfinanceinstitute.com/products-solutions/green-mortgages/>

⁶⁵ <https://www.greenfinanceinstitute.com/products-solutions/property-linked-finance/>

⁶⁶ <https://www.energy.gov/scep/slsc/property-assessed-clean-energy-programs>

Case Study: Kamma

Reliable data is essential for everything from policy decisions to identifying which buildings need retrofitting to optimising the approach to doing so. Current data sources, such as EPCs, are outdated or inaccurate, leading to poorly informed decisions, wasted budget and slow progress towards net zero targets. Without precise insights into emissions and retrofit potential, it is difficult to size the problem, assess solutions or prioritise actions that would make the most impact on reducing carbon. Perhaps most damaging of all, offering sub-optimal retrofit recommendations with overstated pricing and out of date energy savings paints a worse picture of the benefits of retrofit. A lack of understanding is one of the main reasons the UK's notoriously old and leaky housing stock has been so slow to improve, despite the many benefits of doing so.

At Kamma, rather than waiting for EPC reform, they have built the most advanced climate dataset for the entirety of the UK's property sector by layering multiple climate data sources together. Their data engine aggregates millions of data points, generating detailed environmental profiles for every property in the UK. These profiles offer essential metrics, including carbon emissions, climate risk assessments, and personalised retrofit recommendations. These insights equip the property sector with actionable pathways to enhance energy efficiency and achieve net zero targets.

By leveraging this powerful data, Kamma's data powered tools enable businesses in mortgage lending, real estate, and the public sector to navigate the complexities of climate reporting, meet stringent sustainability targets, and engage consumers with clear, informed guidance on their own net zero journey.

Contributing to this report, Orla Shields, Founder of Kamma said "the primary hurdles hindering retrofit adoption—miscommunication of benefits, underwhelming private sector initiatives, and the affordability crisis—are critical to our understanding and approach. The Salary Sacrifice Scheme for Retrofit directly tackles these issues by offering a well-articulated, economically viable, and accessible solution.";

Empowering Households

To ensure that the building blocks outlined above fulfil their decarbonisation potential, we must return to the homeowner, renter or occupier of the building. Minimising the embodied emissions of a building will ensure that the foundations for a low carbon built environment are laid, while a meaningful EPC metric will underpin both informed decision making by a homeowner, and effective government policy. Ensuring that the best technology is accessible via retrofit schemes, and that these technologies are affordable is also vital. But on top of all of this, we must empower households to use energy in their homes optimally.

As we outlined in our November 2023 report, there is a plethora of startups already delivering value to businesses and consumers through being able to use the data associated with their energy usage.⁶⁷ According to data from our 2023 ClimateTech Index, 18 of the 1,000 most valuable UK ClimateTechs are providing energy management products and services for the built environment. They have collectively raised over £171m over the last 13 years, and were worth a combined £243m at the end of 2023. From better value tariffs, to flexible and greener supply, data can unlock all sorts of innovation. Today, however, data is often challenging or not possible to access, and even if it can be accessed with consumer consent, it is unstructured and of inconsistent quality.

Issues like this exist across the economy, but there is a precedent that has demonstrated the innovation possible when regulation is used to accelerate digitalisation. Today, over ten million consumers have used solutions powered by Open Banking, and Startup Coalition data in April 2023 found the value of the UK based Open Banking sector to be in excess of £4bn.⁶⁸ The energy sector could offer the next Open Banking-style success: data is available via smart meters, but often siloed and only available at great expense, and there is consumer demand to access it, as proven by UK startups already enabling portability of this data, such as [Perse Energy](#). Startup Coalition is also part of the Steering Group of [Project Perseus](#), a trailblazing initiative seeking to automate small business emissions reporting.

This is where the Digital Information and Smart Data (DISD) Bill, announced in the King's Speech this year, will be key. Under the last Government, energy was confirmed as one of seven priority sectors to be deployed under the Bill, but we are yet to see Labour's priorities. In the meantime, in August 2024, Ofgem launched a consultation on data portability consent models - part of its own approach to data sharing in the energy market.⁶⁹ This initiative is welcome, but there is a risk of fragmentation if sectors advance with their own initiatives ahead of the cross-sector framework to be introduced under the DISD.

We believe that the Energy Smart Data scheme should be prioritised, where smart meter data is made accessible under a regulated regime of interoperable APIs, with consumer consent. It will require a consultation to understand which datasets and data holders will be required to act, and this can occur in parallel with the passage of the DISD.

Recommendation 10: DESNZ should expedite a consultation on a Smart Data scheme for the energy sector.

⁶⁷ <https://startupcoalition.io/u/2023/11/ClimateTech-Report-November-2023-FOR-RELEASE.pdf>

⁶⁸ <https://startupcoalition.io/news/the-4bn-open-banking-ecosystem/>

⁶⁹ <https://www.ofgem.gov.uk/consultation/consumer-consent-solution-consultation>

Case Study: Switchee

The first B-Corp certified technology partner in social housing, Switchee's mission is to utilise the power of data to support social housing providers to improve the quality of life for their residents. We aim to deliver more control to residents through its Switchee device, allowing them control of their heating and hot water, and improve communication between tenants and landlords. Switchee's efficient and unobtrusive in-home display collects over 16 billion data points annually, transforming the management and delivery of housing services.

17% of UK households live in social housing, provided by local authorities or private, registered providers. With the UK's housing stock being the oldest in Europe, these homes are often expensive to heat and prone to issues such as damp and mould. At the same time, the cost of living crisis has exacerbated the issue and impacted millions. New figures from Ofgem highlight that energy debt has reached record levels of £3.3 billion, with the NEA predicting that 6 million people will be in fuel poverty this winter. Fuel poverty is a catalyst for wider health issues impacting vulnerable households, as well as exacerbating issues such as damp and mould.

Real-time Switchee intelligence empowers landlords and local authorities to identify in-home hazards such as damp and mould, optimise property performance, and help reduce heating bills for residents by up to 17%. Leveraging data that informs, measures, and improves retrofit interventions enables housing providers to improve the quality of their existing housing stock. Over 130 social housing providers partner with Switchee to help ensure safe, warm, and healthy homes. Plus, the device itself cuts carbon emissions by optimising residents' heating.

The potential for Switchee's data to be harnessed by policymakers to improve the social housing stock is significant, and offers an unparalleled window into the issues facing the social housing sector. We want to collaborate and coordinate with policymakers to ensure our data and insights are used effectively to improve national social housing stock.

Helen Langley, Senior Support Officer, Dudley Metropolitan Borough Council, said of the council's partnership with Switchee that "engaging with our tenants is very important to us and the Switchee messaging service gives us a new, exciting way of offering information and support to help residents to afford to heat their homes."

Case Study: Oak Network

OAK Network is offering a revolution in how we power the present to collectively decarbonize the future using data. Their approach is rooted in facts, science, technology, common sense, and measurable impact. It empowers users to choose the type of energy that best supports & powers their vision of a clean world.

OAK offers four products to deliver this revolution in energy data:

- Performance Reporting: providing automatic reporting on mandatory consumption emissions and insights into the timing, methods, and reasons behind your energy bills. Data is collected via API from the main billing meter.
- Insights Reporting: generating savings recommendations and insights from collected data, helping businesses advance their Net Zero Journey. Data is collected via API from the main billing meter. Expected savings range from 3% to 6% if recommendations are implemented.
- Live Monitoring: a live monitoring service that offers real-time data management and recommendations through a web-based platform. With live data, they anticipate savings of 5% to 25% if recommendations are followed, covering the main meter and up to four appliances.
- Net Zero Services: through their OAK packages, OAK's Digital Sustainable Services provide unlimited benchmarking for tech and infrastructure financing, maintenance optimizations, and Energy modelling all backed by 3rd party funding.

OAK works in such a way that as more members join the network, price stabilisation and energy reductions are optimised, and users can then use the insights gained to access funding options including debt financing, Energy as a Service models, and Green Bonds.

The Network is also committed to donating 9% of membership fees to support their educational non-profit, The OAK Garden, which inspires primary and secondary school students to engage in their Net Zero Future. Their academic-based non-profit, OAK LAB, then offers research programs to universities and their ISO 14064-certified carbon offsetting partner, enhancing the impact of OAK membership with every data point.

To date, OAK has provided decarbonization plans and support to SME business in York in partnership with a local authority, enriching their data and providing them with reduction recommendations. OAK has also partnered with the European Association of Manufacturers to develop detailed tools and services to provide manufacturing businesses with the ability to report based on emissions as required by the EU starting 2025 for any businesses wanting to import their products.

Our Blueprint to Build Differently

Recommendation 1: Create a holistic strategy for decarbonisation of the built environment from breaking ground to household use. This is our top, and most complex, recommendation for the Government.

Recommendation 2: The UK Government should mandate embodied GHG emissions reporting for new builds.

Recommendation 3: The Government should explore policies and incentives to scale up the use of novel low carbon building materials in construction that it directly or indirectly procures.

Recommendation 4: The EPC metric must be reformed in line with the CCC's recommendations, be changed to renew every five years, and be made available under a Smart Data Scheme.

Recommendation 5: As part of reforming EPCs, the UK Government should consult on whether to make the NABERS rating mandatory.

Recommendation 6: The UK Government must rebalance gas and electricity prices.

Recommendation 7: The Labour Government should introduce a retrofit sandbox as a first initiative under its Regulatory Innovation Office.

Recommendation 8: The Government should explore whether enabling legislation is required to accelerate the use of property-linked finance mechanisms to fund retrofits.

Recommendation 9: The Government should consult on the merits of introducing a salary sacrifice scheme to fund domestic retrofits.

Recommendation 10: DESNZ should expedite a consultation on a Smart Data scheme for the energy sector.

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